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 02/04/2020. Present at the time of inspection was TERENCE A BYRD, OPERATOR; CHARLES E WILLIAMS JR, OWNER; WRITER. Official CHARLES E WILLIAMS JR Address PO BOX 17 JACKSON MS 39205 W.W. Operator TERENCE A BYRD Address 2430 LADD STREET JACKSON MS 39209 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. This Sanitary Survey is generated based on the site visits conducted the week of February 3, 2020 during the EPA / NEICs onsite inspections and/or during a site visit made by MSDH on February 26, 2020. Data from monthly and weekly operating reports along with operator log books contributed to the citing of deficiencies. Any comments NOT pertaining to specific deficiencies have been removed.

2. Condition of source facility: The intake building at the reservoir is in failing condition with holes in the roof. The potassium permanagate feed system at this location is inoperable.

3. Condition of source facility: The walkway to the raw water pumps at JH Fewell is in a failing state due to the wooden support system.

4. Transmission of source water: From conversations with City personnel, the condition of the raw water transmission mains from the reservoir to OB Curtis impedes treatment and disallows major repairs to be made.

5. Capacity of treatment facilities: The O. B. Curtis microscreens have been in a state of disrepair or only partially functioning for almost a year. This equipment plays a vital role in the treatment processes of both the conventional and membrane treatment trains. Since they are inoperable, the amount of water that can be treated is limited. Reports from City personnel as to when they will be repaired and/or replaced have not been consistent. No definitive deadline for the necessary work has been set or communicated to MSDH.

6. Function and condition of treatment facilities: Sludge removal of coagulation solids is a necessary part of conventional drinking water treatment. The claritrac systems are the defined method of sludge removal for both the O. B. Curtis and J. H. Fewell WTP. In lieu of functional claritrac systems for several years, both plants have used draining basins as the standard practice for handling the sludge build-up. This was witnessed by NEIC and MSDH staff during our inspection. This disrupts the treatment process as the sludge blanket accumulates to 10+ feet and is very wasteful for treatment chemicals. Additionally, the current levels of sludge maintained in the basins significantly increases the chance of treatment process issues or complete loss of the conventional treatment process. Claritrac systems must be functioning to have optimized conventional treatment. This equipment is vital to uninterrupted treatment and production of safe drinking water.

7. Function and condition of treatment facilities: As the membrane system operates as direct filtration, the flocculation stage is mandatory to decrease the solids loading on the membrane fibers. At the NEIC inspection only 6 of the 12 flocculation motors were online or functional.

8. Function and condition of treatment facilities: The Membrane Integrity Testing (MIT) is the GE or 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.

9. Function and condition of treatment facilities: The membrane system has been lacking a cover to prevent the membrane fibers from being exposed to the elements since the membrane system was installed in 2006. This missing piece of the facility further adds to undue stress to the membrane plant and all its outdoor equipment (fibers, floc motors, crane, etc).

10. Function and condition of treatment facilities: The conventional filters at both treatment facilities are overdue for rehabilitation. Filter media needs to be replaced and some underdrains and/or valving need to be repaired and/or updated. Due to filter performance records submitted, MSDH is limiting the capacity of JH Fewell to 20 MGD.

11. Disinfection: The chlorine and ammonia feed systems have been running on manual for portions of the time frame in documents submitted to MSDH.

12. Condition of storage tanks: Upon inspection of two ground storage tanks on the well system, inspectors noted the condition of the tanks on TV Road and Maddox Road. Before the TV Road booster station is put back in service, a thorough inspection by a certified contractor must be made of this tank. Also, the Maddox Road tank requires site work. It was observed that there was at least 3" of standing water around the base of the tank indicating draining issues that must be corrected. By observing the gravel support beams along the outside of the tank, it appears that the ground has shifted. Some of the supports are still flush against the tank while others have significant gaps.

13. Automatic controls: The soda ash and ACH feed systems at OB Curtis are not continually operating in automatic. The soda ash system is lacking a proper dilution system, so the pH climbs to dangerously unsafe levels. pH should not exceed 9.7 leaving either plant.

14. Monitoring plans and systems: Throughout both plants, there are online monitoring devices measuring pH, chlorine, turbidity, electrical charge (streaming current). It has been reported that some of these monitors relay signals to other dosing equipment and flow-pacing. (i.e. ammonia feed works with the chlorine feed; streaming current works with coagulant dosing.) Upon the walk through of both plants, it was discovered that a significant number of these monitors were working improperly. Operators are treating water based on grab samples taken every 4 hours. This is unacceptable and leads to instances of losing part or the entire treatment process.

15. Water system staffing: A certified Class A water operator must be onsite at all times that the treatment plant is in operation. If there are non-certified employees leading a shift, a certified operator must also be there. It was observed on February 26, 2020 at O. B. Curtis that a non-certified operator was coming on shift to relieve the previous shift's certified operator. Log book data shows that non-certified employees are often working shifts without certified operators.

16. Inadequate follow-up on previous deficiencies: According to the original corrosion control study completed following the 2015 lead action level exceedance, both treatment plants were to have been switched from lime to soda ash by December 31, 2019. At the conclusion of that agreement, only OB Curtis had soda ash installed. At the time of this report, that system is not functioning properly. Per discussion with City personnel, they desire to do an additional study to determine whether JH Fewell should remain on lime or switch to soda ash. Until soda ash is installed at JH Fewell or a new corrosion control study proves that lime is a viable corrosion inhibitor is accepted by MSDH, the City will remain in violation.

17. Due to the severity of the deficiencies listed, operator log books should be submitted with each Weekly Operating Report until repairs are made at all facilities and MSDH confidence is restored in the City of Jackson's ability to continuously meet and or exceed all federal and state regulations

Completed by Amy L. McLeod, E.I. on 03/23/2020.

Reviewed by Randall B. Smith, E.I. on 04/01/2020.

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

pc:

CHARLES E WILLIAMS JR, OFFICIAL
TERENCE A BYRD, OPERATOR

Mississippi Department of Health
Bureau of Public Water Supply

STANDARD FORM

FY 2020 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: 02-04-2020 County: HINDS
Public Water System: CITY OF JACKSON Conn: 71486
Certified Waterworks Operator: TERENCE A BYRD 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 03/11/2020
Reviewed by Randall B. Smith, E.I. on 04/01/2020

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.	0
[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.	1
[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)		

Public Water System: CITY OF JACKSON PWS ID #: 0250008

FY 2020 Public Water System Capacity Assessment Form Survey Date: 02-04-2020

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.	1
[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.	0
[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)		

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

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

Date Completed: **11/25/2020**
Connections - Actual: **65640** Equivalent: **84521**
Design Capacity: **107639** Percent Design Capacity: **84521/107639 = 78.5%**

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 7/13 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 11/09/20

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 3.53 mg/L. The concentration of free chlorine in the pipe between Sed Basin #4 and the filters was 4.58 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: 4 MGD
Contact time = 25,247 gallons/4,000,000 gal/day x 1440 min/day = 9.09 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: 15 MGD
Contact time = 33,540/15,000,000 x 1440 = 3.22 min

CT SEGMENT 1 (using shortest contact time of 3.22 min) = 4.38 mg/L x 3.22 min
= 14.1 mg/L min

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(Note: Virus inactivation is achieved in Segment 1; 14.1 mg/L min > 3 mg/L min)

SEGMENT 1 LOG INACTIVATION = 14.1 mg/L min/19 mg/L min * (0.5 log) = 0.37 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. * 8 filters +
(25 ft x 28 ft x 3 ft) * 7.48 gal/cu.ft. * 3 filters
= 17,952 gallons + 47,124 gallons
= 65,076 gallons
Residence time = (65,076 gallons/19,000,000 gallons/day)* 1440 min/day
Residence time = 4.93 minutes

CT SEGMENT 2 (assuming chlorine concentration = finished water chlorine concentration = 0.3 mg/L)
CT SEGMENT 2 = 0.2 mg/L * 4.93 minutes = 0.986 mg/L min

SEGMENT 2 LOG INACTIVATION = 0.986 mg/L min / 19 mg/L min * (0.5 log) = 0.026 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 = 0.2 mg/L
CT SEGMENT 3 = 63.7 minutes x 0.2 mg/L = 12.7 mg/L min
SEGMENT 3 LOG INACTIVATION = 12.7 mg/L min / 19 mg/L min * (0.5 log) = 0.34 log

Total CT using free chlorine = (14.1 + 0.986 + 12.7) mg/L min = 27.8 mg/L min

Total LOG INACTIVATION using free chlorine = SEGMENT 1 + SEGMENT 2 + SEGMENT 3
Total LOG INACTIVATION using free chlorine = 0.37 + 0.026 + 0.34 = 0.736 log

CT SEGMENT 4 (UV Disinfection):
At the time of the inspection, Pump 3 was pumping 7.9 MGD and dosing 26.4 mJ/sq.cm and Pump 4 was pumping 7.9 MGD and dosing 27.4 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

FEWELL DESIGN CAPACITY = 20,000,000 gal/day/1440 min/day = 13,889 GPM

MISSISSIPPI DEPARTMENT OF HEALTH
BUREAU OF PUBLIC WATER SUPPLY
DESIGN CAPACITY SHEET

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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 2 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 * 2 TRAINS = 8.4 MGD

TOTAL PLANT CAPACITY: 25.2 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

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

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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.

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 8.4 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 (8.4 MGD)
= 25.2 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 = 25.2 MGD (limiting factor)
Service pump capacity = (8+8+12+12+12+16+16+22+22) = 128 MGD
Total storage located at the plant (clearwell capacity) = 10 MG
Usable storage (volume filled in 6 hours) = 25.2 MGD/24 hrs/day x 6 hrs = 6.3 MG
Total plant capacity = rated treatment capacity of plant + usable storage/200 minutes
Total plant capacity = 25.2 MGD + (6.3 MG/200min * 1440 min/day) = 70.56 MGD
This does not exceed the service pump capacity of 128 MGD, so:
OB CURTIS DESIGN CAPACITY = 70.56 MGD

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TOTAL SYSTEM DESIGN CAPACITY

TOTAL CAPACITY OF FEWELL AND OB CURTIS PLANTS = 20 MGD + 70.56 MGD = 90.56 MGD
90,560,000 gpd / 1440 min/day = 62,889 CONNECTIONS

TOTAL ELEVATED STORAGE ON SYSTEM:
0.5 MG + 0.2 + 1.0 + 0.5 + 1.5 + 1.0 + 0.5 + 1.0 + 1.0 + 0.25 + 1.5 = 8.95 MG
*1.0 MG Byram tank taken out of calculations due to being offline

FINAL DESIGN CAPACITY FOR ENTIRE SYSTEM:
Final design capacity = 62,889 + (8,950,000 gal/200 min) = 107,639 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 = 19,407 x 2/3 = 12,938
Total Adjusted Connections = Actual + Apartment Adjusted
= 54,679 + 12,938 = 67,617

Eq. connections = # of adjusted conn + (# of adjusted conn x Ciu factor x 0.5)
= 67,617 + (67,617 x 0.5 x 0.5)
= 84,521

Total final equivalent connections = 84,521

THEREFORE THIS SYSTEM IS CURRENTLY AT 84,521/107,639 = 78% CAPACITY.