MISSISSIPPI STATE DEPARTMENT OF HEALTH

REPORT OF INSPECTION OF DRINKING WATER SUPPLY

PWS: 0250008 **Class:** A

An inspection of the CITY OF JACKSON water supply in HINDS county was made on 11/08/2021. Present at the time of inspection was MARY D CARTER, OPERATOR; CHARLES E WILLIAMS JR, OWNER; WRITER. Official CHARLES E WILLIAMS JR Address PO BOX 17 JACKSON MS 39205 W.W. Operator MARY D CARTER Address 1053 WHITSETT WALK JACKSON MS 39206 No. Connections 71486 No. Meters ___ Population Served 173514 Field Chemical Analysis: pH ___ Cl2(free) ___ Cl2(total) ___ H2S N/A Iron ___ Fluoride ___ Point of Sampling DISTRIBUTION Water Rates ___ This inspection included a sanitary survey for compliance with the Ground Water Rule.

COMMENTS

Technical: 1 Managerial: 4 Financial: 4

OVERALL CAPACITY RATING: 3.0 / 5.0

1. The plants were inspected on November 8, 2021. Present at JH Fewell were Terence Byrd, James Perry, Chris Ward, Charles Williams, and Keith Allen. Present at OB Curtis were Robert Loftin, LaTanya Thomas, Richard Harper, Hekemia Lawrence, and Keith Allen. The wells and tanks were inspected on November 9, 2021. Present were Terence Byrd and James Perry. The records at the Hood Building were inspected on November 10, 2021. Present were Dr. Charles Williams, Mary Carter, Marlin King, and Tim Cage.

2. The following deficiencies noted in the November 2020 Sanitary Survey have been resolved:
   a.) The walkway replacement project at JH Fewell.

   b.) The claritrac system was fully operational at JH Fewell.

   c.) The TV Road tank is designated as inactive will be inspected once the City is able to use that booster station.

   d.) The chlorine weight indicator had been replaced and the ammonia feed line has been replaced. The disinfection system is able to run in automatic, but it was reported by Mr. Allen that it runs better in manual.

3. The following deficiencies noted in the February 2020 Sanitary Survey were underway, but not yet fully resolved:
   a.) Only one basin at OB Curtis had a claritrac system functioning. It was reported that the City plans to work on these units one basin at a time in the spring of 2022. Due to the claritrac system not functioning, operators must drop the three basins on a routine basis to clean the sludge from them. Constantly doing this leads to issues with treatment chemical dosing, thus affecting filter effectiveness.

   b.) The cover for the membrane system at OB Curtis was under construction at the time of inspection.

   c.) The last two flow meters to be replaced at JH Fewell are part of the upcoming corrosion control project. OB Curtis was lacking one total chlorine analyzer and a 24" flow meter. Both plants now have instruments techs and all analyzers/monitors are being cleaned and calibrated on a routine basis.

   d.) The corrosion control study at JH Fewell has been completed and accepted. Treatment recommendations have been made, funding has been secured, and the design phase is underway.

   e.) The Membrane Integrity Testing (MIT) is the GE/Suez Zeeweed Z500D system's method of proving the fibers are achieving LT2 Log Removal Values (LRV) for cryptosporidium removal. If a train fails MIT, and the LRV is not reported, then the City cannot assure their customers and MSDH that they are properly treating the water to Safe Drinking Water Act Standards. There are various reasons as to why the MIT fails, but according to the CFR, none of those matter for regulation purposes. The MIT must be functioning for all trains in order to stay online. If they cannot pass MIT, then the train must be taken offline immediately. This item has improved in the last year, but there are remaining issues with valves and the timing of their opening/closing that cause the system to kick out. It was reported that new valves and sequence timing will be part of Train 5 fiber replacement in 2022.

   f.) JH Fewell conventional filters #24, 26, 28 have a plan in place to be put back in service. Filter #28 needs an actuator and has been ordered. Filters #24 & 26 are planned for rehabilitation in 2022. All other filters at JH Fewell and OB Curtis have a Scope of Work set up for SRF Loan #3, as reported by Dr. Williams.

4. The following deficiencies noted in the February 2020 Sanitary Survey have not had action at the time of inspection:
   a.) The intake building at the reservoir is in failing condition with hole in the roof. The potassium permanagate feed system at this location is inoperable.

5. While there are still so many outstanding issues with the water system, MSDH requests that the Weekly Operating Reports with logbook entries continue.

6. The following deficiency was noted during the November 2021 Sanitary Survey:
   a.) Pumps & Controls (OB Curtis) - The fire on April 30, 2021 caused all of the High Service #2 pumps to be taken out of service. At the time of inspection there was no target date to have the pumps repaired and put back in service. The loss of these five pumps has caused multiple elevated tanks to be low or empty and has caused certain areas of the distribution to have sustained low pressure. The loss has also caused the City's design capacity to go from 78% in 2020 to 93% in 2021.

7. The following comments outline the changes made to the Design Capacity Calculations from the 2020 Calculations. If at any time filters, trains, or pumps are brought back online, we will recalculate the Design Capacity upon request.
   a.) JH Fewell: Only the online filters were included in the calculations. This includes four 2.0 MGD filters and nine 2.5 MGD filters. This did not affect the plant's ability to treat their assigned 20 MGD. It did affect the contact time in the online filters and put more importance on the chlorine dosage and the UV light disinfection.

   b.) OB Curtis Conventional: Credit was given for the four online filters, bringing that side's capacity from 25 MGD to 16.8 MGD. The CT calculations were not changed. If CT is met at 25 MGD, it is met at the lower flow of 16.8 MGD.

   c.) OB Curtis Membrane: Credit was given for the four trains that are consistently passing MIT and online at the time of inspection, bringing that side's capacity from 25 MGD to 16.8 MGD. If CT is met at 25 MGD, it is met at the lower flow of 16.8 MGD.

   d.) OB Curtis Pumps: The electrical fire on April 30, 2021 caused all High Service #2 pumps to be taken out of service until repairs can be made. At the time of inspection there was no estimated date in which they would be back in service. All HS2 pumps, plus HS1 pump #2 which has been out of service over a year, have been taken out of the calculations.

   d.) The 1.0 MG Byram tank, 0.2 MG Suncrest tank, and 1.0 MG Elaine tank are not included in the elevated tank capacity. The Byram tank has been offline for over a year. The Suncrest and Elaine tanks were empty at the time of inspection. Weekly Operating Reports show that these two tanks are often empty.

   e.) Due to the above items, the City is now serving 93% of the capacity it was designed to serve. It is vital to the continued operations of the City that projects stay on track to increase the City's supply capacity.

8. All online conventional filters at both plants had turbidities less than 0.3 NTU at the time of inspection. Membrane train #1 passed MIT with 5.168, train #2 passed MIT with 5.203, #3 had passed MIT with 5.031 and train #6 had passed MIT with 4.878. All trains had turbidities less than 0.15 NTU.

9. Mr. Allen discussed an upcoming winterization project at OB Curtis. They plan to move the soda ash pumps into the old lime pump room, insulate above-ground piping at the raw water station and pre-ox basin, and install a new soda ash tank.

10. Mr. Loftin reported trouble with the level indicator in Soda Ash Silo 1 at OB Curtis.

11. Based on operator comments, the Membrane treatment trains are not being properly cleaned due to the inability of the trains to perform Tank Deconcentrations (Tank Decon) and daily Maintenance cleans (M Cleans) as required by the vendor. Additionally, faulty feed valves on Trains 1, 3, and 4 are remaining open and not allowing the sludge to be completely drained from the trains during cleans causing ineffective cleans. Recovery Cleans (R-Cleans) are also poorly conducted in manual due to the system having failing valves attached to the Clean In Place (CIP) tanks and piping. These cleanings are needed to maintain the overall system health and to prolong the life of the train fibers and other attached equipment.

12. The yard at the Forest tank had trees that have limbs hitting the tank. These limbs need to be cut back to prolong the life of the exterior paint.

13. The Chastain tank yard has a pine tree leaning toward the fence and apartments next door. This tree needs to be removed.

14. The gate on the fence surrounding the Zoo tank needs to be repaired to prevent unauthorized access.

15. The Windsor Rd Booster Station fence has some erosion at the back side of the fence that needs to be addressed. It was also observed that some of the block is eroding.

16. Beginning July 1, 2021 the target for pH is 9.0 - 9.5 leaving the plants and the current for alkalinity is 15 mg/L or greater. At the time of inspection, only OB Curtis HS #1 was meeting pH target and all entry points were meeting the alkalinity target. (T1, T2-1)

17. The lab equipment at JH Fewell should mirror the equipment at OB Curtis. Currently JH Fewell can run all water quality parameters except color, iron, free ammonia, and monochloramine. Since the City uses chloramines as their disinfectant, each plant should be able to check all four parameters (free chlorine, total chlorine, free ammonia, monochloramine) to be assured treatment is adequate. (T2-2)

18. The two tanks inspected this year were Magnolia & NW Industrial. By the next MSDH inspection, a plan should be presented to address the recommendations on these two tanks plus the five tanks inspected in 2020 (the two ground tanks at JH Fewell, Maddox Rd, Cedar Hills, and Chastain). (T2-3)

19. The water loss report presented at the inspection showed an annual water loss of greater than 40%. (T4-1)

20. Due to OB Curtis not being able to pump enough water to maintain water all elevated storage tanks, this results in calls of low pressure. (T4-3)

21. Credit was not given for T5-1 because the system does not have the ability to provide water during a prolonged power outage. In order to get credit, the City will need to obtain generators capable of operating enough of the plant capacity to keep pressure in the system during a prolonged power outage.

22. Credit was not given for T5-2 because the City needs both treatment plants and the wells to provide water for all customers. If any of them were to go offline, the others could not compensate.

23. Ms. Carter reported that while a cut-off list is generated each billing cycle, the City is still not cutting off delinquent accounts. (F3)

24. Below is a breakdown of the water quality parameters recorded during the inspection:

	JHF	OBC HS #1	OBC HS #2
pH	9.8	9.4	9.6
Cl2 free	0.1 mg/L	0.1 mg/L	0.2 mg/L
Cl2 total	3.1 mg/L	2.7 mg/L	2.8 mg/L
Free ammonia	0.3 mg/L	0.0 mg/L	0.01 mg/L
Monochloramine	2.64 mg/L	2.36 mg/L	2.53 mg/L
Iron	0.01 mg/L	0.0 mg/L	0.00 mg/L
Manganese	0.03 mg/L	0.004 mg/L	0.007 mg/L
Turbidity	0.14 NTU	0.117 NTU	0.140 NTU
Alkalinity	26 mg/L	35.4 mg/L	43.1 mg/L
Hardness	55 mg/L	19.4 mg/L	16.3 mg/L
Color	2	2	3
Fluoride	1.2 mg/L	1.8 mg/L	0.8 mg/L

Completed by Amy L. McLeod, E.I. on 12/09/2021.

Reviewed by Greg Caraway, P.E. on 12/13/2021.

If you have any questions, please call (601)576-7518.

pc:

CHARLES E WILLIAMS JR, OFFICIAL
MARY D CARTER, OPERATOR
HONORABLE CHOKWE ANTAR LUMUMBA, MAYOR
EPA REGION 4

STANDARD FORM

Mississippi State Department of Health
Bureau of Public Water Supply

FY 2022 Public Water System Capacity Assessment Form

NOTE: This form must be completed whenever a routine sanitary survey of a public water system is conducted by a regional engineer of the Bureau of Public Water Supply

PWS ID#: 0250008 Class: A Survey Date: 11-08-2021 County: HINDS

Public Water System: CITY OF JACKSON Conn: 71486

Certified Waterworks Operator: MARY D CARTER Pop: 173514

CAPACITY RATING DETERMINATION

Technical (T) Capacity Rating: [**1**] Managerial (M) Capacity Rating [**4**] Financial (F) Capacity Rating [**4**]

Capacity Rating $= \frac{T + M + F}{3} = \frac{9}{3} = 3$

Overall Capacity Rating = 3.0

Completed by Amy L. McLeod, E.I. on 11/30/2021

Reviewed by Greg Caraway, P.E. on 12/13/2021

Comments:

Technical Capacity Assessment	Point Scale	Point Award
[T1] Does the water system have any significant deficiencies? [(Y) N]	N - 1pt. Y - 0pt.	0
[T2] 1) Was the water treatment process functioning properly? [Y (N)] (i.e. Is pH, iron, chlorine, fluoride, etc. within acceptable range?) **2)** Was needed water system equipment in place and functioning properly at the time of survey? [Y (N)] (**NOTE:** Equipment deficiencies must be identified in survey report.) **3)** Were records available to the regional engineer clearly showing that all water storage tanks have been inspected and cleaned or painted (if needed) within the past 5 years? [Y (N) NA] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	0
[T3] 1) Was the certified waterworks operator or his/her authorized representative present for the survey? [(Y) N] **2)** Was PWS Operations record up to date and properly maintained? [(Y) N] (Are minimum days being met based on system classification) **3)** Was the water system properly maintained at the time of survey? [(Y) N] **4)** Did operator/system personnel satisfactorily demonstrate to the regional engineer that he/she could fully perform all water quality tests required to properly operate this water system? [(Y) N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	1
[T4] 1) Does water system routinely track water loss and were acceptable record available for review? [(Y) N] **2)** Is water system overloaded? (i.e. serving customers in excess of MSDH approved design capacity)? [(Y) N] **3)** Was there any indication that the water system is/has been experiencing pressure problems in any part(s) of the distribution system? [(Y) N] (based on operator information, customer complaints, MSDH records, other information) **4)** Are well pumping tests performed routinely? [Y N (NA)] (**NOTE:** YES FOR #1 & YES OR N/A FOR #4 AND NOs FOR #2 & #3 required to receive point)	1)Y - pt. 2)N - pt. 3)N - pt. 4)Y - pt.	0
[T5] 1) Does the water system have the ability to provide water during power outages? (i.e. generator, emergency tie-ins, etc.) [Y (N)] **2)** Does the water system have a usable backup source of water? [Y (N)] (**NOTE:** Must be documented on survey report)	All Y - 1 pt. Else - 0 pt.	0
TECHNICAL CAPACITY RATING = [1] (Total Points)		

Managerial Capacity Assessment	Point Scale	Point Award
[M1] Were all SDWA required records maintained in a logical and orderly manner and available for review by the regional engineer during the survey? [(Y) N]	Y - 1pt. N - 0pt.	1
[M2] 1) Have acceptable written policies and procedures for operating this water system been formally adopted and were these policies available for review during the survey? [(Y) N] **2)** Have all board members (in office more than 12 months) completed Board Member Training? [Y N (NA)] **3)** Does the Board of Directors meet monthly and were minutes of Board meetings available for review during the survey? (**NOTE:** Quarterly meetings allowed if system has an officially designated full time manager) [(Y) N NA] (**NOTE:** ALL YESs or NAs required to receive point. NA - Not Applicable)	All Y - 1 pt. Else - 0 pt.	1
[M3] Has the water system had any SDWA violations since the last Capacity Assessment? [(Y) N]	N - 1pt. Y - 0pt.	0
[M4] Has the water system developed a long range improvements plan and was this plan available for review during the survey? [(Y) N]	Y - 1pt. N - 0pt.	1
[M5] 1) Does the water system have an effective cross connection control program in compliance with MSDH regulations? [(Y) N] **2)** Was a copy of the MSDH approved bacti site plan and lead/copper site plan available for review during the survey and do the bacti results clearly show that this approved plan is being followed? [(Y) N] (**NOTE:** All YESs required to receive point)	All Y - 1 pt. Else - 0 pt.	1
MANAGERIAL CAPACITY RATING = [4] (Total Points)		

Financial Capacity Assessment	Point Scale	Point Award
[F1] Has the water system raised water rates in the past 5 years? [(Y) N] (**NOTE:** Point may be awarded if the water system provides acceptable financial documentation clearly showing that a rate increase is not needed, i.e. revenue has consistently exceeded expenditures by at least 10%, etc.)	Y - 1pt. N - 0pt.	1
[F2] Does the water system have an officially adopted policy requiring that water rates be routinely reviewed and adjusted as appropriate and was this policy available for review during the survey? [(Y) N]	Y - 1pt. N - 0pt.	1
[F3] Does the water system have an officially adopted cut-off policy for customers who do not pay their water bills, was a copy of this policy available for review by the regional engineer, and do system records (cut-off lists, etc.) clearly show that the water system effectively implements this cut-off policy? [Y (N)]	Y - 1pt. N - 0pt.	0
[F4] Was a copy of the water system's officially adopted annual budget available for review by the regional engineer and does the water system's financial accounting system clearly and accurately track the expenditure and receipt of funds? [(Y) N]	Y - 1pt. N - 0pt.	1
[F5 - Municipal Systems] 1) Was a copy of the latest audit report available for review at the time of the survey? [(Y) N] **2)** Does this audit report clearly show that water and sewer fund account(s) are maintained separately from all other municipal accounts? [(Y) N] (**NOTE:** Yes answer to all questions required to receive point.)	All Y - 1 pt. Else - 0 pt.	1
[F5 - Rural Systems] 1) Was the latest financial report / audit report available for review? [Y N] **2)** Does the latest financial report show that receipts exceeded expenditures? [Y N] (**NOTE:** Yes answer to both questions required to receive point)	All Y - 1 pt. Else - 0 pt.	
FINANCIAL CAPACITY RATING = [4] (Total Points)		

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DESIGN CAPACITY SHEET

System: **CITY OF JACKSON**
ID: **0250008** Class: **A** County: **HINDS**

Date Completed: **12/08/2021**
Connections - Actual: **71486** Equivalent: **82355**
Design Capacity: **88750** Percent Design Capacity: **82355/88750 = 92.8%**

J H FEWELL WATER TREATMENT PLANT

**** CT calculations for FEWELL *****
There are four disinfection segments at Fewell, and the contact time must be determined for each segment to achieve 4-log inactivation of viruses, 3-log inactivation of Giardia, and 3.5-log inactivation of Crypto.

Fewell is required to achieve 0.3 turbidity units 95% of the time to comply with the SWTR. If this treatment is achieved, credit can be given for 2-log removal of viruses & Crypto and 2.5-log removal of Giardia. Free chlorine, chloramination, and UV disinfection must then attain the remaining 2-log inactivation of viruses, 0.5-log inactivation of Giardia, and 1.5-log of Crypto.

Book values:
CT required for 0.5-log inactivation of giardia at 10C and pH at 6.5 = 19 mg/L min
CT required for 2-log inactivation of viruses at 10C and pH at 6.5 = 3 mg/L min

The first segment is free chlorine contact between the point of chlorine injection (at the head of the outlet pipe from the sedimentation basin) and the point of ammonia injection (at the end of the outlet pipe just prior to ammonia injection).

The second is the contact time of free chlorine in the filters during normal filter operation.

The third is the contact time in the clearwell.

The fourth is the UV disinfection.

BASED ON THE TURBIDITY FILTER DATA SUBMITTED ON MONTHLY OPERATING REPORTS, MSDH IS SETTING A MAXIMUM TREATMENT CAPACITY OF 20 MGD. THE 6/14 MGD SPLIT BETWEEN BASINS IS BASED ON STANDARD OPERATION WHEN 20 MGD IS BEING TREATED.

CHLORINE RESIDUALS AND FLOW RATES UPDATED TO REFLECT WHAT THE PLANT WAS TREATING ON 11/08/21

CT SEGMENT 1 (pipes between sed basins and ammonia injection):
The free chlorine is measured by chlorine analyzers which communicate with the ammonia feed system. The concentration of free chlorine in the pipe between Sed Basin #3 and the filters was 3.4 mg/L. The concentration of free chlorine in the pipe between Sed Basin #4 and the filters was 3.3 mg/L.

Calculating the free chlorine contact time between chlorine injection and ammonia injection (at maximum design flows):

Sed basin #3: Pipe dimensions: Length = 351 ft; Diameter = 42 in = 3.5 ft.
Volume in pipe = 0.785 x 3.5 x 3.5 x 351 x 7.48 = 25,247 gallons
Estimated flow through Sed basin #3 train: 6 MGD
Contact time = 25,247 gallons/6,000,000 gal/day x 1440 min/day = 6.1 min

Sed basin #4: Pipe dimensions: Length = 357 ft; Diameter = 48 in = 4 ft.
Volume = 33,540 gallons
Estimated flow through Sed basin #4 train: 14 MGD
Contact time = 33,540/14,000,000 x 1440 = 3.4 min

CT SEGMENT 1 (using shortest contact time of 3.22 min) = 3.4 mg/L x 3.3 min
= 11.2 mg/L min

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(Note: Virus inactivation is achieved in Segment 1; 11.2 mg/L min > 3 mg/L min)

SEGMENT 1 LOG INACTIVATION = 11.2 mg/L min/19 mg/L min * (0.5 log) = 0.3 log

CT SEGMENT 2 (Disinfection in filters):
Disinfectant contact time between filters and clearwell/storage outlet:
Calculate volume of water in filters and estimated residence time:
Volume = L X W X D (where D = depth of water above filter media)
= (20 ft x 10 ft x 1.5 ft) * 7.48 gal/cu.ft. * 9 filters +
(25 ft x 28 ft x 3 ft) * 7.48 gal/cu.ft. * 4 filters
= 20,196 gallons + 62,832 gallons
= 83,028 gallons
Residence time = (83,028 gallons/20,000,000 gallons/day)* 1440 min/day
Residence time = 6.0 minutes

CT SEGMENT 2 (assuming chlorine concentration = finished water chlorine concentration = 0.1 mg/L)
CT SEGMENT 2 = 0.1 mg/L * 6.0 minutes = 0.6 mg/L min

SEGMENT 2 LOG INACTIVATION = 0.6 mg/L min / 19 mg/L min * (0.5 log) = 0.016 log

CT SEGMENT 3 (Disinfection in the clearwell):
Using the clearwell volume of 3.8 MG and a pre-determined baffling factor of 0.233:
Contact time = 3.8 MG/20 MGD x 1440 minutes/day x 0.233 = 63.7 minutes
Free chlorine measured in finished water = 0.1 mg/L
CT SEGMENT 3 = 63.7 minutes x 0.1 mg/L = 6.4 mg/L min
SEGMENT 3 LOG INACTIVATION = 6.4 mg/L min / 19 mg/L min * (0.5 log) = 0.17 log

Total CT using free chlorine = (11.2 + 0.6 + 6.4) mg/L min = 18.2 mg/L min

Total LOG INACTIVATION using free chlorine = SEGMENT 1 + SEGMENT 2 + SEGMENT 3
Total LOG INACTIVATION using free chlorine = 0.3 + 0.016 + 0.17 = 0.486 log

CT SEGMENT 4 (UV Disinfection):
At the time of the inspection, Pump 2 was pumping 8 MGD and dosing 22 mJ/sq.cm and Pump 4 was pumping 7 MGD and dosing 25 mJ/sq.cm.

According to 40 CFR 141.720 (d)(1), a dose of 3.9 mJ/sq.cm. will achieve a 1.5 log inactivation of Crypto and 1.5-log inactivation of Giardia. Therefore, the UV disinfection more than adequately achieves the remaining inactivation of Giardia & Crypto.

NOTE: Any time that the UV disinfection is offline on any service pump, that service pump MUST be taken offline as free chlorine is not enough to achieve the log credit removal for Crypto.

*** FEWELL DESIGN CAPACITY ****
Rated treatment capacity of plant = 20 MGD (limiting factor)
Clearwell volume = 3.8 MG
2 additional ground storage tanks @ 5MG each = 10 MG
Total storage located at the plant = 3.8 MG + 10 MG = 13.8 MG
Usable storage (volume filled in 6 hours) = 20 MGD/24 hrs/day x 6 hrs = 5 MG
Plant capacity = rated treatment capacity of plant + usable storage/200 minutes
Plant capacity = 20 MGD + (5 MG/200 min * 1440 min/day) = 56 MGD
Service pump capacity = (9+9+9+7) = 34 MGD

Plant capacity exceeds service pump capacity so:

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FEWELL DESIGN CAPACITY = 34 MGD

FEWELL DESIGN CAPACITY = 34,000,000 gal/day/1440 min/day = 23,611 GPM

O B CURTIS WATER TREATMENT PLANT

**** CT calculations for OB Curtis ****

This plant must meet 4-log inactivation of viruses, 3-log inactivation of Giardia, and 3.5-log inactivation of Crypto.

The conventional side is required to achieve 0.3 turbidity units 95% of the time to comply with the SWTR, so credit can be given by default for 2-log removal of viruses & Crypto and 2.5-log removal of Giardia. Free chlorine, chloramination, and UV disinfection must then attain the remaining 2-log inactivation of viruses, 0.5-log inactivation of Giardia, and 1.5-log of Crypto.

The membrane system is required to achieve <0.15 turbidity units 95% of the time to comply with the SWTR, so credit can be given by default for 2-log removal of viruses, 3-log inactivation of Giardia, and 2-log inactivation of Crypto. Free chlorine must achieve the remaining 2-log of viruses. Maintaining membrane integrity must achieve the remaining 1.5-log inactivation of Crypto.

MEMBRANE INTEGRITY TESTING (MIT) MUST BE COMPLETED EVERY 24 HOURS, PER THE CFR. IF THE TRAIN FAILS MIT, IT MUST BE TAKEN OFFLINE UNTIL IT PASSES. IF TRAIN TURBIDITIES EXCEED 0.15 NTU, THAT TRAIN *MUST* BE TAKEN OFFLINE UNTIL IT PASSES MIT.

**THE CONVENTIONAL SIDE OF THE PLANT HAS 4 FILTERS ONLINE AND THE MEMBRANE SIDE OF THE PLANT HAS 4 TRAINS THAT CONSISTENTLY PASS MIT. CAPACITY OF THE PLANT HAS BEEN LOWERED TO REFLECT WHAT THE PLANT CAN ACTUALLY TREAT. EACH SIDE WAS RATED AT 25 MGD.

25 MGD / 6 (FILTERS & TRAINS) = 4.2 MGD/FILTER OR TRAIN

CONVENTIONAL: 4.2 MGD * 4 FILTERS = 16.8 MGD
MEMBRANE: 4.2 MGD * 4 TRAINS = 16.8 MGD (online on 11-08-2021)

TOTAL PLANT CAPACITY: 33.6 MGD

CT CALCULATIONS WILL REMAIN AT MAX CAPACITY OF 25 MGD

Book values:
CT required for 0.5-log inactivation of giardia at 10C and pH at 6.5 = 19 mg/L min
CT required for 2-log inactivation of viruses at 10C and pH at 6.5 = 3 mg/L min

The clearwell is divided into two separate zones based on their baffling. The conventional and membrane treatment trains feed mirror image clearwells, so the T and CT values below apply to each treatment process.

Zone 1:
Volume = 1.989 MG; BF = 0.7
T = [(1.989 MG / 25 MGD)*0.7] * 1440 min/day = 80.2 min @ 25 MGD

Zone 2:
Volume = 1.658 MG; BF = 0.3
T = [(1.658 / 25 MGD)*0.3] * 1440 min/day = 28.7 min @ 25 MGD

Total T = 80.2 + 28.7 = 108.9 min

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The free chlorine residual measured from High Service 1 (conventional side) finished water = 0.1 mg/L

Ct25 = 0.1 mg/l * 108.9 minutes = 10.89 mg/L min

Virus inactivation achieved at 0.1 mg/L free chlorine at 25 MGD;
10.89 mg/L min > 3 mg/L min

Giardia log inactivation = 10.89 mg/L min / 19 mg/L min * (0.5) = 0.29 log
Remaining 0.5-log Giardia inactivation not achieved by free chlorine contact time in clearwell.

UV disinfection - UV unit attached to each filter
Each UV unit must be dosing a minumum of 4 mJ/sq.cm. to achieve the final 1.5-log removal of Crypto and the remaining 0.21-log removal of Giardia.
*All four online filters had UV units dosing 23.3 - 31.3 mJ/sq.cm. at the time of inspection

IF AT ANY TIME A UV UNIT IS OUT OF SERVICE, THE CORRESPONDING FILTER MUST BE TAKEN OUT OF SERVICE. CRYPTO AND GIARDIA REMOVAL IS NOT ACHIEVED WITHOUT UV DISINFECTION

Full CT credit for the conventional side at maximum treatment capacity of 25 MGD can be given, so full CT credit at decreased capacity of 16.8 MGD can be given.

The free chlorine residual measured from High Service 2 (membrane side) finished water = 0.2 mg/L.

Using this minimum concentration throughout the clearwell and flow rate of 25 MGD, the contact time is:
T = 108.9 min
CT = 0.2 mg/L * 108.9 minutes = 21.78 mg/L min

Virus inactivation achieved at 0.3 mg/L free chlorine at 25 MGD;
21.78 mg/L min > 3 mg/L min

Giardia & Crypto log inactivation achieved by maintaining turbidities <0.15 NTU 95% of the time. Any time turbidities exceed 0.15 NTU, that train must be taken offline.

Full CT credit for the membrane side at maximum treatment capacity of 25 MGD can be given, so full CT credit at decreased capacity of 16.8 MGD can be given.

Treatment capacity is not limited on either side by CT.

TOTAL TREATMENT CAPACITY AT OB CURTIS = Conventional (16.8 MGD) + Membrane (16.8 MGD)
= 33.6 MGD

*** OB CURTIS DESIGN CAPACITY ***
Raw water pump capacity = (9+8+9+8+8+17+8+17) MGD = 84 MGD
Rated treatment capacity of plant = 33.6 MGD (limiting factor)
Service pump capacity = (8+8+22) = 38 MGD
**HS2 pumps taken out since they have been offline since 04/30/2021; HS1 pump #2 taken out since it has been offline for over a year.)
Total storage located at the plant (clearwell capacity) = 10 MG
Usable storage (volume filled in 6 hours) = 33.6 MGD/24 hrs/day x 6 hrs = 8.4 MG
Total plant capacity = rated treatment capacity of plant + usable storage/200 minutes
Total plant capacity = 33.6 MGD + (8.4 MG/200min * 1440 min/day) = 94 MGD
This does exceed the service pump capacity of 38 MGD, so:
OB CURTIS DESIGN CAPACITY = 38 MGD

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DESIGN CAPACITY SHEET

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TOTAL SYSTEM DESIGN CAPACITY

TOTAL CAPACITY OF FEWELL AND OB CURTIS PLANTS = 34 MGD + 38 MGD = 72 MGD
72,000,000 gpd / 1440 min/day = 50,000 CONNECTIONS

TOTAL ELEVATED STORAGE ON SYSTEM:
0.5 MG + 1.0 + 0.5 + 1.5 + 1.0 + 0.5 + 1.0 + 0.25 + 1.5 = 7.75 MG
*1.0 MG Byram tank taken out of calculations due to being offline (11-09-2020)
*0.2 MG Suncrest tank & 1.0 MG Elaine tank taken out of calculations due to being empty on 11-08-2021

FINAL DESIGN CAPACITY FOR ENTIRE SYSTEM:
Final design capacity = 50,000 + (7,750,000 gal/200 min) = 88,750 CONNECTIONS

EQUIVALENT CONNECTIONS CALCULATIONS:

COMMERCIAL/INDUSTRIAL USAGE FACTOR CALCULATIONS:
Ciu = Average total CI use(gal)/avg total use (gal)
The Ciu factor calculated from 2019 data = 0.5
Number of Actual Connections = 54,679
Apartment Adjusted = # Units X 2/3 = 16,807 x 2/3 = 11,205
Total Adjusted Connections = Actual + Apartment Adjusted
= 54,679 + 11,205 = 65,884

Eq. connections = # of adjusted conn + (# of adjusted conn x Ciu factor x 0.5)
= 65,884 + (65,884 x 0.5 x 0.5)
= 82,355

Total final equivalent connections = 82,355

THEREFORE THIS SYSTEM IS CURRENTLY AT 82,355/88,750 = 93% CAPACITY.