WRWA: Our DBP Journey —

Warrior River Water Authority (WRWA)

ADEM Surface Water Meeting

October 2026

Two systems became one

1966

WRWA formed

Original system is now the Oak Grove service area.

1970

Roupes Valley formed

Original system is now the McCalla service area.

1998

Systems merged

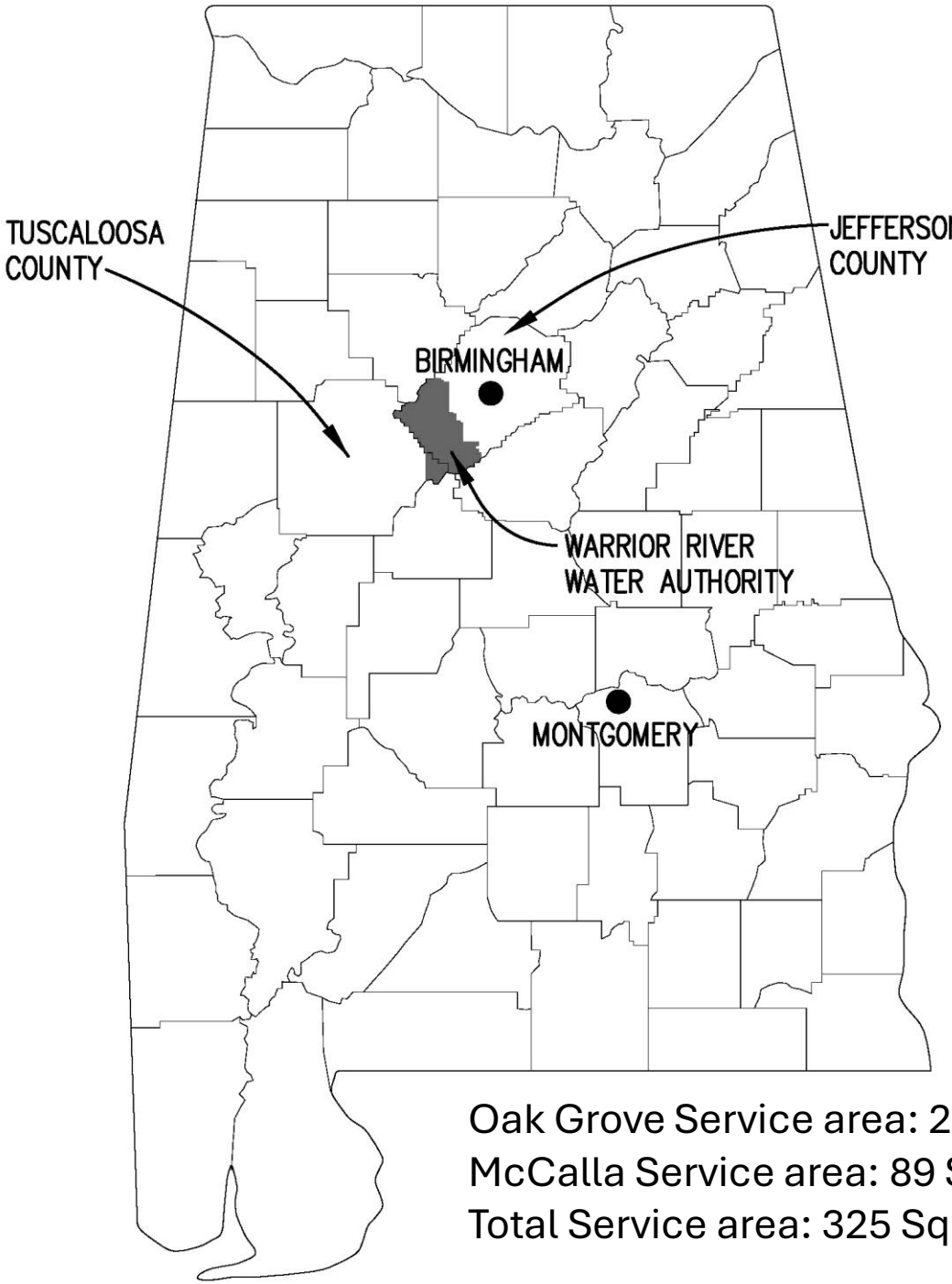
WRWA acquired Roupes Valley assets and obligations.

TODAY

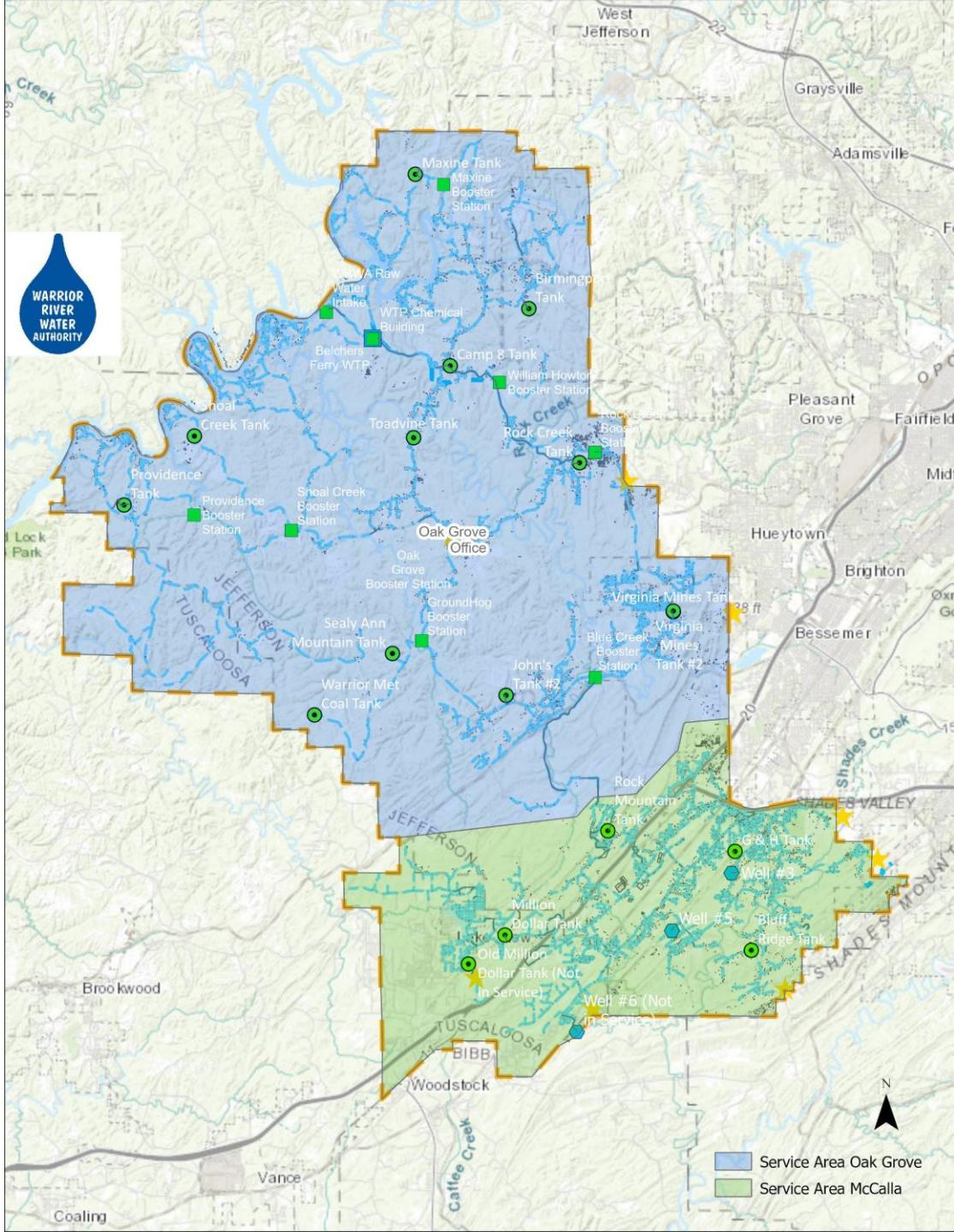
WRWA

Oak Grove + McCalla operate as one system.

Oak Grove: historically surface water • McCalla: historically groundwater



Oak Grove Service area: 236 Sq. Miles
McCalla Service area: 89 Sq. Miles
Total Service area: 325 Sq. Miles



DBPs – We Believed We Were On The Right Track

- Turbidity levels “Optimized”
- Using ClO2 as primary oxidant at Plant thus reducing Cl2 dose
- Lowered Cl2 leaving Plant
- 24/7 flushing in dead ends of system
- Good Cl2 levels dead ends indicating fresher water

ADEM Notices Received September 2024

Houston, We Have A Problem !

LANCE R. LEFLEUR
DIRECTOR

KAY IVEY
GOVERNOR

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Montgomery, Alabama 36130-1463
(334) 271-7700 ▪ FAX (334) 271-7950

September 6, 2024

Mr. Greylan Glaze, General Manager
Warrior River Water Authority
8900 Lock 17 Road
Bessemer, AL 35023

RE: DBP MCL Violation
PWSID #AL0000763
Jefferson County

Dear Mr. Glaze:

The Warrior River Water Authority has exceeded the average maximum contaminant level (MCL) for total trihalomethanes (TTHM) at the 17235 Prudes Creek location for the July – September 2024 monitoring period. The running annual average for TTHMs during the July - September 2024 monitoring period was 0.081 mg/L at the 17235 Prudes Creek location. This value exceeds the TTHM MCL of 0.080 mg/L.

The water system is required to take the following actions:

1. Provide Public Notification for this non-compliance by **October 5, 2024**, using the attached notice template (**required language in bold**) in the following way:
   i. To meet federal/state requirements, the public notification for the non-compliance must be provided to customers by inclusion in a water bill, mail out, or hand delivery.
   ii. Additionally, to meet a separate state-only requirement, the notice must be provided to a local communications medium.
2. Submit to the Department the attached Certification Form (enclosed) and a copy of the notice provided to customers as described above by **October 15, 2024**.
3. Include the violation in the 2024 CCR, per ADEM Admin. Code r. 335-7-14-.04(5)(d).

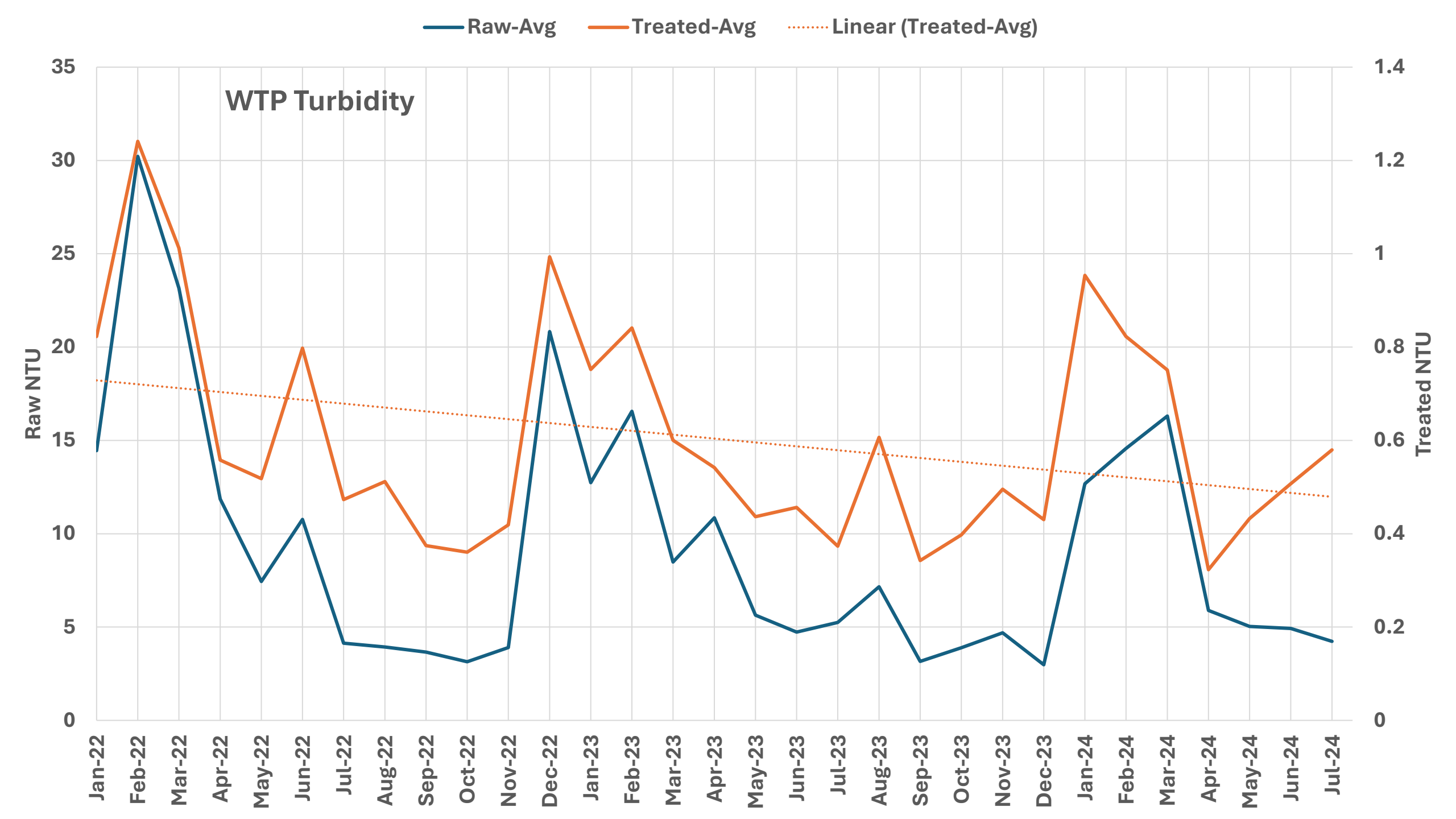
Birmingham Office
110 Vulcan Road
Birmingham, AL 35209-4702
(205) 942-6168
(205) 941-1603 (FAX)

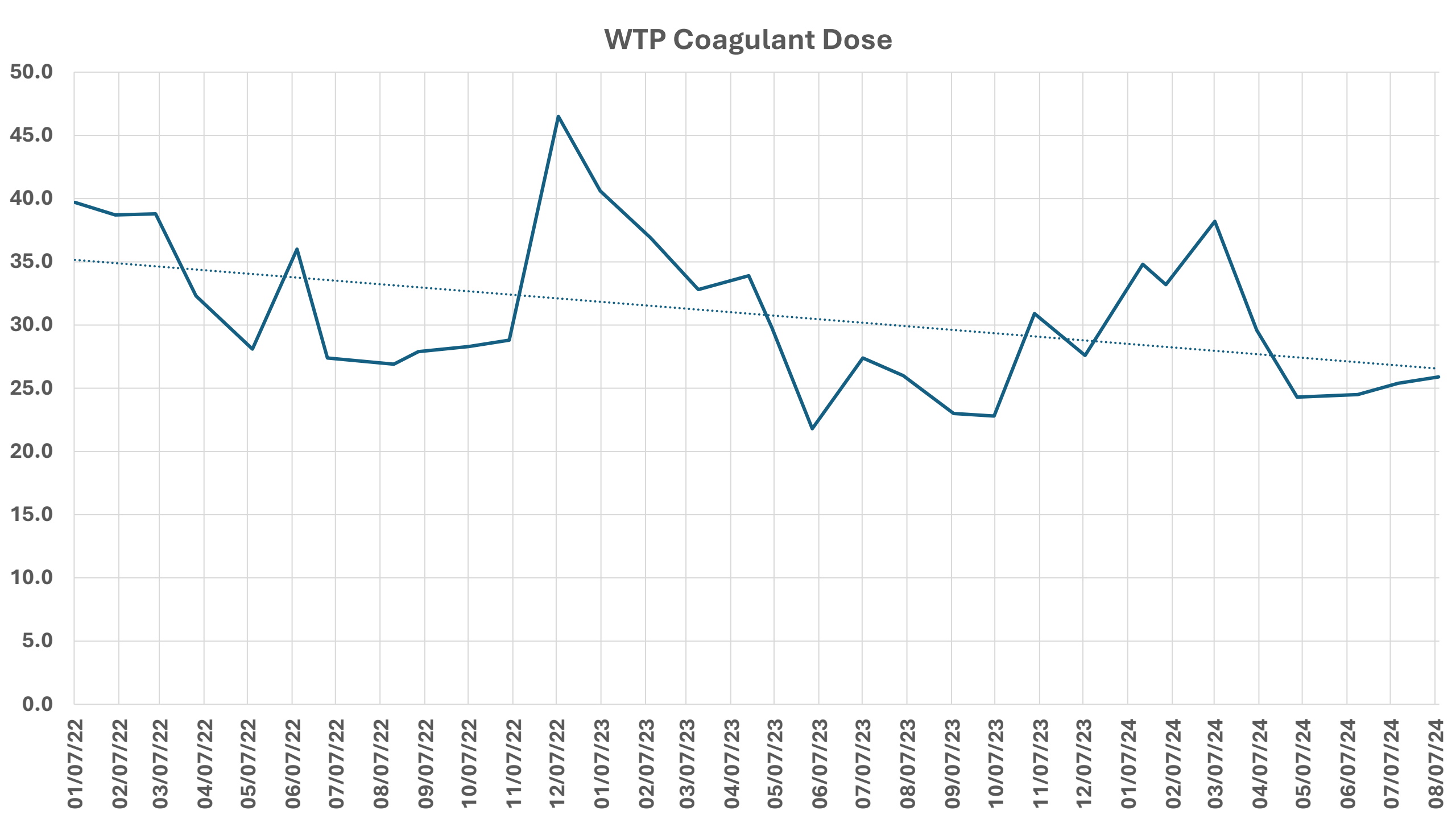
Decatur Office
2715 Sandlin Road, S.W.
Decatur, AL 35603-1333
(256) 353-1713
(256) 340-9359 (FAX)

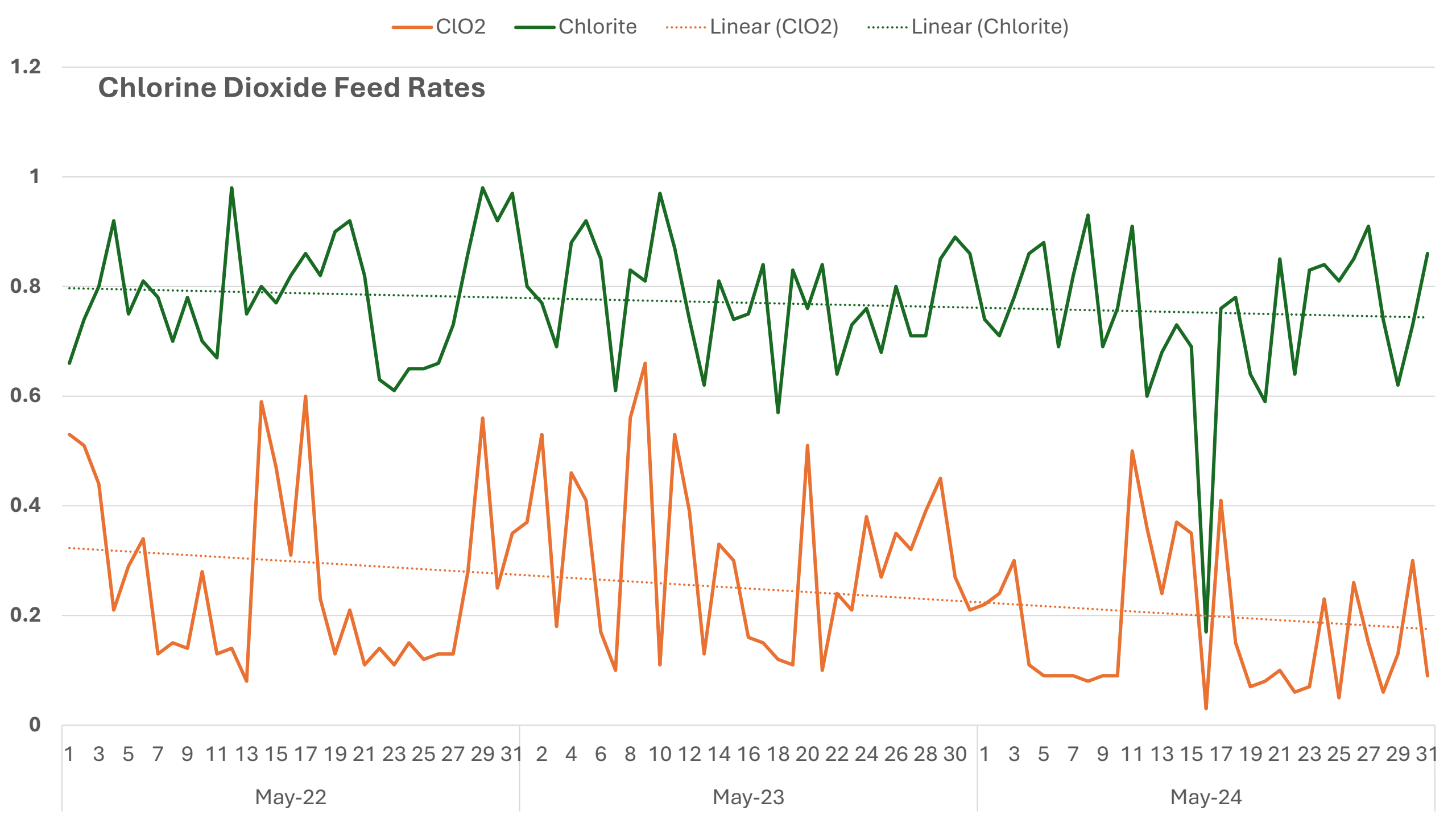
Coastal Office
1615 South Broad Street
Mobile, AL 36605
(251) 450-3400
(251) 479-2593 (FAX)

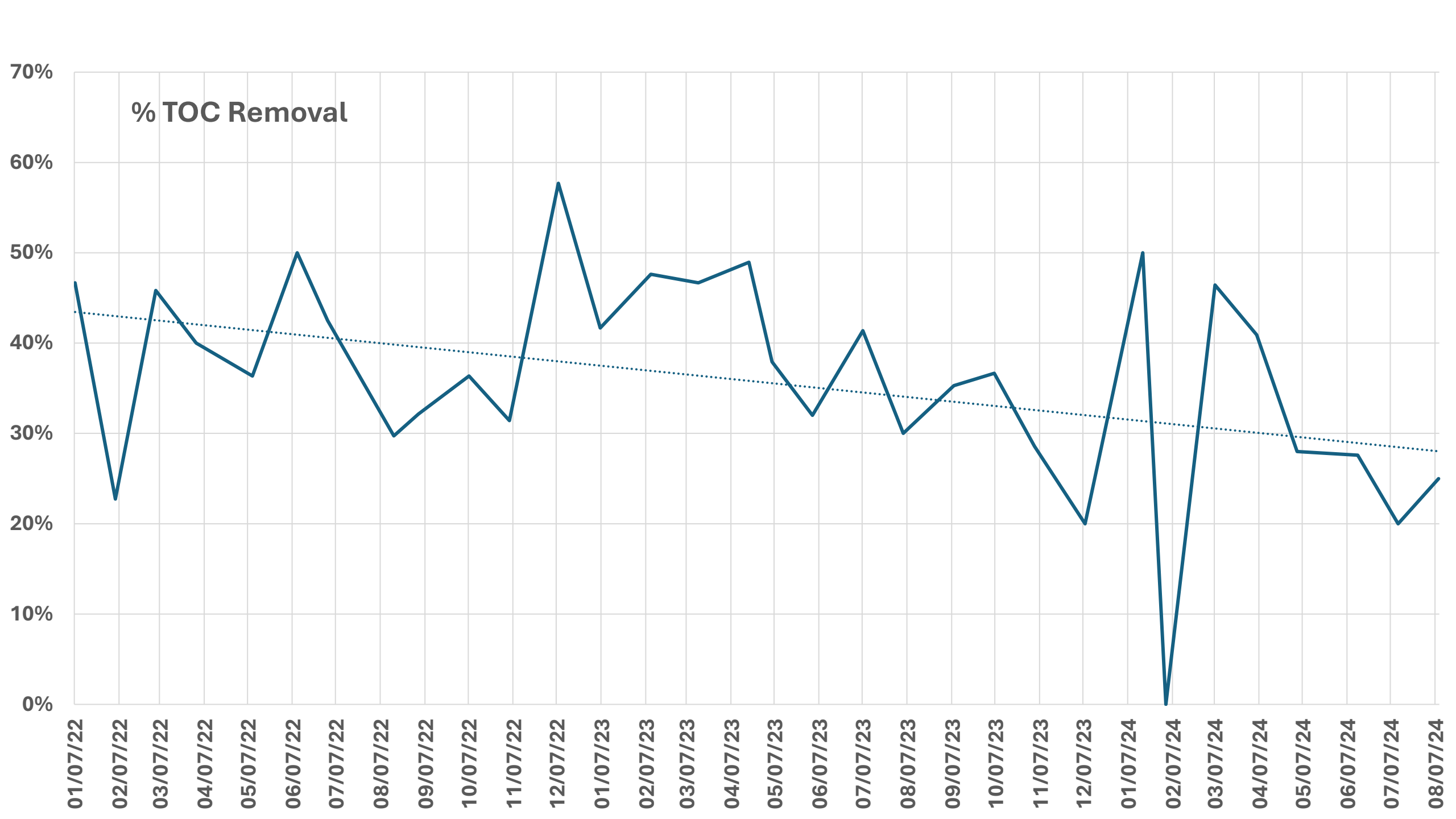
WHAT Happened : Evaluation Of What Went Wrong Our initial thoughts – Plant

- Plant-We gathered and analyzed information from the Plant. The information shows that from January 2022 till August 2024, treated water turbidities were trending down, Coagulant Dose had trended down, Chlorine dioxide feed rates had trended down, and subsequently TOCs increased. Due to good DBP results over last few years, treatment became more centered on turbidity removal vs TOC removal. All was good until it wasn't.


Raw-Avg
Treated-Avg
Linear (Treated-Avg)
WTP Turbidity
Raw NTU
Treated NTU
35
30
25
20
15
10
5
0
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jan-22
Feb-22
Mar-22
Apr-22
May-22
Jun-22
Jul-22
Aug-22
Sep-22
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
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May-24
Jun-24
Jul-24

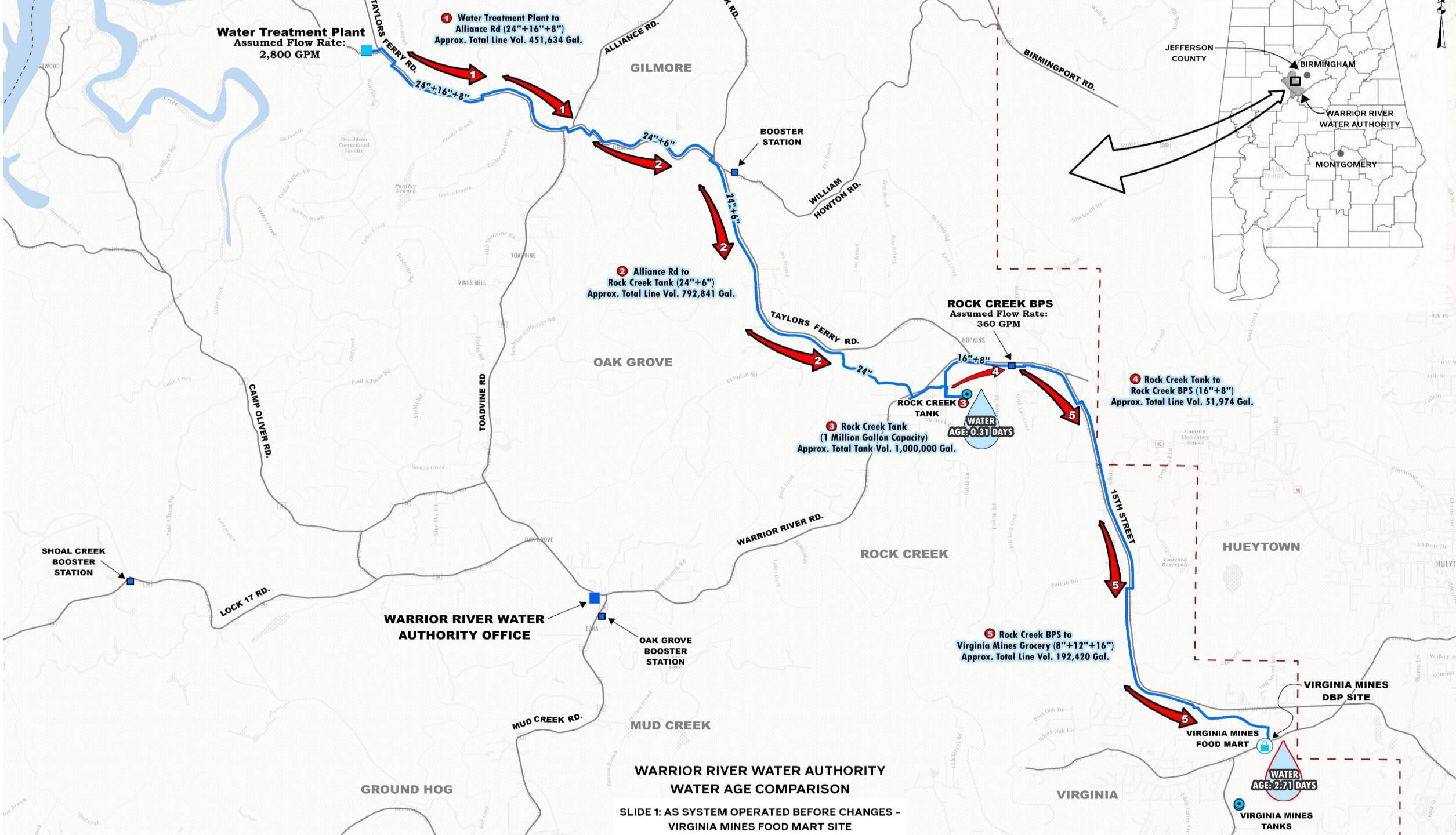

WTP Coagulant Dose
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
01/07/22
02/07/22
03/07/22
04/07/22
05/07/22
06/07/22
07/07/22
08/07/22
09/07/22
10/07/22
11/07/22
12/07/22
01/07/23
02/07/23
03/07/23
04/07/23
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10/07/23
11/07/23
12/07/23
01/07/24
02/07/24
03/07/24
04/07/24
05/07/24
06/07/24
07/07/24
08/07/24


ClO2
Chlorite
Linear (ClO2)
Linear (Chlorite)
Chlorine Dioxide Feed Rates
1.2
1
0.8
0.6
0.4
0.2
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
May-22
May-23
May-24


% TOC Removal
70%
60%
50%
40%
30%
20%
10%
0%
01/07/22
02/07/22
03/07/22
04/07/22
05/07/22
06/07/22
07/07/22
08/07/22
09/07/22
10/07/22
11/07/22
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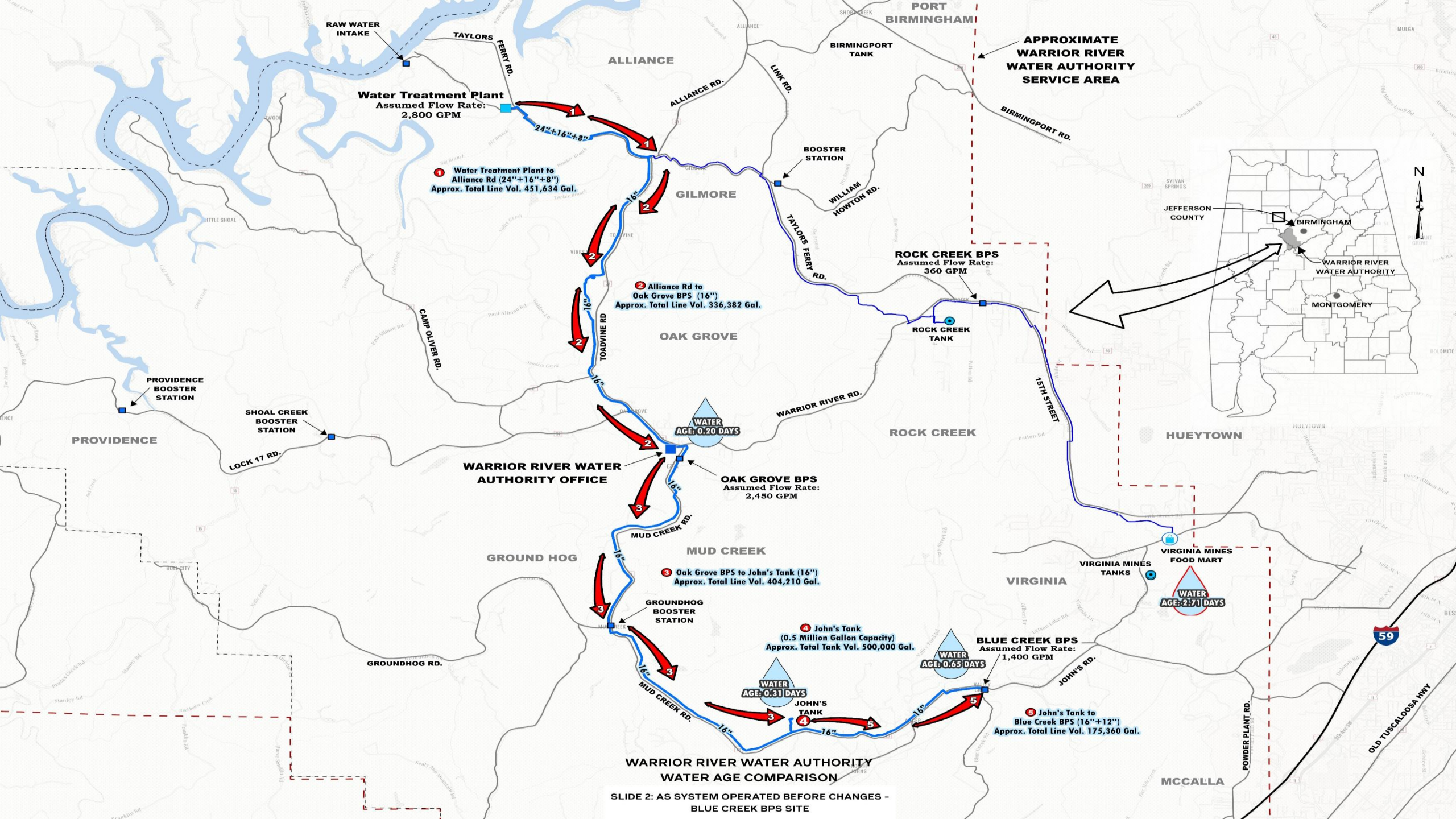
WHAT Happened : Evaluation Of What Went Wrong Our initial thoughts-Distribution

- 2024 3rd quarter testing results were unexpected, so we dug deeper.
- Distribution System was analyzed. We used test results, analyzed available data to determine how water was really moving through system, and dug into actual water age throughout the system and realized some of what we thought about water age in our system were not true.



WARRIOR RIVER WATER AUTHORITY WATER AGE COMPARISON

SLIDE 1: AS SYSTEM OPERATED BEFORE CHANGES - VIRGINIA MINES FOOD MART SITE


RAW WATER INTAKE
TAYLORS FERRY RD.
Water Treatment Plant
Assumed Flow Rate:
2,800 GPM
ALLIANCE
ALLIANCE RD.
LINK RD.
BIRMINGPORT TANK
PORT BIRMINGHAM
APPROXIMATE WARRIOR RIVER WATER AUTHORITY SERVICE AREA
BIRMINGPORT RD.
24"+16"+8"
1 Water Treatment Plant to Alliance Rd (24"+16"+8")
Approx. Total Line Vol. 451,634 Gal.
BOOSTER STATION
WILLIAM HOWTON RD.
GILMORE
16"
TAYLORS FERRY RD.
ROCK CREEK BPS
Assumed Flow Rate:
360 GPM
ROCK CREEK TANK
2 Alliance Rd to Oak Grove BPS (16")
Approx. Total Line Vol. 336,382 Gal.
OAK GROVE
TOADVINE RD
CAMP OLIVER RD.
JEFFERSON COUNTY
BIRMINGHAM
WARRIOR RIVER WATER AUTHORITY
MONTGOMERY
N
PROVIDENCE BOOSTER STATION
SHOAL CREEK BOOSTER STATION
PROVIDENCE
LOCK 17 RD.
WARRIOR RIVER WATER AUTHORITY OFFICE
WATER AGE: 0.20 DAYS
WARRIOR RIVER RD.
ROCK CREEK
15TH STREET
HUEYTOWN
OAK GROVE BPS
Assumed Flow Rate:
2,450 GPM
MUD CREEK RD.
MUD CREEK
GROUND HOG
3 Oak Grove BPS to John's Tank (16")
Approx. Total Line Vol. 404,210 Gal.
VIRGINIA MINES FOOD MART
VIRGINIA MINES TANKS
VIRGINIA
WATER AGE: 2.71 DAYS
GROUNDHOG BOOSTER STATION
4 John's Tank
(0.5 Million Gallon Capacity)
Approx. Total Tank Vol. 500,000 Gal.
BLUE CREEK BPS
Assumed Flow Rate:
1,400 GPM
WATER AGE: 0.65 DAYS
JOHN'S RD.
GROUNDHOG RD.
WATER AGE: 0.31 DAYS
JOHN'S TANK
5 John's Tank to Blue Creek BPS (16"+12")
Approx. Total Line Vol. 175,360 Gal.
59
OLD TUSCALOOSA HWY
POWDER PLANT RD.
MCCALLA
WARRIOR RIVER WATER AUTHORITY
WATER AGE COMPARISON
SLIDE 2: AS SYSTEM OPERATED BEFORE CHANGES - BLUE CREEK BPS SITE

What Needed To Change:
Our Approach Needed To Change

We Stopped Looking for One Cause and began evaluating. monitoring, and adjusting:

-What information was being collected and how was it being utilized(Plant water parameters)

-Addressed Communication (between all departments)

-Looked at how personnel and outside vendors and consultants were being utilized

-How data was collected and shared

-Reviewed Treatment (all processes and chemicals)

-How were Raw water parameters were being considered in treatment processes

-Distribution system evaluated (when and where are the problems)

-Evaluated Flushing program

-Where were Sampling locations and are more needed to better analyze overall water quality

-Looked at seasonal conditions (what/when are adjustments needed)

Implemented Changes: Looking at the Plant

- Improved communication and shared data between departments and identified the ultimate goals with the entire team (operators, management, chemical supplier, consultants, etc.)
- Set a minimum coagulant dose (enhanced)(until TOC monitor active)
- Incorporated TOC online monitoring in the treatment process. (primary)
- UV-254 testing (while waiting on TOC analyzer)
- Permanganate trial (potassium to sodium)
- Improved record keeping/Data collection in easily accessible in shared DBP spreadsheet and shared flushing file

Distribution: The Flushing Dilemma

- **Flush more**
  → reduces water age
  → uses treated water
  → affects storage/demand balance
- **Flush less**
  → conserves water
  → potentially increases water age
  → potentially increases DBP formation
- The answer isn't simply **"flush more."**
- The goal is **targeted distribution management based on system conditions and seasonal demand patterns**.

Implemented Changes: Distribution- Oak Grove - The Water Age Challenge

- Controlled Flushing – Better balance of when/where/how much flushing
- Historically smaller booster pump capacities in the Oak Grove Service Area- Upgraded 2 Booster Stations
- Controlling direction of water flows through valving
- Evaluate and manage Booster pump operations
- Tank Turnover - some cases changing tank operating range - we let data dictate the changes.
- Moved Sample/Water Quality to Distribution department (from Plant)
- Customer service + storage + pumping + flushing + water age + DBPs had to be balanced better to get in compliance


TTHMs Leaving Filter Plant
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2/8/2022
5/9/2022
8/7/2022
11/5/2022
2/3/2023
5/4/2023
8/2/2023
10/31/2023
1/29/2024
4/28/2024
7/27/2024
10/25/2024
1/23/2025
4/23/2025
7/22/2025
10/20/2025
1/18/2026
4/18/2026
7/17/2026

We Are On The Right Track Now

- Historically Low DBPs at Plant and in system for 2025 and through early quarters of 2026.
- TOC Analyzer online and TOCs trending lower

- Not So Fast – 3rd quarter 2026 Reality Check.


TTHMs Leaving Filter Plant
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2/8/2022
5/9/2022
8/7/2022
11/5/2022
2/3/2023
5/4/2023
8/2/2023
10/31/2023
1/29/2024
4/28/2024
7/27/2024
10/25/2024
1/23/2025
4/23/2025
7/22/2025
10/20/2025
1/18/2026
4/18/2026
7/17/2026


TTHMs Leaving Filter Plant
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2/8/2022
5/9/2022
8/7/2022
11/5/2022
2/3/2023
5/4/2023
8/2/2023
10/31/2023
1/29/2024
4/28/2024
7/27/2024
10/25/2024
1/23/2025
4/23/2025
7/22/2025
10/20/2025
1/18/2026
4/18/2026
7/17/2026

Hard Lesson-Nature Has The Last Laugh: Raw Water Conditions Matter

- As we entered third quarter of 2026 and we approached time to sample, we were in an abnormally hot and dry summer.
- We observed pH and alkalinity rising in raw water, TOCs rising in finished water.
- It was like watching a train wreck.
- We adjusted coagulant and other chemicals to no avail. What was going on??
- Our Coag was becoming less and less effective as the pH and alkalinity levels rose.
- We evaluated and identified other coagulant options that work under different raw water conditions.
- Jar Test Time.
- Currently in full scale trial to determine the best coag solution at the Plant. We will be ready for higher pH and Alkalinity.

What We Learned up to this point.

1. **DBPs are a whole system problem.**
   - Not just a treatment-Plant or Distribution problem.
2. **Water age matters in Distribution**
   - But it is equally if not more important to maximize TOC removal at Plant thus minimizing chances of DBP formation regardless of water age.
3. **Raw-water conditions matter.**
   - pH, alkalinity, organic matter and seasonal conditions affect treatment.
4. **One solution doesn't fit every part of the system.**
5. **Communication is important**
   - Problems can’t be solved if they aren’t known.
   - Harder to solve problems if everyone not on same page.
6. **DBP management is ongoing.**
   - Improvement doesn't mean the problem disappears.
   - Always expect the unexpected.

TAKEAWAYS
What Would We Tell Another Utility?

Evaluate the entire system and process:

- Raw water
- Treatment
- Finished water
- Storage
- Pumping
- Distribution
- Water age
- Sampling locations

With the goal of using all data to determine what the problems actually are before deciding what the solutions need to be. Make sure communication is a top priority. Utilize engineering team, chemical consultants, and ADEM staff and resources.

Questions?

- Questions / Discussion

