

Final Report for the March 2014 Targeted Performance Improvement Visit at the City of Wichita Falls Cypress Water Treatment Plant

Executive Summary

TCEQ staff from the WSD and the Region 3 office, and a TCEQ subcontractor, conducted a site visit at the City of Wichita Falls Cypress Street Water Treatment Plant. The purpose of the visit was to:

- discuss the status of the full-scale verification study (FSV) on being conducted at the City's Direct Potable Reuse (DPR) facilities;
- verify that the City had addressed the issues identified during a site visit conducted in January 2014;
- try to identify any serious problems with data collection, recording, and reporting protocols by spot checking some of the grab sample and on-line data; and
- talk with the City about the structure and content of the FSV Study Report and its anticipated submission date.

The TCEQ staff identified a few issues that the City needed to address during the last few days that remained during the FSV. The findings were discussed with plant staff and utility administrators throughout the on-site visit and during an exit meeting with City staff.

Joel Klumpp (WSD), Matthew Kerns (R3), and Jack Schulze, P.E. (subcontractor) performed the data review while Craig Stowell (WSD), Jenelle Crane (R3), and Cliff Moore (R3) followed up on issues noted during a previous FSV site visit.

This report covers the findings of the team that conducted the data review/audit; the findings of the other team are covered in a separate report.

Technical Summary

The team conducting the data review identified the following issues which the plant staff needs to address as it completes the FSV testing and prepares the FSV report. Each of these issues was discussed with City representatives during the visit and at the exit meeting at the plant.

1) Chemical Feed Rate and Dosage Information

The approved FSV protocol requires that the City report several chemical feed rate and dosage results on a 4-hour basis. Although the City is calculating dosage information once every 4 hours, some of the data used in these calculations were being collected at the beginning and end of each 8-hour shift rather than on 4-hour intervals. The TCEQ staff requested that, for the remainder of the FSV study, the City collect feed rate information at the approved 4-hour interval. The TCEQ staff explained that, without this 4-hour data, the TCEQ would be unable to determine if it could reduce the sampling interval if the City receives approval to begin discharging treated DPR water to the customers.

2) Anomalous Free Chlorine, Total Chlorine, Monochloramine, and Free Ammonia Results

During a previous FSV site visit, the TCEQ team noted some inconsistencies in the results from grab sample analyses and the data produced by on-line instruments. Similar inconsistencies were observed during the data review conducted on the FSV. For example,

- On one day, the grab sample monochloramine results seemed to be consistent with one set of on-line data but not another.

- Free chlorine and free ammonia react to form chloramines. However, on another day, the on-line instruments showed the simultaneous presence of significant amounts of free chlorine and free ammonia at the same sampling point as well as an increase in free ammonia levels following the addition of chlorine.

It is unclear whether this anomalous data suggests that one analytical instrument/method is more reliable than another or could be the result of poor chemical dispersion or some other site-specific condition. A more comprehensive assessment of these inconsistencies is probably needed during the preparation and review of the final FSV report so that the City and TCEQ can determine:

- if design changes are needed at the chlorine or ammonia injection points in the CFE line, and
- which methods or sampling frequency is most appropriate to use if the plant receives permission to send treated water to its customers.

3) Chlorine Dioxide Method for Disinfection Zones D1 through D3 at the 2010 WTP

The plant staff has been using the DPD-Glycine analytical method for testing the ClO_2 residual levels at the sampling points on the raw surface water line from the Secondary Reservoir. The plant chose this method because:

- a) Enclosure C of the FSV Protocol Approval letter allows the method to be used since the procedure is listed in 40 CFR 141.131 as an approved method for ClO_2 measurement.
- b) Plant staff reported that they have some earlier data which shows that, at these sample sites, the amperometric titration and DPD-Glycine methods produce essentially identical results.
- c) Since each amperometric titration test takes about 40 minutes and the approved FSV protocol required sampling each of the three zones at 4 hour intervals, the plant staff realized they would have trouble keeping up with their other duties if they used the amperometric method.

The TCEQ representatives reminded plant staff that 30 TAC 290.111(d)(4)(E) does not explicitly state that the DPD-glycine method is approved for measuring dioxide residuals used in CT calculations. We suggested that the City should discuss the acceptability of this method with TCEQ and, if appropriate, seek written approval for using the DPD-Glycine method for this purpose if the City wants to continue using it after the FSV study ends.

4) Unusually high dioxide residual at EP

The daily log sheets indicate that there are atypically high ClO_2 residuals at the 2010 clearwell. The plant injects ClO_2 in the raw water line from the Secondary Reservoir. The data from the D1 through D3 sampling points (at the 2010 WTP) indicate that the oxidant demand is being met by the time the water reaches the D1 sampling point and there is little ClO_2 loss in the last several hundred feet of the raw water line. Although ClO_2 will produce a stable residual when properly applied, it is a dissolved gas that is susceptible to off-gassing in open basins, especially if the water is highly agitated. It is also susceptible UV decay when exposed to sunlight and will decay back to the chlorite or chloride ion if exposed to soluble iron or other reducing substances. At the 2010 plant, the raw water spills over a weir in the splitter box and passes through a mechanical rapid, both of which agitate the water, before entering a large, open solids contact clarifier. In addition, the plant uses a ferric coagulant which should result in further reduction in the ClO_2 residual. The data suggests that the ClO_2 levels have been stable despite conditions that suggest there should be a decline.

5) Contact Time Studies and Surface Water Monthly Operating Reports for the DPR and 2010 Plants

The TCEQ and City representatives reviewed the CT studies and SWMOR spreadsheets for the FSV project. Together we identified and corrected a couple of errors in the draft SWMORs for the DPR plant. TCEQ representatives also:

- a) noted that the CT studies for the DPR and 2010 plants would need to be updated to include the 10 MGD clearwell/storage tank before treated water could be sent to distribution; and
- b) recommended that the City submit the two updated CT Studies at the same time it submits the final FSV report so that concurrent, rather than sequential, reviews could occur.

Recommendations

The Wichita Falls TPI project was completed successfully. Based on these findings, the contractor recommends that:

- 1) Regional and WSD staff should continue to take the opportunity to participate in TPI training events.
- 2) It may be beneficial to for the TCEQ to develop a short questionnaire, similar to the ones used when contractors provide DAM training, to solicit feedback from the plant staff and regional staff that participate in a TPI event.
- 3) TCEQ should conduct a more thorough comparison between on-line and grab sample data when reviewing the final FSC report. The information from this review will help TCEQ define the most appropriate monitoring technology and interval for sites where both on-line and grab sample data were collected during the FSV.
- 4) The TCEQ and the City should probably discuss whether it would be beneficial for the City to redefine the first three disinfection zones at the 2010 WTP (D1 – D3) as three parallel zones (D1A – D1C). Doing so could reduce the number of ClO₂ analyses required and minimize the need to use the DPD-Glycine method for compliance monitoring.
- 5) If the City requests permission to continue using the DPD-Glycine method for monitoring the ClO₂ residual at the end of disinfection zones D1 – D3, the TCEQ will need to determine if it can grant the request since 30 TAC 290.111(d)(4)(E) does not explicitly state that the DPD-glycine method is approved for measuring dioxide residuals used in CT calculations.

Jack Schulze's Field Notes

Mr. Schulze has transcribed his field notes into the checklist spreadsheet that Marlo Wanielista-Berg (WSD) prepared to facilitate data collection during this FSV site visit. A copy of the applicable sections of this updated spreadsheet is shown in Attachment 1.

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
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)	Yes	4-hrs	same (2, 6, 10)	yes	
2. Influent water temperature (oC) (from TCEQ-3J-6)	Yes	4-hrs	ditto	yes	
3. Coagulant dosage (mg/L)	Yes	4-hrs	ditto	NO Needs to change monitoring interval to beginning and middle of shift for the rest of the FSV	Dose = (A/1440)/B * conversion factor, where A = total coagulant V B = instantaneous Q @ 4-hours
4. Quantity of coagulant used (gpd)	Yes	1/day	same	yes	tank V at end of day X - tank V at end of day (X-1)
5. Escherichia coli (E. coli) enumeration		PCR: once per day & EPA 1623: start up, 30 day, end			
6. Giardia (cysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			
7. Cryptosporidium (oocysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
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)	Yes	15-min			
2. Free chlorine dosage (mg/L)	Yes	4-hrs			hasn't been used during FSV
3. Ammonia dosage (mg/L)	Yes	4-hrs			hasn't been used during FSV
4. Total chlorine residual, after ammonia injection (mg/L)	Yes	4-hrs	same (2, 6, 10)	yes	checked 02/20/14; all data from plant lab data sheets matched the data in the FSV spreadsheet.
5. Monochloramine residual, after ammonia injection (mg/L)	Yes	4-hrs	ditto	yes	
6. Free chlorine residual, after ammonia injection (mg/L)	Yes	4-hrs	ditto	yes	
7. Free ammonia level, after ammonia injection (mg/L)	Yes	4-hrs	ditto	yes	
8. pH level at monochloramine residual monitoring tap	Yes	4-hrs	ditto	yes	
9. Water temperature at monochloramine residual monitoring tap (oC)	Yes	4-hrs	ditto	yes	
10. Quantity of chlorine used (ppd)	Yes	1/day	same	yes	weight at end of day X - weight at end of day (X-1)
11. Quantity of ammonia used (ppd)	Yes	1/day	same	yes	weight at end of day X - weight at end of day (X-1)
TCEQ-6J: 2008 MF/RO SWTP Radial Flow Clarifier (flocculation & clarification)					
1. Effluent flow rate (gpm) (clarifier influent flow rate minus blowdown flow rate)	calc	15-min	same	yes	Flow rate = (A/1440)/B, where A = sum of timer frequency * timer duration * rate B = influent Q
2. Settled water turbidity level (NTU)	Yes	2-hrs	same (2, 4, 6, 8, 10, 12)	yes	checked 03/02/14; all data from plant lab data sheets matched the data in the FSV spreadsheet.
3. Effluent pH level	Yes	4-hrs	same (2, 6, 10)	yes	
4. Calculated flocculator hydraulic detention time (Based on influent flow rate, mins.)	Yes	1/day and any time flow changes	15-minute	yes	HDT = Flocculator chamber V/instantaneous influent Q min daily value reported verified the equation on the FSV spreadsheet
5. Calculated clarifier surface overflow rate (gpm/sf)	Yes	1/day and any time flow changes	15-minute	yes	SOR = instantaneous influent Q/total Clarifier surface area max daily value reported verified the equation on the FSV spreadsheet NOTE: Told Mark to change the formula so that it only uses the annular (settling zone) area
6. Effluent TOC (mg/L) (to be conducted on-site)		1/7 days			
7. Effluent DOC (mg/L)		1/7 days			

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-7J: End WW DZ 2 (at 2008 MF/RO SWTP's radial flow clarifier's effluent pipe)					
1. Total chlorine residual (mg/L)	Yes	15-min	same	yes	checked FSV spreadsheet, all data being recorded
2. Monochloramine residual (mg/L)	Yes	15-min	ditto	yes	ditto
3. Free chlorine residual (mg/L)	Yes	15-min	ditto	yes	ditto
4. Free ammonia level (mg/L)	Yes	15-min	ditto	yes	ditto
5. pH level at monochloramine monitoring tap	Yes	15-min	ditto	yes	ditto
6. Water temperature (oC) at monochloramine monitoring tap	Yes	15-min	ditto	yes	ditto
TCEQ-8J: Begin WW DZ 3 (at MF membrane units' feed trough)					
1. Free chlorine dosage rate (mg/L)	calc	4-hrs	4-hr calcs based on shift readings	NO Needs to change monitoring interval to beginning and middle of shift for the rest of the FSV	Dose = (A/1440)/B * conversion factor, where A = ppd feed rate measured at the beginning and ending of each shift B = instantaneous Q @ 4-hours verified the equation on the FSV spreadsheet
2. Ammonia dosage rate (mg/L)	calc	4-hrs	4-hr calcs based on shift readings		
3. Total chlorine residual, after ammonia injection (mg/L)	Yes	4-hrs	same	yes	checked 02/20/14; all data from daily log data sheets matched the data in the FSV spreadsheet.
4. Monochloramine residual, after ammonia injection (mg/L)	Yes	4-hrs	same	yes	
5. Free chlorine residual, after ammonia injection (mg/L)	Yes	4-hrs	same	yes	
6. Free ammonia level, after ammonia injection (mg/L)	Yes	4-hrs	same	yes	
7. Water temperature at monochloramine residual monitoring tap (oC)	Yes	4-hrs	same	yes	
8. pH level at monochloramine residual monitoring tap	Yes	4-hrs	same	yes	
9. Quantity of chlorine used (ppd)	Yes	1/day	same	yes	weight at end of day X - weight at end of day (X-1)
10. Quantity of ammonia used (ppd)	Yes	1/day	same	yes	weight at end of day X - weight at end of day (X-1)
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)	?	15-min	same	yes	They are recording the water level and TMP in each cell. NOTE: I have no idea if this is acceptable but it seems logical.
2. Influent silt density index (SDI)		1/day			

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-10J: Selected MF Membrane Unit Filtrate Quality (after vacuum pump & prior to blending with any other MF filtrate)					
1. Effluent turbidity (mNTU)	Yes	5-min	same	yes	
3. Outlet pressure, vacuum (psi)	Yes	15-min	same	yes	
4. Selected MF unit's effluent flow rate (gpm)	Yes	15-min	same	yes	
5. Temperature (oC) (from TCEQ-11J-6)		15-min			
6. pH level (from TCEQ-11J-5)		15-min			
7. Calculated average transmembrane pressure (TMP, psi)		4-hrs	every 15 minutes with 4 hr calculations	yes	For FSV report: value = sum of 15-min readings during the 4 hrs/16 For RR SWMOR-Alt: value = sum of 15-min readings/96
8. Calculated average flux rate (gallons per square-foot per day, gfd)		4-hrs		yes	
9. Calculated average specific flux rate (gfd/psi) at measured temperature		4-hrs		yes	
10. Calculated average specific flux (gfd/psi) normalized to 20o C		4-hrs		yes	
11. SDI		1/day			
12. Alkalinity (mg/L) (to be conducted on-site)		1/7 days			
13. TOC (mg/L) (to be conducted on-site)		1/7 days			
14. DOC (mg/L)		1/7 days			
15. Escherichia coli (E. coli) enumeration		PCR: once per day & EPA 1623: start up, 30 day, end			
16. Giardia (cysts/L) enumeration		PCR: once per day & EPA 1623: start up, 30 day, end			
17. Cryptosporidium (oocysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			
18. Total culturable viruses (MPN/L)		PCR: once per day & EPA 1623: start up, 30 day, end			

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-11J: End WW DZ 3 (at combined MF filtrate pipe)					
1. Total chlorine residual (mg/L)	Yes	15-min	same	yes	The review of the 03/03/14 spreadsheet revealed that there are some "odd" on-line values. Some 15-minute data sets had: 1) site 11J mono readings >> the corresponding site 7J readings (although no chlorine or ammonia was being added) 2) FCL > 0.3 at site 11J even though FAA at site 11J > 4
2. Monochloramine residual (mg/L)	Yes	15-min	same	yes	
3. Free chlorine residual (mg/L)	Yes	15-min	same	yes	
4. Free ammonia level (mg/L)	Yes	15-min	same	yes	
5. pH level at monochloramine residual monitoring tap	Yes	15-min	same	yes	
6. Water temperature at monochloramine residual monitoring tap (oC)	Yes	15-min	same	yes	
7. Combined MF units' effluent flow rate (gpm)	Yes	15-min	same	yes	
TCEQ-12J: Sodium Bisulfite Feed System					
1. Sodium bisulfite dosage (mg/L)	Yes	4-hrs	4-hr calcs based on shift readings	NO Needs to change monitoring interval to beginning and middle of shift for the rest of the FSV	Dose = $A/B \times \text{conversion factor}$, where A = volume at end of shift - volume at beginning of shift B = instantaneous Q @ 4-hours verified the equation on the FSV spreadsheet
2. Quantity of sodium bisulfite used (ppd)	Yes	1/day	yes		sum of gallons used during each shift

Item	Location	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
	ok? (y/n)				
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)	Yes	4-hrs	same (1, 5, 9)	yes (see note)	checked 02/20/14; all data from daily log sheets matched the data in the FSV spreadsheet.
2. pH level	Yes	4-hrs	ditto	yes	NOTE: the operators are now using DPD-Glycine for testing ClO ₂ zones D1-D3. Using amperometric titration for 3 samples was adding about 2 hrs to their work and they couldn't accomplish other duties
3. Temperature (oC)	Yes	4-hrs	ditto	yes	
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)	Yes	4-hrs	same (1, 5, 9)	yes (see note)	checked 02/20/14; all data from daily log sheets matched the data in the FSV spreadsheet.
2. pH level	Yes	4-hrs	ditto	yes	NOTE: the operators are now using DPD-Glycine for testing ClO ₂ zones D1-D3. Using amperometric titration for 3 samples was adding about 2 hrs to their work and they couldn't accomplish other duties
3. Temperature (oC)	Yes	4-hrs	ditto	yes	
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)	Yes	15-min	same	yes	checked 02/20/14; all data from daily log sheets matched the data in the FSV spreadsheet. NOTE: the operators are now using DPD-Glycine for testing ClO ₂ zones D1-D3. Using amperometric titration for 3 samples was adding about 2 hrs to their work and they couldn't accomplish other duties
2. Chlorine dioxide residual (mg/L)	Yes	4-hrs	same (1, 5, 9)	yes	
3. pH level	Yes	4-hrs	ditto	yes	
4. Temperature (oC)	Yes	4-hrs	ditto	yes	
5. Turbidity (NTU)	Yes	4-hrs	ditto	yes	
6. Total alkalinity (mg/L as CaCO3)	Yes	1/day	daily (0900)	yes	
7. Nitrate (mg/L)	Yes	1/day	daily	yes	checked 02/20/14; all data from plant lab data sheets matched the data in the FSV spreadsheet.
8. Chlorite (mg/L)	Yes	1/day	daily	yes	checked 02/20/14; all data from plant lab data sheets matched the data in the FSV spreadsheet.

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
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)	See note	4-hrs	15-minute	yes	NOTE: Flow rate data is from parshall flume at 2010 Plant checked 02/20/14; all data from plant lab data sheets matched the data in the FSV spreadsheet.
2. Turbidity (NTU)	Yes	4-hrs	same (1, 5, 9)		
3. pH	Yes	4-hrs	ditto		
4. Temperature (oC)	Yes	4-hrs	ditto		
5. E. coli enumeration		PCR: once per day & EPA 1623: start up, 30 day, end			
6. Giardia (cysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			
7. Cryptosporidium (oocysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			
8. Nitrate (mg/L)		1/day also split sample to lab Startup, 30 day and end			
9. Water color		1/day			
10. Odor (threshold odor number)		1/day			
11. TOC (mg/L) (to be conducted on-site)		1/ 7 days			
12. DOC (mg/L)		1/ 7 days			
13. TTHM (mg/L)		1/ 7 days			
14. HAA5 (mg/L)		1/ 7 days			
15. Bromide (mg/L)		1/ 7 days			
16. Chemicals listed in §290.106(b) Inorganic Chemicals 3		Start up, 30 days , end			
17. Chemicals listed in §290.107(b) Organic Chemicals 3		Start up, 30 days , end			
18. Chemicals listed in §290.108(b)(1) radionuclides		Start up, 30 days , end			
19. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d) manmade radionuclides		Start up, 30 days , end			
20. Chemicals listed in §290.118(b) Secondary Chemicals		Start up, 30 days , end			

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
21. Total culturable viruses (MPN/L)		Start up, 30 days , end			
24. Chlorite (mg/L)		1/day			
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)	See note	4-hrs	Calculated every 4 hrs	NO Needs to change monitoring interval to beginning and middle of shift for the rest of the FSV	Cl ₂ and NH ₃ feed rates measured at the beginning and ending of each shift Dose = A/B * conversion factor, where A = ppd B = Instantaneous Flume Q @ at 4 hrs
2. Ammonia dosage (mg/L)	See note	4-hrs			
3. Total chlorine residual, after ammonia injection (mg/L)	See note	4-hrs	same (1, 5, 9)	yes	checked 02/20/14; all data from plant lab data sheets matched the data in the FSV spreadsheet. NOTE: samples are being collected at sample site 28J because the transmission line is buried under a paved drive and was inaccessible to install a sample tap at location 30J
4. Monochloramine residual, after ammonia injection (mg/L)	See note	4-hrs	ditto	yes	
5. Free chlorine residual, after ammonia injection (mg/L)	See note	4-hrs	ditto	yes	
6. Free ammonia residual, after ammonia injection (mg/L)	See note	4-hrs	ditto	yes	
7. pH level at monochloramine residual monitoring tap	See note	4-hrs	dfi	yes	
8. Water temperature at monochloramine monitoring tap (oC)	See note	4-hrs	ditto	yes	
9. Quantity of chlorine used (ppd)	Yes	1/day	yes	yes	
10. Quantity of ammonia used (ppd)	Yes	1/day	yes	yes	

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-32J: Conventional 2010 SWTP Flocculation & Clarification (Accelerator solids-contact flocculation and clarification)					
1. Effluent flow rate (gpm) (clarifier influent flow rate minus blowdown flow rate)	Yes	15-min	same	yes	A = influent Q based on Parshall flume B = sludge blowdown V/1440 effluent Q = A - B
2. Settled water turbidity (NTU)	yes	2-hrs	same		
3. Cationic polymer dosage (mg/L)	yes	4-hrs	2 per 8-hr shift	NO Needs to change interval to beginning and middle of shift for the rest of the FSV	A = mL/min poly (drawdown at beginning and ending of 8-hr shift) * density B = 4 hr instantaneous Q influent dose = A/B * conversion factor
4. Lime feed rate (gpm)	Yes	4-hrs	same	NO Needs to change interval to beginning and middle of shift for the rest of the FSV	gpm setting at the beginning and ending of each shift
5. Quantity of cationic polymer used (gpd)	Yes	1/day	same		beginning day X - beginning of day (X-1) verified the equation on the FSV spreadsheet
6. Quantity of lime used (ppd)	Yes	1/day	3X/day	yes	sum of the (end weight - beginning weight) for each of the 3 shifts verified the equation on the FSV spreadsheet
7. Calculated flocculator hydraulic detention time (mins.)	calc	1/day and anytime flow changes	every 15 min	yes	HDT = Flocculator V/instantaneous influent Q min daily value reported verified the equation on the FSV spreadsheet
8. Calculated clarifier surface overflow rate (gpm/sf)	calc	1/day and anytime flow changes	every 15 min	yes	SOR = instantaneous influent Q/total clarifier surface area max daily value reported verified the equation on the FSV spreadsheet NOTE: Told Mark to change the formula so that it only uses the annular (settling zone) area
9. Effluent TOC (mg/L) (to be conducted on-site)	Yes	1/7 days	same	Yes	daily laboratory sheets daily lab report matched FSV spreadsheet on 03/02/14
10. Effluent DOC (mg/L)	Yes	1/7 days	same	Yes	daily laboratory sheets daily lab report matched FSV spreadsheet on 03/02/14

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-35J: Selected Conventional 2010 SWTP Gravity Media Filter (selected individual filter effluent (IFE))					
1. Selected individual filter's effluent (IFE) turbidity level (NTU)	Yes	15-min	same	yes	
2. Selected IFE flow rate (gpm)	Yes	4-hrs	every 15 min	yes	each IFE flow rate is continuously monitored
4. Calculated selected IFE hydraulic loading rate for selected filter (gpm/sf)	Yes	1/day and anytime flow changes	every 15 min	yes	HLR (FLR) = instantaneous IFE Q/Filter surface area max daily value (for max filter) reported verified the equation on the FSV spreadsheet
TCEQ-36J: End Blended DZ 4 (after Conventional 2010 SWTP combined filter effluent (CFE) and prior to downstream chlorine injection point)					
1. Total chlorine residual (mg/L)		15-min			oops . . . It looks like I failed to check this DZ monitoring point
2. Monochloramine residual (mg/L)		15-min			
3. Free chlorine residual (mg/L)		15-min			
4. Free ammonia level (mg/L)		15-min			
5. pH level at monochloramine residual monitoring tap		15-min			
6. Water temperature (°C) at monochloramine residual monitoring tap		15-min			
7. Combined filters' effluent (CFE) water flow rate (gpm)	Yes	4-hrs	15-minute	Yes	reported that the sum of the four on-line filter IFE Q's is calculated every 15 minutes the maximum value is reported on the FSV spreadsheet <u>did not</u> verify the spreadsheet formula

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-38J: Begin Blended DZ 5 (at chlorine injection prior to Conventional 2010 SWTP Clearwell)					
1. Free chlorine dosage (mg/L)		4-hrs	same (1, 5, 9)	NO Needs to change monitoring interval to beginning and middle of shift for	Cl ₂ and NH ₃ feed rates measured at the beginning and ending of each shift Dose = A/B * conversion factor, where A = ppd B = Total IFE Q @ at 4 hrs
2. Ammonia dosage (mg/L)		4-hrs	ditto		
3. Total chlorine residual, after ammonia injection (mg/L)		4-hrs	ditto	yes	I did not do a full data comparison between daily log sheets and FSV spreadsheet for this sample site. However, I did compare one data set as part of a comparison between on-line and grab sample results. See data audit worksheet for 38J and 39J
4. Monochloramine residual, after ammonia injection (mg/L)		4-hrs	ditto	yes	
5. Free chlorine residual, after ammonia injection (mg/L)		4-hrs	ditto	yes	
6. Free ammonia level, after ammonia injection (mg/L)		4-hrs	ditto	yes	
7. pH level at monochloramine residual monitoring tap (from TCEQ-36J-5)		4-hrs			
8. Water temperature at monochloramine residual monitoring tap (oC) (from TCEQ-36J-6)		4-hrs			
9. Quantity of chlorine used (ppd)		1/day			
10. Quantity of ammonia used (ppd)		1/day			
TCEQ-39J: End Temporary Blended DZ 5 (at Conventional 2010 SWTP Clearwell's transfer pumps)					
1. Total chlorine residual (mg/L)	Yes	15-min	same	yes	NOTE: samples for 39J and 40J are collected at the same sample site
2. Monochloramine residual (mg/L)	Yes	15-min	15-minute & daily grab @ 0900	yes	
3. Free chlorine residual (mg/L)	Yes	15-min	same	yes	
4. Free ammonia level (mg/L)	Yes	15-min	same	yes	
5. pH level at monochloramine residual monitoring tap	Yes	15-min	same	yes	NOTE: See data audit worksheet for 38J and 39J
6. Water temperature at monochloramine residual monitoring tap (oC)	Yes	15-min	same	yes	

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
TCEQ-40J: Conventional 2010 SWTP Clearwell Effluent Water Quality (after 2010 clearwell transfer pumps and prior to GSTs)					
1. Flow rate (gpm)	Yes	15-min	same	yes	
2. Turbidity (NTU) (the City has selected this turbidity monitoring method at this sample site)	Yes	15-min	same	yes	NOTE: samples for 39J and 40J are collected at the same sample site
4. Nitrate (mg/L)	Yes	15-min	same	yes	
5. TDS (mg/L)	Yes	15-min	same	yes	
6. E. coli enumeration		PCR: once per day & EPA 1623: start up, 30 day, end			
7. Giardia (cysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			
8. Cryptosporidium (oocysts/L)		PCR: once per day & EPA 1623: start up, 30 day, end			
9. Fluoride (mg/L) (*Should not be over 2.0 Enclosure D #5 and 6)		1/day, also split sample to lab Startup, 30 day and end			
Enclosure D 1. Fluoride system in operation?					
D 2. Fluoride conform with ANSI/NSF					
D. 3 and 4. Day tank provided and spill containment for bulk and day tank.					
D 5. Amount of Fluorisilic acid, and dosage		1/day			
10. Daily quantity of water treated (MGD)		1/day			
11. Chlorine dioxide (mg/L)		1/day			
12. Chlorite (mg/L)		1/day			
13. Color (color units)		1/day			
14. Odor (threshold odor number)		1/day			
15. Alkalinity (mg/L)		1/ 7 days			
16. Hardness as calcium carbonate (mg/L)		1/ 7 days			
17. Calculated Langelier saturation index (LSI)		1/ 7 days			

Item	Location ok? (y/n)	TCEQ Frequency	WF Frequency	Frequency Ok? (y/n)	Comments
18. Chemicals listed in §290.106(b) Inorganic Chemicals 3		Start up, 30 days , end			
19. Chemicals listed in §290.107(b) Organic Chemicals 3		Start up, 30 days , end			
20. Chemicals listed in §290.108(b)(1) (radium 226, radium 228, uranium, gross alpha activity)		Start up, 30 days , end			
21. Chemicals listed in §290.108(b)(2) & 40 CFR §141.66(d)		Start up, 30 days , end			
(gross beta particle and photon radioactivity, tritium, strontium 90)		Start up, 30 days , end			
22. Chemicals listed in §290.118(b) Secondary Chemicals		Start up, 30 days , end			
23. TTHM (ug/L)		1/7 days			
24. HAA5 (ug/L)		1/7 days			
25. Lead (mg/L)		Start up, 30 days , end			
26. Total culturable viruses (MPN/L)		Start up, 30 days , end			
36. Perchlorate (ug/L)		Start up, 30 days , end			
37. Bromate (mg/L) (TCEQ added disinfection by-product)		1/7 days			

Data Comparison (38J and 39J)

38J Sample site is located upstream of Cl₂ and NH₃ injection point

38J Sample site is located downstream of Cl₂ and NH₃ injection point

chlorine dose = ppd chlorine @ D5 influent/instantaneous CFE Q * conversion factor

Ammonia dose = ppd ammonia @ D5 influent/instantaneous CFE Q * conversion factor

Data Comparisons

Date and Time	Parameter	38J	chlorine dose	ammonia dose	39J	
		grab			grab	on-line
02/20/2014 @ 1700	Mono	1.7	0.97	0	3.1	1.63
	TCL	3.2			NA	2.98
	FCL	0			NA	0.9
	FAA	0.18			NA	0.04
03/02/2014 @ 1700	Mono	3.6	0.91	0	3.6	3.15
	TCL	3.5			NA	3.86
	FCL	0			NA	0.69
	FAA	0.45			NA	1.1

EXCEPTION CONDITIONS	Corrected?	How?
For the Secondary Reservoir raw surface water CT Workbook:		
1. 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	yes	
>Viruses must be 2.0, not 5.0 as was entered.	yes	
2. On the Calculator Worksheet the disinfectant for disinfection zones (DZ) Nos. 2 and 3 should be chlorine dioxide, not chloramines.	yes	
3. 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.	we discussed this. We also asked them to indicate (in the comments cell) that the D2 pipe length is the segment between the D1 and D2 monitoring points (just to reduce any potential for confusion)	
4. 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.	yes, the schematic now shows 3	
For the RR WWTP source water CT Workbook:		
1. On the Schematic Worksheet please revise the zones shown as DZ 3A and DZ 3B into a single disinfection zone, DZ 3.	yes	
2. 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.	yes	
3. 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.	yes	dimensions provided

EXCEPTION CONDITIONS	Corrected?	How?
4. 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	yes yes	dimensions provided
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.	yes yes yes	template now contains a value of 2297 gpm (but not the actual formula)
6. The flow rate through each MF tank must be monitored and the highest flow rate entered for DZ 3 on the Calculator Worksheet.	discussed this	TCEQ needs to stipulate this in the CT Study approval letter

EXCEPTION CONDITIONS	Corrected?	How?
On the T10 Detail Worksheet for both CT Templates in Enclosure H, please note:		
1. 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: $= (Q \times 10^6) / 1440, \text{ where } Q \text{ is the flow rate in MGD}$	yes	the Q values appear seem to be consistent with max flow rate
2. 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 (7.0 MGD)	Mark didn't understand the comment; he will check	
Other Concerns		
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.	Mark didn't know if this has been done yet (i.e., the drawings); he will check with Daniel	JCS: I think this has been done but we need to check with Red

Check the SWMOR for the following parameters

General set up

CT parameters

CT recordings - worst of all data sets

Turbidity (membrane and conventional) IFE & CFE

flows

DIT

Parameter/ Zone	04/30/12 DIT Ltr	08/29/13 FSV CT Study	SWMOR-RR
DIT	16.5		same
Δ P	1.65		same
LRC	3.0		2.8†
D1		7.50/357.0	same
D2		7.50/223.2	same
D3		3.308/5.6	7.50/5.6‡
D4		10.0/67.1	same
D5		10.0/7.9	same

† Daniel says there is a subsequent letter that limits LRC to 2.8

‡ Discussed the need to base the Q for zone d4 (the membrane cells) on the flow rate and volume of a single cell unless there is a TCEQ letter that explicitly states to do otherwise for some reason

Additional RR SWMOR-Alt Notes

- 1) FSV spreadsheet calculates TMP and flux based on daily average of all 15-min readings
- 2) IFE confirmation procedure
 - a) computer reports max 5-min IFE reading for each cell
 - b) if reading > 0.10, computer reports next 5-min reading
 - c) if a) was >0.10, computer reports next highest reading
 - d) if c) > 0.10, computer repeats step b)
 - e) computer repeats the process until it gets to a "next highest" reading that is ≤ 0.10
 - f) operator reviews daily report and determines if there is a validated reading > 0.10 and records the appropriate value on log sheet.
 - g) Plant Superintendent transfers transfers to SWMOR.
- 3) CT Data
 - a) Operators do an IR calculation every 4 hours but currently only fill out a CT calculator worksheet for the lowest IR data set for their shift (i.e., 2 sets of calculations but only one set of data calcs recorded on log sheet).
 - b) Plant superintendent then transfers the lowest of the three reported IR sets on the SWMOR-Alt.
- 4) Reviewed LT Summary. Mark has misunderstood how to report the use of 2nd stage clarifier (the 2010 unit) under the Performance Demonstration column. Corrected the draft MOR during the visit to show 0.5-log credit instead of max MF cell reading.

	08/29/13	
Zone	FSV CT Study	SWMOR-RR
D1	5.0/8.3	same
D2	5.0/10.4	same
D3	5.0/116.1	same
D4	10.0/67.1†	same
D5	10.0/7.9	same

† The total volume and Q for the conventional filters was used because the plant always (and only ever) has exactly 4 filters online at any given times.

Additional 2010 SWMOR-Alt Notes

1) IFE confirmation procedure

- a) computer reports max 15-min/4-hour IFE reading for each filter
- b) if reading > trigger, computer reports next 5-min reading
- c) if a) was > trigger, computer reports next highest reading
- d) if c) > trigger, computer repeats step b)
- e) computer repeats the process until it gets to a "next highest" reading that is <= trigger
- f) operator reviews daily report and determines if there is a validated reading > trigger and records the appropriate value on log sheet.
- g) Plant Superintendent transfers transfers to SWMOR.

2) CT Data

- a) Operators do am IR calculation every 4 hours but currently only fill out a CT calculator worksheet for the lowest IR data set for their shift (i.e., 2 sets of calculations but only one set of data calcs recorded on log sheet).
- b) Plant superintendent then transfers the lowest of the three reported IR sets on the SWMOR-Alt.