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Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

May 1, 2014

Mr. Russell Schreiber, P.E., Director of Public Works
City of Wichita Falls
P.O. Box 1431
Wichita Falls, TX 76307-1431

Subject: City of Wichita Falls – PWS ID No. 2430001
Notice of Deficiencies in the Emergency Direct Potable Reuse Project Full-Scale Verification Test (FSVT) Report
Response to FSVT Report Requests
Wichita County, Texas

CN 600129316; RN 105598759

Dear Mr. Schreiber:

On Friday, March 28, 2014, staff from the City of Wichita Falls (City) delivered the Emergency Direct Potable Reuse (DPR) Project Full-Scale Verification Test (FSVT) Report (Report) at approximately 8:00 pm. Water Supply Division staff began review of the Report on Monday, March 31, 2014. TCEQ staff determined that the Report was administratively incomplete and notified you of this via a phone call on April 11, 2014. A teleconference was held between TCEQ staff and the City on April 14, 2014 in which TCEQ explained the additional information required to make the Report administratively complete. The City has provided multiple additional submittals for which we are thankful.

At this time, we have determined that significant deficiencies exist in the Report and the TCEQ is unable to issue approval for use of the DPR Project. **Water from the DPR water treatment plant (WTP) facility cannot be discharged to the City's potable water distribution system.** Please see the enclosure which identifies TCEQ's concerns with the Report.

Because the City failed to demonstrate adequate operation of the DPR WTP facility during the FSVT, **the TCEQ requires the City to restart the verification test (FSVT 2) and demonstrate proper operation of the DPR WTP facility for an additional 30 consecutive days**. Because the City failed to conduct daily direct integrity tests of the microfiltration membranes on 18 days during the FSVT, the TCEQ will be on site during the first 18 days of the FSVT 2 to observe plant operations and confirm that daily direct integrity testing is completed. The test must include at least 3 calendar days of successful operation of each of the five individual microfiltration units as the lead unit in a pair of filters. Prior to starting the FSVT 2, the City must submit new or revised standard operating procedures (SOPs) as identified in the enclosure. If desired, the TCEQ is able to provide technical assistance with developing comprehensive SOPs for the DPR WTP facility on May 7 and 8, 2014. After TCEQ approval of the SOPs, the City must demonstrate that WTP facility operators have received training on the SOPs. TCEQ can be on-site for this activity from May 13 to 15, 2014. The FSVT 2 should

monitor at the sample sites from a TCEQ-approved Full-Scale Operation Monitoring Plan, show that all microfiltration membranes can be operated without elevated turbidity readings, demonstrate daily direct integrity testing, and demonstrate the successful operation of all processes. TCEQ personnel can be available on-site May 16 – June 2, 2014 to observe the beginning of the FSVT 2. After the first 18 days, the City must continue the FSVT 2 for an additional 12 days before completing the test, compiling the necessary data, and submitting the FSVT2 report to the TCEQ for review.

Duration of the Emergency DPR Project

The TCEQ understands the City's challenges due to the current drought's impact on its source water supply. Information provided by the City indicates that, if approved, the City may operate the Emergency DPR Project for a duration longer than six months. As documented in previous correspondence to you from the TCEQ, additional treatment barriers may be required for long-term operation of the DPR Project. Due to the amount of time required to plan for additional barriers, the TCEQ is hereby notifying you that if this project is approved for distribution to the public, **the maximum duration it can be operated is six months unless UV disinfection providing at least 3-0 log inactivation of *Cryptosporidium* is approved and installed**.

Revised Minimum Treatment Requirement for *Giardia*

The maximum concentration of *Giardia* found in the wastewater effluent during the FSVT was an order of magnitude higher than the concentration observed in other results provided to the TCEQ. This indicates that the level of *Giardia* under normal operations is higher than expected and that the facility will need to provide more treatment than TCEQ first believed.

The level of treatment provided during the FSVT was adequate for this normal level of treatment but more treatment may be needed if an outbreak of *Giardia* occurs. The City did not address the higher level of *Giardia* or treatment needs in the Report. **The TCEQ is revising the minimum specified level of treatment for *Giardia* from 7.0-log removal/ inactivation to 8.0-log removal/inactivation**. The Report indicated that the City achieved at least 10.1-log removal/inactivation of *Giardia*, so sufficient log removal/inactivation may be achieved

Loss of Flux in Microfiltration Membranes

Based on our review of the information provided in the Report, the TCEQ is concerned about the lifespan of the MF membrane modules and what that means to the overall operation. Shortened membrane life will impact either the life cycle cost of the DPR Project or the ability to maintain the output of the plant. It appears that the clean-in-place procedure did not recover the specific flux to near the level at the beginning of the FSVT. The Report did not discuss full-scale cleaning methods or the potential shortened life span of the membrane units. Please see the enclosure for additional information on this topic.

Maximum Percentage of Contribution from Wastewater Effluent

Please be reminded that per our September 5, 2013 letter, the flow rate of the partially treated River Road Wastewater Treatment Plant 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.

Requests within the Report

Additionally, the Report included requests for re-issuance of the granted temporary exceptions which expired upon completion of the FSVT, approval of a handheld device to analyze chlorine dioxide concentrations in samples taken from the Secondary Reservoir, and approval of a revised CT Study. The three requests are addressed separately below.

Requested Exceptions

In TCEQ's letter dated September 5, 2013, multiple temporary exceptions were granted to the City for the duration of the FSVT. These exceptions will be revoked once the City has completed a TCEQ-acceptable FSVT. You have requested that these temporary exceptions be re-issued. At this time, the City has not completed an acceptable FSVT and therefore **these temporary exceptions are still valid and in place**.

Chlorine Dioxide Analytical Method

You requested approval to use the DPD-Glycine colorimetric method for measuring chlorine dioxide concentrations. We have evaluated the chlorine dioxide data that accompanied your letter. These data were produced during a special study (2013 Study) that compared the results of the amperometric method for chlorine dioxide measurement with those from the DPD-Glycine colorimetric method. Based on our review of your data, we are **unable to approve your request to use the DPD-Glycine colorimetric method for monitoring chlorine dioxide levels in the raw water line from the Secondary Reservoir to the Cypress WTP**. The data from the 2013 Study revealed that the colorimetric and amperometric methods did not consistently produce essentially identical results. Erroneously high results inside the plant result in an overestimation of the disinfection level achieved by chlorine dioxide, thereby overestimating the level of public health protection the plant is providing.

Despite the apparent limitations of the DPD-Glycine method, the TCEQ recognizes that the method may be useful when samples have to be collected in the distribution system. Therefore, the TCEQ **approves** the City's request to use the method if distribution samples are analyzed at the site of collection rather than being transported back to the WTP for analysis. There is an upper limit on the chlorine dioxide residual in distribution and obtaining erroneously elevated chlorine dioxide residuals in distribution will result in process changes that provide even more public health protection against elevated chlorine dioxide levels. Please see the enclosure for supporting information on these determinations.

Revised CT Studies

You included a proposed revision to the water treatment plant's CT Study in the Report. This proposal included a series of three sequential separate disinfection zones (i.e, D1, D2, D3) for the raw water line from the Secondary Reservoir to the WTP splitter box. More recently, the City provided revised CT Study forms via email dated April 25, 2014. At this time, TCEQ staff have not completed review of the most recent submittal. **A response letter regarding the CT Study will be prepared separately**.

If you have any questions regarding this letter, please contact Joel Klumpp at (512) 239-4453 or by e-mail at joel.klumpp@tceq.texas.gov or Vera Poe at (512) 239-6988 or by e-mail at vera.poe@tceq.texas.gov.

Sincerely,

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LB/JPK/VP

Enclosure: Wichita Falls DPR FSVT Report Issues

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
City of Wichita Falls - Attn.: Daniel K. Nix, Utilities Operations Manager, P.O. Box 1431, Wichita Falls, Texas 76307-1431

City of Wichita Falls (PWS ID 2430001)
Direct Potable Reuse (DPR)
Full-Scale Verification Test (FSVT) Report Issues

Enclosure to Texas Commission on Environmental Quality (TCEQ)
Water Supply Division (WSD) Letter dated May 1, 2014

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A. General Consistency of Documents

Taken together, the Standard Operating Procedures (SOPs), Operations and Maintenance (O&M) Manual, CT study (disinfection protocol), Monitoring Plan, Shutdowns and Alarms list, and notification documentation show the operators how to run the plant and identify the key control points to assure safe water is produced by the plant. These documents represent the operational readiness of Wichita Falls to operate the direct potable reuse (DPR) plant for six months. The TCEQ found many inconsistencies in the documents provided by the City of Wichita Falls. Without accurate documents and instructions, the plant personnel do not have the tools they need to respond to the failure of a key control point.

The City should cross-check the various documents and update them to be internally consistent. Specific inconsistencies are described below.

B. Log Removal and Inactivation

B.1. Requirement for Additional Measures

In TCEQ's September 5, 2013 letter, we requested results from a real time microbial monitoring method with the caveat that if the real time method was not useful as an indicator of pathogen rule, additional measures would have to be implemented.

The assumption that a polymerase chain reaction (PCR) result of zero indicates the absence of human pathogens has not been scientifically validated. The more robust methods (EPA Method 1623 for cysts/oocysts and EPA Method 1615 for viruses) must be sent off site, so results cannot be seen for several weeks, which is too long for an immediate response. Without a reliable method, the City would not be prepared for a waterborne disease outbreak. Continuous, reliable confirmation of treatment efficacy must be used to demonstrate pathogen removal and inactivation. The City intermittently demonstrated that the DPR treatment process has the capability to remove and inactivate bacteria (*E. coli*), *Cryptosporidium*, *Giardia*, and viruses; but this capability must be implemented continuously and demonstrated daily to protect public health. Therefore, the City must perform the monitoring described herein for full-scale operation (FSO).

The TCEQ has reviewed the level of removal and inactivation necessary to ensure public health protection. Based on the concerns regarding the City's ability to provide safe and adequate water reliably over an extended period of time, if the City operates the DPR for more than six months, it may only do so after adding an additional, redundant barrier for *Cryptosporidium*. By adding this additional barrier, the City will be assured of its ability to provide water if a treatment unit becomes nonfunctional. **Without a redundant barrier, the entire plant must be shut down if any process has a problem.** The additional barrier must achieve 3-log inactivation of *Cryptosporidium*, in order to ensure full redundancy. Ultraviolet disinfection is an acceptable redundant barrier.

B.2. Daily Direct Integrity Testing: Verification of Pathogen Removal

Based on federal requirements, the City is required to conduct a direct integrity test (DIT) on a microfiltration (MF) unit every day that a filter has any run time on that day. If a filter runs for even one minute, the filter needs to have a DIT that day. This daily integrity test is required because there is currently not an acceptable real-time test for pathogens. The EPA-approved methods can take weeks to return results, thus the plant cannot measure the pathogen load in the water, but must assure that the treatment being provided for pathogens is working properly. Pick a time each calendar day, and run the DIT at that time each day. When we refer to a 24-hour period, it is intended to ensure that a DIT is not run at 1 am one day, and 11 pm the next day. **The DIT requirement is not based on filter run time.**

MF unit 4 did not have DITs on the following days:

- 1/28, 1/30, 1/31, 2/2, 2/8, 2/11, 2/17, 2/18, 2/22.

MF unit 5 did not have DITs on the following days:

- 1/28, 1/30, 1/31, 2/2, 2/4, 2/6, 2/7, 2/8, 2/11, 2/12, 2/13, 2/16, 2/17, 2/18, 2/20, 2/22, 2/23, 2/28.

Due to the failure of the City to conduct daily DITs during 18 days of the full-scale verification test (FSVT), the City must restart the FSVT and show that the MF membranes can be operated without elevated turbidity readings and with daily direct integrity testing.

The explanation given of why DITs were not performed daily as required was that the DIT frequency was based on 24 hours of run time. However, the City also exceeded 24 hours of runtime on Unit 4 before doing a DIT on three days:

- 2/1, 2/3, 2/19

Without daily DITs the pathogen treatment is reduced. The table below indicates the pathogen treatment achieved without MF:

Pathogen	Required Minimum Treatment	Achieved Without MF
Cryptosporidium	5.5 log	4.5 log
Giardia	7.0 log*	10.1 log

*Following the protocol established by the EPA in the preamble to the Surface Water Treatment Rule (Federal Register Vol. 54, No. 124, Page 27491), based on public health protection of 1 disease in 10,000. Texas is the only state considering DPR. Our options were to refuse approval, or to consider the protection provided by treatment. Please note that the minimum treatment required for *Giardia* has been increased to 8.0-log removal/inactivation based on a result of 203.39 cysts/liter reported during the FSVT.

This item was documented in the TCEQ's September 5, 2013 letter (item 21), in which we required daily DITs for MF membranes. The City submitted Appendix I showing that the

DITs are performed less frequently than daily and Appendix H in which the SOP for Microfiltration Pressure Decay Test indicates that the test is done automatically every 24 hours of run time.

C. Alarms and Shutdowns

There are issues with the information provided in the Report regarding alarms and shutdowns. In several cases, operational and reporting changes are needed. In other cases, discrepancies between the SOPs, Monitoring Plan, and other documents need to be resolved in order to ensure that alarm and shutdown procedures are followed by **all** operators. The decision-maker should be involved in all training.

Below are examples and details of the issues that we noted when reviewing the FSVT Report, Appendix C and Appendix H. C.1. Alarm and Shutdown Conditions Requiring Operational and Reporting Changes.

The City did not list shutdown parameters for the DPR plant in related SOPs. Appropriate SOPs need to include all the shutdown items that are listed in the "List of Shutdown Triggers and Alarms" in Appendix C. Each shutdown and alarm must be detailed in an SOP (see Section G of this document).

C.1.a. Microfiltration (MF) Over 0.100 NTU for Two Consecutive Readings

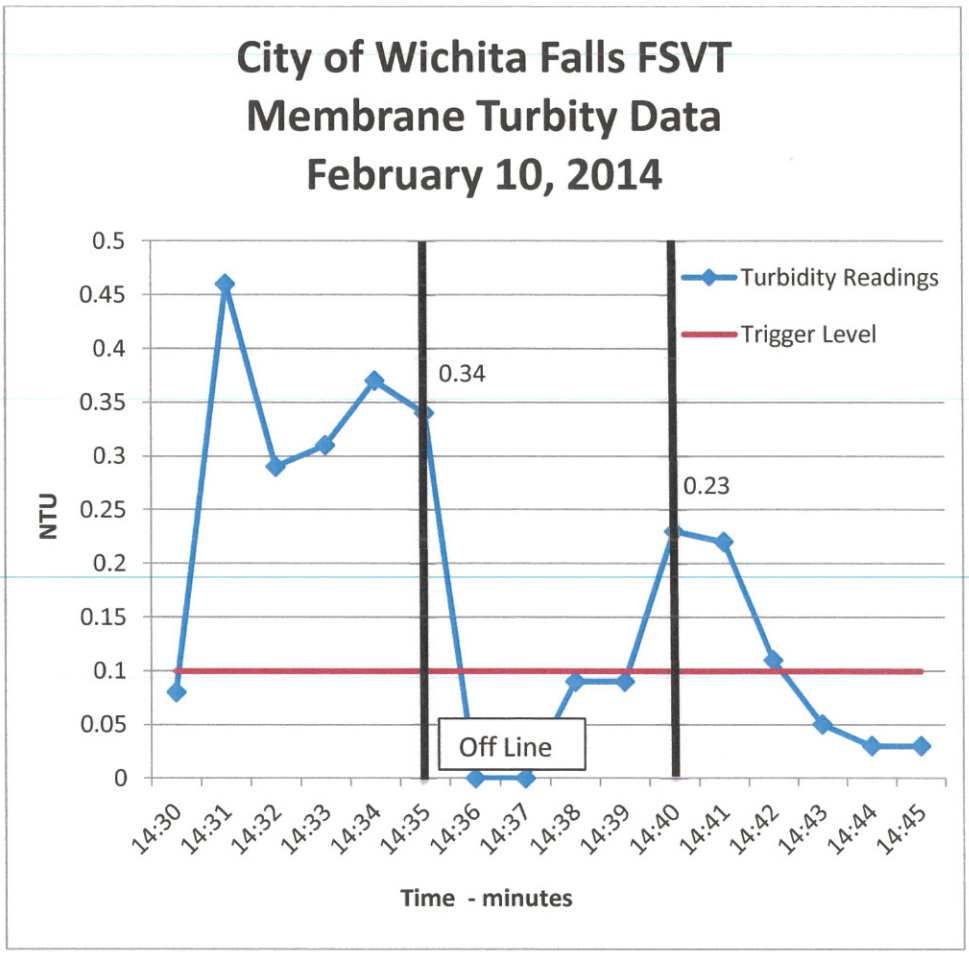
Turbidity of each membrane filter effluent is monitored to assure that the membranes are intact and removing pathogens. Once the turbidity levels reach 0.100 nephelometric turbidity unit (NTU) for two consecutive readings the unit is to be taken off line and a direct integrity test (DIT) performed.

The MF turbidity data shows levels higher than the 0.100 NTU trigger (0.34 NTU and 0.23 NTU) for two consecutive 5-minute readings (14:35 and 14:40) on February 10, 2014, in data file 10J of the submittal, but no DIT was performed. A graph of this data is shown below. This behavior was also found on the following days:

- Unit 4 - 1/31, 2/17, 3/6, 3/10.
- Unit 5 - 2/2.

During a conference call, the City indicated that they would watch the one minute data and they would take the MF unit off-line before two consecutive 5 minute readings exceeded 0.100 NTU, see below graph. If the MF unit is off-line it still counts towards the consecutive readings—it does not "restart the clock." By taking a unit off-line and restarting the clock, you could have run for nine minutes and shut down for one minute all day long, have all the water above the turbidity limit, and yet still appear to be in compliance. **Circumventing the intent of this requirement is not appropriate.** The TCEQ rules specifically state that DIT is based on two consecutive readings. If the City continues to use the 1-minute readings in the future, TCEQ will look at each distinct reading for compliance with the state and Federal rules.

The City needs to investigate the high turbidity readings and find a solution so that the turbidimeters give reliable and accurate readings. The SOP related to MF operation and shutdown must be updated to address these issues.



In the TCEQ's September 5, 2013 letter (items 6b, 23, 24, Enclosure E), and reiterated in the TCEQ's October 15, 2013 letter (item 1), we required the plant to shut down if results of MF turbidity exceeded 0.100 NTU.

The data related to continuous 5-minute turbidity data for the MF units was submitted in Section TCEQ 10J. The SOP in Appendix H indicates that the DIT test is done every time the MF turbidity data shows an exceedance of 0.100 NTU for two consecutive five minute readings. In addition, Appendix C "List of Shutdown Triggers and Alarms" indicates alarm and auto shutdown when the MF effluent is > 0.100 NTU for two consecutive five-minute readings.

C.1.b Daily DIT

As discussed above, under item B.2., daily DIT testing of MF units is federally required and is the basis for ensuring demonstrated daily removal of pathogens. The shutdown condition related to daily DITs must be revised accordingly. As discussed elsewhere, an SOP describing how this shutdown will be implemented must be provided.

Further, if a MF membrane unit cannot be repaired, cannot pass a DIT, or exceeds the 0.100 NTU for two consecutive five-minute readings in one-hour period after being returned to service, any testing must be halted and the City must contact the TCEQ's Water Supply

Division for assistance. This requirement was identified in the TCEQ's September 5, 2013 letter, page 11, item 24.

C.1.c Waterborne Disease Outbreak

Cryptosporidium is a significant concern in drinking water because it contaminates most drinking water sources, it is resistant to chlorine and other disinfectants, and it has caused waterborne disease outbreaks. Consuming water with *Cryptosporidium* can cause gastrointestinal illness, which may be severe and sometimes fatal for people with weakened immune systems (which may include infants, the elderly, and people who have AIDS). There is no treatment for cryptosporidiosis. An outbreak in the 1990s in Milwaukee sickened over 400,000 people and killed at least 69 people. Infected individuals can shed millions of *Cryptosporidium* oocysts daily in their feces.

Giardia is also a significant concern in drinking water because it contaminates most surface water sources and can cause waterborne disease outbreaks. Consuming water with *Giardia* can cause gastrointestinal illness. Rarely does *Giardia* infection cause death, but each year 4,600 persons with giardiasis are estimated to be hospitalized in the United States. Infected individuals can shed between 1-10 billion cysts daily in their feces.

The FSVT Report does not clearly describe what the City will do if there is a waterborne disease outbreak. There are no SOPs or Appendix C List inclusion of alarms and shutdowns when a pathogen outbreak is identified. A waterborne disease outbreak must trigger an immediate shutdown of the Cypress DPR plant and notification to the TCEQ. The TCEQ will be available for notification at any time. We have the capability for receiving calls 24 hours a day, seven days a week. The City can contact us at:

- Abilene Region Daytime Main Number: (325) 698-9674
- Primary 24-Hour Emergency Response Phone: (325) 232-3213
- Secondary 24-Hour Emergency Response Phone: (325) 280-0934

Subsequently, the TCEQ will work with the City's "Health Department and Water Quality Task Force" to determine when and if the plant can be placed back in service, and inform the City.

The list in Appendix C (pages 18-21) of the FSVT Report states that a waterborne disease outbreak will trigger an alarm and a shutdown of the DPR plant. However, no SOPs describing the procedures for what actions to take in response to a waterborne disease outbreak were included in Appendix H. While any approved six-month DPR emergency operation is underway, the City needs to tell us how they are going to identify when a disease outbreak is occurring. The trigger list provided needs to be expanded to include other reasonable indicators that citizens are experiencing increased gastrointestinal distress. For example, if flow increases to the RRWWTP, it may indicate increased toilet flushing, thus indicating disease.

C.2. Other Alarm and Shutdown Condition Issues

The following alarm and shutdown conditions are not consistently documented in the City's list of alarms and shutdowns (Appendix C), the SOPs, the Monitoring Plan, and the notification procedures. The City should ensure that these documents are consistent.

The chain of command is extremely important for decision making relating to alarms and shutdowns. When you develop new SOPs or revise existing ones, be very clear about the decision making process. Please clarify the individuals and communication process for every alarm and shutdown.

C.2.a. River Road Wastewater Treatment Plant (RRWWTP) Alarms and Shutdowns

For most of the RRWWTP triggers for alarms and shutdowns, decision making resides with the DPR "Operations Supervisor." This is a very important role, and the person making the decision should be at a high enough level of authority to oversee the entire operation. Please clarify the individuals and communication process for every alarm and shutdown.

There are several discrepancies between the list of alarms and shutdowns in Appendix C and the SOPs in Appendix H.

1) **Sample Point 1J: Petroleum Detected in Final Clarifiers**

   There is a discrepancy between the SOP in Appendix H which states "if it is agreed upon that there is petroleum in the water the Operations Supervisor will be notified, and the decision to shut down will begin" and the List of Shutdown Triggers and Alarms in Appendix C which indicates an "alarm only" trigger by a grab sample and the entire DPR plant will be taken off-line upon triggering.

2) **Sample Point 1J: Solids Washout in Final Clarifier**

   The SOP in Appendix H does not indicate that an alarm will be triggered if a high volume of visible solids are present in the Secondary Clarifier or the Chlorine Contact Basin. The list in Appendix C mentions the Final Clarifier and indicates an "alarm only" trigger based on grab sample results, and the entire DPR plant will be taken off-line upon triggering.

3) **Sample Point 1J: Surfactant Visible in Final Clarifier**

   The SOP in Appendix H indicates that the Cypress DPR will be notified when surfactant is visible, and the DPR plant will make the decision whether or not to shut down. The list in Appendix C indicates an "alarm only" trigger based on a grab sample and the entire DPR plant will be taken off-line upon triggering.

4) **Sample Point 1J: Detection of *Giardia* >7000 cysts/100 mL, *Cryptosporidium* >948 oocysts/100 mL, and Total Culturable Virus > 22.2 MPN/L**

   The SOP in Appendix H indicates that the shutdown triggers are based on the following findings on the water delivered at the Cypress DPR. The decision to shutdown due to pathogens will be initiated by the Cypress DPR.

   - *Giardia* 70 (no units provided)
   - *Cryptosporidium* 9.48 (no units provided)

- Total Culturable Viruses 22.2 (no units provided)

Appendix C lists the following triggers for an alarm only and not an auto shutdown, although it also indicates the equipment will be taken off-line upon triggering:

- *Giardia* > 700 cysts/100 mL
- *Cryptosporidium* > 948 oocysts/100 mL
- Total Culturable Virus > 22.2 MPN/mL

There is a discrepancy between these two lists provided by the City. In addition, the triggers required in the TCEQ's September 5, 2013 letter were as follows:

- *Giardia* > 7.000×10^{-6} cysts/100 ml
- *Cryptosporidium* > 2.999×10^{-5} oocysts/100 ml
- Total Culturable Virus > 2.222×10^{-7} MPN/L

On Appendix H page H-115, the RRWWTP Effluent *Giardia* shutdown trigger is 70 (no units specified). Table 5-2 on page 22 of the FSVT Report executive summary re-states that the plant will be shut down if the *Cryptosporidium*, *Giardia*, or virus concentrations are above the historical values reported to the TCEQ. The City reported a *Giardia* result of 203 cysts/L on March 11, 2014 in data file "TCEQ-1J," on page 1J-192.a.

Because the sample was taken on the last day of testing, no shut down could be performed, but the amount of treatment provided by the DPR plant should be reconsidered due to the higher level of *Giardia* found. Before the FSVT 7-log *Giardia* treatment was required based on historical data showing less than 70 cysts/L. The new *Giardia* levels of 203 cysts/L on March 10, 2014 and 105.5 cysts/L on February 26, 2014 seen during the FSVT will require at least 8-log removal for *Giardia*. TCEQ used the acceptable risk level for *Giardia* provided by the USEPA Surface Water Treatment Rule and extrapolated the amount of treatment necessary to reach this acceptable risk level based on the baseline *Giardia* load found in the City's wastewater treatment plant effluent. The FSVT showed that the plant can provide 8-log removal. There was no discussion of this issue in the FSVT Report.

5) Sample Point 1J: Turbidity > 24.0 NTU

The Appendix H SOP is for a turbidity trigger in the secondary clarifier's effluent or in the chlorine contact basin. The trigger includes different actions such as cleaning the turbidity meter and notifying the Cypress DPR who ultimately will make the decision to shutdown.

The list in Appendix C includes alarm & auto shutdown if the turbidity is > 24.0 NTUs. This is the correct trigger except it should be changed to >= (greater than or equal to) to 24.0 NTU.

Although the table titled "List of Shutdown Triggers and Alarms" in Appendix C indicates alarm and automatic shutdown when the turbidity readings are above 24.0 NTU the "Emergency Shutdown Procedures" section of Appendix H does not indicate that shutdown will occur. In addition, the shutdown must occur not only at a reading above 24.0 NTU but also at a reading equal to 24 NTU. An SOP is required for this trigger.

6) Sample Point 2J: High Chlorine Demand and Chlorine Failure

An SOP exists for this trigger, but the SOP language is incorrect. It needs to agree with the language on the List in Appendix C regarding chlorine injection failure. The SOP, Section 5, does not include the 0.5 parts per million (ppm) of chlorine trigger listed in Appendix C for when the chlorine feed fails.

The word injection is not stated on the list. In addition, the high chlorine demand will trigger an alarm and shutdown on the list and testing and notification to the Cypress DPR on the SOP. The Cypress DPR Operations Supervisor will make the decision to shutdown.

7) Sample Point 2J: Permit Failure

The Appendix H SOP states that the triggers for notifying the Cypress DPR for the Operations Supervisor to make the decision to shutdown are based on a 2010 Class II reclaim water permit. The triggers for this permit are:

- *E. coli* exceeding 200 colony forming units per 100 milliliters (CFU/100 mL) geometric mean for any calendar month
- *E. coli* exceeding 800 CFU/100 mL for a single grab sample
- Carbonaceous biochemical oxygen demand (CBOD) exceeding an average of >15.0 mg/L for any calendar month

These concentrations of bacteria may not be protective. Class II permits assume no human contact with the water.

The Class I reclaim water permit limits are as follows:

- *E. coli* exceeding 20 CFU/100 mL geometric mean on a 30-day daily average
- *E. coli* exceeding 75 CFU/100 mL for a single grab sample
- CBOD exceeding an average of 5 mg/L on a 30-day daily average
- Turbidity of 3 NTU on a 30-day daily average

This is acceptable to the TCEQ; however it is not required, and the City may eliminate the shutdown aspect of the above Class 1 triggers, and consider them alarms only. The shutdown aspect of this condition has been replaced by item 5 above: turbidity over 24 NTU at 1J, as documented in the draft full scale operation (FSO) Monitoring Plan and in the related SOP. If the City chooses to change the procedure, care should be taken to ensure that any SOPs, lists, Monitoring Plan and any other related documentation are consistent.

However, if *E. coli* exceeding 75 CFU/100 mL is detected at sample site 2J for a single grab sample; after that alarm is triggered the City must convene the Water Quality Task Force.

8) Sample Point 3J: Detection of a leak on the pipeline between RRWWTP and Cypress Water Treatment Plant (CWTP)

An SOP was provided describing how the pipeline between the RRWWTP and the CWTP will be inspected to detect leaks or suspicious leaks. The Appendix C List includes this trigger for an alarm only. This is inconsistent; care should be taken to ensure that any SOPs, lists, Monitoring Plan and any other related documentation are consistent.

C.2.b. MF/Reverse Osmosis (RO) Plant Alarms and Shutdowns

As discussed above, the chain of command for making the decision to shut down the plant is very important. Please make that process very clear in your documentation, including SOPs.

1) Sample Point 10J: MF Unit Failing DIT

There is no SOP regarding when and how the MF membranes fail a DIT and what to do about it. The Appendix C List includes a trigger for when the MF unit fails a DIT using a TCEQ approved or greater test pressure for alarms and shutdowns and taking the MF membrane off-line until repaired and passing a TCEQ approved DIT.

2) Sample Point 10J: MF Unit Effluent

The Appendix C List includes triggers for the following:

- MF unit effluent >0.100 NTU for two consecutive 5-minute readings (trigger is alarm and auto-shutdown and taking the MF membrane unit off-line until backwashed and the unit passes a TCEQ approved DIT).
- MF unit effluent >0.100 NTU for two consecutive 5-minute readings twice in a one-hour period (trigger is alarm and auto shutdown and taking the entire DPR plant off-line and notifying the TCEQ's Water Supply Division and Region 3-Abilene).

The reference to this item on the list in Appendix C is inconsistent with the SOP in Appendix H. Please ensure that the SOP is consistent with the conditions of the exceptions and the TCEQ rule.

Please note that the TCEQ has reviewed this trigger and is clarifying that the individual unit must be shutdown, not the whole DPR plant.

3) Sample Point 16J: Combined MF Turbidity

There is no SOP for combined MF effluent turbidity. The Appendix C List includes triggering for the following:

- Combined MF unit effluent >0.100 NTU for two consecutive 5-minute readings (trigger is alarm and auto shutdown and taking all equipment from MF units forward off-line and the MF system investigated). Please clarify how the flow of water will be modified to allow not taking the entire plant off-line.

4) Sample Point 16J: RO Feed Silt Density Index (SDI) >3 and RO Feed >500 mV or Detectable Total Chlorine

The SOP in Appendix H indicates that the SDI must pass with less than 3.0 and the oxidation reduction potential (ORP) must be less than 300 millivolts (mV) before the reverse osmosis (RO) train can be started. It also states that if the feed water ORP is 500 mV or higher for 30 seconds, the trains will automatically shut down.

Appendix C List includes the following triggers:

- RO Feed SDI > 3 (alarm only; everything from RO forward taken off-line)
- RO Feed ORP > 500 mV or detectable total chlorine (alarm only and everything from RO forward taken off-line)

Please clarify how the flow of water will be modified to avoid taking the entire plant off line.

5) **Sample Point 16J: RO Permeate Nitrate > 9.5 ppm**

There is no SOP regarding RO permeate nitrate exceeding 9.5 ppm. The Appendix C List includes a concentration trigger of > 9.5 ppm with alarms and auto shutdown for the entire RO train.

6) **Sample Point 20J: Detection of *Giardia* and *Cryptosporidium* in RO Permeate**

There is no SOP regarding the detection of *Giardia* and/or *Cryptosporidium* in the RO permeate. The Appendix C List includes an alarm only trigger and all the equipment from the RO forward to be taken off-line for any detection of *Giardia* and/or *Cryptosporidium* in the RO permeate.

7) **Sample Points 3J-22J: Power Failure**

The SOP indicates that the RRWWTP will be shutdown and the Cypress WTP operator notified of the power failure. The SOP needs to be amended to include the shutdown of the transmission of water from the RRWWTP. The Appendix C List includes an alarm only and all the equipment to be taken off-line for the entire DPR.

8) **"High Dissolved Oxygen Demand" and Unexpected Low Flows**

These two SOPs were included in Appendix H with triggers for shutdowns but no mention of them on the Appendix C List.

C.2.c. Conventional 2010 SWTP Alarms and Shutdowns

1) **Sample Point 28J: Lagoon Flow Exceeding Secondary Reservoir Flow**

There are no SOPS regarding automatic shutdowns for the flow rate of the partially treated wastewater from Lagoon No. 3 exceeding the 50/50 blend with raw surface water. The Appendix C List indicates an alarm for the lagoon flow exceeding secondary reservoir flow. An SOP is needed establishing a procedure for this shutdown following the requirements in the TCEQ February 21, 2014 letter of shutdown for exceedance of this ratio at 5-minute intervals. In addition, there is no explanation regarding a measuring of total flow at this sampling point and subtraction of the flow at either 22J or 27J sampling points.

2) **Sample Point 35J: Individual Filter Effluent (IFE) Turbidity**

There is no clear SOP in Appendix H describing the procedures for alarms and shutdowns when the individual filter effluent turbidity is > 0.15 NTU for two consecutive 15-min readings and > 0.3 NTU for two consecutive 15-min readings at the 2010 Cypress SWTP granular filters. The only Appendix H SOP related to this issue gives instructions on how to start-up and shutdown the 2010 plant filters.

The Appendix C List includes an alarm when the IFE turbidity is > 0.15 NTU for two consecutive 15-min readings and an alarm and auto shutdown of the granular filters when the IFE is > 0.3 NTU for two consecutive 15-min readings.

3) **Sample Point 40J: Clearwell Level below 50% of Total Volume**

There is no SOP in Appendix H describing the procedures for alarms and shutdowns for this item.

The Appendix C List includes an alarm and the transfer pumps ramped down or shutdown if ramping does not increase the clearwell level. A complete SOP describing the procedures clearly is needed.

4) **Sample Point 40J: Detection of *Giardia/Cryptosporidium*/Total Culturable Virus at the Entry Point to Distribution**

There is no SOP in Appendix H describing the procedures clearly.

The Appendix C List includes an alarm only and the entire DPR plant taken off-line due to the following:

- Detection of *Giardia* and/or at the entry point (EP) to distribution using qPCR
- Detection of *Giardia* and/or *Cryptosporidium* by a TCEQ acceptable laboratory after filtering a minimum of 15 liters of water at the entry point and analyzing it using the EPA Method 1623
- Detection of any culturable virus by a TCEQ acceptable laboratory at the entry point to distribution

The City did not provide an explanation of how these triggers reflect real-time monitoring and the purpose of an alarm and DPR plant shutdown when the *Giardia/Cryptosporidium*/virus results are received two or three weeks after sampling.

5) **Sample Point 40J: Monochloramine Residual below 3 mg/L in Water Entering Distribution**

There is no SOP in Appendix H describing this procedure.

The Appendix C List includes an alarm and notification of the supervisor supervisor when the monochloramine residual in the water entering the Distribution System drops below 3 ppm. No clear explanation was provided.

6) **Sample Point 40J: Nitrate at Entry Point to Distribution >9.5 ppm**

There is no SOP in Appendix H describing this procedure.

The Appendix C List includes an alarm and automatic shutdown and the DPR plant taken off-line in this situation.

Appropriate SOPs need to include all the shutdown items that are listed in the "List of Shutdown Triggers and Alarms" in Appendix C. The SOPs should be consistent with the list

All the 10.0-MG GST's high service pumps out of service when: the nitrate level in the 10.0 MG GST's effluent is greater than 10.0 mg/L; or the 10.0-MG GST's volume of water is less than 50.0-percent of the reported full operating capacity.

7) **Sample Point 40J: Turbidity at Entry Point to Distribution > 0.2 NTU at Hourly Monitoring and > 0.3 NTU for Two Consecutive 15-Minute Readings**

There is no SOPs in Appendix H describing these procedures.

The Appendix C List includes an alarm only for the turbidity > 0.2 NTU at any hourly monitoring and an alarm and shutdown for the turbidity > 0.3 NTU for two consecutive 15-minute readings. The first will trigger notification to the supervisor and the second a shutdown of the DPR plant.

Please note that this is not the entry point sample site. The entry point sample site is at 42J. Also, please note that it may be beneficial to designate a shutdown at 0.3 NTU—rather than above 0.3 NTU because that is the 95th percentile limit for conventional water plants.

8) Sample Point 40 J: CT Failure

There is no SOPs in Appendix H describing the procedure.

The Appendix C List includes an alarm only when there is low/no monochloramine residual in a disinfection zone that prevents the required pathogen inactivation from being achieved. The alarm will trigger a shutdown of the DPR plant.

9) Sample Point 40 J: TTHM/HAA5 at the Entry Point to Distribution Exceeding 40/30 ppb Respectively

There is no Appendix H SOPs describing the procedure.

The Appendix C List includes an alarm only and operations notification.

10) Sample Point 40J: Violation of any Primary or Secondary Drinking Water Standard at Entry Point to Distribution

There is no SOPs in Appendix H describing the procedures.

The Appendix C List includes an alarm and a shutdown of the DPR plant.

11) Sample Point 42J: 10 MG GST Volume < 50% of the Total Volume

There is no SOPs in Appendix H describing the procedures.

The Appendix C List includes an alarm when the 10 MG GST volume is less than 50% of the total volume. The alarm triggers the service pumps at the DPR Cypress plant to ramped down or shutdown if the ramping does not increase the GST level.

Appropriate SOPs need to include all the shutdown items that are listed in the "List of Shutdown Triggers and Alarms" in Appendix C. The following shutdown procedures must be listed in the SOPs described below:

- 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.
- All the 10.0-MG GST's high service pumps out of service when: the nitrate level in the 10.0 MG GST's effluent is greater than 10.0 mg/L.

D. Notification

Generally, additional detailed information is required for notification procedures. For each type of notification that is triggered, describe:

- Who will be notified,
- How soon after the triggering event notification will occur,
- The manner of notification (for example: phone, e-mail, letter, media, task force, etc.),
- The contents of the notification, and
- How periodic updates, like restarting after a shutdown, will be communicated.

Notification procedures for a range of groups is needed, for example:

- TCEQ Region and Water Supply Divisions,
- Water quality task force,
- Medical service providers,

- Retail customers, and
- Wholesale customers.

The City does not propose to notify each retail customer in writing of the DPR project nor propose any public meeting to address any concerns of individuals. Please be aware that the TCEQ considers communication with retail customers to be very important. Therefore, the City must notify each customer individually in writing before the DPR plant is put on line. Written notice is required in addition to electronic notification because not every customer has a computer or watches television. The retail customers must be notified as early as possible; for example, as soon as approval is received from the TCEQ, and the City starts working to re-connect the plant.

The SOPs do not include 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. They also do not include the list of triggers that will activate each of the above health groups and actions that will be taken. Appropriate SOPs need to include all the actions related to alarm and shutdowns including "What to do and who to contact".

In TCEQ's September 5, 2013 letter (page 17), we required the City to provide their method of notifying retail customers if certain health concerns occurred. A description of the electronic media methods that will be used to inform retail customers is included on page 20 of the Executive Summary. No text of the press release is provided. Appendix Q shows the letter that will be sent to wholesale customers, wherein the City states that DPR water will be used starting May 1, 2014. This letter should be modified to ensure that the DPR is not started until approval is received from the TCEQ.

E. Monitoring Plan

The City provided an updated Monitoring Plan by e-mail on April 24, 2014, which addressed some of the TCEQ's concerns. The TCEQ's review of the Monitoring Plan is not complete, as of April 28, 2014. Further review may identify additional issues beyond those listed here.

Although our review is incomplete, this document appears to still contain some some incomplete items. The Monitoring Plan needs to describe how the City's sampling will ensure compliance with the DPR-specific conditions set by the TCEQ. Specifically, the Monitoring Plan needs to contain any information on:

- Monitoring and recording flow rates at critical locations in the treatment process, including:
    - Daily raw and treated production, and
    - Rate of flow (each treatment process/unit and DZ);
- Measuring various chemical feed rates and calculated chemical doses;
- Measuring the sludge depth in the clarifiers;
- Conventional filter operation data including:
    - Monitoring flow rate, head loss, and filter run times for the conventional filters,
    - Number of on-line conventional filter IFE readings;
    - Number of on-line conventional filter IFE readings that are above 0.1 NTU,

    - Number of times consecutive conventional IFE were above 0.3 each day, and
    - What data goes where on which Surface Water Monthly Operating Report (SWMOR);
- Action levels that trigger alarms, shutdowns, or other actions; and
- References to related SOPs.

In the context of the DPR full-scale operation (FSO), the term "Compliance Calculations" is not limited to mathematical calculations. Instead, the heading should be shortened to "Compliance" and should include any actions taken in order to comply with the approval conditions set by the TCEQ in letters and other correspondence. For example, under the item regarding entry point nitrate monitoring, it should be noted that a level of 9.5 mg/L triggers an alarm and possible shutdown. As another example, if sampling at a location is used for SWMOR reporting, that should be noted under 'Compliance.'

E.1 Online Disinfection Monitoring Anomalies

In the TCEQ's September 5, 2013 and October 15, 2013 letters, we asked for documentation of disinfectant residuals. The requested data for free chlorine, total chlorine, monochloramine, and ammonia was provided in the data files (Excel and PDF), but anomalous results caused the data to have gaps.

This issue may have been addressed in the Monitoring Plan submitted by the City on April 24, 2014. As of April 28, 2014, the TCEQ's review of the Monitoring Plan is not necessarily complete; we will review the Monitoring Plan's handling of this issue as soon as possible.

For example, at sites 3J, 7J, 36J, and 39J on-line results for all parameters were identical for as much as two days or longer before the instrument returned to collecting data. An explanation of these anomalous results was not provided. These anomalies mean that there are extended periods when requested data was not measured and therefore was not provided to TCEQ as required.

The Monitoring Plan should be updated to include a description how the City will periodically ensure that the data produced by online instruments is meaningful.

E.2 Online Raw Turbidity Monitoring Failures

In the TCEQ's October 15, 2013 letter (Addendum J page 12); we required sampling for raw turbidity every 15 minutes. The City provided data in Excel and PDF files named TCEQ 23J. Analysis of that data revealed that the on-line turbidimeter appears to have failed several times, such as on January 28 where the turbidity seems stuck at 20.7 NTU for over a complete day. There were a few days in a row when the turbidimeter reported 0 or 50--meaningless data. Turbidity is a critical parameter for evaluating the raw water quality, and for determining the adequacy of treatment.

During the FSO this monitoring point needs to be moved to after the raw water and RO filtrate are combined. This location is more useful in establishing the appropriate coagulant dose at the 2010 plant.

E.3. Disinfection Zone Monitoring

In Section 2.1, the Treatment Table (page 30), identify the sample sites associated with each disinfection zone even more clearly by giving the sample site ID. For example, if the sample site for disinfection zone WW DZ1 is site 24J, put the '24J' in parentheses next to 'WW DZ1' in the table, and so forth.

Identify the overlapping disinfection zones in the table, or as a footnote. The DPR reporting is complex; two SWMORs refer to the same plant sections as different zones. Zone D4 for the DPR process is called D2 for the 2010 conventional plant. Similarly, Zone D5 for the DPR process is called zone D3 for the 2010 plant. Specifying this in the Monitoring Plan would help new City staff.

For each item in Section 2.3 of the Monitoring Plan that is used for CT compliance monitoring, note that in the "Compliance" portion of that item; usually section (e). For example, if disinfection zone DZ4 (for blended source water) monitoring is done at sample site 37J, make a note of that in the Compliance portion of the total chlorine monitoring item.

In Section 2.1, the Treatment Table (page 30) shows bisulfite addition inside disinfection zone WW DZ3. Bisulfite removes the disinfectant, so monitoring after bisulfite injection would give a residual of zero, and not give the zone the credit it earns for disinfection. Either the sample site for WW Dz3 must be moved upstream of bisulfite injection, or bisulfite injection must be moved downstream of the CT compliance sample site for WW DZ3.

In Section 2.1, the Treatment Table (page 31), blended source water disinfection zones DZ5 and DZ6 must be merged to be consistent with the most recent April 25, 2014 CT study, which eliminates disinfection zone D5, consistent with the FSVT data analysis.

The Treatment Schematic in Section 2.2 (page 32) must be updated to reflect the newest CT study which eliminates disinfection zone Dz5. Also, it would be helpful to use the D1a, D1b, D1c terminology consistently for the chlorine dioxide disinfection zones on the schematic and table. Although the table does have a cross reference, it would be simplest for operators to understand a single name for each zone.

Throughout Section 2.3, the CT compliance location sampling for total chlorine, monochloramine, free ammonia, and free chlorine is scheduled at a 2-hr frequency. While this is acceptable to the TCEQ, it would also be acceptable to the TCEQ for the City to monitor for CT compliance every four hours. The FSVT data analysis shows that the total chlorine and monochloramine levels at these locations are stable enough to allow a four hour frequency with no negative impact. If the City chooses to change the frequency, the Monitoring Plan must be updated accordingly.

In Section 2.3, Item 2.3(2)(b) (page 38) sampling must be added at sample site 42J, which represents the CT compliance location for disinfection zone DZ5.

In Section 2.3, Item 2.3(3)(a) (Page 39) the sampling frequency is listed as every 15 minutes. It is not necessary to use on-line monitoring for total chlorine. If the online monitoring results are intended to be used for SWMOR reporting, that should be noted under "Compliance." Also, the related SOP should be consistent.

If continuous monitoring is used for process control or compliance, the frequency with which the instrument is checked manually needs to be captured. Data analysis shows that online chlorine monitors may give erroneous results.

In Section 2.3, item 2.3(4)(a), monochloramine is noted as being used for CT compliance monitoring. This is acceptable to the TCEQ, but it would also be acceptable for the City to use total chlorine at this location, since it is after bisulfite addition.

E.4. Calibration

In Section 2.3, under item 2.3(2)(f) (page 38) the calibration of the chlorine analyzer is listed as according to manufacturer's recommendations. This must be updated to meet the calibration requirements of Title 30, Texas Administrative Code (30 TAC) §290.42(s)(2)(C)(i), because locations 36J and 42J are the ends of disinfection zones DZ4 and DZ5, respectively.

Item 2.3(4)(f) related to calibration of the instrument used for the end of disinfection zone Dz3 states that calibration will be performed to manufacturer recommendations. That is incorrect. This needs to be updated to ensure that calibration occurs consistent with the TCEQ rules in 30 TAC §290.46(s)(2)(C)(i).

Item 2.3(6)(f) (page 40) lists calibration to manufacturer's recommendations for chlorine dioxide analysis. We highly recommend that the City additionally use a chlorite standard quarterly to ensure that the instrument is distinguishing chlorite from chlorine dioxide.

In item 2.3(8)(f) (page 41), the pH calibration is stated as following manufacturer's recommendations. This is inadequate. The pH calibration must be consistent with the requirements of 30 TAC §290.42(s)(2)(A).

The turbidity meters must be calibrated in accordance with 30 TAC §290.46(s)(2)(B), not just annually as stated in the Monitoring Plan, item 2.3(14)(f). (page 44).

Item 3.1(2)(f) specifies calibration of the total chlorine analytical equipment according to manufacturer's specifications. This must be updated to ensure consistency with 30 TAC §290.46(s)(2)(C).

In Section 3.1, item 3.1(6)(f) (page 54), the Monitoring Plan states that the pH meter will be calibrated according to manufacturer's recommendations. This is inadequate. The Monitoring Plan must be updated to ensure that calibration is performed in accordance with the requirements of 30 TAC §290.42(s)(2)(A), because this is the end of disinfection zone Dz5.

E.5. Turbidity Monitoring

In item 2.3(10)(b) (page 42) raw turbidity monitoring at sample site 3J should be added for continuous monitoring.

In Section 2.3, item 2.3(10)(d) (page 42), the equipment used for continuous monitoring is listed as a Hach Surface Scatter 7 turbidimeter. At this location a Hach FilterTrak Laser turbidimeter must be used.

In Section 2.3, item 2.3(14)(b) (page 44), location 30J for the blended raw water should be added for 2-hour turbidity monitoring, since this is the location that should be used to evaluate the feed water for the 2010 conventional plant.

E.6. Other Monitoring Plan Issues

In Section 2.2 (page 37) a photo of sample site 42J is needed. This sample site represents two compliance locations: the disinfectant residual monitoring location for disinfection zone Dz5 and the entry point.

In Section 2.3, Item 2.3(1)(b), sample site 38J should replace sample site 39J. Site 38J is the appropriate process control point. Also, it would be helpful to define the meaning of "monitoring only."

In item 2.3(8)(b) (page 41), pH monitoring location 39J should be replaced with 42J which represents the end of disinfection zone DZ5.

In item 2.3(9)(b) (page 42), temperature monitoring at sample site 39J should be replaced with sample site 42J which represents the end of disinfection zone DZ5.

In Section 2.3, item 2.3(15)(b) (page 44), a number of sample sites are listed for weekly total organic carbon (TOC) analysis. Locations 1J and 23J should be added; and location 32J could be replaced with either 36J, 40J, or 42J in order to accurately represent the points used for calculating TOC removal ratios.

In Section 2.3, item 2.3(26)(b) (page 50), lists sample sites for alkalinity monitoring. This list needs to be changed to meet SWMOR reporting requirements. For weekly (or monthly) alkalinity sampling, sites 1J and 23J should be added, and site 32J should be replaced with site 36J, 40J, or 42J. Those sites represent the locations possible for calculations of TOC removal compliance.

A new item should be added to ensure daily alkalinity sampling at sample sites 3J and 28J, which is required on the SWMOR.

For item 3.1(1)(a) (page 52), free chlorine is required to be monitored every two hours. This is acceptable. It would also be acceptable to reduce or remove free chlorine sampling at this location, since compliance is determined using total chlorine. If the City chooses to make this alteration, any SOPs and related documents must be updated.

Item 3.1(2)(a) (page) 52 specifies total chlorine monitoring once every two hours; this must be updated to ensure continuous monitoring at the entry point sample site.

In Section 2.3, item 3.1(3) (page 53), monochloramine is noted as being used for CT compliance monitoring. This is acceptable to the TCEQ, but it would also be acceptable for the City to use total chlorine at this location, since it is after bisulfite addition.

F. Operations and Maintenance (O&M)

The TCEQ identified operational issues from analysis of the FSVT Report data. These are described below.

F.1. MF/RO Operations

The TCEQ identified concerns related to how the MF/RO units were operated during the FSVT which will impact full-scale operation.

F.1.a. RO versus MF turbidity

The TCEQ needs clarification from the City to understand what is causing the rise in turbidity in the RO feed water after it comes from the membranes. The turbidity (IFE) from the MF membrane units was mostly below 0.1 NTU. In comparison, the turbidity (CFE) entering the RO is mostly above 0.1 NTU. This occurred frequently, but it was very evident on February 26, 2014. Please explain.

In Appendix J of the September 5, 2013 letter, the TCEQ asked for both the individual membrane filter turbidity (IFE) and the RO feed turbidity (CFE) be measured. The City submitted data file TCEQ 10J, showing inconsistencies in the turbidity data reported for that sample site.

F.1.b. RO Chemical Integrity Test Based on Sulfate

The FSVT Report shows that the City uses sulfate reduction to determine membrane integrity in the RO membranes. This is acceptable to the TCEQ, but the RO units did not meet the sulfate reduction goal daily. If the City plans to request using sulfate to daily determine if the RO unit is removing chemicals, the TCEQ could consider this request. Sulfate appears to be in a large enough quantity in the influent to show removal. **The only issue is that the FSVT did not show that the RO achieved the sulfate removal goal <u>each calendar day</u>. The City can request using sulfate, but they may have to shut down the RO unit for inspection when sulfate reduction is not achieved. If sulfate is not chosen, another method of RO unit integrity testing must be chosen.**

In Appendix B of the September 5, 2013 letter, the TCEQ asked for data about any RO integrity testing performed. Integrity testing data for the RO is shown in Appendix I on pages I-8 and I-9 of the City's FSVT Report. The data does not support RO unit integrity. Also, please make your SOPs consistent with these requirements.

F.1.c. RO/MF Clean-in-Place (CIP)

The RO clean-in-place (CIP) was not done at the same time as the MF CIP. The RO units were cleaned, because they exceeded an operating parameter. Cleaning was not based on 30 days of run time. There was no proposal for the CIP frequency during the full-scale operation or any corrective action to extend the CIP frequency to 30 days. The fact that the early CIP was conducted before the end of the 30-day run can mean that the RO membranes are fouling quickly with this source water. Shorter membrane life span can occur. TCEQ is concerned about the lifespan of these membrane modules.

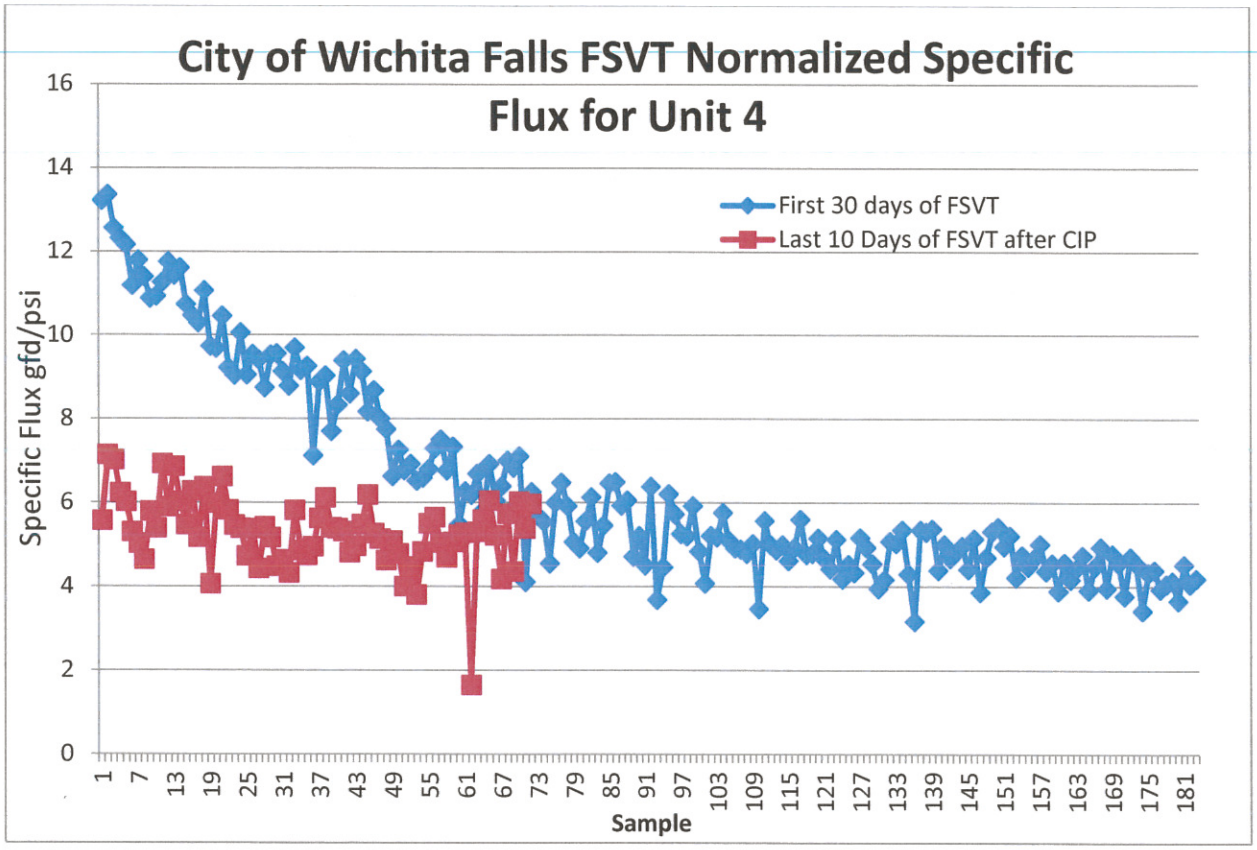
The TCEQ's September 5, 2013 letter (FSVT Protocol item 1(d), page 15) requires that the CIP on the RO be performed at the same time as the MF CIP. The City submitted data for the CIP for RO done before the end of the 30-day run based on pressure drop. See the FSVT Report, Appendix I, pages I-9 and I-16.

F.1.d. Loss of Flux in MF Units

TCEQ is concerned about the lifespan of the MF membrane modules and what that means to the overall operation. Shortened membrane life will impact either the life cycle cost or the ability to maintain the output of the plant. By graphing the temperature adjusted specific flux, data analysis shows that Unit 4 lost over 40% of the specific flux after the CIP. That shows the CIP did not recover the specific flux to near the level at the beginning of the FSVT. The City's March 28, 2014 FSVT Report did not discuss full scale cleaning methods or the potential shortened life span of the membrane units.

In the TCEQ's February 8, 2013 letter, we required the City to run the FSVT for 30 days, do a CIP, and then run at least 10 days to check the CIP effectiveness.

The City submitted the 4-hour specific flux for each membrane unit operated during the FSVT in data file TCEQ10J starting on page 442.



F.2. Operational Dose Calculations

The City included the results for most of these calculations, but not the sampling data or procedures used to obtain the resulting values. Consequently, the TCEQ is unable to validate the underlying data collection or calculation methodologies. Without this information, the TCEQ lacks the information to determine what monitoring interval is appropriate for the operations and maintenance manual and Monitoring Plan.

In the TCEQ's October 15, 2013 letter, Addendum J, we requested dosage rates for various chemicals and other calculated values at sample sites 24J.1, 29J.1-7, 30J.1, 31J, 32A, and other locations; the results of 4-hour chemical dosage measurements at various sample sites, including sample site TCEQ-J32; and the results of 4-hour chemical dosage measurements at various sample sites.

The City provided most of this data, with the exception of the dose results for sample site 32J. Results for sample site 32J were not included in the original FSVT Report submitted on March 28, 2014, or the subsequent submittals.

F.3. O&M manual

The O&M manual should document that the above issues are addressed and should be consistent with all related SOPs, Monitoring Plan, Alarm and Shutdown list, and any other documentation.

G. SOPs

The SOPs should document that the TCEQ's issues are addressed and should be consistent with the related O&M manual, Monitoring Plan, Alarm and Shutdown list, and any other documentation.

In particular, every procedure that results in an alarm or shutdown should be in an SOP.

G.1. Missing or Incomplete SOPs

Some SOPs are incomplete (e.g. Filter Backwash) or missing (i.e. SWMOR Completion). This list does not necessarily include every SOP that has issues. SOPs are living documents, and part of any quality assurance program. Accordingly, further review and direction may be needed.

G.1.a Filter Backwash SOP

Before FSO, the City must update the filter backwash SOP and ensure that it is consistent with the Monitoring Plan and all other related documentation.

Backwash triggers must be documented clearly. For example, the 2010 Filter Backwash SOP in Appendix H of the FSVT Report (page H-51) does not include a turbidity trigger; the Monitoring Plan in Appendix P did, but not the run time or head loss ones (p P-8).

In the TCEQ's September 5, 2013 letter, we required submittal of a Monitoring Plan for full-scale operation.

G.1.b Surface Water Monthly Operating Report (SWMOR) SOP

Before starting FSO, the City must develop a SOP for reporting, using, and printing the SWMORs. The City must submit two SWMORs, which is more complex than the average surface water treatment plant. Therefore, a good SOP will help operators report data accurately.

The SWMOR SOP must address:

- What data goes where on which SWMOR;

- Monitoring and recording flow rates at critical locations in the treatment process, including:
    - Daily raw and treated production, and
    - Rate of flow (each treatment process/unit and DZ);
    - Measuring various chemical feed rates and calculated chemical doses;
    - Measuring the sludge depth in the clarifiers;
- Conventional filter operation data including:
    - Monitoring flow rate, head loss, and filter run times for the conventional filters,
    - Number of on-line conventional filter IFE readings,
    - Number of on-line conventional filter IFE readings that are above 0.1 NTU,
    - Number of times consecutive conventional IFE were above 0.3 NTU each day; and
- Action levels that trigger alarms, shutdowns, or other actions
- Printing of the SWMOR; and
- References to related SOPs.

G.1.c. Shutdown and Alarm SOPs

As noted under Section C of this document, an SOP must be provided for each shutdown or alarm trigger.

G.1.d. RO Membrane Integrity

An SOP describing the way that the City plans to determine RO membrane integrity is needed.

G.1.e. Notification SOPs

A set of SOPs for notification are needed.

G.1.f. SOP for MF Pressure Decay Test

The SOP for MF DITs needs to be updated to reflect daily DITs.

G.1.g. Flow Monitoring and Calibration

SOPs must be provided to describe how all flows will be monitored and how the related meters will be calibrated.

G.1.h. 50:50 Blending Ratio

An SOP providing a description of how the 50:50 blending ratio at the splitter box shall be maintained is needed.

G.2. SOP Training

For SOPs to be effective, the staff involved in performing the work described in the SOP must be trained to follow the SOP. If those workers identify needed changes to the work, the SOPs must be updated. After any update to an SOP, workers must be re-trained. TCEQ requests notification of the training dates and information regarding any needed updates prior to the City requesting FSO.

G.3. General Contents of SOPs

For SOPs to be effective, certain minimum standards must be adopted. It is understood that when SOPs are initially developed, they will not be perfect. Therefore, a formal procedure for making improvements must be in place. Some minimum standards that will make the update process easier include:

- Include the name or reference number on every page of each SOP.
- Include the page number and number of pages on each page of each SOP (for example: Page 1 of 2).
- Include the revision date on each page of each SOP.
- In the SOP, state who approved it.
- Signature and date of the operators who received training on SOPs

Some of the SOPs provided by the City in Appendix H are missing one or all of these items.

Please note that the TCEQ's review of SOPs for FSO will include a review of the manner in which the SOPs are periodically updated, the organizational strategy under which they are maintained, and the manner and frequency with which they are used for training.

H. Pretreatment

The City's submittal did not contain any information regarding the strategies the City will implement for control of industrial contributions to the RRWWTP as requested by the TCEQ's September 5, 2013 letter (pages 21-23).

I. Concentration-time (CT) Study

I.1. CT Calculation Discrepancies

There are some errors in the concentration-time (CT) calculations; for example., the calculations show an additional 0.5-log *Giardia* removal credit (instead of 1-log) for enhanced IFE performance and the 12AM – 8AM calculation shows 0.01-log *Giardia* removal credits (instead of 2.80-log) for the MF membrane beginning on February 4, 2014.

It would be beneficial for the City to update those calculations, and to ensure that they are described accurately in any associated SOPs.

In the TCEQ's October 15, 2013 letter (page 7, item 16), we required the submittal of removal and inactivation calculations. The City submitted the CT study in Appendix J, pages J-73 and J-83 in the FSVT Report of March 28, 2014. The City submitted an updated CT study by e-mail April 25, 2014 which we believe corrected the errors in the original submittal. We are in the process of reviewing the new submittal.

I.2. Chlorine Dioxide Disinfection

As of April 28, 2014, the TCEQ and the City have resolved issues related to the disinfection zones for chlorine dioxide in the raw surface water. The zones will be identified as zone D1a, D1b, and D1c.

The procedures for when to monitor in zones D1a and D1b need to be described in detail in an SOP. The SOP should be consistent with updated requirements in the Monitoring Plan (Section 2.3 item 2.3(7)(a), page 41). Trigger levels for follow up monitoring should be set explicitly. For example, if the sample collected at sample site 27J has a residual below 0.05 mg/L, then the operator should immediately go back and collect a sample at one or both of the alternate sites to ensure that the chlorine dioxide generator is working and get an accurate assessment of the inactivation being achieved.

I.3. Chlorine Dioxide Monitoring

I.3.a. Amperometric Titration for Raw Water Chlorine Dioxide

The City must use amperometric titration to measure the chlorine dioxide concentrations in the raw water line from the Secondary Reservoir. The TCEQ's data analysis determined that the colorimetric method is not reliable enough to use for CT calculations.

In the TCEQ's FSVT approval letter dated September 5, 2013, Enclosure C, we allowed the City to use a chlorine dioxide analytical method approved by the EPA but not by the TCEQ for measuring chlorine dioxide residuals at the plant during the FSVT.

The City submitted the results of a special study conducted in 2013 to compare the results of the amperometric and colorimetric methods in Appendix N of the FSVT for sampling sites TCEQ-25J, 26J, and 27J.

I.3.b. Colorimetric Monitoring for Chlorine Dioxide in Distribution

In Section 4.6 of the Monitoring Plan, item 4.6(c) the amperometric method is specified for sampling in the distribution system. This is acceptable to the TCEQ. However, for distribution sampling, the colorimetric method is also acceptable. In any case, all SOPs, and related documents must be updated and made consistent.