



City Council Meeting
Temple Terrace, Florida
Tuesday, May 19, 2026
6:00 PM
City Hall Council Chambers

Agenda

1. Call to Order

2. Invocation

3. Pledge of Allegiance to the Flag

4. Historical Fact

5. Recognition and Proclamations

5.A. Proclamation - National Public Works Week

5.B. Proclamation – Emergency Medical Services Week

6. Presentations

7. Board Appointments

8. Consideration of Minutes from Previous Meetings

8.A. Approval of May 5, 2026 City Council Meeting Minutes

9. Public Comment

Persons Wishing to Heard on Items on the Consent Agenda or Non-Agenda Items. (The public may comment on an agenda item during the public comment period for each agenda action item. There will be a 30-minute time limit for all public comment to be continued at the end of the meeting if more time is needed):

NOTE: A three-minute time limit will be imposed on ALL comments from the public, regardless of the subject matter. Individual members of the public who are present in the audience may designate in writing a representation spokesperson to speak on their behalf and thereby relinquish their time to that spokesperson. Thereafter, they may not be heard on the agenda item for which designation was made. The representative spokesperson shall be allowed to speak for 1 minute for each such designation up to a maximum of 10 minutes. Appropriate dress when appearing before the Mayor and City Council is appreciated. Cell phones must be silenced while in the Council Chambers.

10. Communications and Petitions

11. Consent Agenda

12. Public Hearings, Ordinances, and Resolutions

13. Council Business

13.A. Consultant Report - Water Treatment Facilities Master Plan

13.B. Funding Options for Proposed Water Plant Improvements

14. New Business and Board Reports

15. City Manager's Report

16. City Attorney's Report

17. Persons Wishing to be Heard on Items NOT Listed on the Agenda (continued if necessary):

Americans for Disabilities Act

The City of Temple Terrace is committed to making our website accessible to all users, including those with disabilities. While we strive to adhere to the accepted guidelines and standards for accessibility and usability, it is not always possible as it relates to attachments on the agenda that don't meet Federal standards for Americans with Disabilities Act (ADA) compliance. Please call the City Clerk's office at (813) 506-6440 for information on how to access these documents.

Adjournment

The Temple Terrace City Council meets the first and third Tuesday of each month and the meetings held at City Hall are broadcast "live" on Spectrum Channel 641 and Frontier Channel 39, beginning at 6:00 p.m. A rebroadcast of the latest meeting (or a taped version of the meeting if held at locations other than City Hall) can be seen on Wednesday and Friday at 2:00 p.m. and on Monday and Thursday at 7:00 p.m. Please be advised that there may be a scheduling delay in the rebroadcast of meetings held in locations other than City Hall, such as the Lightfoot Center, to allow time for the camera footage to be reformatted for broadcast. Meetings can also be viewed on the City's official YouTube channel at <https://youtube.com/user/cityoftempleterrace>.

Minutes of the City Council meetings can be obtained from the City Clerk's office. The meetings are recorded, but the minutes are not transcribed verbatim. Persons requiring a verbatim transcript may make arrangements with the City Clerk to duplicate the recordings or arrange to have a court reporter present at the meeting. The cost of duplication and/or court reporter will be at the expense of the requesting party.

Persons who wish to appeal any decision made by the City Council with respect to any matter considered at this meeting will need a record of the proceedings, and for such purpose may need to ensure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal is based.

In accordance with Section 282.26, Florida Statutes, persons with disabilities needing special accommodations to participate in this meeting should contact the Mayor through the City Clerk's office no later than 5:00 p.m. two business days prior to the meeting.

Item Cover Page

City Council Item Report

Date: May 19, 2026
From: Karmen Pitts, Executive Assistant
Item Type: Recognitions/Proclamations
Subject: Proclamation - National Public Works Week
Presenter: Andy Ross, Mayor

Recommendation:

Staff recommends that a Proclamation be issued to bring awareness of the importance of Public Works and Public Works professionals who are engineers, managers, and employees at all levels of government and the private sector, who are responsible for rebuilding, improving and protecting our nation's transportation, water supply, water treatment and solid waste systems, public buildings, and other structures and facilities essential for our citizens.

Discussion:

The National Public Works Week May 17-23, 2026 will be received by Jason Warrenfeltz, Public Works Director.

Resolution/Ordinance Information:

n/a

Appropriation Code:

n/a

Requirements:

Cost:

0.00

Attachments:

1. Proclamation - National Public Works Week

PROCLAMATION



TEMPLE TERRACE

Amazing City. Since 1925.

WHEREAS, Public Works professionals focus on infrastructure, facilities and services that are of vital importance to sustainable and resilient communities and to the public health, high quality of life and well-being of the people of Temple Terrace; and

WHEREAS, these infrastructure, facilities and services could not be provided without the dedicated efforts of Public Works professionals, who are engineers, managers, and employees at all levels of government and the private sector, who are responsible for rebuilding, improving and protecting our nation's transportation, water supply, water treatment and solid waste systems, public buildings, and other structures and facilities essential for our citizens; and

WHEREAS, it is in the public interest for the citizens, civic leaders and children in Temple Terrace to gain knowledge of and to maintain an ongoing interest and understanding of the importance of Public Works and Public Works programs in their respective communities; and,

WHEREAS, the year 2026 marks the 66th annual National Public Works Week sponsored by the American Public Works Association.

NOW, THEREFORE, I, ANDREW ROSS, by virtue of the authority vested in me as Mayor of the City of Temple Terrace, Florida, do hereby set aside May 17-23, 2026 as

National Public Works Week



IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the CITY OF TEMPLE TERRACE To be affixed, at TEMPLE TERRACE, FLORIDA, this 19th day of May 2026

X

Andrew Ross
Mayor

Item Cover Page

City Council Item Report

Date: May 19, 2026
From: Brianne Holacik, Executive Assistant
Item Type: Recognitions/Proclamations
Subject: Proclamation – Emergency Medical Services Week
Presenter: Andy Ross, Mayor

Recommendation:

Present a proclamation recognizing May 17–23, 2026, as Emergency Medical Services Week in the City of Temple Terrace.

Discussion:

Emergency Medical Services Week recognizes the important role EMS providers play in delivering lifesaving care to our community.

The Temple Terrace Fire Department’s EMTs and Paramedics respond to medical emergencies 24 hours a day, seven days a week, providing critical care and transport for those experiencing illness or injury. Their work requires ongoing training, professionalism, and a strong commitment to public service.

This year marks the 52nd anniversary of EMS Week, with the national theme, *“Improving Outcomes, Together.”* This reflects the teamwork it takes across the entire emergency response and healthcare system to ensure patients receive the best possible care. This proclamation gives us the opportunity to highlight the importance of high-quality emergency medical services while recognizing the dedication and contributions of our EMS personnel and the role they play in protecting the health and safety of our residents.

Resolution/Ordinance Information:

Appropriation Code:

Requirements:

Cost:

Attachments:

1. Proclamation - EMS Week

PROCLAMATION



TEMPLE TERRACE

Amazing City. Since 1925.

WHEREAS, this year's National EMS Week Theme is, "EMS Week: Improving Outcomes, Together"; and

WHEREAS, Emergency Medical Services are a vital public service. The members of the Temple Terrace Fire Department, both Firefighters and EMS Responders, provide lifesaving care to those in need 24 hours a day, seven days a week; and

WHEREAS, access to quality emergency care dramatically improves the survival and recovery rate of those who experience sudden illness or injury; and

WHEREAS, the emergency medical services system consists of first responders, medical directors, emergency nurses, emergency medical technicians, paramedics, firefighters, educators, administrators, and others; and

WHEREAS, the Temple Terrace Fire Department's EMTs and Paramedics engage in thousands of hours of specialized training and continuing education to enhance their lifesaving skills; and

WHEREAS, it is appropriate to recognize the value and the accomplishments of emergency medical services providers by designating Emergency Medical Services Week.

NOW, THEREFORE, I, ANDREW ROSS, by virtue of the authority vested in me as Mayor of the City of Temple Terrace, Florida, do hereby proclaim May 17 – 23, 2026, as

Emergency Medical Services Week



IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the CITY OF TEMPLE TERRACE to be affixed, at TEMPLE TERRACE, FLORIDA, this 19th day of May 2026.

X

Andrew Ross
Mayor

Item Cover Page

City Council Item Report

Date: May 19, 2026
From: Lynda Sader, City Clerk
Item Type: Minutes
Subject: Approval of May 5, 2026 City Council Meeting Minutes
Presenter: Andy Ross, Mayor

Recommendation:

Approve the May 5, 2026 City Council Meeting Minutes

Discussion:

Resolution/Ordinance Information:

Appropriation Code:

Requirements:

Motion

Cost:

Attachments:

1. 05-05-2026 Council Regular Minutes

**CITY OF TEMPLE TERRACE, FLORIDA
CITY COUNCIL MEETING MINUTES**

Having been duly advertised as required by law, the regular meeting of the Mayor and City Council of the City of Temple Terrace, Florida, was held on Tuesday, May 5, 2026, in the Council Chambers at City Hall.

Present were: Mayor Andy Ross, Council Members James Chambers, Alison Fernandez, Erik Kravets and Gil Schisler, City Manager Carlos Baia, City Clerk Lynda Sader, and City Attorney Ernest Mueller.

Absent was: None.

Also present were: Police Chief Rob Staley, Leisure Services Director Karl Langefeld, Finance Director Jim Ingram, IT Director Sally Cabrera, Public Works Director Jason Warrenfeltz, Fire Chief Ian Kemp, City Planner Joseph Moreda, and several others.

There being a quorum present, Mayor Ross called the meeting to order at 6:00 p.m., led the invocation, and the Pledge of Allegiance to the Flag.

4. Historical Fact

Council Member Kravets presented a historical fact asking the question: how do people in Temple Terrace learn about their own city? The answer actually goes back about 100 years. The story begins around 1920, when developers first launched Temple Terrace. They needed to convince both Floridians and Northerners to come buy lots here. So, how did they do it? They took out full-page advertisements in the Tampa Tribune with the slogan: "Florida's Masterpiece." They also placed glossy spreads in a regional real estate magazine called Sunnyland and printed twelve-page brochures showcasing the river, the golf course, and the Mediterranean Revival homes rising along Riverhills Drive. The very first media in Temple Terrace came from real estate agents, which feels like a classic Florida story. By 1931, a true local newspaper had emerged: the Temple Terrace Beacon. It was weekly, locally produced, and focused on community news, but it wasn't alone. There was also the Sentinel, edited by a man named John L. Perry, whose masthead proudly declared: "We print only the truth." The Beacon outlasted them all and still exists today. Residents also created other ways to preserve the community's story. The Garden Club, the Women's Club, and the public library all became important civic institutions. In 1982, an arsonist destroyed nearly 12,000 books at the library, which was a shocking detail to learn. Apparently, though, people in Temple Terrace really love books and reading. The community reopened the library in temporary quarters just six weeks later. Later, Cleo Burney published a book titled

Temple Terrace: The First Fifty Years. He has seen this book in many hands over the years, even at Barnes & Noble, and as far as he could tell, it's still being sold today. It was published for the city's fiftieth anniversary. If anyone here is looking for a side project or perhaps a publishing opportunity, another window may be opening right now. We've just celebrated our centennial. Every fifty years, perhaps it's time for a new city chronicle. The last volume came out fifty years ago. Maybe someone here will write the centennial edition and bring us volume two.

The major metropolitan newspapers were always around, but they never really gave Temple Terrace its own bureau, at least not from anything he's been able to find. The Tampa Tribune had a Northside edition that covered Temple Terrace as part of a larger area, and the St. Petersburg Times, now the Tampa Bay Times, launched a Tampa edition in the late 1980s that reported on Temple Terrace regularly. However, contraction in the newspaper industry hit hard. The Tampa Bay Times went through round after round of layoffs and now prints only twice a week. The era when a Temple Terrace household could subscribe to a daily newspaper that meaningfully covered local affairs has, for the most part, passed. In the late 1990s, the city itself stepped in to help fill part of that gap. Temple Terrace launched an official website, City Council meetings began airing on television, and the city started its own television production operation a year later. Today, that's Temple Terrace TV, available on Spectrum channel 641 and Frontier channel 39. Not long after, the City also began publishing a community newsletter, which today is the monthly Temple Terrace Insider.

As valuable as all of these resources are, government talking about itself is never a substitute for free press. Today we have the Beacon, the City's own communications channels, Facebook groups, civic clubs, and now also TempleTerrace.org, which he launched yesterday as a place where residents can find civic information, meeting summaries, voting records, and updates on issues facing the city. Wherever you get your information, he hopes you keep reading, stay informed, and remain engaged.

5. Recognitions and Proclamations:

5.A. Certificates of Recognition – 2025 Firefighter of the Year

Mayor Ross asked Firefighter Zhan'delle Jackson to come to the podium. He has been selected as the Temple Terrace Fire Department's 2025 Firefighter of the Year in recognition of his outstanding performance, professionalism, and dedication to the department and the community. Firefighter Jackson began his career with the Fire Department in January 2022 and has been a City employee since 2014. He consistently demonstrates a strong work ethic, a positive attitude, and a commitment to excellence in all aspects of his duties. Zhan'delle is actively involved in training, participates on the Rapid Intervention Team, contributes to departmental initiatives, and embraces leadership opportunities.

Firefighter Jackson was also recognized for fostering teamwork and mentoring fellow firefighters, while maintaining a high standard of professionalism on every shift. His contributions have made a meaningful impact on the department and the citizens we serve. His compassion, professionalism, and respect for our citizens and visitors is evident both on and off duty. We are proud to honor him as the Temple Terrace Fire Department's 2025 Firefighter of the Year.

Firefighter Jackson thanked Mayor Ross and the Council for the Award. He stated he is very privileged and honored to be a City firefighter.

5.B. Certificate of Recognition – 2025 Police Officer of the Year

Mayor Ross asked Officer Allyssa Caisse to come to the podium. The Police Officer of the Year Award recognizes exceptional service, either through multiple instances of outstanding performance over the course of a year or through a single act of exemplary service in the face of significant difficulty or personal danger.

Since joining the Temple Terrace Police Department on November 28, 2019, Officer Caisse has consistently embodied our organization's core values of Courage, Honor, and Commitment. Throughout her career, she has demonstrated outstanding performance in all areas of law enforcement, continually working to improve both the department and the community she serves. Officer Caisse earned her certification as a Field Training Officer on May 19, 2023, and has since made significant contributions to the Department's development of its future personnel. In 2025 alone, she trained four of the eight officers hired that year, all of whom have spoken highly of her mentorship and maintained excellent professional standing within the agency.

Throughout 2025, Officer Caisse responded to 445 calls for service, conducted 177 traffic stops, oversaw 650 Directed Patrols, and participated in 112 park walk-and-talk initiatives. She accomplished these tasks while simultaneously training officers, leading the traffic fatality unit (TFU), and attending ongoing educational classes. Her exceptional work ethic, professionalism, and leadership have distinguished her as an invaluable member of the department and a notable contributor to the City of Temple Terrace, demonstrating a commitment beyond standard expectations. Officer Caisse's significant contributions to the Temple Terrace Police Department, the City of Temple Terrace, and the law enforcement community are undeniable. For these reasons, Officer Caisse has been awarded the Thomas L. Lewis Law Enforcement Award (Officer of the Year) for her outstanding actions in 2025.

Officer Caisse thanked the Mayor and City Council for the Award.

5.C. Certificate of Recognition – 2025 Public Safety Telecommunicator of the Year

Mayor Ross asked Mark Ramirez to come to the podium. He stated he is honored to announce that Mark Ramirez is the Public Safety Telecommunicator of the Year for 2025. Mark's dedication, professionalism, and unwavering commitment to excellence make him exceptionally deserving of this recognition.

Throughout the past year, Mark has consistently gone above and beyond in his role within the Temple Terrace Emergency Communications Unit. He has demonstrated remarkable initiative by stepping up to assist in training new hires, ensuring they are well-prepared to meet the demands of this critical profession. His willingness to share knowledge and mentor others reflects both his leadership and his commitment to the continued success of the team.

In addition to his training efforts, Mark has selflessly covered additional shifts to support operational needs, often during high-demand periods. His reliability and strong work ethic have helped maintain continuity of service and ensured that the community continues to receive prompt and effective emergency response support.

What truly sets Mark apart is his consistently positive attitude and professional demeanor. He approaches each shift with optimism and focus, contributing to a supportive and collaborative work environment. Mark also demonstrates a high level of self-awareness, he readily acknowledges areas for growth and takes full accountability for his performance, continuously striving to improve.

Mark Ramirez is an invaluable asset to the Temple Terrace Emergency Communications Unit and to the residents we serve. His dedication to public safety, his team, and his own professional development exemplify the highest standards of this profession.

Mr. Ramirez thanked Mayor Ross, the Council, Chief Staley and others.

5.D. Proclamation - Temple Terrace Garden Club's 80th Anniversary Week

Mayor Ross introduced Gayle Mohr, Temple Terrace Garden Club President and presented the proclamation.

Ms. Mohr thanked Mayor Ross and the City for the recognition.

5.E. Proclamation - Historic Preservation Month

Mayor Ross introduced Cheri Donohue, Chair of the Historic Preservation Board and the Historic Preservation Board Members and presented the proclamation.

Ms. Donohue thanked Mayor Ross and the Council for the proclamation.

5.F. Proclamation - Banana Pudding as the Official Dessert of the City of Temple Terrace

Mayor Ross introduced Sushilla Maharaj, President Temple Terrace Women's Club, representing Maryrose Owens and TTWC Members, Cheri Donohue and Carol Dell, representing Eleanor Wells and presented the proclamation.

Ms. Maharaj, Ms. Donohue and Ms. Dell thanked Mayor Ross and the Council for the proclamation and spoke of Maryrose Owens and Eleanor Wells commitment to the City.

5.G. Proclamation - Water Safety Month

Mayor Ross introduced Tiffany Beltran, Aquatics Supervisor-Family Rec Complex and presented the proclamation.

Ms. Beltran thanked Mayor Ross and the Council for the proclamation.

5.H. Proclamation - National Police Week and Peace Officers Memorial Day

Mayor Ross introduced Police Chief Staley and presented the proclamation.

Chief Staley thanked Mayor Ross and the Council for the proclamation.

Mayor Ross asked Council for the privilege of moving item 13.A. GO Bond Referendum - Christopher B. Roe, Bryant, Miller, Olive P.A. to be presented at this time.

13.A. GO Bond Referendum - Christopher B. Roe, Bryant, Miller, Olive P.A.

Christopher Roe, Bryant, Miller, Olive P.A. presented information that City Staff and City Council may present to citizens pertaining to the GO Bond Referendum.

Council Member Fernandez stated her primary concern is to make sure that whatever Council Members or the City staff use to advertise or educate, would not do anything that could cause the referendum item to become tainted or null and void, or something that the City or Council should not be saying.

Mr. Roe stated the relevant statute was adopted in 2009 and it basically allowed a city to transmit information concerning a forthcoming referendum to the electorate, provided the information that was transmitted, was limited to factual matters, and did not involve express advocacy for

the defeat or passage of a referendum matter. The upshot of the statute was at the time, a city could, for instance, include a stuffer in the monthly utility bill describing the forthcoming bond referendum and factual information about it. It could be TV ads, could buy radio ads, newspaper ads, magazine ads, etc. The statute was amended recently in 2022 to basically say, now that a city may not spend any public funds on communications sent to electors, even if it's limited to factual information. As of right now, you cannot spend any public funds on things like radio buys, television ads, even stuffers that would be included in the informational section of a utility bill, even if it's limited to factual information. You can as board members, share your opinion on a forthcoming matter at any time from the dais, out in the public, so long as you don't violate that prohibition against spending public moneys to broadcast that message.

Council Member Fernandez asked about presentation materials, such as creating a powerpoint slideshow or video, with factual information, and taken to a location to present.

Mr. Roe stated the statute includes a number of items that are not precluded by the statute, one of which is reporting on the actions of the governing board. As long as the reporting is done in a fair and accurate manner. For instance, you could say staff could inform the public that City Council has adopted an ordinance calling a referendum, you are not precluded from posting factual information to the city website about the forthcoming referendum.

You're not precluded from providing information in response to a request by the public. If someone asks you for information, you can provide factual information. You are not prohibited from hosting or providing factual information at a public forum. For instance, if you held a workshop or if members of staff went out into the community and held a forum that the public was able to attend, you could provide information through a PowerPoint.

Council Member Kravets thanked Mr. Roe for the memo and stated it answered a lot of his questions. He asked about the use of terminology of the phrase public forum. He noted that a workshop or a town hall makes sense but asked if a presentation to a members only club would be considered a public forum.

Mr. Roe stated if it is open to members of the public generally, then it would be a public forum. The audience is, itself, a contained subset of the public.

Council Member Kravets asked about City staff presentations to political organizations that are membership based such as a democratic club or republican club.

Mr. Roe noted the statute is stated in terms of public forum. He noted if it is a political action committee, a PAC, he would need to research that.

Council Member Kravets noted that in reading the memo, the five Council Members, as elected officials, have an unabridged right to speak about the general obligation bond at any time, in any way and asked Mr. Roe if that is correct.

Mr. Roe stated that is correct as long as it is not funded from public funds and the members are broadcasting their opinions.

Council Member Kravets asked, as to expenditure of public funds, how staff time is treated and if this takes away from their normal duties.

Mr. Roe noted if it's something that is occurring through the course of their normal duties, then there is no prohibition. If it's something that someone was paid extra, like over time paid for staff time where there were otherwise off and they weren't engaged in performing their duties on behalf of the city, that could fall within the prohibition. If the sharing of information is something that is typically undertaken by that staff member speaking to the public to address matters regarding not only the referendum, but other City affairs, then it would not constitute a prohibited expenditure.

Mayor Ross noted that the distinction of the PAC was not actually what was asked, it was a local Republican club, Democrat club, or some other local club. He stated that the City is trying to get in front of local residents.

Mr. Roe stated the statute is written to focus on the expenditure of public funds. If a staff member met with a particular group that wasn't necessarily open to the public, but did not spend public funds to transmit information, it's not prohibited by the statute.

Council Member Kravets asked about some of the phrasing in terms of electioneering language, such as using the term modern or that the new building is more suitable or that it meets our needs.

Mr. Roe noted that the allowance is factual matters and at times could be difficult to discern. With an example of response times, it is safe to say that a building in that area will improve response times, and would be within a range of factual.

6. Presentations:

6.A. Presentation - Modernizing Bicycle Parking and End-of-Trip Facilities in Temple Terrace

Brent Buffington, Bicycle-Pedestrian Advisory Committee Chair, presented recommendations updating the City's development code to better support residents who bike. The BPAC believes

that current standards are inconsistent, leading to gaps in bicycle parking and basic end-of-trip amenities. He presented recommendations to modernize how the development code could support people who bike by asking the City to explore standards for bicycle parking and end of trip facilities.

The Bicycle Pedestrian Advisory Committee was formed in 2022 to advise the Mayor, City Council and City Administration on matters involving bicycle and pedestrian safety infrastructure and the convenience of cycling and walking on city streets and facilities. As Temple Terrace continues to grow, we have an opportunity to ensure that new developments support safe, convenient and practical transportation options for all residents, whether they drive, walk or bike. People are already biking in Temple Terrace, but the development code does not consistently support them once they arrive at their destination. Without up-to-date standards, the results vary. Some developments may provide convenient bicycle parking or storage, while others may provide little or none. That leaves residents, visitors, employees and customers to figure it out on their own. We can improve this going forward with simple, flexible standards that apply to new development. The goal is not making biking the only option. The goal is to make biking a practical option. That means supporting everyday trips to work, shops, parks, schools and other destinations, not just recreational rides. Bicycle parking and end of trip help make that possible. This includes short-term parking near entrances, secure long-term storage for employees and residents and where appropriate, basic end-of-trip facilities such as lockers, changing areas, or showers. These are the small but important details that make every day biking viable.

He briefly defined what is meant by bicycle parking and facilities. Bicycle parking generally falls into two categories. The first is short-term bicycle parking. These are racks located near entrances for customers, visitors, or anyone making a shorter trip. The second is longer term bicycle parking. This is more secure storage intended for people who may be leaving a bike for several hours or overnight, such as employees or residents. Both types matter because they serve different needs. A customer shopping at a business needs something visible and convenient, and an employee or resident needs something more secure and protected. End of are the additional supports that make biking more practical for longer or more routine trips. These can include lockers, changing areas, and in some cases, showers. Not every development would need these same facilities. The point is to create standards that are flexible and appropriate to the type and scale of the development. Together, bicycle parking and facilities help answer a basic question. Updating our development code aligns with the work the city is already doing. It supports our Safe Streets goals, aligns with recent multi-modal planning efforts, enhances access to parks, schools and businesses, improves health and safety outcomes, and strengthens local economic activity. This also connects directly to what residents have told them during the recent Multimodal Trail Network study. Survey respondents ranked parks, shopping and neighborhoods among the top places where they want better walking and biking connections: however, those

connections do not end at the sidewalk, the trail or the street, they end at the destination. If we're asking how to make it easier for people to bike to parks, shops, schools and neighborhoods, we also need to ask what is waiting for them when they arrive.

These are not experimental policies. Modern bicycle parking standards are already being used by cities of different sizes, in different regions, and with different development patterns. For this review, our committee looked at examples from both Florida communities and nationalized national recognized bike friendly cities. That includes Florida examples like Saint Petersburg, Pembroke Pines, and Gainesville; and all those medium sized cities such as Fort Collins and Madison, which have incorporated bicycle parking into their development or zoning standards. The point is not that Temple Terrace should copy any one city exactly. The point is that these standards are common, scalable, and adaptable. Staff can review what other cities have done, identify what is appropriate for our local context, and bring back recommendations tailored to Temple Terrace.

This recommendation does not create any new operating expenses for the city. These types of improvements we are discussing would be incorporated into new development or substantial redevelopment, similar to other site requirements that are already reviewed during the permitting process. Developers already designed around requirements for automobile parking, ADA accessible spaces, landscaping, stormwater sidewalks, and other site features. Bicycle parking and where appropriate, end of trip facilities would function in a similar way. They would be considered as part of the site design review during permitting, and scaled based on the type and size of the development, so the cost is not borne by the city's operating budget, it is integrated into the development process. We also expect that administrative impact to be limited because this would be reviewed through existing planning, zoning and permitting procedures. The purpose of using established guidance is to make sure that whatever comes back to Council is technically sound, realistic, and appropriate for the city.

He stated they are asking for direction for staff to evaluate this issue and bring back recommendations from where we sit. We see the proposed process starting off with staff, reviewing VPCs, draft concepts and benchmarking against peer cities from their staff could evaluate the planning, zoning, legal and administrative considerations back.

Our committee would remain available as a resource throughout the process, providing feedback and helping review options as they are developed. If staff determines that code updates are appropriate, the next step would be draft ordinance development and return to City Council for consideration. Tonight's request is simply to begin the review process.

The reason to act now is that development is already happening and development patterns can be difficult and expensive to change later. When bicycle parking and endif are considered early

in the site design process, they can often be incorporated in a practical and cost effective way. When those needs are not considered until after a site is built, the result is often less convenient, less secure, and more expensive to retrofit. This is a low cost, high impact opportunity to make sure that as Temple Terrace grows, it grows in a way that supports safe, practical transportation choices. Small changes to the code today can help prevent larger gaps in the built environment later.

He stated they respectfully request that City Council provide direction for staff to evaluate bicycle parking and end of trip facility standards for new development and substantial redevelopment. Specifically, they're asking council to direct staff to review the committee's draft materials, evaluate peer city examples, coordinate with back during the process, and return with recommendations for council consideration.

Council Member Kravets asked for Mr. Buffington to share what some of these changes mean to him personally and to other bicyclists in the community.

Mr. Buffington noted the recreation center, he pulls up and the bike racks are right there. However, at other places, there are not bike racks and its hard to go there and shop with nowhere to park the bike safely. As you get into the longer term, if you were going to your job and you were leaving it there for eight hours, or at any of our residential apartment complexes where people choose to lock up their bikes. They hope that no one tampers with the bikes and that they are safe from the elements. In talking with other residents, not just from our committee, we know that people are out there and they're using their bikes, as we mentioned, the recreational side as well.

Council Member Kravets clarified the request is to evaluate the landscape, make a recommendation, review the committee's draft materials, have that flow into the recommendation and then to consult with the committee.

Mr. Buffington stated to review the committee's research, draft materials, evaluate the peer cities, coordinate with the committee through the process, and if there is a decision to make adjustments to the code, return to Council with a recommendation.

Council Member Fernandez asked staff what is already being done with commercial development, as part of the process, and does the City specify where the racks are located.

Greg Pauley, Director of Community Development, stated commercial properties, once the parking deck is calculated, the City asks for ten percent of the parking deck, so for 100 parking spaces at a commercial site, the City would want to see racks for ten bikes. The location of racks

is part of the Development Review Committee site plan review, the location is not a hard standard but it is reviewed and part of the site plan.

Council Member Fernandez stated this is not just bicycle, but the pedestrian walkability, golf cart access, bicycle use in the community, especially from interior to the perimeter streets, is something that is very interesting to people. She would agree with most of the request but is not sure that we have to include options, like an end-use facility, including showers and all of that. Some options do not need to be considered for all development.

Mayor Ross thanked them for the presentation and said the City looks forward to working with them. He stated that there would be more discussion and could come up during Council Business later in the meeting.

Council Member Kravets asked to proceed with a motion and discussion, with Mayor Ross stating that would be out of order and could be brought up during Council Business or New Business.

7. Board Appointments:

7.A. Municipal Code Enforcement Board - One Regular Member

Mayor Ross stated there was one regular member vacancy on the Municipal Code Enforcement Board. The City received an application for Reappointment from Gina D'Angelo.

Upon motion by Council Member Chambers, seconded by Council Member Schisler, **RESOLUTION 49-26(M), ADOPTED AND APPROVED** the Reappointment of Gina D'Angelo as a member of the Municipal Code Enforcement Board for a term extending until March 21, 2029.

Vote on the motion being: Mayor Ross and Council Members Chambers, Fernandez, Kravets and Schisler voting "aye," no "nay."

8. Consideration of Minutes from Previous Meetings:

8.A. Approval of the April 21, 2026, City Council Meeting Minutes

Council Member Kravets stated he would not make a motion but read a note requesting it to be put into the minutes of May 5, regarding the substance of the policy question that he raised at the previous meeting. He stated the previous minutes simply said he wanted to look into how these issues could be addressed, stating that is not what he said. He stated he raised a specific instructional issue. The City's rental housing permit program currently applies to small rental properties. It does not encompass large multi-unit complexes. That is the asymmetry he asked about. That is the policy question he wanted to address. At that time, he asked the Clerk to note

in the record that his inquiry concerned the scope of the rental housing permit program and whether it would be extended or could be extended to large multi-unit residential complexes.

He also stated he read what was said about the residents who came to public comment at the previous meeting, and the minutes only captured that they came to talk about water shutoffs and various other issues. They addressed so many additional things going beyond that, including mold, vermin, sewage, and backups. It was an extensive discussion, and he was disappointed that none of that made it into the minutes.

Upon motion of Council Member Chambers, seconded by Council Member Schisler, the **MINUTES** of the April 21, 2026, City Council Meeting, were **APPROVED** as presented with the following vote.

Vote on the motion being: Mayor Ross and Council Members Chambers, Fernandez, and Schisler voting “aye,” Kravets “nay.”

9. Persons Wishing to be Heard on Items NOT Listed on the Agenda or Items on the Consent Agenda:

Mayor Ross stated the process for Public Comments.

Normandy Piccolo commented on the noise, toxic chemical smells, and coals at the Terrace Oaks Plaza.

Charles Loeb noted ideas of Cinco De Mayo holiday, USF stadium, and MOSI science center concerns of daycare and transportation.

Diane Skripek commented on traffic, driving defensively and offensively, and issues at red lights.

Don Balaban commented on the GO Bonds for the Fire/Police stations, getting information out to citizens by groups such as unions, chambers, etc., taxes are capped, and noted apartments and crime.

10. Communications and Petitions: None

11. Consent Agenda:

11.A. Resolution Approving a Marine Resources Conservation Trust Fund Grant Extension

11.B. Resolution Approving the Ballot Language for the August 18, 2026 General Obligation Bond Referendum

11.C. Resolution Approving Payment to Superior Asphalt for the Family Recreation Complex Resurfacing Project

Upon motion by Council Member Schisler, seconded by Council Member Chambers, and unanimously carried, **RESOLUTION, 11.A.-11.C.**, were **ADOPTED** by consent, as follows:

Vote on the motion being: Mayor Ross, Council Members Chambers, Fernandez, Kravets and Schisler voting “aye”, no “nay”.

RESOLUTION 50-26, Adopted the resolution and approved a Marine Resources Conservation Trust Fund Grant Extension.

RESOLUTION 51-26, Adopted the resolution and approved the Ballot Language for the August 18, 2026 General Obligation Bond Referendum.

RESOLUTION 52-26, Adopted the resolution and approved Payment to Superior Asphalt for the Family Recreation Complex Resurfacing Project.

12. Public Hearings, Ordinances, and Resolutions:

12.A. First Reading of an Ordinance Amending Section 1-104 (Enforcement Procedures) and 1-105 (Schedule of Violations and Penalties)

Code Compliance Director Jack Shanks stated this ordinance amends the City of Temple Terrace Code of Ordinances Chapter 1 to expand the City’s civil citation program by providing verbiage to allow for the immediate citation of certain violations of an itinerant or transient nature, adding additional violations to be eligible for citations, and establishing a Class IV violation category within the existing Schedule of Violations and Penalties. The goal of this amendment is to improve and encourage compliance with existing regulations, enhance enforcement efficiency, and support the preservation of neighborhood character and quality of life. While the City’s current Code of Ordinances includes regulations addressing yard parking, recreational vehicles, trailers, commercial vehicles, outdoor storage, inoperable vehicles, and certain impacts associated with short-term rentals, many of these violations are easily repeatable and can be difficult to resolve through existing enforcement processes alone. The current framework often requires extended notice and compliance periods, which may not effectively deter recurring violations or achieve consistent, long-term compliance.

This amendment provides an additional enforcement mechanism by allowing designated violations to be addressed through civil citation. The intent is not to create new regulations, but rather to strengthen the City’s ability to enforce provisions that are already in place. By enabling

more immediate enforcement action when appropriate, the City can more effectively address these specific violations, reduce prolonged enforcement cases, and promote equitable, city-wide compliance. The proposed fine structure retains a graduated approach. For the proposed Class IV violations, this includes a \$250 fine for a first offense and \$500 for second and subsequent offenses of the same violation. For local reference, the City of Tampa utilizes a Class III violation with a first offense of \$300 and a second or subsequent offense of \$450. These are for violations including unauthorized burning or burying of garbage, littering, street or sidewalk obstruction, allowing a dangerous tree, untrimmed tree branches over sidewalks or streets, and several others. Tampa's Class IV violations are set at \$450 and include illegal rental, underage house parties, nuisance structures, accumulation of trash, debris, and garbage, and others.

The selected fine amounts are intended to ensure that citations serve as a meaningful deterrent to both initial and repeat violations. In 2025, 896 parking-related cases were generated, representing the largest single category of violations, followed by 639 cases involving grass and yard maintenance. The most frequent resident complaints involve yard parking, overgrown grass/weeds/underbrush, and the storage of RVs, boats, and trailers with some properties reaching compliance quickly then returning to a noncompliant pattern. This graduated fine structure is designed to promote prompt initial compliance while appropriately addressing repeat violations, reinforcing the City's emphasis on voluntary compliance rather than punitive enforcement.

Except in cases involving an immediate life/safety concern, violators will first receive a courtesy notice accompanied by an attempt at direct communication to explain the violation and provide a reasonable timeframe for correction. Staff will also make reasonable efforts to identify any barriers to compliance, such as age, financial limitations, or health conditions, and provide guidance or resources where appropriate. The courtesy notice will clearly outline the escalation process and associated fine amounts to encourage prompt correction and avoid future citations. If compliance is not achieved following the courtesy notice and communication attempt, an initial citation will be issued, with additional outreach efforts made to facilitate compliance. Continued noncompliance will result in a second citation and any subsequent enforcement actions as necessary. The overarching goal of this process is to achieve compliance without the need for citation issuance.

This ordinance provides:

- New verbiage to an existing subsection that will include violations that are itinerant or transient.
- Additional violations added to the table of code sections eligible for citations.

- An additional classification of violations (Class IV) within the existing civil citation framework.
- Expanded eligibility for civil citation enforcement for specific, repeatable code violations.
- A more efficient and timely method for addressing violations that impact residential neighborhoods.
- A graduated fine structure intended to promote sustained compliance.
- Consistent and equitable enforcement tools for use across the City.

Mayor Ross asked for public comments, hearing none, he moved to Council Member questions.

Council Member Schisler noted his concerns with monitoring the process. He stated the process now of the courtesy notice, returning to see if in compliance, taking pictures, issuance of certified letter to owner and postings, then evidence presented at the Municipal Code Enforcement Board (MCEB), managing the chain of evidence.

Mr. Shanks stated Section 1-104 of our code already lays out the basis for everything as far as civil citations. It talks about who is responsible for those and what happens if, for example, somebody doesn't pay their citation when it comes to internally how the Code Enforcement department is going to monitor that, it's going to be like we do it now. Nothing's really going to change. The Code Officer will contact the office before a citation is written. They will take pictures, date/time stamped, but a courtesy notice will be given first. It will specify that should the violation continue, the next step in the process will be the civil citation.

Council Member Schisler asked about the process to fight the civil citation.

Mr. Shanks stated they will have right to contest it, the officer will write ticket and it will go to County Court, with the process being established with the Court. He stated that if there are circumstances, they will try to help with resources for the citizen before the citation is written.

Council Member Schisler stated he wanted to make sure it does not get out of hand with the public.

Council Member Chambers asked if this passes on second reading, when would it go into effect.

Mr. Shanks stated that a process for the officers needs to be finalized, ordering of the citation booklets must occur, the City will work with court, and he will write an internal policy.

Council Member Chambers asked if any information of the citations would be reported to the MCEB.

Mr. Shanks stated he would monitor and could be noticed to MCEB.

Council Member Chambers asked about liens on citations.

Mr. Shanks stated these would go to the County Court and a judge would be involved and decide.

Council Member Chambers asked if other jurisdictions to this.

Mr. Shanks replied yes and he worked closely with Tampa and reviewed their process.

Council Member Fernandez asked if other jurisdictions use this method of citation for short-term rentals.

Mr. Shanks stated he has not reviewed it for short-term rentals. What they are seeing in other jurisdictions is that citations are used for violations of the regular code. These two are primarily used for yard parking and assembly uses.

Council Member Fernandez noted her concern is that this would be applied not just for owner occupied or short-term rentals but all properties.

Mr. Shanks stated they're applicable across the City. The only two that are specifically to the short-term rentals are the one for parking and the one for assembly uses. The other ones apply across the board. The reason that those two are specific are because they affect the certificate of use and they read differently because the person being cited (violation) is not the property owner.

Council Member Fernandez noted her concern about the strength of enforcement and with an example such as a ticket for a boat in the driveway that is there within the time allowed but a ticket is issued. What if a citizen feels they are being targeted.

Mr. Shanks stated a courtesy notice would be given and would be monitored before a citation is given. 90% comply immediately. These are the violations that receive the most complaints,

nothing is changing except the response is citation instead of to the MCEB. He noted this is a tool and hopefully the fine amount will make a difference, especially for repeat offenders. He stated he will review before citations are written.

Mayor Ross asked about schedule 2 and schedule 4 violations. Will the citation program completely take over and become the new mechanism of enforcement for these violations or will the City simultaneously use the current code board procedure that has been used for years and concurrently at the same time use the citation program.

Mr. Shanks stated the intention for these specific codes that have been introduced on this item, is to use them specifically for the citations and pull them away from the board. Using the MCEB is an option, but there could be a time to revert to that but for consistency and treating everyone the same, the process would be consistent for the type of code violations. Overgrown grass and commercial vehicle violations are the big issues. These would be handled by the citation method, the MCEB method takes too long and violators can comply and then violate it again right away.

Mayor Ross stated his concern is that these violations comprise the majority of what the MCEB deals with. He was also concerned with violations when there is a circumstance such as illness or a financial problem and violators can not comply. He stated the original intent of forming a code board for the City was to have a panel of neighbors, peers, the people that live in the City to hear their plight. The Board can hear these, then take that into consideration and possibly give extra time to comply. He stated an additional concern that this could be a heavy load for the court.

Mayor Ross also mentioned that awhile back, it was decided that some egregious violators that were not responsive to the code violations, with liens running up, that Legal staff has taken some cases to court, but those are done on a very deliberate basis. He stated the short-term rental parking and assembly make sense. He offered maybe send it to the MCEB and if it happens again then go the citation and court route.

Mr. Shanks gave examples of situations where they have worked with residents for a work around to keep them in compliance. It comes down to communication and courtesy notices and working with the residents. They will see if resources are needed and get those resources for the person. He stated that they have made relationships with different partners/organizations. These situations for this action are cases where the person just does not want to comply and have no special circumstances.

Mayor Ross noted he is concerned about the selection of what gets a citation and what doesn't. He would feel more comfortable if it was triaged and set the schedule of citation violations up

differently. An example perhaps would be weeds and grass and underbrush and duty to keep premises clean. That's a garden variety code violation. Just about every code violation includes one of those two. He would feel more comfortable if the first time the people went through the system, they got a notice of violation and came before the code board. He understands the issue of grass being mowed right before the meeting and three weeks later, there is the same issue. In this situation, they would now get a citation because it is a repeat violation.

Council Member Schisler asked if Code Enforcement have any idea statistically of what is coming before the MCEB.

Mr. Shank stated there are overgrown grass cases throughout the year. He stated recently, mostly parking, a lot of stop work orders, trees, and commercial vehicle parking violations.

Council Member Schisler stated he would like a breakdown of type of cases before the second reading. He noted when the officers go from one zone to another, that seems to be when he hears complaints that residents get violations that were not given before. He wants to make sure the proper training is being done.

Council Member Kravets asked Mr. Shanks to address the timeline from the initial friendly outreach to being in the court. How many days are there from the first outreach, for example, from the courtesy notice to the violation, from the violation to the further escalation that leads to the courtroom eventually. What would that look like in a practical setting so that there's no concern that these routine things will just all end up in court all of a sudden.

Mr. Shank used a grass issue and explained that if a resident has a yard with very high grass, an officer goes out, identifies this property is in violation, and leaves a courtesy notice. That would be followed up by an attempt at contact, where the Code Officer would knock on the door or try to make a phone call. If we have email access, and if we have their email documented somewhere, we will try to email them and find out what the situation is. From that courtesy notice, they will generally have anywhere generally from 15 to 30 days depending on the situation. Depending what exactly is going on at that time, a second contact would be made and if nothing happens, and that's exactly how we do things right now with the regular notice violations at that time, a decision will be made whether to write the citation, with the Director being notified. He would then give the approval to write the citation or not. The citation is written with a copy mailed to the property owner, a copy will go to the court, and a copy will go to our Clerk. At that time, they would have 30 days to pay the citation. If they don't pay the citation, they will need to go to court and the judge would then determine what's going to happen with the citation.

Mayor Ross asked the Clerk to read the title of the ordinance.

The City Clerk therefore read the title.

AN ORDINANCE OF THE CITY COUNCIL OF TEMPLE TERRACE, FL, AMENDING THE CITY OF TEMPLE TERRACE CODE OF ORDINANCES, CHAPTER 1, GENERAL PROVISIONS, ARTICLE II, CODE ENFORCEMENT, DIVISION 3, SUPPLEMENTAL ENFORCEMENT PROCEDURES BY AMENDING SECTION 1-104(d), BY AMENDING SECTION 1-105(b), AND BY CREATING SECTION 1-105(d); PROVIDING FOR SEVERABILITY; PROVIDING FOR CONFLICTS; PROVIDING FOR INCLUSION IN THE TEMPLE TERRACE CODE OF ORDINANCES; PROVIDING AN EFFECTIVE DATE.

Upon motion by Council Member Chambers, seconded by Council Member Fernandez, **APPROVED the Ordinance**, on First reading, Amending Section 1-104 (Enforcement Procedures) and 1-105 (Schedule of Violations and Penalties) and scheduling a Public Hearing and Second Reading for June 2, 2026.

Council Member Chambers stated there is a big difference between the grass ordinance and premises clean. The grass ordinance is very cut and dried. There are a lot of those cases. It could be up to sixty days and neighbors get very upset. Premises Clean is more vague in interpretation. He noted his example of a code case with a pool security violation. The house was vacated, it had a pool, and the fence was down on both sides. The only recourse the City had, takes two months to resolve, noting that's a safety violation issue. The City can't put barriers up on private property, therefore taking two months to get action. He noted other issues and stated he is in support of the idea of this item. He noted he is the liaison to the MCEB and hears all the cases that come before them.

Council Member Schisler noted he is in basic support of this process. He was glad that Mr. Shanks will approve the citations before they are issued and agrees that pool safety issues are critical. He noted he would just like to see general statistics on the violations the board is having to spend time on and training for the officers.

Mayor Ross noted the pool issue is a no-brainer and he is not against the program. He is against citations for some and thinks citations need to be tweaked for what will be a citation and what will not. The pool issue and the improper parking would be fine but the weeds, grass, and keep premises clean are a concern to him going directly to citations and possibly the court.

Council Member Fernandez stated her understanding is that the homeowner would get a courtesy notice and be given time to correct. Then if it's not corrected, the citation would be issued. They can pay the citation. They wouldn't go to court unless the citation remains unpaid or they contest it. The issue of contesting it causes her concern. Another concern she has is the situation with grass, if they go through the current process, it could be a long time before they actually have to do anything to not get fined. This causes issues for the neighbors and could cause a rodent issue. She is in support of taking care of some of these issues in a quicker method.

Council Member Kravits asked for clarification on the process of contesting the citation. Would it be an administrative process with the City at first, not automatically going to the court, unless the City actually initiated a court proceeding.

Mayor Ross noted that the process as presented at this time, the process of contesting the citation would be with the court.

Council Member Kravets offered that maybe an internal contestation process would be needed, where they could contest it with Director Shanks, review it, like for 10 days, 20 days, 30 days. He stated this is something he knows from his home jurisdiction, where you have a 30-day period after you get an administrative act to resolve it with the issuing authority and then afterwards you have the right to go to court.

Mr. Shank noted the problem with that is the way the code reads, the county court shall have jurisdiction over all violations governed in the division. He thinks that takes away the City's ability to move on that after the citation is written.

City Attorney Mueller stated that he has knowledge with his experience with the City of Tampa, sitting up their civil citation program. He stated the Clerk of the Court actually asked them to hold the citation for 30 days. If it was paid, the Court did not have to handle it. Maybe this time could be used to have a process for Director Shanks or someone to review if someone wants to challenge it. If the challenge is not upheld, it would go to the court. It could be looked at if a review process could be fit into the system and not become cumbersome and not undercut the entire civil citation process.

Mayor Ross noted his concern of having the appeal going to Director Shanks who was the person originally approving the citation.,

City Attorney Mueller stated the review process would need to be looked at.

Council Member Chambers noted his take on this is that the Council does not disapprove of the program, just that some items may not go forward. Maybe the Council Members could offer their concerns to the City Manager.

Mayor Ross stated Council Members can interact with staff and discuss, giving suggestions. He did feel like it needed to be tweaked and refine the list. Ultimately, it is the decision of the whole Council.

Council Member Schisler asked if this would be worked out with the Clerk of the Court before it is brought back for second reading.

City Attorney Mueller stated the Clerk of the Court would be contacted after, if this passes on second reading.

Vote on the motion being: Mayor Ross and Council Members Chambers, Fernandez, Kravets and Schisler voting “aye,” no “nay.”

Mayor Ross stated the Ordinance would appear for a second reading and public hearing on Tuesday, June 2, 2026.

Mayor Ross noted the next item requires polling for ex parte communication, Ordinance 1595, pertaining to the rezoning of Property on the North Side of Harney Road, East of Davis Road (RZP 25-01)

At this time, City Attorney Mueller asked if any member of the City Council had communications with anyone regarding this matter that was before the Council that evening as quasi judicial. That is item 12.B. If they had verbal ex parte communications, please disclose the when and where and with whom those communications occurred, as well as the summoned substance of those communications, if they had any written communications, please disclose the form of those written communications.

Mayor Ross, and Council Members Fernandez, Chambers, Kravets and Schisler stated they had no communications.

12.B. Second Public Hearing and Second Reading of Ordinance 1595 Rezoning Property on the North Side of Harney Road, east of Davis Road (RZP 25-01).

Mayor Ross opened the public hearing.

City Planner Joseph Moreda stated this is for rezoning modification for RZP 25-01. This is the second reading and this is a request to modify an existing plan development located on Harney Road, east of Davis Road. This is an existing plan development known as Point Plaza. The subject of this item is for lot three, and the applicant is proposing to revise the lot to add an additional 30,000 feet of limited light industrial commercial use. The applicant has agreed to not have any outdoor storage in this area. Lot three is a vacant redevelopment pad. It's about 3.9 acres, and a portion of it serves as a master retention area for the overall plan development. It will have access via Davis Road and Harney Road. Both are County roads and Hillsborough County will be reviewing the access management, and the Council will have review of that as part of the final site plan review. The Planning Commission found this to be consistent with the Comprehensive Plan of the City.

Mayor Ross asked for public comments and received no requests to speak. The Council had no questions.

Mayor Ross closed the public hearing and asked the Clerk to read the title of the ordinance.

The City Clerk therefore read the title.

AN ORDINANCE OF THE CITY OF TEMPLE TERRACE, FLORIDA REZONING A PARCEL TOTALING 3.9 ACRES (±) (FOLIOS 38210.7606) FROM PD TO PD THAT IS GENERALLY LOCATED ON THE NORTH SIDE OF HARNEY ROAD APPROXIMATELY 245 FEET EAST OF THE INTERSECTION OF HARNEY ROAD AND DAVIS ROAD; PROVIDING FOR AMENDMENT OF THE OFFICIAL ZONING ATLAS MAP OF THE CITY; PROVIDING FOR SEVERABILITY; PROVIDING FOR CORRECTION OF TYPOGRAPHICAL ERRORS; REPEALING ALL ORDINANCES OR PARTS OF ORDINANCES IN CONFLICT HEREWITH; PROVIDING FOR AN EFFECTIVE DATE.

Upon motion by Council Member Schisler, seconded by Council Member Fernandez, **APPROVED Ordinance 1595** on Second reading, Rezoning Property on the North Side of Harney Road, East of Davis Road (RZP 25-01) with conditions.

Vote on the motion being: Mayor Ross and Council Members Chambers, Fernandez, Kravets and Schisler voting “aye,” no “nay.”

13. Council Business:

13.A. GO Bond Referendum - Christopher B. Roe, Bryant, Miller, Olive P.A.

(Item was presented earlier in the meeting agenda.)

Council Member Fernandez asked in regard to the larger rental units, meaning apartments of multifamily units, they have to maintain a certain standard of living, a certain standard of occupancy. Who goes back and checks or inspects to see that they are maintaining the appropriate level of habitation.

City Attorney Mueller stated for overall habitability, sanitation inspections, as he provided in his memorandum, it would be the Department of Business and Professional Regulation, the Division of Hotels and Restaurants. They are preempted to regulate all of that. The City can regulate as to the Florida Fire Prevention Code and the Florida Building Code. Mr. Shanks has been working with the DBPR and if they ask for assistance the City can provide assistance to them. But statutorily, it would be the Division of Hotels and Restaurants.

Council Member Fernandez noted comments from residents last meeting of a particular resident that sounded fairly egregious in terms of meeting the living conditions required. How does that happen if the City would be giving violations to ordinary house owners. Is the City relying on other entities to do the inspections.

City Attorney Mueller stated the City can't regulate through citation or Code Board. If we are contacted, the City would investigate and contact DBPR if it requires regulation.

Council Member Fernandez stated her concern with all the different housing types, that the City cannot have a mechanism to maintain that level in multifamily.

City Manager Baia stated the City takes pride that the City can offer services to citizens quicker than larger government. He stated Director Shanks and members of his team were out on that property, talked to the property owner, understood the property owner was making significant improvements to the plumbing of all the buildings and changing out the copper piping for their facilities, putting in valves. That explains some of the water disruptions. Historically here, there is basically one valve per building. If a water heater in one unit had to be replaced, the entire building would need to be shut off. They are putting in new pipes and valves to bring it up to higher standards. Mr. Shanks did go into one or two units of the people that were here at the meeting and looked at issues. If he found anything there that he felt would fall under the purview of DPBR in terms of a violation, he'll make the link and he'll try to advocate for our residents even if the City does not have the authority to issue citations.

Council Member Fernandez commented on the noise issue at the shopping center and stated she has heard it and would not eat at the restaurant or be next door with the volume.

City Manager Baia stated Mr. Shanks has made contact with the owner.

Mr. Shanks stated he made contact and they explained it was a grand opening, a big party. He has only received this one complaint from that resident, and he can't duplicate it. He has asked the resident to let him know what time it is happening and he will go there at that time. With the smells that were noted, he did speak with an inspector that was there and the business had dumped coals, including putting some type of liquid on it. He has not seen that repeated. But he will check on that again.

Council Member Kravets asked if the DBPR, the Department of Business and Professional Regulation, Division of Hotels and Restaurants is what City Attorney Mueller was referring to.

City Attorney Mueller stated yes, the one that's identified in the statute.

Council Member Kravets stated on DBPR's FAQ, it says, "I need to report a safety concern or sanitation issue at an apartment, building, or complex. Who Should I contact? Issues should first be reported to property management. If the issue is not subsequently resolved in a reasonable manner, please let the Division of Hotels and Restaurants know so it can review the circumstances. Complaints arising from violations of the Florida Building Code or Florida Fire Protection Code may be addressed by contacting the appropriate local government office." He stated he finds this a little strange to hear that.

Other Council Members stated that is what the City Attorney just said.

Council Member Kravets stated the local government office is the City.

Council Members again stated that is what the City Attorney just said.

Council Member Kravets noted he is hearing that the City is preempted from having any regulations on this. He looked at Tampa and stated that Tampa regulates apartment complexes. He does not understand why we're in the situation that Tampa can do things that we can't do. He noted the discussion of short-term rentals that other cities regulate. He stated that the Council is being given advice that the City cannot do things that many other cities in Florida do and which the DBPR itself says that people should refer their complaints to us as the local government office, finding that to be incredibly confusing, that if it is read that we are supposed to send things to DBPR and DBPR says that they have to send things to us. He stated there is a regulatory void there, a catch 22 where nobody is responsible even though in our largest neighboring jurisdiction these kind of regulations and inspections already exist.

City Attorney Mueller stated again as in the email that he sent out and clearly said this evening, the City can regulate the Florida Building Code and the Florida Fire Prevention Code. It's the sanitation and habitation issues that have been preempted to the State.

Council Member Kravets stated habitability and sanitation are in the Florida Building Code. Habitability is a core element of the Florida Building Code and our current building director has the right to intervene on that basis under Florida statute right now.

City Attorney Mueller stated he was not sure how to respond to that of habitation and sanitation. He remembers questions or comments being about the condition of the carpet, mold issues along those lines, would fall under the habitation and sanitation that the City would not be able to regulate. But there are aspects of the Florida Building Code that deal with sewer water going into the buildings and the units that would become part of the building code and the City could address.

Council Member Kravets stated that he wants to know why Orlando, Pompano Beach, Tampa, Lake Fort Worth, any number of other cities in Florida, including the jurisdiction that we literally abut can do this. Why are they not preempted and we are.

City Attorney Mueller stated that if the Council would like him to look into the other jurisdictions, he can do that. He stated when he worked at the City of Tampa, they were unable to regulate the sanitation, habitation, and inspection of apartment complexes more than four units.

Council Member Kravets asked how it could be explained that Tampa does inspections then. They don't necessarily inspect for the contractual issues, but they do inspections. They have an inspection program for apartment complexes and Temple Terrace does not.

City Attorney Mueller stated the Fire Department does. They check for sprinklers and other fire safety issues, like fire extinguishers. And again stated that if City Council wants him to inquire to the extent that their code enforcement department is regulating apartment complexes of more than four.

Council Member Kravets asked where in the Florida statute that the City Attorney cited, that it differentiates between big and little apartments, where is it that it says if you have three or more, then the City can't do these things, but if three or fewer, you can. He stated that he did not find in the statute that large landlords are treated more leniently than small landlords.

City Attorney Mueller stated that he cited that in the email and read the statute into the record. Section 509.032A7 states that the regulation of a public lodging establishment including but not limited to sanitation standards inspections is preempted to the state. Then there is an exception to that preemption which is any place renting four rental units or less unless the rental units are advertised or held out to be to the public to be places that are regularly rented to transients. Under 509.032 they accept out of the preemption, any place renting four rental units or less. So we can regulate four rental units or less but anything over four is preempted to the state.

Council Member Kravets requested the first section to be read again.

City Attorney Mueller read again, the regulation of public lodging establishments, including but not limited to sanitation standards, inspections, etc., is preempted to the state.

Council Member Kravets asked about building code.

City Attorney Mueller continued to read, this paragraph does not preempt the authority of a local government or local enforcement district to conduct inspections of public lodging establishments for compliance with the Florida Building Code and the Florida Fire Prevention Code.

Council Member Kravets stated that is whether the building code applies equally and whether the City can inspect people for compliance with the building code and he stated he thought the City could. With that, he asked if so, then what exactly is it that the building code allows us to inspect for. He stated Tampa inspects large apartments and by doing that, they achieve a higher standard for the tenants who live there. He stated that there is leeway to regulate these large apartment buildings.

City Attorney Mueller stated he said several times, we can regulate using the Florida building code. As to what extent our building official is going to be able to go in, regulate and what falls under the building code and what does not, he would leave that to the our City Building Official.

Council Member Kravets stated he agreed and thought the City should explore that.

14. New Business and Board Reports:

Council Member Kravets stated that BPAC is engaged and a dedicated committee. They have contributed strategic overviews to the City such as the pedestrian and bicycle master plan. Recently, upping their commitment to having monthly meetings instead of once every two months.

Upon motion by Council Member Kravets, seconded by Council Member Fernandez, **RESOLUTION 53-26(M), ADOPTED AND APPROVED** for staff to evaluate the regulatory landscape that's available and make a recommendation to improve bicycle facilities at end of transit, and that the staff can coordinate with the Committee during the process of doing that review, and that staff will consult with the Committee's draft materials while doing that. This is just exploratory.

Council Member Schisler stated he has no problem with the basic premise of what this is trying to provide for new construction but not to go back and require people to do retrofitting especially with what is called the end of the route type things, such as showers and lockers, etc.

Mayor Ross noted he will support looking into this, BPAC is a very productive committee, but he stated he has a caveat on this, at least from him. He stated that staff and Council are in the middle of budget, a bond referendum, PFAS and many other things. He would expect this to take a little longer than a normal turnaround. Also there are land use revision ordinances already in the pipe line with some of them over a year in the process. He does not want this to turn into a scolding because they are not getting it done, when the Council continues to throw other projects on staffs schedule. This will take a place behind some other projects. He noted he thinks when it returns to the Council, it should be in the form of a workshop.

Council Member Kravets asked if he should add the workshop to the motion.

Mayor Ross stated it should not be added, if too much is in the motion, support will be lost.

Council Member Kravets noted that BPAC has surveys and has done a lot of the heavy lifting and could work with staff to put together a legislative proposal.

Vote on the motion being: Mayor Ross and Council Members Chambers, Fernandez, Kravets and Schisler voting “aye,” no “nay.”

Council Member Kravets asked about the Sunnyside Road project and noted that on Sunday, a line fell down behind one of his neighbor’s houses on Brentwood and a thousand homes lost power. He noted the whole peninsula is dependent on a single power source and when it fails, thousands of homes have no power. He noted he spoke with a contact, Joel Brown at TECO, which City Manager Baia kindly gave him. Mr. Brown promised a hardening study and he wants to say this is an appeal for support. He asked Council and the City to put pressure on TECO to take care of this issue.

Council Member Fernandez asked about a project of TECO having lines in back yards, but plan to move to front yards.

City Manager Baia stated he thinks it is not back to front, but a long-term plan is to bury the lines. He will follow up with Mr. Brown.

Council Member Schisler asked if it would be possible to have Mr. Brown come in to a Council meeting.

City Manager Baia will check with Mr. Brown.

Council Member Chambers stated for the public that golf carts need a sticker and that drivers must have a driver's license.

15. City Manager's Report:

15.A. Fiscal Year 2026 Q2 Reports

City Manager Baia noted the second quarter reports are part of this meeting's packet. On May 19, the agenda will be light on items but it will include the presentation from CHA.

He noted that staff is in budget season and are in the process of departmental budget meetings. He appreciates the consideration of staff resources that are going to be tied up pretty heavy for a few months.

Council Member Fernandez noted with going into budget season and putting in new water meters, if there would be help for the residents to identify when larger outflows are happening and notify the customer sooner before there is a very large bill.

City Manager Baia noted he could have Utility Billing staff prepare an updated memo for Council regarding that issue and distribute it to Council.

16. City Attorney's Report:

City Attorney Mueller stated he did not have a report.

Council Member Kravets asked about outstanding litigation.

City Attorney Mueller stated he is finalizing the litigation report and looking to see the best way to provide that. Certain things are confidential, and he must not break any confidentiality.

Mayor Ross noted that City Attorney Mueller is appreciated for his work, the way he protects the City and how he looks out for the City's interests. He thanked him for what he does and knows that staff appreciates him.

Adjournment:

Meeting adjourned at 9:00 p.m.

X

Andrew R. Ross
Mayor

X

Gil Schisler
Council Member

X

James Chambers
Vice Mayor

X

Alison Fernandez
Council Member

X

Erik Kravets
Council Member

Attest:

X

Lynda Sader
City Clerk

Item Cover Page

City Council Item Report

Date: May 19, 2026
From: Jeannie Barlow, Senior Executive Assistant
Item Type: Discussion
Subject: Consultant Report - Water Treatment Facilities Master Plan
Presenter: Andy Ross, Mayor

Recommendation:

Discussion:

CHA Consulting Senior Principal Engineer Ed Talton will present the Water Treatment Facilities Master Plan to the Council.

Resolution/Ordinance Information:

Appropriation Code:

Requirements:

Cost:

Attachments:

1. WTPsMasterPlanFinal-05.13.2026



WATER TREATMENT FACILITIES MASTER PLAN

The City of Temple Terrace

May 13, 2026



PREPARED FOR:

Jason Warrenfeltz
Public Works Director
The City of Temple Terrace
11250 N 56th St
Temple Terrace, FL 33617

FOR MORE INFORMATION CONTACT:

Ed Talton, PE
Client Service Director
Cell: (407) 789-1892
ETalton@chasolutions.com

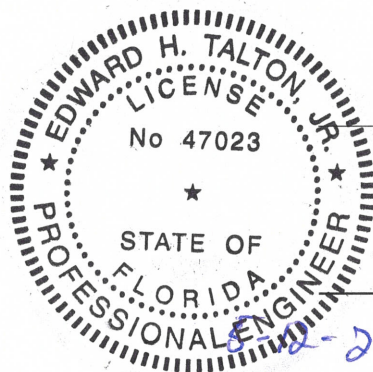


CERTIFICATION

I, the undersigned, certify that I am currently a State of Florida registered professional engineer and that this Water Treatment Facilities Master Plan Report was prepared in accordance with all applicable statutes and regulations.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, the undersigned, of CHA Consulting, Inc. have been designated by the Site owner to sign this certification for the Site.

For CHA Consulting, Inc.:



Edward H. Talton, Jr., P.E.

Printed Name of Certifying Engineer

Edward H. Talton, Jr.

Signature of Certifying Engineer

Senior Engineer

Title

5-12-2026

Date of Certification

License Number: 47023

FL Professional Engineer Registration Number

Florida

Registration State



HISTORY AND BACKGROUND

HISTORY

CHA is engineering support hired by the City in 2024 to complete a water treatment master plan to provide the Utility with a framework for needed capital and process improvements.

2025 PFAS SAMPLING

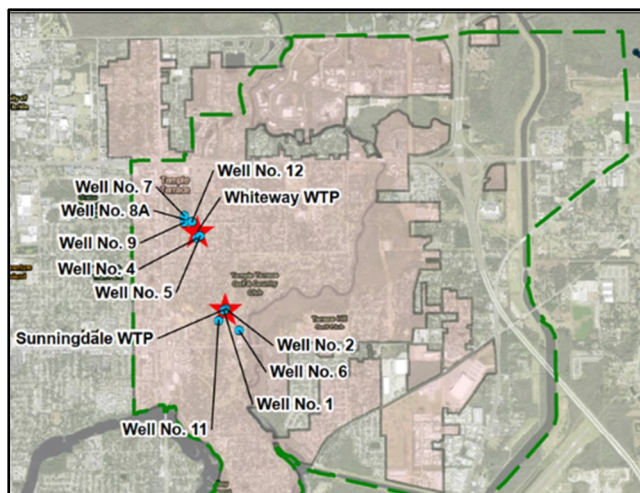
In response to the Environmental Protection Agencies (EPA) Unregulated Contaminant Monitoring Requirement-5 (UCMR5) and the upcoming 2031 EPA compliance deadline proposed for the regulation of PFAS, the Utility commissioned CHA to perform an additional, concurrent analysis to determine most appropriate mitigation method for PFAS.

TREATMENT MASTER PLAN

CHA conducted an examination of WTP construction as-builts, interviewed City staff, conducted site inspections, ran PILOT treatment systems both at Whiteway WTP and at UCF, researched comparable plant size production and filtration technologies, produced cost estimates and investigated alternative funding options as part of its work. The findings of these activities inform this report.

PLANNING RESULTS

Based on the findings, CHA developed a 20-year approach for Temple Terrace Utilities to phase in the various elements of their proposed work program in a manner that takes into account the WTP's physical plant capacity and that of City staff and is conscious of spreading the costs over time.



BACKGROUND

Temple Terrace Utilities Water Division maintains and operates the City's two potable Water Treatment Plants (WTPs) – Sunningdale and Whiteway – that provide reliable, high-quality potable water service to over 30,000 Temple Terrace residents.

SUPPLY

Established in the 1920's, the City's potable water system has grown and evolved to include productive Upper Floridan aquifer well fields supplying the City's two WTPs, two remote storage and repump stations and extensive distribution system. The City draws water from the Upper Floridan Aquifer through 10 production wells; this master plan's focus is the two WTPs and their supply.



MASTER PLANNING PROCESS

WATER SUPPLY & TREATMENT

The City's Whiteway and Sunningdale Water Treatment Plants (WTPs) and supply wells were evaluated for needed improvements to continue to reliably deliver potable water to City customers for now and the future.

IDENTIFY CITY QUALITY GOALS

In addition to meeting current State and Federal drinking water regulations:

- Reduce calcium hardness to <150 mg/l
- Reduce PFAS to below EPA limits
- Enable removal of future contaminants

DEFINE/PRIORITIZE WTP NEEDS

Onsite inspections, full WTP facility renewal and treatment process evaluations were performed in concert with City staff to identify and prioritize major needs:

- Increase WTP reliability
- Renew aged WTP components
- Reduce calcium hardness
- Meet EPA future PFAS compliance date

EVALUATE OPTIONS

1. Non-treatment options
2. Upgrade existing-no PFAS removal
3. Add Adsorptive PFAS removal
4. Add Nanofiltration + Concentrate
5. Convert Sunningdale to Booster Pump

SELECT THE BEST OPTIONS

Compare alternatives on a capital, operating and life cycle (\$/1,000 gallon) cost basis.



PRIORITIZE AND BUDGET

CHA assisted the City to develop a Water Treatment Facilities Master Plan (Master Plan) to evaluate the physical condition and treatment process performance of both WTPs to renew and improve, budgeting future capital needs.

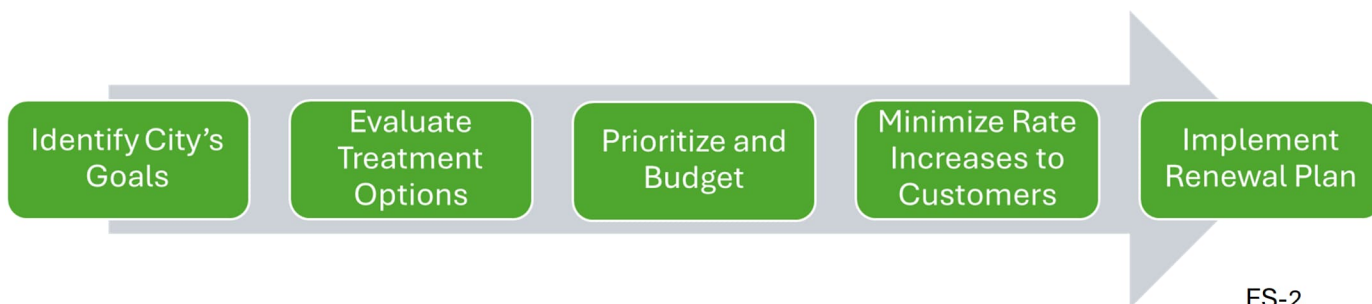
FUNDING TO MINIMIZE RATES

Source water testing per EPA's Unregulated Contaminant Monitoring Rule 5 revealed the presence of per- and poly-fluoroalkyl (PFAS) species. The National Primary Drinking Water Regulation PFAS compliance date is currently set for April 2029, but the EPA has proposed an extension to 2031.

DEVELOP RENEWAL PLAN

Address critical WTP renewal needs and meet PFAS regulations by year 2031:

1. Coordinate with Local Regulators
2. Funding plan actions
3. Organize into 4 Construction Projects
4. Refine PFAS Disposal/Destruct plan
5. Prepare site for new NF treatment
6. Design, pre-purchase, bid, construct



WATER TREATMENT PLANT PHYSICAL CONDITION

WTP RELIABILITY AND RISK

WTP components (pumps, tanks, mixers, blowers, injection systems, and controls) experience predictable deterioration, occasional sudden failures and gradual obsolescence. WTPs need high-reliability and effective serviceability requiring:

- Condition-ratings and service status
- Risk of failure and renewal costs
- Deterioration forecast curves
- Proactive renewal budgeting

FACING END OF SERVICE LIFE

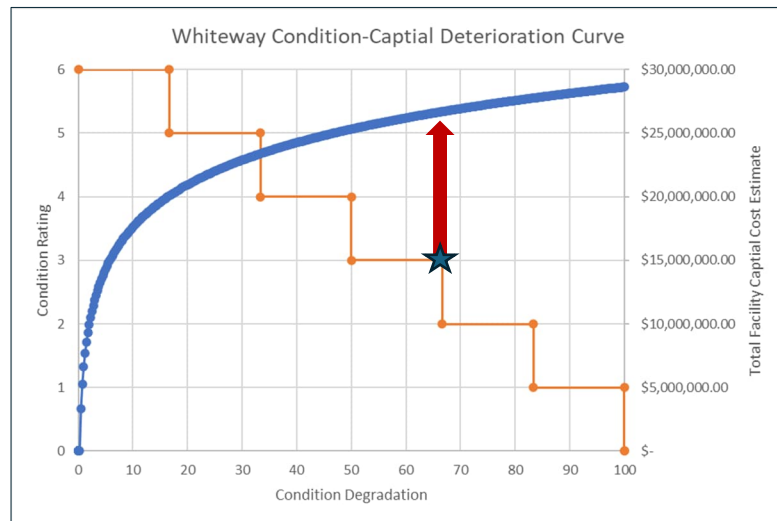
Both the City's WTPs are nearing the end of service life, having supplied the City with clean water for 40+ years. Whiteway's softening process cannot meet hardness goals with reliability issues. Both WTPs currently have higher-than-acceptable risks and need extensive rehabilitation.

SUNNINGDALE CONVERSION

While adding NF treatment to Sunningdale was considered, the site area is small with significant logistical, capital and operating cost advantages to consolidating treatment at Whiteway. To consolidate treatment, it is recommended to convert Sunningdale WTP to booster pumping and increasing Whiteway WTP from 5 to 6 MGD capacity. Conversion includes conversion/demo, well transfer and distribution capacity increase.

WHITEWAY RENEWAL COST

The City is facing at \$30M+ to just renew its WTPs without considering PFAS removal. Major cost items include replacement of process equipment (lime softening, chlorination) and refurbishment of electrical, plant controls, structural and demolition.



PRIORITIZING RENEWAL

Water treatment plant component physical condition was evaluated and ranked to prioritize replacement/renewal:

1. Electric power feed/looping/grounding
2. Motor control centers
3. Mechanical equipment
4. Replace softeners with new process



WTP RENEWAL BUDGETING

This master plan identified plant component by-component needs prioritized by risk of and consequence of failure. The resulting year-by-year renewal costs were estimated to help facilitate City budget upgrades.

MEETING PFAS AND HARDNESS GOALS

PFAS REMOVAL NEEDED

City supply well testing per EPA's National Primary Drinking Water Regulations revealed the presence of per- and poly-fluoroalkyl (PFAS) species. PFAS is nearly ubiquitous globally and nationally and contaminated the City's supply wells, due to extensive use as fire retardant and water repellent in firefighting, carpets, clothing, cookware, wearables, etc.

PFAS TREATMENT TESTING

Bench and pilot scale testing was performed to assess treatment systems to comply with PFAS limits. Granular activated carbon (GAC) and ion exchange (IX) media testing indicated inefficient PFAS removal due to high media changeouts and operating costs.

ALTERNATIVES EVALUATED

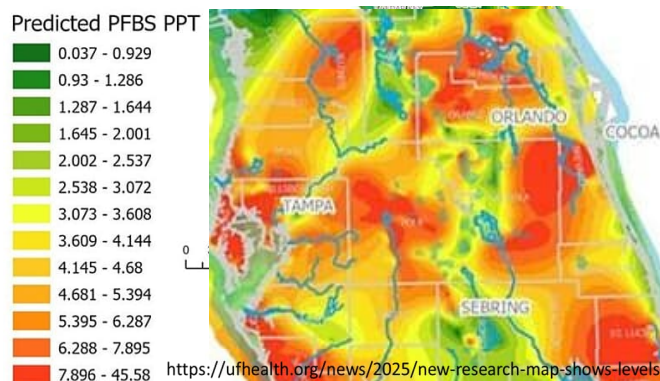
- Baseline - No PFAS Removal
- Non-treatment – Bulk purchase from neighboring utilities or new City wells
- Full treatment – softening + PFAS
- PFAS Disposal/Destruction

ALTERNATIVES CONCLUSIONS

- ✓ \$36.5M capital to renew WTPs, no PFAS removal
- ✓ NF softening cost is equivalent to Lime softening replacement cost and provides PFAS removal
- ✓ NF selected for softening and PFAS removal capabilities

PFAS PROCESS DECISION

Bench scale testing for nanofiltration (NF), technology that treats hardness and PFAS, showed promising results meeting the City's treatment goals. NF also removed smaller chain PFAS present that GAC/IX could not.



Water Quality Parameter	MCL	MCLG	Whiteway	Sunningdale
			May 2025	May 2025
PFOA	4	0	8.7	7.7
PFOS	4	0	19	16
PFHxS	10	10	8.2	8.6
PFNA	10	10	< 3.7	< 4.1
HFPO-DA (Gen-X)	10	10	< 4.6	< 5.2
PFBS	-	-	12.2	9.2
Hazard Index	1	1	0.92	0.96

All units in ppt, except Hazard Index (calculated, unitless).

HARDNESS PROCESS DECISION

NF has the capability to remove nearly all PFAS and is highly effective softening Florida groundwater. NF is marginally more costly than lime softening but can remove PFAS and future unregulated contaminants.

NON-TREATMENT OPTIONS

New City wells and supply from adjacent utilities were considered. Interconnection with neighboring systems (City of Tampa and Hillsborough County) was evaluated at a planning level. Interconnect options present significant constraints, including limited available capacity from regional suppliers, complex interagency agreements, and substantial infrastructure costs in the \$30M or more range. With the highest life cycle costs, risks and complexity, interconnection is not considered practical or cost-effective compared to improvements within the City's existing system.

WATER TREATMENT RENEWAL PLAN

RECOMMENDED PLAN

- Immediate Electrical Renewal
- **Renew and Add Nanofiltration to Whiteway WTP for 6 MGD**
- Convert Sunningdale to booster
- **Pursue Funding initiatives**

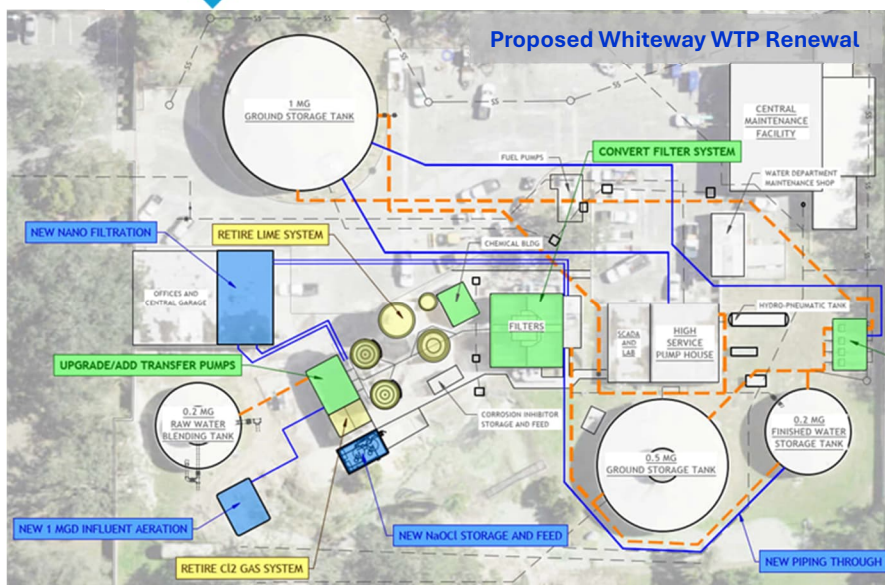
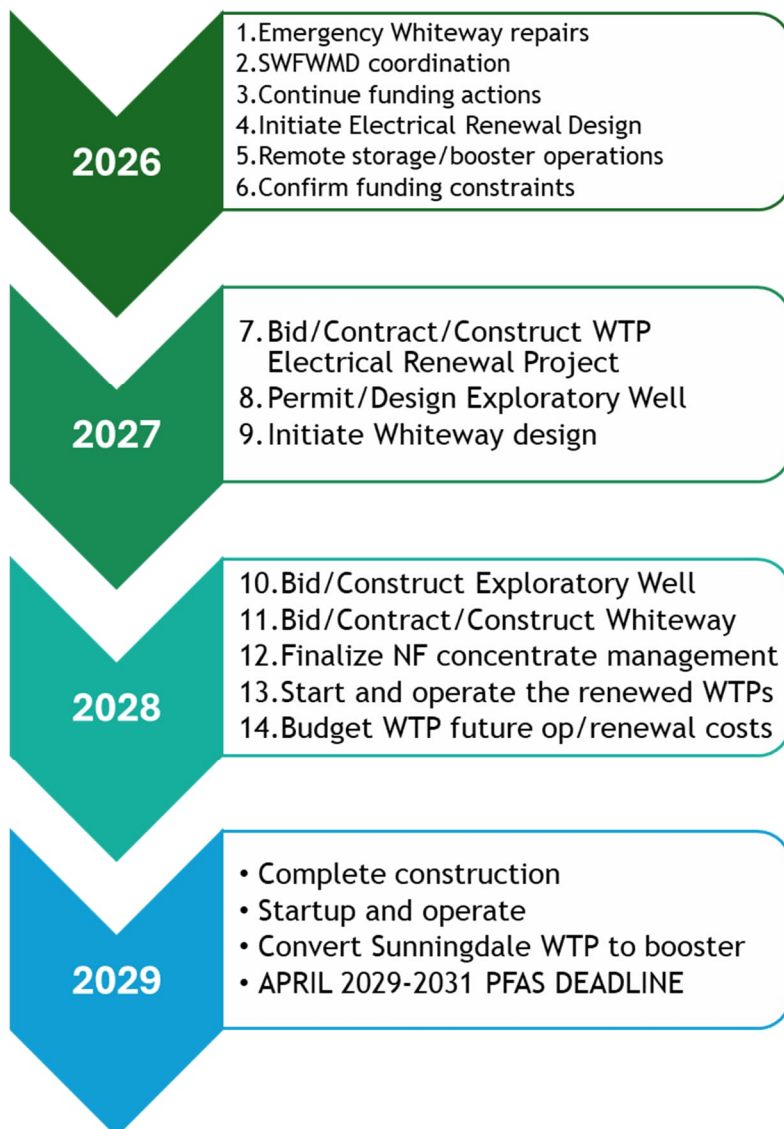
PROJECTS TO COMPLETE

- A. Priority – Recarb bypass, remote tank operations
- B. Exploratory Well – Less PFAS
- C. Electrical R&R – Renew electrical, SCADA, NF-ready
- D. General Plant – Renew facilities, add NF and concentrate disposal



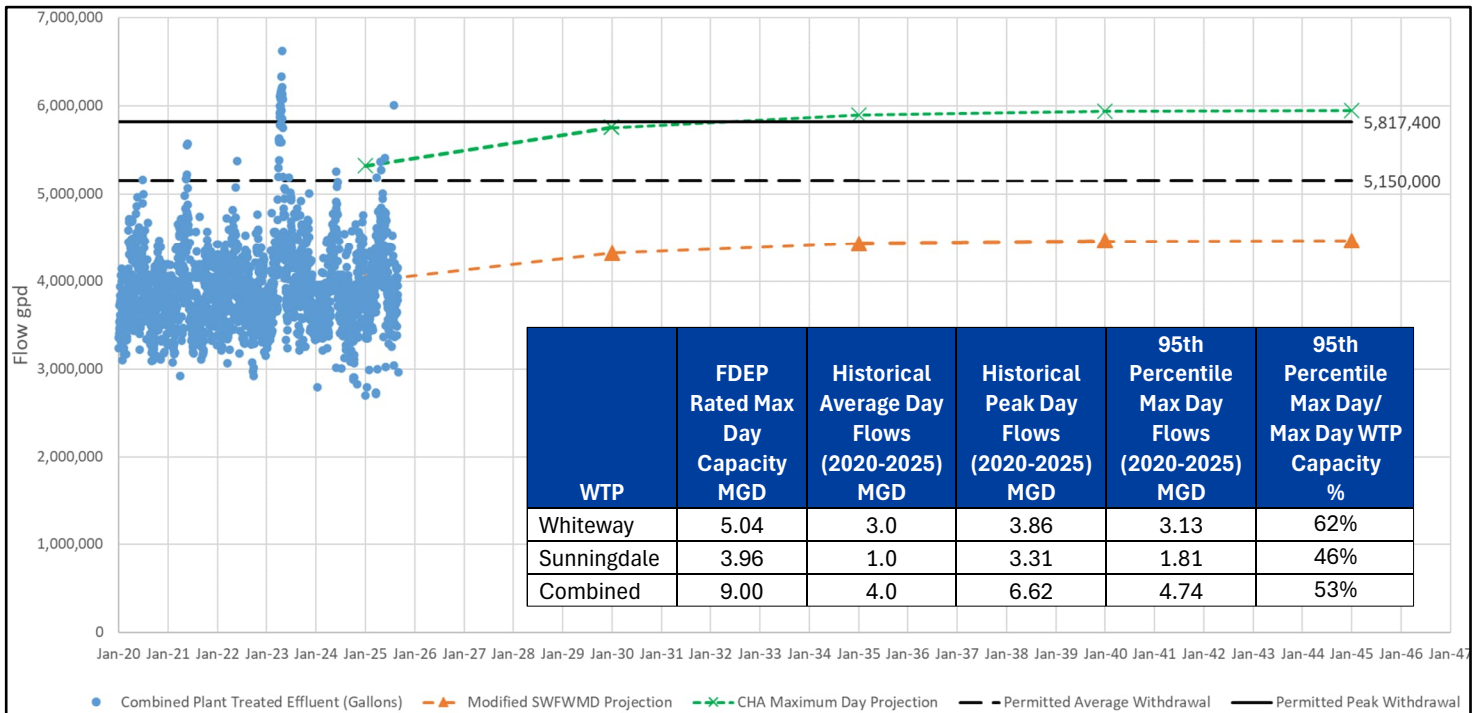
NF CONCENTRATE STREAM

Nanofiltration results in “concentrated” flow to account for 90% raw to product water conversion (recovery). NF concentrate can be classified as hazardous, especially with PFAS. The best practice is to further concentrate the PFAS by various methods and ultimately destroy, landfill or deep well inject. Destruction is preferred; the technology is evolving with deep well as this plan’s base option.



CAPACITY AND COSTS

NEEDED WTP CAPACITY



WATER USE PERMIT INCREASE

Future Condition	WTP ADF MGD	ADF WUP Surplus/Deficit MGD	Peak Month Flow MGD	Peak Month WUP Deficit MGD
SWFWMD Permitted Withdrawal	5.15	--	5.817	--
Projected Flows (2029, PFAS Compliance Deadline)	4.26	+ 0.89	5.66	+ 0.155
Flows Required for Membrane Treatment at 85% recovery (2029)	5.01	+ 0.14	6.66	- 0.84
Projected Flows (2045)	4.47	+ 0.68	5.95	- 0.133
Flows Required for Membrane Treatment at 85% recovery (2045)	5.26	- 0.11	6.99	- 1.173

CAPITAL COST ESTIMATE (2025\$)

Project	Whiteway	Sunningdale	Total
Priority Repairs	\$300,000	\$0	\$300,000
Exploratory Well	\$7,152,500	\$0	\$7,152,500
Electrical R&R, Feed/Loop, NF	\$6,094,013	\$1,572,010	\$7,666,023
General WTP	\$52,953,375	\$4,191,013	\$57,144,389
WTP R&R	\$3,071,375	\$4,191,013	\$7,262,389
NF Softening+PFAS Removal	\$23,082,000	--	\$23,082,000
Concentrate Management	\$26,800,000	--	\$26,800,000
Total	\$66,499,888	\$5,763,023	\$72,262,912



Project	2026-2027	2027-2028	2028-2029	2029-2030	2030-2031	5-Year Total
Project A-Priority Repairs	\$300,000	\$0	\$0	\$0	\$0	\$300,000
Project B-Exploratory Well	\$0	\$852,500	\$800,000	\$5,500,000	\$0	\$7,152,500
Project C-Electrical WTP Upgrades	\$4,048,973	\$1,508,525	\$1,408,525	\$700,000	\$0	\$7,666,023
Project D-Whiteway NF+Deep Well	\$3,182,295	\$10,362,270	\$18,356,454	\$20,498,361	\$4,745,009	\$57,144,389
Totals	\$7,531,268	\$12,723,295	\$20,564,979	\$26,698,361	\$4,745,009	\$72,262,912

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LIST OF ACRONYMS & ABBREVIATIONS

AACE	Association for the Advancement of Cost Engineering
AACEI	Association for the Advancement of Cost Engineering, International
ACS	American Chemical Society
ADD	Average Day Demand
ADEQ	Arizona Department of Environmental Quality
AER	Anion Exchange Resins
AFFF	Aqueous Film Forming Foam
ANSI	American National Standards Institute
AOP	Advance Oxidation Processes
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BAT	Best Available Technology
BGS	Below the Ground Surface
BLDG	Building
CAA	Clean Air Act
CaCO ₃	Calcium Carbonate
CCL	Contaminant Candidate List
CCL3	Third Contaminant Candidate List
CCL4	Fourth Contaminant Candidate List
CCPP	Calcium Carbonate Precipitation Potential
CCRO	Closed Circuit Reverse Osmosis
CFU	Colony Forming Unit
CIP	Capital Improvement Plan
CL ₂	Chlorine
CSMR	Chloride to Sulfate Mass Ratio
CY	Calendar Year
DBP	Disinfection By-Product
DBPR	Disinfection By-Product Rule
DOC	dissolved organic carbon
DoD	Department of Defense
DOH	Department of Health
EA	Each
EBCT	Empty Bed Contact Time
EPA	Environmental Protection Agency
EPDS	Entry Point to the Distribution System
ERV	Expected Replacement Value
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FL	Florida

FRRO	Flow Reversal Reverse Osmosis
FY	Fiscal Year
GAC	Granular Activated Carbon
GIS	Geographic Information System
GPM	Gallons Per Minute
GST	Ground Storage Tank
GWR	Ground Water Rule
H ₂ S	Hydrogen Sulfide
HAA	Halo-Acetic Acid
HASP	Health and Safety Plan
HFPO-DA	Hexafluoropropylene dimer acid
HI	Hazard Index
HP	Horsepower
HPC	Heterotrophic Plate Count
IDSE	Initial Distribution System Evaluation
IN	Inch
IX	Ion Exchange
LCR	Lead and Copper Rule
LRAAs	Locational Running Annual Averages
LSI	Langelier Saturation Index
MCL	Maximum Contaminant Limit
MCLG	Maximum Contaminant Level Goal
MDD	Maximum Day Demand
MDL	Method Detection Limit
MG	Million Gallon
MGD	Million Gallons per Day
MOR	Monthly Operating Report
MRDL	Maximum Residual Disinfectant Level
MWCO	Molecular Weight Cut Off
NaCl	Sodium Chloride
NaOCl	Sodium Hypochlorite
NDAA	National Defense Authorization Act
NDMA	N-nitrosodimethylamine
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NF	Nanofiltration
NMR	Nuclear Magnetic Resonance
NPDWR	National Primary Drinking Water Regulations
NSDWR	National Secondary Drinking Water Regulations
NSF	National Science Foundation
NTU	Nephelometric Turbidity Unit
OPCC	Opinion of Probable Construction Cost
PAC	Powder Activated Carbon

PACI	Polyaluminum Chloride
PCC	Probable Construction Cost
PFAS	Per- and Poly- Fluoro Alkyl substances
PFBA	Perfluorobutanoic Acid
PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PMCLs	Primary MCLs
PQL	Practical Quantitation Limit
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
PWS	Public Water System
QA	Quality Assurance
QC	Quality Control
RAA	Running Annual Average
RCRA	Resource Conservation and Recovery Act
RO	Reverse Osmosis
RPM	Revolutions per Minute
RSSCT	Rapid Small-Scale Column Testing
RTCR	Revised Total Coliform Rule
RWSP	Regional Water Supply Plan
SAC	Strong-Acid Cation
SBA	Strong-Base Anion
SCADA	Supervisory Control and Data Acquisition
SDI	Silt Density Index
SDWA	Safe Drinking Water Act
SMCL	Secondary Minimum Contaminant Level
SRBs	Sulfate Reducing Bacteria
SUVA	Specific Ultraviolet Absorbance
SWFWMD	Southwest Florida Water Management District
T.O.N.	Threshold Odor Number
TDS	Total Dissolved Solids
THMs	Trihalomethanes
TOC	Total Organic Carbon
TSDF	Treatment, Storage, and Disposal Facility
TSS	Total Suspended Solids
TTHM	Total Trihalomethanes
TYP	Typical
U.S.	United States
UCMR	Unregulated Contaminant Monitoring Rule
UCMR5	Unregulated Contaminant Monitoring Rule

UFA	Upper Floridan Aquifer
UV	Ultraviolet
UV254	Ultraviolet - 254nm
VFD	Variable Frequency Drives
VOC	Volatile Organic Carbon
WAC	Weak-Acid Cation
WBA	Weak-Base Anion
WQP	Water Quality Parameter
WTF	Water Treatment Facility
WTPs	Water Treatment Plants
WUP	Water Use Permit

1.0 INTRODUCTION

1.1 Project Background

Temple Terrace Utilities Water Division maintains and operates the City's two (2) potable Water Treatment Plants (WTPs) – Sunningdale and Whiteway – that provide reliable, high-quality potable water service to over 30,000 residents living in the Temple Terrace service area. Established in the 1920's, the City's potable water system has grown and evolved to include productive Upper Floridan aquifer well fields supplying the City's two WTPs, two remote storage and repump stations and extensive distribution system. The City draws water from the Upper Floridan Aquifer through 10 production wells ranging from 155 feet to 505 feet in depth, under SWFWMD's Water Use Permit #450.011. This master plan is focused on the two WTPs and their supply. **Figure 1-1** shows the City's topographic map; **Figure 1-2** depicts the WTPs and well fields.

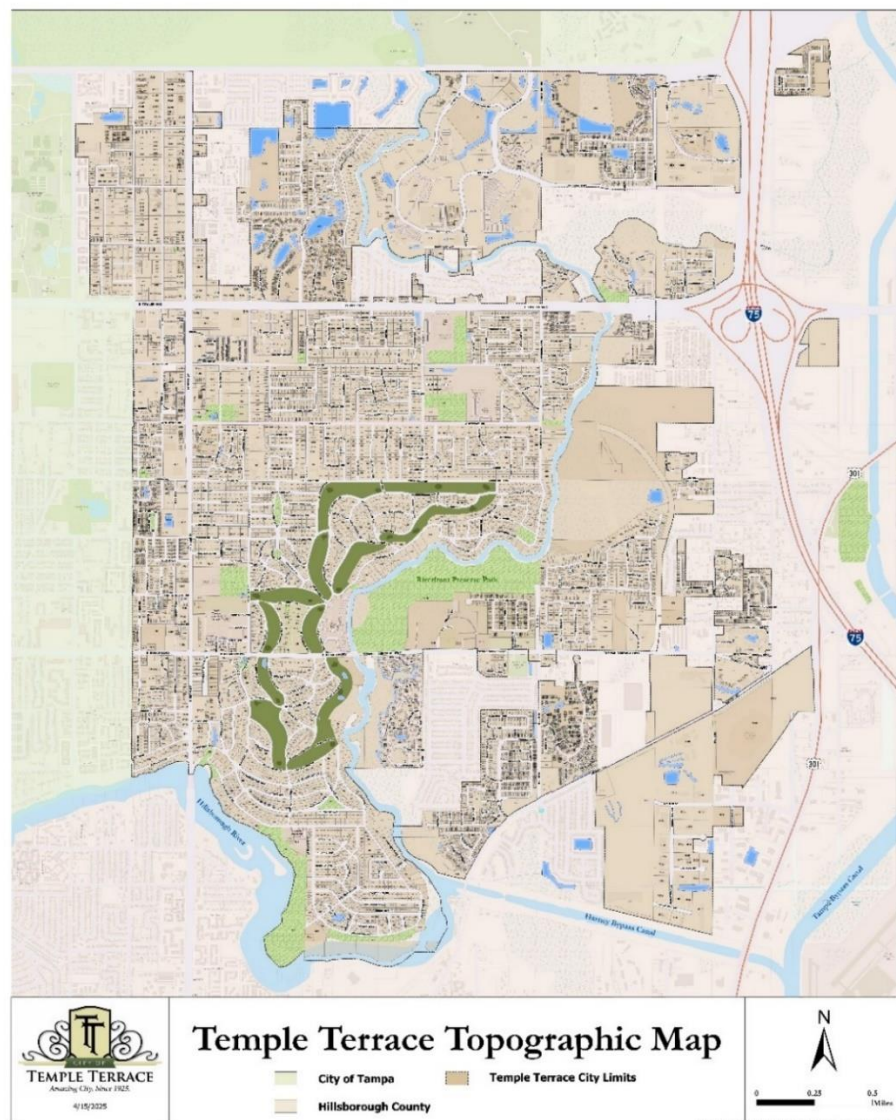


Figure 1-1. Map of Temple Terrace

Source: City of Temple Terrace GIS

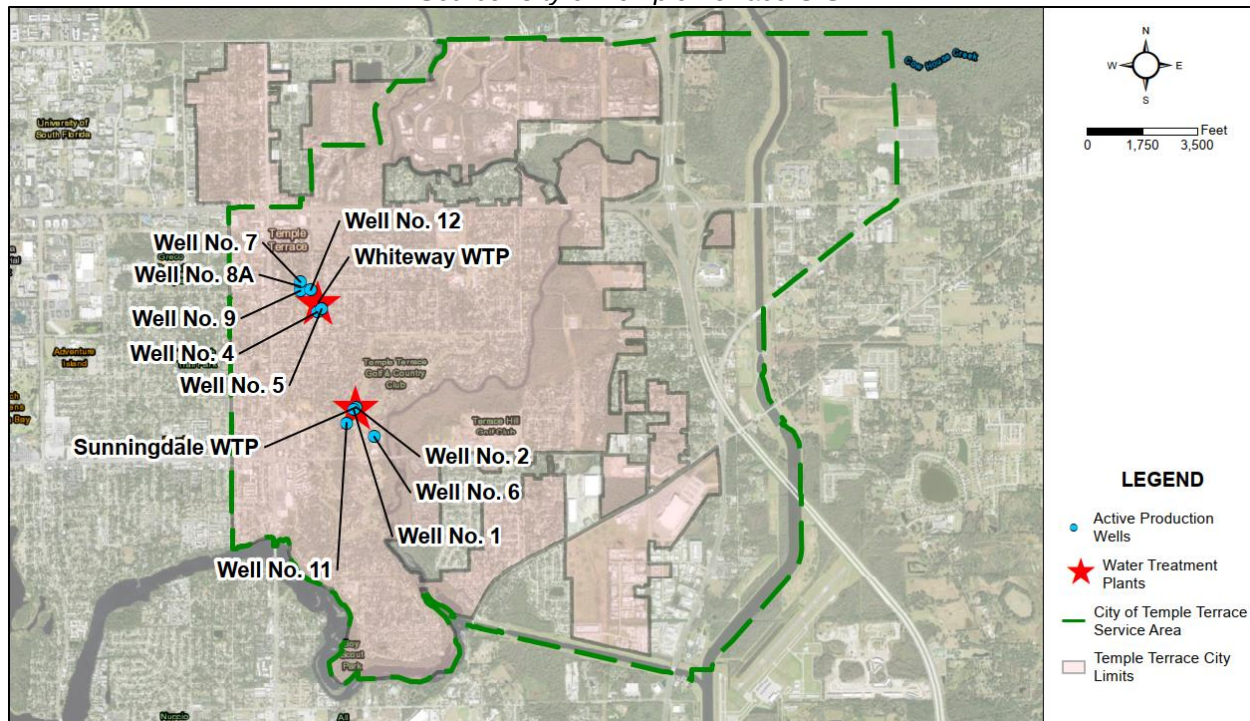


Figure 1-2. Temple Terrace Wellfields

The Whiteway WTP, located in north Temple Terrace, is the larger of the two water treatment facilities. Whiteway WTP draws water from six (6) production wells; four wells from Richlyne Wellfield (Wells No. 7, 8A, 9, and 12) located adjacent to the WTP, and two wells located on-site (Wells No. 4 and 5). The site originally was fitted only for water collection and distribution with a storage tank and high-service pumps. In the 1980's the plant was upgraded to add several water treatment facilities and was further upgraded in 1993 to construct a new ground storage tank. Currently, the Whiteway WTP is designed to provide aeration, lime softening, recarbonation, multi-media filtration, free-chlorine disinfection and corrosion-inhibitor addition. Whiteway's fluoridation process was recently retired due to Florida legislation preventing the addition of water quality "additives," such as fluoride, via Senate Bill (SB) 700 passed July 1, 2025. State-certified water treatment plant operators monitor both WTPs 24 hours per day, 365 days per year, via SCADA located in the Whiteway plant's operations building.

The Sunningdale WTP, located in south Temple Terrace, is smaller than Whiteway, and operates during peak flow needs. Sunningdale draws water from four (4) wells; two are at a nearby well field (Wells No. 6 and 11) and two are located on-site (Wells No. 1 and 2). The on-site production wells were previously self-contained wells until the plant was constructed in 1993 to supplement the water distribution system during high demand periods. The plant has capabilities for chlorination, fluoridation, and corrosion-inhibitor addition. Sunningdale's fluoridation process is

still functional but will be retired in conjunction with Whiteway's fluoridation system retirement. The plant can be monitored remotely through SCADA at the Whiteway facility.

1.2 Purpose

The purpose of this Master Plan Update is to provide the City of Temple Terrace (the City) with a 20-year plan addressing upgrade needs, for the City's two water treatment plants (WTPs), that may serve as a guide for allocating capital improvement plan (CIP) funds to maintain a high level of water quality that keeps up with future regulations and water demands. This Master Plan will identify repair/renewal, capital and operational efficiency opportunities to continue meeting and exceeding the City's standard of service. The City has requested CHA Consulting, Inc. (CHA) support the master planning effort, focused on the following specific goals:

- Update the City's delivered potable water quality parameter service-level goals
- Develop a capital improvement plan for the WTPs spanning 20 years to 2045
- Define future requirements for operation and performance of the Sunningdale and Whiteway WTPs based on existing and future drivers
- Perform evaluations of the condition of buildings, building systems, and process facilities at the WTPs and well fields, and recommend a schedule for improvements or replacement
- Evaluate the performance, capacity, and suitability of existing process facilities and systems at the WTPs, and recommend improvements to meet current and future regulatory requirements, demand projections, and permitting needs
- Evaluate and recommend new process systems and facilities at Sunningdale and Whiteway WTPs required to meet current and future needs
- Develop revised site plans for the WTPs to support recommended improvements

The WTP evaluations are divided into two major sections:

- WTP Treatment Process Evaluation
 - o Existing conditions
 - o Future conditions (Demand projections and regulatory changes)
 - o Capacity vs. projected demands
 - o Water quality goals, regulatory compliance and treatment needs
 - o Alternatives life cycle cost evaluation
- WTP Conditions Assessment
 - o Major WTPs asset inventory
 - o Asset condition/risk ranking
 - o Projected R&R needs and costs

1.2.1 WTP Treatment Process Evaluation

The treatment process evaluation involves capacity assessment to meet the 2045 planning horizon and water quality assessment to meet current and future regulations characterizing trends and the performance of each facility. This is done by CHA performing on-site walkthroughs of the WTPs and utilizing City staff's experience and knowledge of the plant to supplement and provide context to what is observed. In addition, sampling and analysis for a broad spectrum of analytes was performed to ensure full compliance with primary drinking water standards.

The observations of the City's treatment performance are then compared to existing and emerging regulations, to determine whether the City meets the treatment goals, and what deficiencies exist in that regard including PFAS regulatory compliance. Using the data collected, several alternative upgrade plans were developed to address current and future treatment needs.

1.2.2 WTP Condition Assessment

The condition assessment involves a visual inspection of each unit process in the WTPs, focusing on the physical condition and remaining lifespan of different components. This is to assess the likelihood of failure, which, combined with the criticality of the component to the overall treatment process, determines the priority of replacement. The condition assessment focuses on four major aspects: Structure and foundation, Process (capacity and condition of process equipment), electrical (compliance, capacity, condition), and Instrumentation and control.

1.3 Project Scope

The Water Treatment Facilities Master Plan for the City of Temple Terrace establishes a comprehensive framework for evaluating, maintaining, and improving the City's potable water treatment infrastructure. This effort focuses on the Sunningdale and Whiteway Water Treatment Plants (WTPs) and associated well fields, ensuring that these facilities continue to deliver reliable, high-quality drinking water to residents over a 20-year planning horizon. CHA was not scoped to evaluate the City's water distribution infrastructure needs or water quality in the distribution system. The scope of services is organized as follows:

Project Initiation and Data Collection

The project begins with a structured initiation phase to align objectives, define success criteria, and establish communication protocols. Workshops with City staff to facilitate knowledge transfer from City staff and confirm project goals, schedule, and milestones. Historical and operational data, including water quality records, facility studies, and maintenance documentation was compiled to support technical evaluations.

Treatment Process Evaluation

An assessment of existing treatment processes at both WTPs. Site visits and historical performance reviews identified operational trends, chemical usage, and compliance with regulatory standards. Water quality sampling and analysis supported future treatment strategies considering emerging regulatory requirements, technology advancements, and resiliency needs, culminating in conceptual recommendations for process modifications and enhancements.

Condition Assessments

A systematic visual inspection of major process systems, electrical infrastructure, and instrumentation was conducted to assess physical condition, remaining service life, and potential risks. Findings were documented (in Chapter 5) with needs identification and planning-level cost estimates for repair or replacement. This assessment will prioritize improvements necessary to maintain reliability.

Upgrade Plan Development

Building on the process and condition evaluations, a prioritized Capital Improvement Program (CIP) that addresses near-term and long-term facility needs will be developed in conjunction with the City. The CIP includes planning-level cost opinions and an implementation timeline based on risk mitigation and regulatory compliance. A master site plan will be prepared to accommodate future improvements and support operational efficiency.

1.4 Regulatory Framework and Water Quality Goals

Finalized regulations promulgated by EPA include primary and secondary drinking water standards. Primary standards address contaminants that may deteriorate water quality as it affects human health, whereas secondary standards address contaminants that may affect the aesthetic and economic qualities of the water. Primary standards are enforceable and are enforced by state agencies having primacy. For Temple Terrace, the Florida Department of Health (FDOH) monitors and enforces federal and state drinking water regulations.

This section provides a summary of the current drinking water regulations (EPA and FDOH) applicable to the operation of the City's potable water system, also referenced here: (<https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations>).

1.4.1 Primary Drinking Water Standards

Within the National Primary Drinking Water Regulations (NPDWR), several contaminants, including turbidity, microorganisms (e.g., total coliforms and turbidity that indicate the presence of disease-causing organisms), radionuclides, inorganic contaminants, and organic contaminants exist. Maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) have been set for these several contaminants and disinfectants (e.g., chlorine), and several other

contaminants have requirements established for treatment techniques. The City was compliant with primary drinking water standards for the period that available data and parameters were reviewed.

In addition, the following primary drinking water standards set by the EPA are relevant to the operation of the City water system and the Whiteway and Sunningdale WTFs:

- Stage 1 Disinfectants and Disinfection By-products Rule (Stage 1 D/DBPR)
- Stage 2 Disinfectants and Disinfection By-products Rule (Stage 2 D/DBPR)
- Groundwater Rule

1.4.1.1 Stage 1 and 2 D/DBP Rule

Stage 1 D/DBPR was the first of a staged set of rules that were created to reduce the allowable levels of DBPs in drinking water. The existing Maximum Contaminant Levels (MCLs) included in the Stage 1 D/DBPR (published in 1998) are contained in **Table 1-1**. The MCL for Stage 1 is based on a system-wide four-quarter running annual average (RAA).

Table 1-1. Maximum Residual Disinfectant Levels

Disinfection Byproduct	Unit	MCL
TTHMs	ppb or µg/L	80
HAAs	ppb or µg/L	60
Bromate	ppb or µg/L	10

µg/L = microgram(s) per liter
HAA = haloacetic acid
MCL = Maximum Contaminant Level
ppb = part(s) per billion
TTHM = total trihalomethane

The limits on disinfectants in the Stage 1 D/DBP Rule were finalized as Maximum Residual Disinfectant Levels (MRDLs) instead of MCLs (**Table 1-2**). The WTPs currently use chlorine as the disinfectant in the distribution system.

Table 1-2. Maximum Residual Disinfectant Levels

Disinfectant	Unit	MRDL
Chlorine (as Cl ₂)	ppm or mg/L	4.0
Chloramines (as Cl ₂)	ppm or mg/L	4.0

mg/L = milligram(s) per liter
MRDL = Maximum Residual Disinfectant Level
ppm = part(s) per million

The Stage 2 Disinfectants and Disinfection By-products Rule (Stage 2 D/DBPR), promulgated in 2006, addresses risks from disinfectants and disinfection byproducts. DBPs as currently regulated

under Stage 2 of the D/DBP rule retain the same MCLs for DBPs from Stage 1, but also require that reporting of DBPs be site-specific, based on locational running annual averages (LRAAs) instead of reporting running annual average values (RAAs). Sampling sites for the Stage 2 DBP Rule are selected through the Initial Distribution System Evaluation (IDSE) process as required by Stage 2 of the D/DBPR. The City has historically been consistently within the Stage 2 D/DBPR limits and PFAS treatment processes also remove DBP precursors, therefore, evaluation of DBP formation was not a focus of this Master Plan.

1.4.2 EPA Drinking Water Standards on PFAS

In April 2024, the U.S. Environmental Protection Agency (EPA) announced the final National Primary Drinking Water Regulation (NPDWR) that establishes Primary Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for six PFAS substances in drinking water. Individual MCLs are set for Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), Perfluorohexanesulfonic acid (PFHxS), Perfluorononanoic acid (PFNA), Hexafluoropropylene dimer acid (HFPO-DA) and its ammonium salt, and a combined Hazard Index (HI) MCL is set for the mixture of PFHxS, PFNA, HFPO-DA, and Perfluorobutanesulfonic acid (PFBS). Details are summarized in **Table 1-3**.

Table 1-3. EPA Drinking Water Standards on PFAS

Contaminants	Critical Health Impact	MCL (ppt)	MCLG(ppt)
PFOA	Cancer	4.0	Zero
PFOS	Cancer	4.0	Zero
PFHxS	Thyroid Effects	10.0	
PFNA	Developmental Effects	10.0	
HFPO-DA (GenX' chemicals)	Liver Effects	10.0	
Mixture of GenX, PFBS, PFNA PFHxS	Multiple	Hazard Index* of 1	

$$*Hazard\ Index = \left(\frac{[GenX]}{[10\ ppt]} \right) + \left(\frac{[PFBS]}{[2000\ ppt]} \right) + \left(\frac{[PFNA]}{[10\ ppt]} \right) + \left(\frac{[PFHxS]}{[10\ ppt]} \right)$$

EPA also released the compliance timeline with a phased approach, as listed below:

- By 2027, public water systems must complete initial monitoring of the regulated PFAS, followed by ongoing compliance monitoring.
- Beginning in 2027, public water systems must provide the public with information on the PFAS levels in their drinking water.
- The National Primary Drinking Water Regulation PFAS compliance date is currently set for April 2029, but the EPA has proposed an extension to 2031.
- At the compliance date, public water systems that have PFAS in drinking water above one or more of these Primary MCLs (PMCLs) must take action to reduce levels of PFAS in their drinking water and provide Tier 2 notification (long-term exposure, potential health

risk but no immediate threat) to the public of the violation.

In May 2025, EPA announced the agency will keep the current NPDWR for PFOA and PFOS with an intent to rescind and reconsider the regulatory determinations for PFHxS, PFNA, HFPO-DA (commonly known as GenX), and the Hazard Index mixture of these three plus PFBS, to ensure that the determinations and any resulting drinking water regulation follow the legal process laid out in the Safe Drinking Water Act. On May 14, 2025, EPA announced its intentions to delay SDWA PFAS compliance deadlines for two PFAS chemicals, PFOS and PFOA, by two years, until 2031. On Jan. 21, 2026, the District of Columbia Circuit Court denied EPA's Sept. 11, 2025 request to vacate the other four previous SDWA PFAS rules for PFNA, PFHxS, HFPO-DA, and the Index PFAS.

1.4.2.1 Ground Water Rule

The EPA Ground Water Rule (GWR) was enacted on November 8, 2006, and published in the Federal Register. The Rule was intended to provide increased protection against microbial pathogens in public water systems that use groundwater sources. Because disease-causing pathogens are found in fecal contamination, EPA is concerned about the groundwater systems that are susceptible to fecal contamination. The GWR applies to public water systems that use groundwater and also applies to systems that use both groundwater and surface water sources in their system.

Public groundwater systems that do not conduct compliance monitoring and are notified of a total coliform-positive routine sample collected in compliance with the EPA Total Coliform Rule (40 Code of Federal Regulations 141.21) must conduct triggered source water monitoring and take corrective action if a significant deficiency is identified. To be subject to triggered source water monitoring, a ground water system operator such as the City can notify the state that it provides at least 4-log treatment of viruses using virus inactivation, removal, or a state-approved combination of 4-log virus inactivation and removal before or at the first customer.

The City achieves the required 4-log virus inactivation through chlorine disinfection, according to the Florida Administrative Code (FAC) for the two WTFs.

1.4.3 Secondary Drinking Water Standards

Secondary standards are not enforced by EPA but are strongly recommended and may be enforced at the discretion of individual state primacy agencies. The Secondary Drinking Water Standards with Secondary Maximum Contaminant Levels (SMCLs) for various contaminants are summarized in **Table 1-4**.

Table 1-4. Secondary Drinking Water Standards

Parameter	Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color (True)	15 color units
Copper	1.0 mg/L
Corrosivity	Noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Zinc	5 mg/L

Parameter	Standard
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5 to 8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Hardness	none

mg/L = milligram(s) per liter

Hardness is a characteristic of water caused primarily by the salts of calcium and magnesium, such as bicarbonate, carbonate, sulfate, chloride, and nitrate. Hard water is not currently known to adversely affect human health in any significant manner. However, hard water consumes more soap/detergent, tends to stain bathroom fixtures, leave scale in water heaters and damage some industrial processes.

Water suppliers classify the hardness of a water as soft (below 60 mg/L as CaCO₃), medium hard (60 to 120 mg/L as CaCO₃), hard (120 to 180 mg/L as CaCO₃), very hard (180 to 350 mg/L as CaCO₃), and brackish (above 350 mg/L as CaCO₃). Based on this classification, source water for the two WTFs is considered to very hard (recent data for hardness in wells: 270-347 mg/L as CaCO₃). Individual well total hardness varies from 200 to 400 mg/L as CaCO₃.

1.4.4 Future Drinking Water Regulations

As part of the master planning process, a review of the status of several potential future regulations was conducted to identify any new treatment processes or operational changes or improvements that would be needed to achieve regulatory compliance, if and when these regulations are finalized. The following discussion highlights the current regulatory situation regarding the most relevant and critical, future drinking water regulatory developments.

1.4.4.1 Disinfection Byproducts

An increasing number of drinking water utilities in the United States have been using or are considering chloramination over chlorination. In comparison with chlorination, chloramination has been shown to minimize the formation of trihalomethanes (THMs) and haloacetic acids (HAAs), thereby offering a cost-effective means to comply with the Stage 2 D/DBPR. However,

chloramines have been implicated in the formation of nitrosamines such as N-nitrosodimethylamine (NDMA).

There are currently no EPA regulations for nitrosamines. Five nitrosamines (NDEA, NDMA, NDPA, NPYR, and N-Nitrosodiphenylamine) were listed on the third and fourth contaminant candidate lists (CCL3 and CCL4), indicating that EPA is considering these contaminants for potential regulatory determination. Nitrosamines (including NDMA) are also under evaluation in the third six-year review of the Microbial and Disinfection Byproduct Rules (EPA, 2016).

1.4.4.2 Fifth Unregulated Contaminant Monitoring Rule

The Safe Drinking Water Act (SDWA) amendments require that once every 5 years, EPA issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems. EPA collects data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the SDWA, to fill the occurrence data gaps in the CCL.

The fifth Unregulated Contaminant Monitoring Rule (UCMR5) was published on December 27, 2021. The UCMR5 requires monitoring of 30 chemical contaminants between 2023 and 2025 using analytical methods developed by EPA and consensus organizations. This action provides EPA and other interested parties with scientifically valid data on the national occurrence of these contaminants in drinking water. Consistent with EPA's PFAS Strategic Roadmap, UCMR 5 will provide new data that is critically needed to improve EPA's understanding of the frequency that 29 per- and polyfluoroalkyl substances (PFAS) and lithium are found in the nation's drinking water systems.

1.4.5 Treatment Goals

Comparing the source water analysis PFAS results, conducted by CHA and Eurofins (seen in **Table 2-11**) to EPA standards, PFAS in the raw water feeding the two WTFs exceed the PMCLs (4 ppt) with concentrations ranging from 10 to 20 ppt. The current treatment process does not provide adequate removal of PFAS; therefore, additional treatment is required to meet or beyond the drinking water standards.

To provide safe drinking water to the water users and ensure compliance in the future, the MCLGs (zero for PFOA & PFOS, 10 ppt for PFHxS, PFNA, GenX, and HI <1) are set as the treatment goal for this project, and to consider alternatives to go beyond federal standards and remove 90+% of each PFAS component. Also, as the source water for the two WTPs is considered very hard, the City has identified a desire to bring their water's hardness levels to approximately 150 mg/L.

1.4.5.1 Percolation Pond Regulations

Percolation ponds for discharging effluent and/or backwash water are regulated by FDEP, delegated to the Hillsborough County Environmental Protection Commission, under FAC 62-600 and FAC 62-620.910. Discharging backwash water from the filters to the percolation pond would require monitoring the water to determine they meet the facilities' effluent requirements prior to discharging into the pond. However, discharging to a percolation pond may require additional PFAS monitoring due to the presence of known PFAS contamination.

1.4.6 Regulatory Implications for the City

This report assesses compliance with the current regulations, City's internal water quality goals and summarizes and discusses the existing finished water quality data. To meet future regulatory requirements, it may be necessary for the City to do some or all the following:

- Make operational changes at the WTP (e.g., upgrade the lime softening process to meet the City's hardness goals)
- Add new unit processes for treatment (e.g., GAC or Ion Exchange or Nanofiltration/Reverse Osmosis to achieve compliance with PFAS)
- Blending, future water purchase from Hillsborough County or City of Tampa

1.5 PFAS Pilot and Process Evaluation

Details on the PFAS removal pilot and process evaluation efforts are summarized in **Appendix B**.

2.0 EXISTING CONDITIONS

2.1 Geography and Service Area

The City of Temple Terrace (City) is located in northeastern Hillsborough County, Florida, adjacent to the City of Tampa. Positioned within the Tampa–Clearwater–St. Petersburg metropolitan area, the City is situated near the transportation hub of I-4, I-75 and I-275 providing easy access to University of South Florida, downtown Tampa, Orlando, and Gulf Coast beach destinations. Temple Terrace is interspersed with beautiful live oak canopies, earning it the Tree City USA designation.

Temple Terrace encompasses approximately 7.77 square miles, of which 7.47 square miles is land and 0.30 square miles is water. Land use is primarily residential with commercial and industrial along major arterials, community parks and greenspaces throughout and institutional use in the north including Florida College. The City elevation ranges from 7 feet to 98 feet with an average of 59 feet including rolling and namesake terraced terrain. The Hillsborough River forms a defining natural feature along the City's western boundary, providing scenic views and recreation. This riverfront location historically influenced land use and development patterns, including the establishment of parks, trails, and the historic Temple Terrace Golf & Country Club. The City's utility service area map is presented in **Figure 2-2**.

Figure 2-1. City of Temple Terrace Entrance

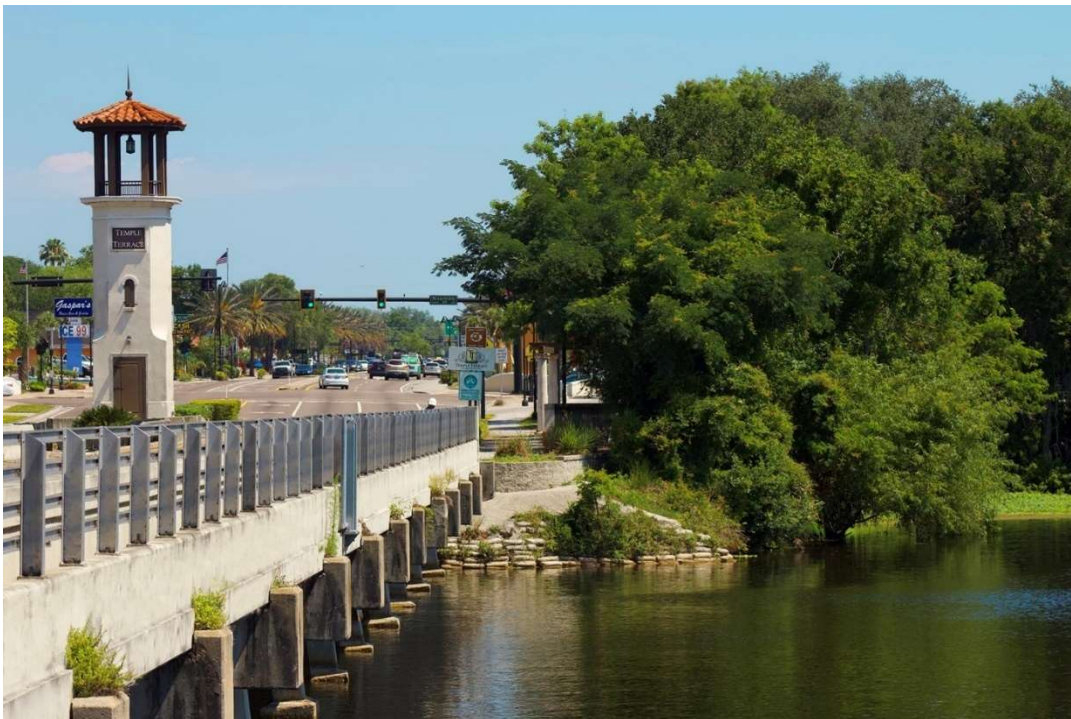
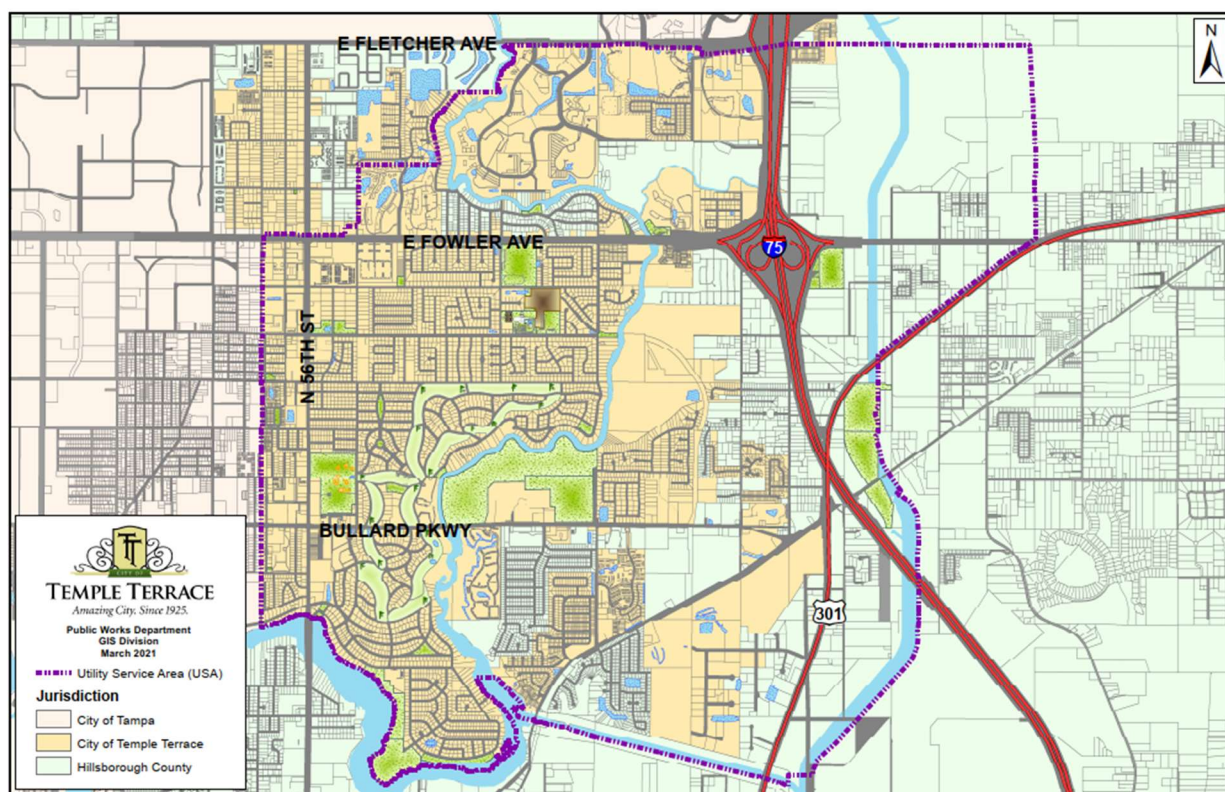


Figure 2-2. Temple Terrace Potable Water Service Area



Source: City of Temple Terrace GIS Department

2.2 Permit Conditions

- Current Permit Limits
 - SWFWMD Water Use
 - Average Permitted Withdrawal covering all of the City wellfields: 5,150,000 gallons per day or 5.150 MGD
 - Peak Permitted Withdrawal: 5,817,400 gallons per day or 5.8174 MGD
 - FDEP/Health Dept WTP Design (Max Day) Capacity
 - Whiteway: 5.04 MGD
 - Sunningdale: 3.96 MGD
 - Total: 9.0 MGD, if both plants are running at peak capacity, which is greater than water use permitted flows

EXISTING CONDITIONS

2.3 Existing Demand Conditions

2.3.1 Historical Demands

Historical flow data was reviewed for the City of Temple Terrace. Expected Flows (Based on Flow Data from 2020-2025 MORs):

- Maximum Day
 - Whiteway Historical Max Day: 3.856 MGD (3/26/2025)
 - Sunningdale Historical Max Day: 3.310 MGD (4/28/2023)
 - Peak day “outlier” events were due to WTP or tank maintenance, pipe break, drought weather event or similar non-standard operating event.
 - CHA would propose a combined max day PFAS treatment in the 6 MGD range, matching the 2045 adjusted SWFWMD maximum day demand projections
 - 90th percentile historical max day flows
 - Whiteway: 3.080 MGD
 - Sunningdale: 1.618 MGD
 - Combined: 4.524 MGD*
 - 95th percentile historical max day flows
 - Whiteway: 3.126 MGD
 - Sunningdale: 1.811 MGD
 - Combined: 4.741 MGD*
- Average Day
 - Whiteway Historical Avg Day: 3.0 MGD
 - Sunningdale Historical Avg Day: 1.0 MGD
 - Combined flows from Whiteway and Sunningdale WTPs: 4.0 MGD
- PFAS Treatment capacity if raw water stays separated at each WTP:
 - Whiteway WTP Max Day: 4 MGD
 - Sunningdale WTP Max Day: 2 MGD
 - Note that PFAS treatment processes could require more raw water than permitted; discussions are ongoing with the SWFWMD by the City to obtain additional permitted water supply quantities

* Maximum Day Flows are based on historical data. “Combined” flows refer to the combined flows of Whiteway and Sunningdale on a given day, and therefore may not align with the historical max flows of Whiteway and Sunningdale individually.

EXISTING CONDITIONS

Figure 2-3. Sunningdale Daily Treated Water

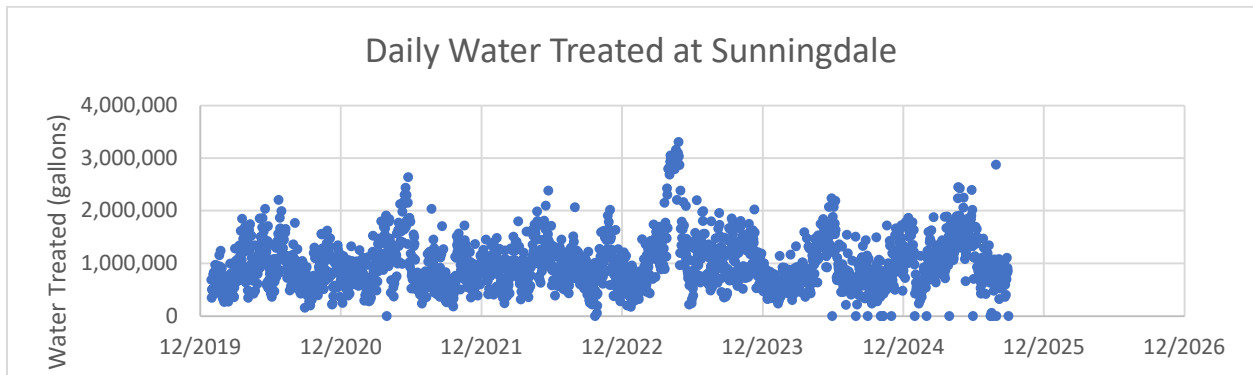


Figure 2-4. Whiteway Daily Treated Water

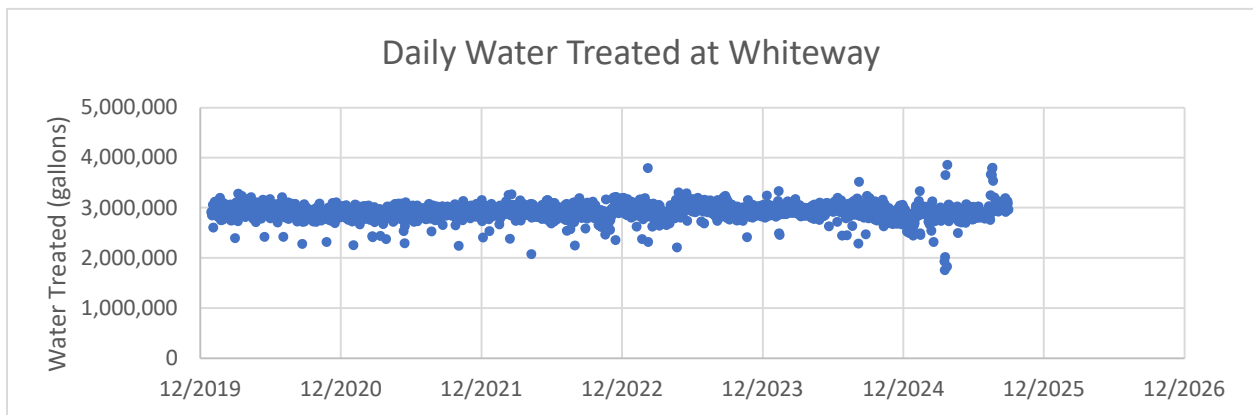
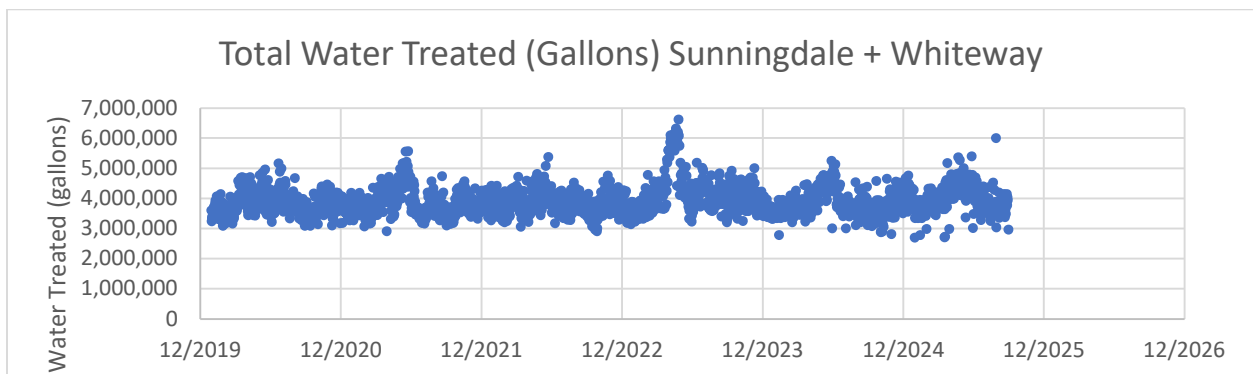


Figure 2-5. Sunningdale and Whiteway Treated Water



2.3.2 Population Projection and Future Demands

Planning for long-term water supply requires a clear understanding of anticipated growth and its impact on potable water demand. The Southwest Florida Water Management District (SWFWMD) provides population and water demand projections through its Regional Water Supply Plan (RWSP), which covers a 20-year planning horizon from 2025 to 2045. SWFWMD projections were developed using a geospatial small-area forecasting model that incorporates U.S. Census data, local development plans, University of Florida's Bureau of Economic and Business Research (BEBR) population projection models and utility service area boundaries to ensure accuracy at the municipal level and were recently updated in 2025.

Temple Terrace is located within the Tampa Bay Planning Region, which includes Hillsborough, Pasco, and Pinellas counties. According to SWFWMD's draft 2025 RWSP, Hillsborough County is expected to experience steady population growth, driving increased demand for public water supply. The RWSP estimates that public supply water demand in the Tampa Bay region will rise significantly over the next two decades, influenced by residential development, economic activity, and conservation trends. These projections account for both base population growth and seasonal fluctuations, ensuring that peak demand scenarios are considered in planning efforts.

The City of Temple Terrace is nearly fully developed, therefore, growth is anticipated to follow regional trends via redevelopment and infill with relatively small incremental increases in total potable water demand projected by the SWFWMD. The City practices water conservation by restricting lawn and plant watering to two specified days of the week – Thursday and Sunday for even numbered addresses and Wednesday and Saturday for odd numbered addresses. Watering is additionally restricted to occur before 8 a.m. or after 6 p.m. in accordance with City Code of Ordinances Sec. 22-161. - Mandatory Water Use Restrictions. There are also suggested water use practices posted on the City website for efficient water use in relation to car washing, pressure washing, etc. Per capita water use (113 gpcd 2016-2020 average) is expected to continue to be moderated by conservation measures and potential adoption of alternative water sources mentioned in the RWSP. That stated, RWSP methodology assumes the City continues reliance on groundwater from the Floridan Aquifer, supplemented by reclaimed water reuse for irrigation.

SWFWMD projected 2025 average water demand was slightly lower than the actual treated water volume observed in the City's MORs for 2025. To amend this, CHA added the difference between the projection and actual observed average daily demand, 0.296 MGD. This modified average demand was then multiplied by a Max Daily Demand scaling factor of 1.33, obtained by dividing the average MOR-observed maximum day flows, roughly 5.3 MGD, by the combined WTPs' average daily flow, 4.0 MGD ($5.0 \text{ MGD} / 4.0 \text{ MGD} = 1.33$). The 1.33 Max Day factor was applied to future average demand projections up to year 2045. A summary of projected demands is

EXISTING CONDITIONS

provided in **Table 2-1** below. Potable water demand projections are compared to the historical flows and the City's current WUP in **Figure 2-6**.

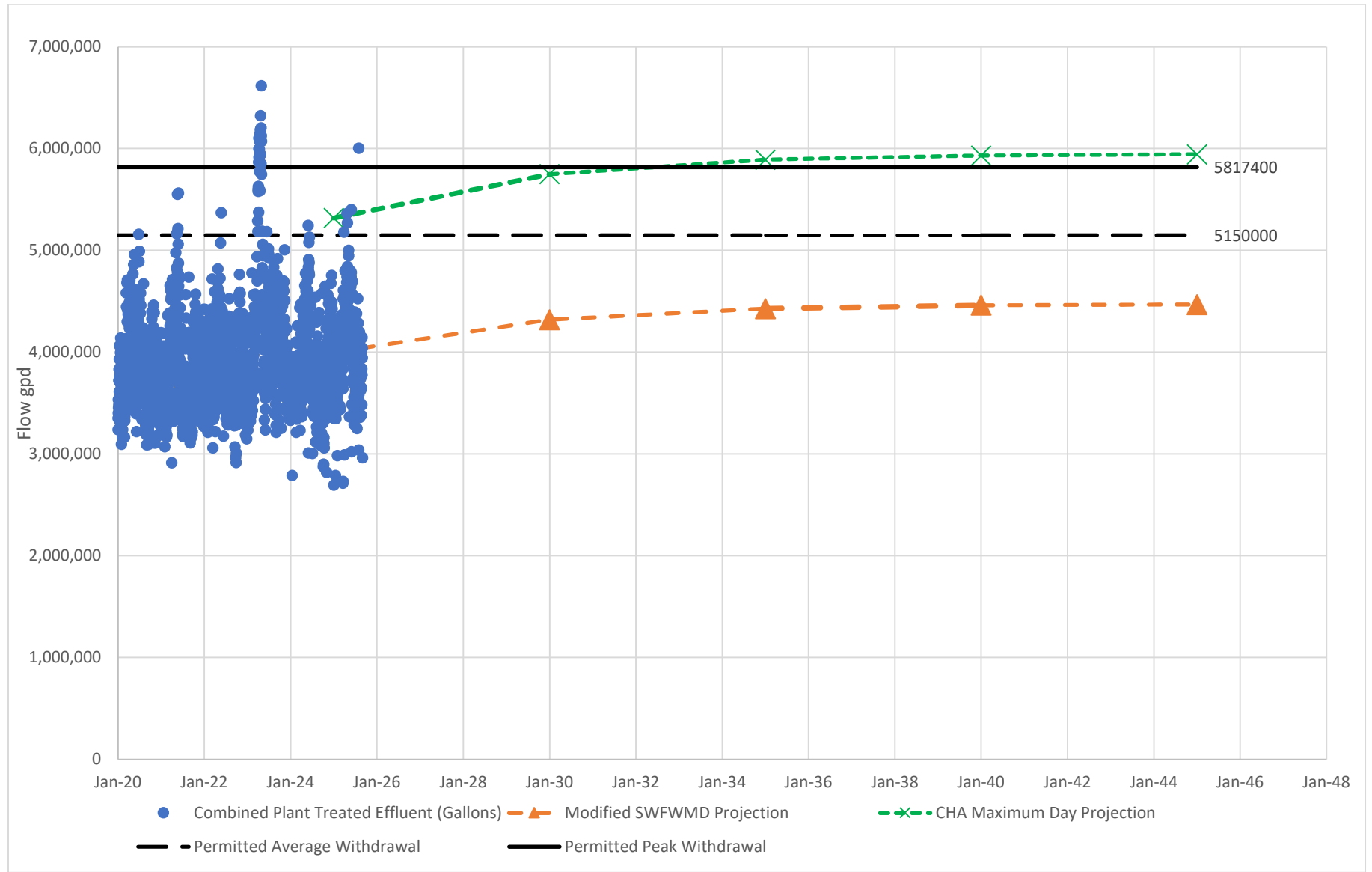
Table 2-1. City of Temple Terrace Projected Water Demands

Projected Characteristic	Year				
	2025	2030	2035	2040	2045
SWFWMD Population Projection	32,841	35,700	36,658	36,930	37,014
SWFWMD Demand Projection (MGD)	3.704	4.026	4.134	4.165	4.174
CHA modified SWFWMD Demand Projection (MGD)	4.000	4.322	4.430	4.461	4.447
CHA Max Daily Demand Projection (MGD)	5.320	5.748	5.892	5.933	5.945

Note: Stated potable water demands and projections cover the portions of the City's utility service area that are served by its WTPs. Small, demand enclaves are served by adjacent utilities and not anticipated to change service in the future.

EXISTING CONDITIONS

Figure 2-6. Projections Compared with Historical Flows



EXISTING CONDITIONS

2.3.3 Demand Summary

Based on the demand analysis, the following was estimated to configure improvements:

- Whiteway WTP
 - ADD = 3.0 MGD
 - MDD = 4.0 MGD
- Sunningdale WTP
 - ADD = 1.0 MGD
 - MDD = 2.0 MGD
- Total: Peak Permitted Withdrawal currently limited to 5,817,400 gallons per day; additional water use permit quantities will be required from the SWFWMD to cover this gap and an additional 10% to 15% to cover proposed treatment recoveries. The difference between permitted limits and required flows are shown in **Table 2-2** below.

Table 2-2. Projected Flows vs. Permitted Withdrawal

	Average Flow	Permit Deficit (Average Flow)	Peak Flow	Permit Deficit (Peak Flow)
SWFWMD Permitted Withdrawal	5.15 MGD		5.817 MGD	
Projected Flows (2045)	4.47 MGD	0.68 MGD	5.95 MGD	- 0.133 MGD
Flows Required for Membrane Treatment at 85% recovery	5.26 MGD	- 0.11 MGD	6.99 MGD	- 1.173 MGD

*A (-) deficit value indicates the projected flows exceed the permitted withdrawal by the written value.

EXISTING CONDITIONS

2.4 Whiteway WTP

2.4.1 Whiteway WTP Layout and Contents

The Whiteway WTP process flow diagram and layout are depicted in **Figure 2-8** and **Figure 2-9**, respectively.

2.4.2 Raw Water Blending/ Aeration Tank

Whiteway wells flow directly to the raw water blending/aeration tank. The 0.2 million gallon (MG) pre-stressed concrete tank is located on the north side of the Whiteway WTP site. The tank has a built-in cascade aerator to strip volatile compounds including hydrogen sulfide. The tank is used to blend raw water from the six production wells feeding the Whiteway WTP and reduce hydrogen sulfide. The tank and aerator were built in the 1980 expansion. fiberglass tray aerator has 4 levels containing 24 total cascade trays.



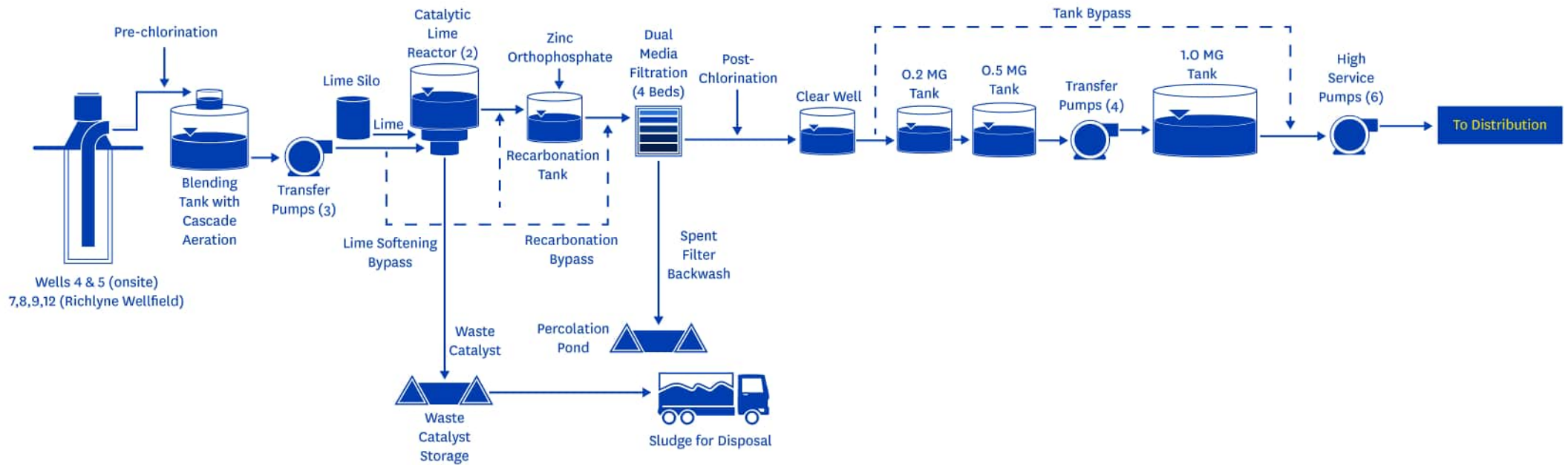
Figure 2-7. Blending/Aeration Tank

2.4.3 Lime Reactor Transfer Pumps

The raw water from the blending tank is transferred to the lime softening units by three constant speed vertical turbine transfer pumps (40 HP each) with a capacity of 1,750 gallons per minute (gpm). The pumps are housed in a concrete building south of the aeration tank and draw flow from a 20-inch header.

EXISTING CONDITIONS

Figure 2-8. Whiteway WTP Process Flow Diagram





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Drawn	VVV
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Approved	---
Date	02/2026

1"=1' AT FULL SIZE

CITY OF TEMPLE TERRACE
WTP SITES IMPROVEMENTS

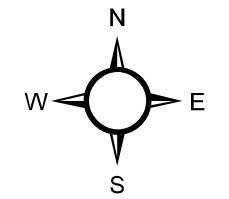
WHITEWAY WATER TREATMENT PLANT
EXISTING SITE PLAN

100335

FIGURE 2-9

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CHA
CHA CONSULTING, INC.
CERTIFICATE OF AUTH. 28386
2502 N ROCKY POINT DR
SUITE 145
TAMPA, FL 33607
(813) 549-0919



0 100 200 Feet

LEGEND

- Well Locations
- ★ Water Treatment Plants



City of Temple Terrace
City of Temple Terrace Water Master Plan
WHITEWAY WTP PRODUCTION WELL LOCATIONS

FIGURE 2-10

2.4.4 Lime Softening Reactors and Recarbonation Tank

There are two Infilco catalytic lime-softening units (Gyratur process, circa 1960) located next to the transfer pump building. Each reactor is rated at 2.52 MGD (1,750 gpm). The “Gyratur/catalytic lime softening” process is a type of cold lime softening that removes calcium and magnesium hardness from water in a fluidized bed reactor. The reactors are designed to introduce raw water and lime-softening chemicals (quick lime, CaO) to the bottom of the reactor. The added lime reacts with the hardness and carbon dioxide in the water to precipitate as calcium carbonate and bind with the catalytic sand.

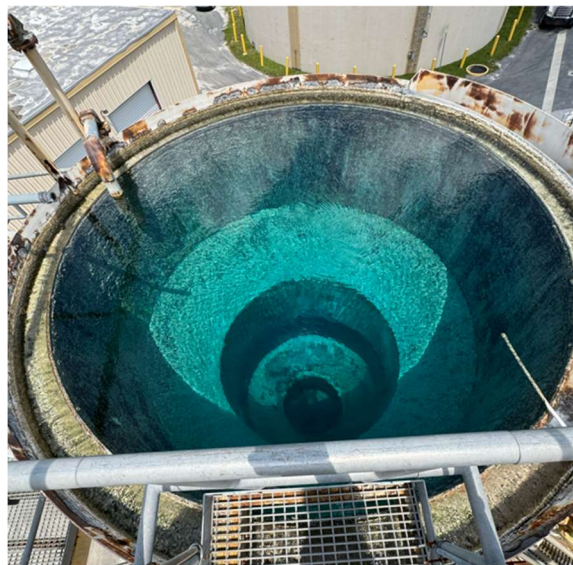


Figure 2-11. Inside Gyratur Reactor

The treated water precipitates calcium carbonate onto the surface of fine sand "seeds," forming dense, easily removable pellets. The accumulated pellets are periodically drained from the bottom of the reactor and then sent to a storage area adjacent to the reactors for disposal. Softened water, with ~30% of the hardness removed, is drawn from the top of the reactor and flows next to the recarbonation step. The recarbonation tank was designed to add carbon dioxide, alum, and chlorine to the softened water.

The reactors are designed to introduce raw water and lime-softening chemicals to the bottom of the vessels, where catalytic sand is settled. The added lime reacts with the hardness and carbon dioxide in the water to precipitate as calcium carbonate and bind with the catalytic sand. The waste catalytic sand is then sent to a storage area adjacent to the reactors. The reactor diameter increases as the water rises, causing the precipitate to clarify out of the water. The clarified water then overflows the top weir to the recarbonation tank, designed to add carbon dioxide, alum, and chlorine to the softened water.



Figure 2-12. Exterior of Gyratur Reactor (Right) and Recarb Tank (Left)

EXISTING CONDITIONS

Historically, the City modified operations to improve recarbonation tank performance by softening a portion of the raw water. One reactor was used for softening while the other operated in bypass, and the two streams were blended in the recarbonation tank. Due to subsequent operational challenges with the lime reactors, including elevated turbidity, the City has paused softening operations.



Figure 2-13. Recarbonation System from City of Boca Raton

2.4.5 Dual Media Filters

Four Infilco Greenleaf Dual Media filters with a design capacity of 5 MGD (3,500 gpm) reduce particulate organics and particulate matter, reducing turbidity generated from the upstream treatment processes. The filter media is composed of anthracite, sand, and gravel layers. The first layer (anthracite) filters out coarse particles from the water and assists in post-softening precipitation of any unreacted lime and alkalinity. The second layer (sand) captures any finer particles that may exist as the water penetrates through the layer. The last layer (gravel) serves to support the first two filter layers and promotes distribution of backwash water. The filtered water flows through the underdrain system, over an effluent weir, and to the clear well adjacent to the south of the filter basin. The filter beds are housed in a square concrete structure measuring approximately 40 feet wide by 40 feet long by 16 feet tall. Each of the four filter units has a surface area of approximately 293 square feet, with a surface loading rate of 2.92 gpm/sqft at a flow rate of 3,500 gpm (5 MGD). Water is distributed to each of the filter beds from a circular distribution trough.

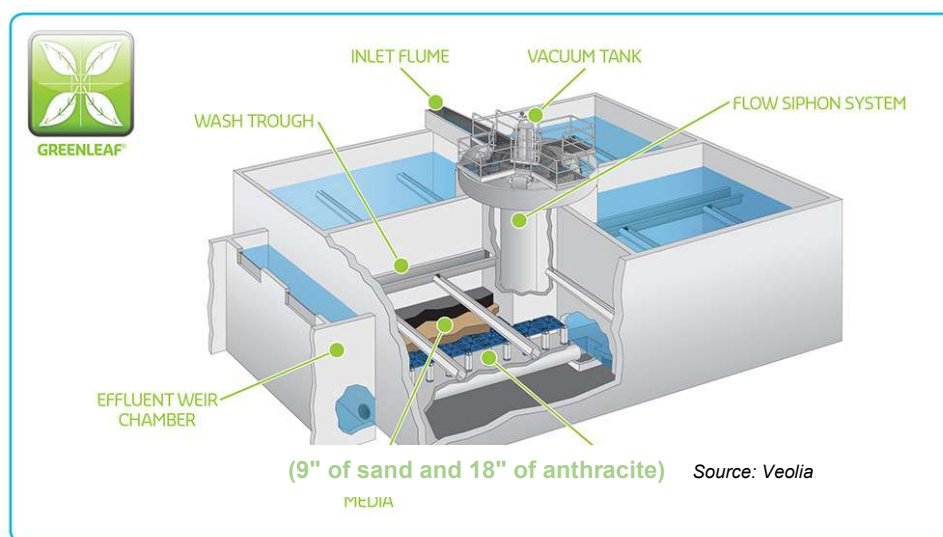


Figure 2-14. Greenleaf Filter Basin Schematic

EXISTING CONDITIONS

When the filters accumulate solids, the pressure differential across the cell rises. The filter cell then requires that it goes through a backwash cycle to remove accumulated solids from the filter media. Prior to the full backwash, a surface wash can be performed to break up heavier solids on the surface of the filter cells. An electronic probe signals when the filter beds require backwash by measuring the depth of water above the filter media. Filter operations are largely time-based, with backwash typically performed once per day, and filters operated on ~96-hour cycles without differential pressure-based control (Operator controlled).

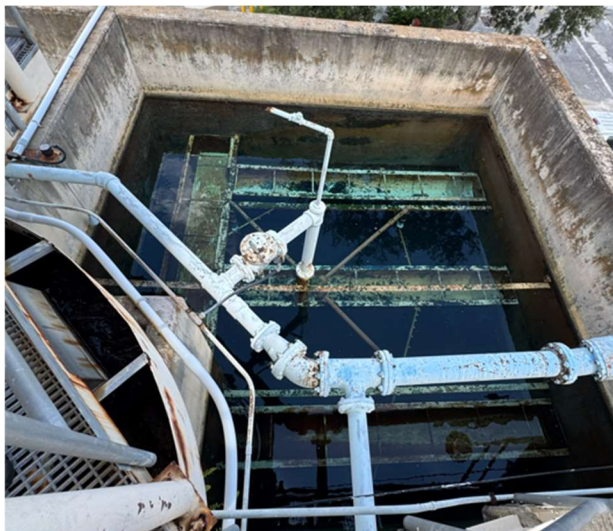


Figure 2-15. One Filter Bed of Greenleaf Filter Basin

Operations staff also monitor filter effluent turbidity for backwashing. The backwash waste is sent to the percolation pond on site. The backwash pump operates at ~5,100 gpm for 10 to 15 minutes generating 90,000 gallons of backwash waste every 96 hours or 23,000 GPD average.

In addition to the backwash pump, the filter basin has two filter control vacuum pumps (3 HP) and one filter surface-wash pump (225 gpm). These pumps are located at or on the filters to feed water to the instrumentation, and to aid in breaking up surface buildup prior to backwashing.

2.4.6 Finished Water Storage

Water flows by gravity from the filter basin, through the clear well, and to the finished water storage tanks. The 0.5 MG tank is the original tank on site, which was then supplemented by a 0.2 MG tank during the 1980s plant expansion. An additional 1.0 MG tank was added close to the WTP entrance during the 1993 expansion. The two smaller tanks, known as the “Back Tanks” function as preliminary holding



Figure 2-16. 0.2 MG (Rear) and 0.5 MG (Front) “Back Tanks”

EXISTING CONDITIONS

vessels which provide chlorine contact time. Finished water is transferred by a second set of four (4) transfer pumps to the 1.0 MG tank before being pumped to distribution. The transfer pumps range from 10-25 HP and operate as required, cycling through each pump.

2.4.7 High Service Pumps

There are six (6) high service pumps which provide flow and pressure to the distribution system, located in a building attached to the SCADA office and plant laboratory, as seen in **Figure 2-9**. The characteristics of each of the high service pumps, in addition to Whiteway's other pump can be seen in **Table 2-3**. Pumps No. 2 and 4 have variable frequency drives (VFD) to meet varied flow and pressure demands. Inside the high service pump room, there is a 600kW CAT 3412 diesel generator for backup power. A 1,000-gallon diesel fuel tank is located above ground outside the high service pump building.

EXISTING CONDITIONS

Table 2-3. Whiteway WTP Pump Summary

Pump Location	Pump ID/Description	Type of Pump	Manufacturer	Model	HP	Capacity (gpm)
Transfer Pump Set 1	Raw 1	Transfer	Mader	82124561	40	1750
	Raw 2	Transfer	Mader	82124562	40	1750
	Raw 3	Transfer	Aurora	82124563	40	1750
Filter Backwash	Backwash Pump	Backwash Pump	US Electrical Motors	Unknown	30	5100
	Surface Wash Pump	Surface Wash Pump	Aurora	364 A	25	225
	Vacuum Pump 1	Vacuum Pump	NES Company	NHP-50	3	6.3
	Vacuum Pump 2	Vacuum Pump	NASH	MHF-50	3	6.7
Transfer Pump Set 2	TR 1	Vertical Turbine	US Motors	14HH	10	1750
	TR 2	Vertical Turbine	US Motors	14HH	10	1750
	TR 3	Vertical Turbine	US Motors	14MF	20	3255
	TR 4	Vertical Turbine	WILO	H12PMF	25	3304
High Service Pumps	1	Horizontal Centrifugal	Worthington	5LR-13	50	1100
	2	Horizontal Centrifugal VFD	Worthington	5LR-13	60	1200
	3	Horizontal Centrifugal	Worthington	5LR-13	60	1500
	4	Vertical Centrifugal VFD	Aurora	365TDS	75	1700
	5	Vertical Centrifugal	Aurora	365TDS	75	2000
	6	Vertical Centrifugal	Aurora	882410	75	2200

EXISTING CONDITIONS

2.5 Sunningdale WTP

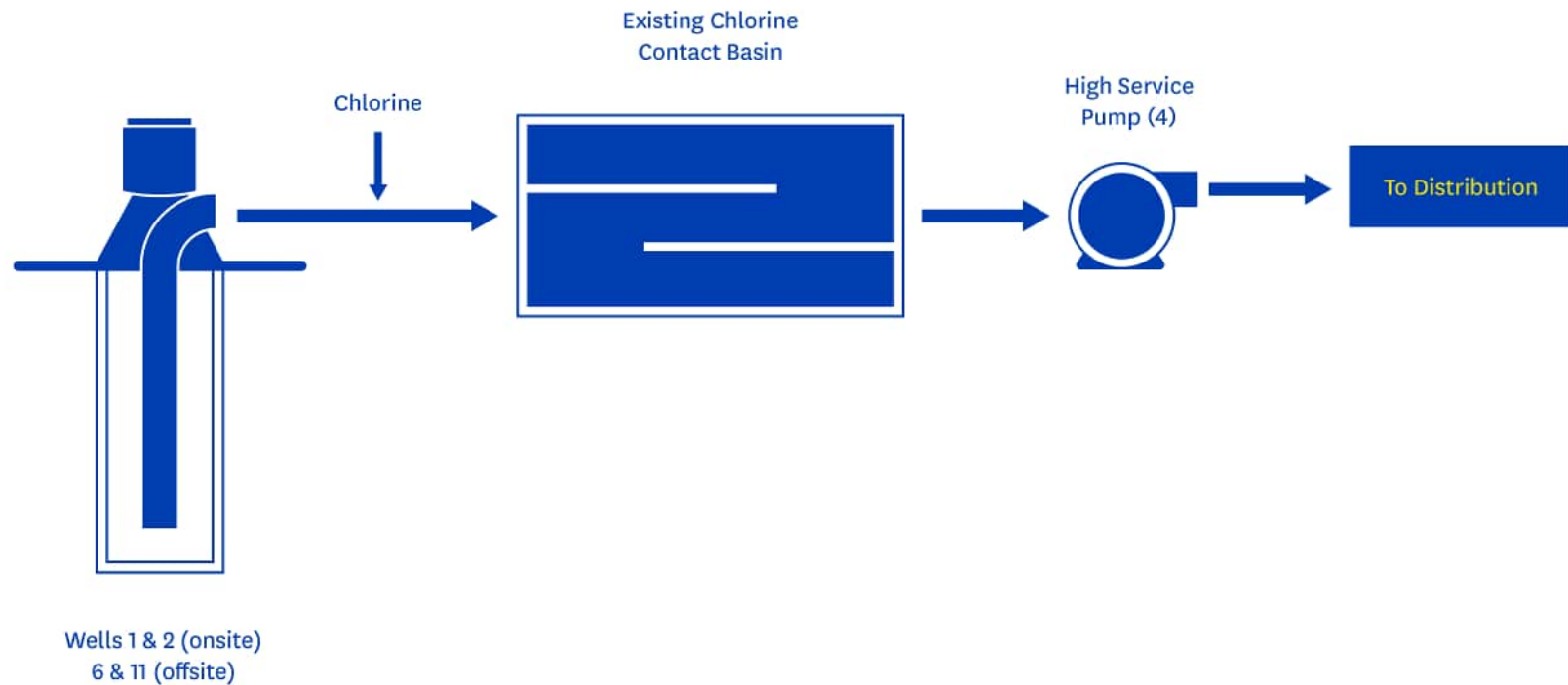
2.5.1 Sunningdale WTP Layout and Contents

The Sunningdale WTP process flow diagram and layout are depicted in **Figure 2-18** and **Figure 2-19**, respectively.

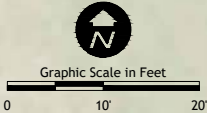


**Figure 2-17. Sunningdale WTP Safety Shower/
Eyewash**

Figure 2-18. Sunningdale WTP Process Flow Diagram



Note: Fluoridation process exists at Sunningdale WTP but is being mothballed in conjunction with Whiteway WTP's fluoridation retirement.



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Designed EHT Drawn VVV Reviewed --- Approved --- Date 11/2025 LINE IS 1"=AT FULL SIZE	CITY OF TEMPLE TERRACE WTP SITES IMPROVEMENTS		100335	CHA CONSULTING, INC. CERTIFICATE OF AUTH. 28386 2502 N ROCKY POINT DR SUITE 145 TAMPA, FL 33607 (813) 549-0919
	SUNNINGDALE WATER TREATMENT PLANT EXISTING SITE PLAN		FIGURE 2-19	
			--	



EXISTING CONDITIONS

2.5.2 Sunningdale Treatment Process Components

The Sunningdale WTP has a design capacity of approximately 4.0 MGD and the four production wells that feed this plant have a capacity of approximately 4.17 MGD. Sunningdale is a peaking facility that supports Whiteway's base loaded flow during high demand periods.

The water from all four production wells flows into, and is blended in the covered chlorine contact basin, which has a maximum capacity of 0.06 MG. The chlorine is fed by 150-pound gas cylinders in a dual 100 lb/day automatic transfer system located adjacent to the well No. 2 building. The chlorine feed is flow-paced from the common meter in front of the chlorine contact tank. The plant has a chlorine gas containment and scrubbing system, featuring a packed tower with sodium hydroxide to capture fumes that are drawn into the unit.

The contact basin provides required disinfection contact time (CT) for free chlorine at groundwater temperatures for the design capacity of 4 MGD. Water is drawn from the chlorine contact basin by four vertical high service pumps to the distribution system, characterized in **Table 2-4**. The site has an auxiliary generator to provide emergency power. Information was obtained from onsite observations, City staff and previous City planning and design documents.



Figure 2-21. Chlorine Contact Basin



Figure 2-22. Sunningdale High Service Pump Room

EXISTING CONDITIONS

Table 2-4. Sunningdale WTP Pump Summary

Pump Location	Pump ID/Description	Type of Pump	Manufacturer	Model	HP	Capacity (gpm)
High Service Pumps	1	Vertical Centrifugal	Peerless TI56733	12LD2	50	900
	2	Vertical Centrifugal	Peerless TI56733	12LD2	50	900
	3	Vertical Centrifugal	Peerless TI56733	12LD2	50	900
	4	Vertical Centrifugal	Peerless 53733	12LD2	50	900

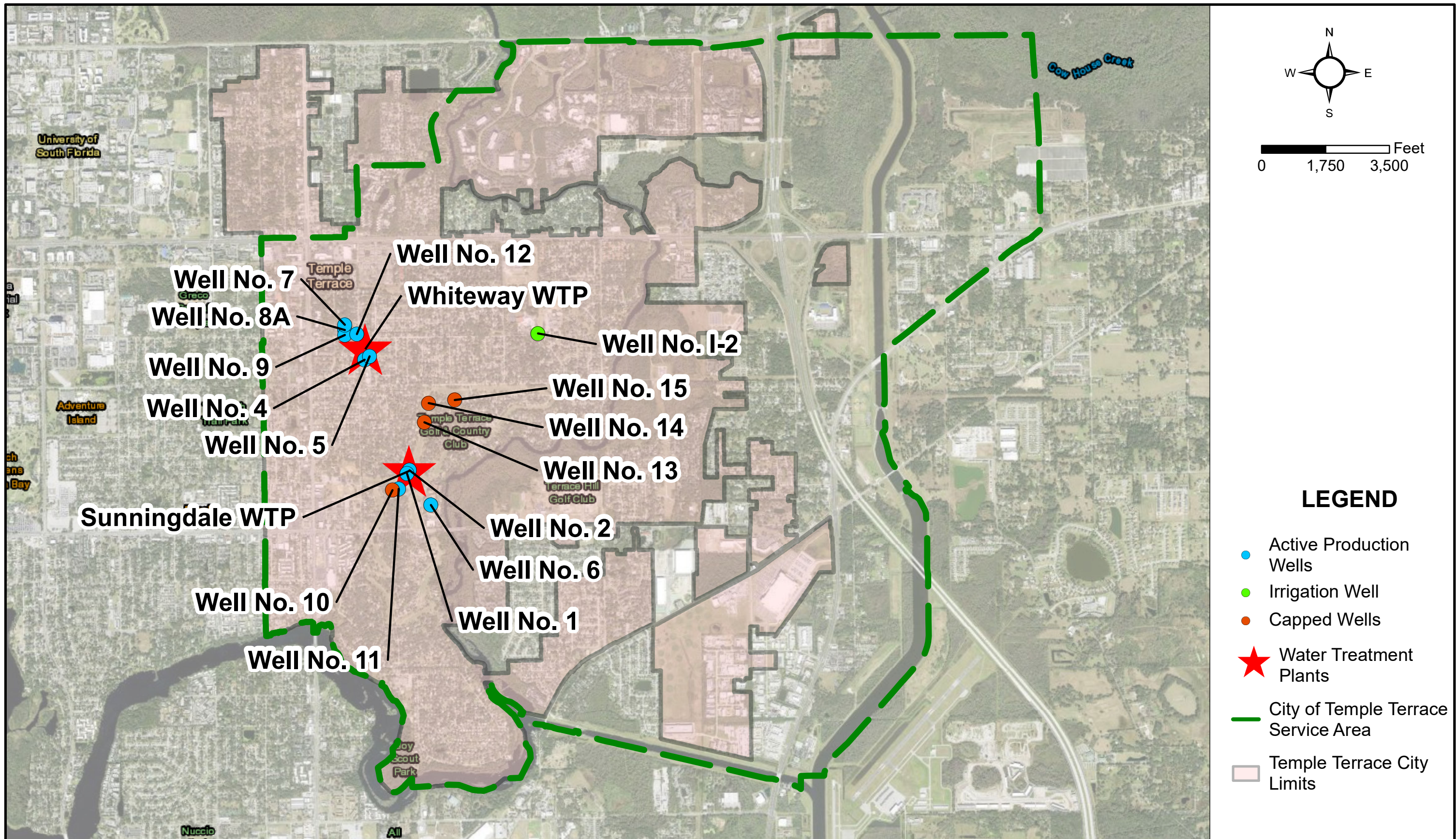
EXISTING CONDITIONS

2.6 Wellfields

The City of Temple Terrace has a total of 15 wells listed in their water use permit; 4 of the wells are capped, 1 is an irrigation well, and 10 are active production wells that supply the WTPs. Whiteway draws water from six (6) production wells; four of the wells are from Richlyne Wellfield (Wells No. 7, 8A, 9, and 12) located across the street from the plant, and two wells are located on-site (Wells No. 4 and 5). The Sunningdale WTP is used as a peaking facility to meet the steady, base loaded flow provided by Whiteway WTP in the distribution system. Sunningdale draws water from four (4) wells; two are at a nearby well field (Wells No. 6 and 11) and two are located on-site (Wells No. 1 and 2). **Figure 2-24** shows the location of the wells. **Table 2-5** summarizes the characteristics of the wells, obtained from the SWFWMD database, last updated in 2019.



Figure 2-23. Production Well No. 2



City of Temple Terrace
City of Temple Terrace Water Master Plan
WATER TREATMENT PLANT AND GROUNDWATER WELL LOCATIONS

FIGURE 2-24

EXISTING CONDITIONS

Table 2-5. Potable Well Field Summary

Well Field	Well Number	Year Drilled	Casing Inner Diameter (in.)	Casing Depth, bls (ft.)	Total Depth (ft.)	Type	Manufacturer	Model	HP	Capacity (GPM)
Whiteway WTP	4	1956	12	119	180	Vertical Turbine	Aurora	Unknown	40	1000
	5	1959 Refurbished	8	126	500	Submersible	Aurora	Unknown	25	420
Richlyne Well Field	7	1963	10	108	155	Vertical Turbine	Flowise	FW9YC	30	875
	8A	2001	14	118	145	Submersible	Goulds	10RJLC030	30	875
	9	1963	6	119	170	Submersible	Centri	6M304	30	700
	12	1982	8	175	370	Submersible	Vertiline	V82-72423	25	500
Sunningdale WTP	1	1920	8	80	480	Vertical Turbine	US Worthington	Unknown	40	500
	2	1954	10	93	480	Vertical Turbine	US Motors	1269976	75	1000
Florida College Campus	6	1926	8	42	384	Vertical Turbine	US Electric	R622904678	40	400
Woodmont Clubhouse	11	1974	12	45	390	Submersible	Peerless	9LA	60	850
Irrigation Well	I-2	1987	10	100	400	Unknown	Unknown	Unknown	Unk	800
Capped Wells	10	N/A	12	58	313	Unknown	Unknown	Unknown	Unk	850
	13	N/A	12	127	460	Unknown	Unknown	Unknown	Unk	700
	14	N/A	12	130	475	Unknown	Unknown	Unknown	Unk	700
	15	N/A	12	134	470	Unknown	Unknown	Unknown	Unk	700

From FDOH-H 2024 Sanitary Survey and SWFWMD WUP Updated 2019

EXISTING CONDITIONS

Table 2-6. Production Well Specs

Well	HP	RPM	Voltage	Type	Pump Size	Stages	Head	Casing Depth	Well Depth	Drilled Date	Rebuild Date	Rating
Richlyne Well Field												
Well No. 7	30	1760	440	Vertical	10" x 8"	4	110'	108'	155'	1963	2000	875 GPM (1.26 MGD)
Well No. 8A	30	3450	440	Submersible	10RJLC	1	110'	*118'	*145'	*2001	2008	875 GPM (1.26 MGD)
Well No. 9	30	3600	440	Submersible	6" 7THSHC	3	105'	*114'	170'	1963	2007	700 GPM (1.008 MGD)
Well No. 12	25	3600	460	Submersible	6" 7TLC	3	103'	*175'	*370'	1982	2007	500 GPM (0.72 MGD)
Whiteway WTP												
Well No. 4	40	1775	440	Vertical	10DHHO	4	112'	119'	*180'	1956	2005	1000 GPM (1.44 MGD)
Well No. 5	40	unk	440	Submersible	8" x 8"	unk	94'	*130'	*500'	*1959	1998	*420 GPM (0.60 MGD)
Sunningdale WTP												
Well No. 1	40	1750	440	Vertical	6" x 6"	3	85'	80'	480'	*1920	2005	500 GPM (0.72 MGD)
Well No. 2	75	1800	440	Vertical	8" x 8"	8	102'	93'	480'	1954	2006	*1000 GPM (1.44 MGD)
Florida College Wellfield												
Well No. 6	40	1750	440	Vertical	6" x 6"	10	90'	42'	384'	1926	2004	400 GPM (0.57 MGD)
Woodmount Wellfield												
Well No. 11	60	3600	440	Submersible	9LA	2	200'	45'	*390'	1974	1999	*850 GPM (1.22 MGD)

From City of Temple Terrace On-Site Well Spec Data Sheet, dated pre-2005

*Updated information from 2024 Sanitary Survey and 2019 WUP

EXISTING CONDITIONS

2.7 Water Storage

The Whiteway WTP currently has 3 ground storage tanks located on site, storing a combined 1.7 MG of finished water. Water is first stored in the smaller 0.2 MG and 0.5 MG ground storage tanks, which provide chlorine contact time post-chlorination, and is then transferred via the 4 transfer pumps to the 1.0 MG storage tank. Chlorine contact time is provided for free chlorine disinfection prior to distribution. The finished water is then pumped to the distribution system via the six high service pumps.

The City has booster stations with two ground storage tanks integrated into the distribution system, which provide extra water during high demand periods and emergency situations, such as fires and power outages. The tanks are filled during low demand periods and then emptied during high demand periods and scheduled maintenance. The first GST, the Chinaberry Storage Facility, is located south of the Whiteway Plant at 7307 Sarvis St. The facility features a 0.5 MG storage tank and a booster pump station with two booster pumps and one recirculation pump. The second GST is at the Telecom Parkway Storage Facility, located on Hollow Stump Rd, next to the fire station at 7772 East Telecom Parkway. This tank is accompanied by a duplex pump station.

Table 2-7. Booster Station Pump Details

Pump Location	Pump ID/Description	Type of Pump	Manufacturer	Model	HP	Capacity (gpm)
Chinaberry Booster Station	1	Horizontal Split Booster	Worthington	5LR-15	50	300
	2	Horizontal Split Booster	Worthington	5LR-15	50	300
Telecom Booster Station	1	Horizontal Split Booster	US Motors	6LF-13A	100	1700
	2	Horizontal Split Booster	US Motors	6LF-13A	100	1700

Table 2-8. City Tank Details

Facility	Diameter (ft)	Nominal Capacity (MG)	Minimum Water Level (ft)	Overflow Level (ft)	Usable Storage Volume (Gallons)
Whiteway WTP	70	0.5	6	17.42	328,760
Whiteway WTP	50	0.2	6	15.58	140,710
Whiteway WTP	80	1.0	8	26.58	698,630
Chinaberry	70	0.5	6	21.83	455,720
Telecom Parkway	70	0.6	6	17.33	326,170
Total	--	2.8	--	--	1,949,990

EXISTING CONDITIONS

2.8 Water Distribution System

The City's water distribution network was originally developed around the Temple Terrace Golf Course between 1922 and 1925. Additional water mains were added from 1925 through the early 1970s, but most major system expansion took place during the 1970s and 1980s as new supply facilities and distribution lines were built.

Today, treated water is delivered from the treatment plants at pressures typically between 55 and 65 psi, serving more than 30,000 residents through roughly 150 miles of pipelines. The Public Works Department manages the operation and upkeep of the system, which primarily uses ductile iron pipe (DIP), cast iron pipe (CIP), and polyvinyl chloride (PVC) pipe. Other materials found in the system include asbestos cement (AC), galvanized steel, and high-density polyethylene (HDPE).

2.9 Historical Raw Water Quality

The City provided the monthly operating reports (MORs) for the previous 5 years of operation (2020-2025). These reports track pH, hardness, turbidity, chlorine concentration (free and total), among other characteristics of the water at three steps in the process at the Whiteway WTP: raw, post-filtration, and finished. At the Sunningdale plant, only chlorine concentration is tracked daily.

After analyzing the results of the MORs, the City appears to have only had one infraction on primary drinking standards, that being on September 15th, 2022 having a free chlorine concentration at the Sunningdale plant of 7.2 mg/L versus the MRDL of 4.0 mg/L free chlorine.

2.9.1 Historical Water Quality Trends

Graphs of the water hardness, turbidity, and chlorine concentrations have been made from the City's MORs, see **Figures 2-25 through 2-32** below. The raw water hardness is comprised of calcium and magnesium hardness, and averages between 250 and 300 mg/L as CaCO₃. Since January 2025, it has trended up towards 350 mg/L total hardness. Hardness does not have a regulated primary, nor a secondary treatment standard; but having too much hardness in the water can cause issues with plumbing and reduce the life of water heaters and other equipment.

The finished water is very sporadic, with the data points oscillating between approximately 300 mg/L to under 200 mg/L frequently. Operators have noted that the lime softening reactors have not operated properly over the past few years with the last attempt approximately 8 months ago and caused issues with high turbidity. This agrees with historical data, suggesting that when the lime reactors were in service, they softened the water to a maximum observed hardness reduction of 30 percent.

Figure 2-25. Whiteway Raw Total Hardness

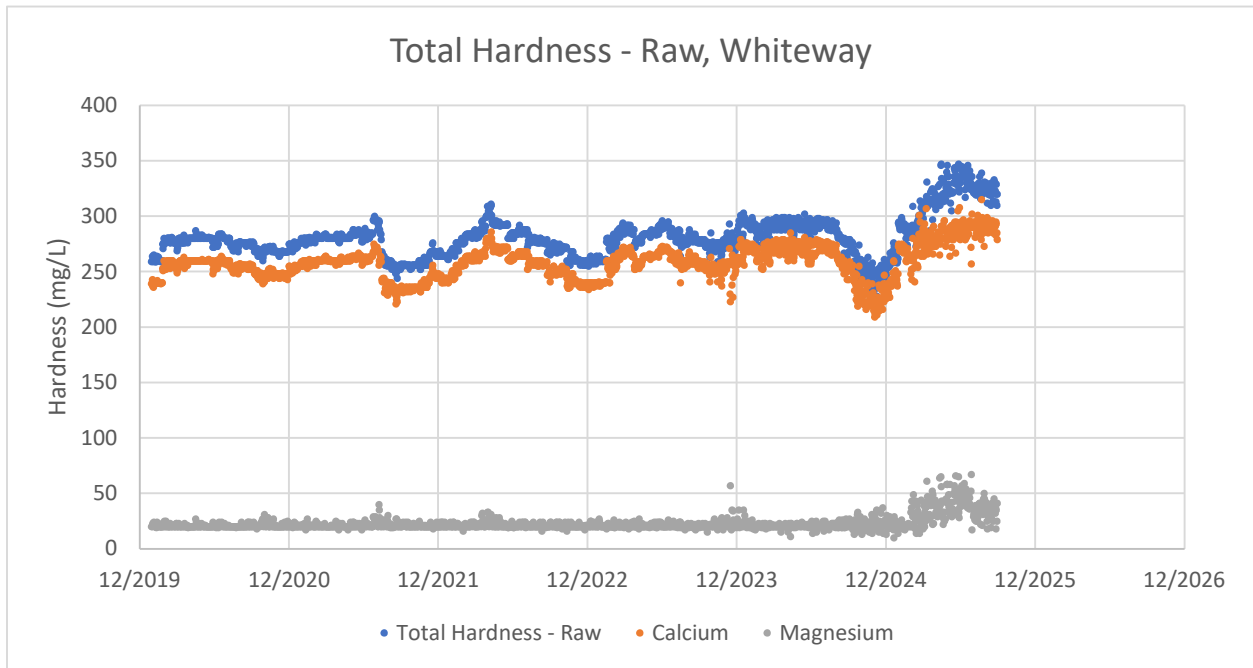


Figure 2-26. Whiteway Finished Total Hardness

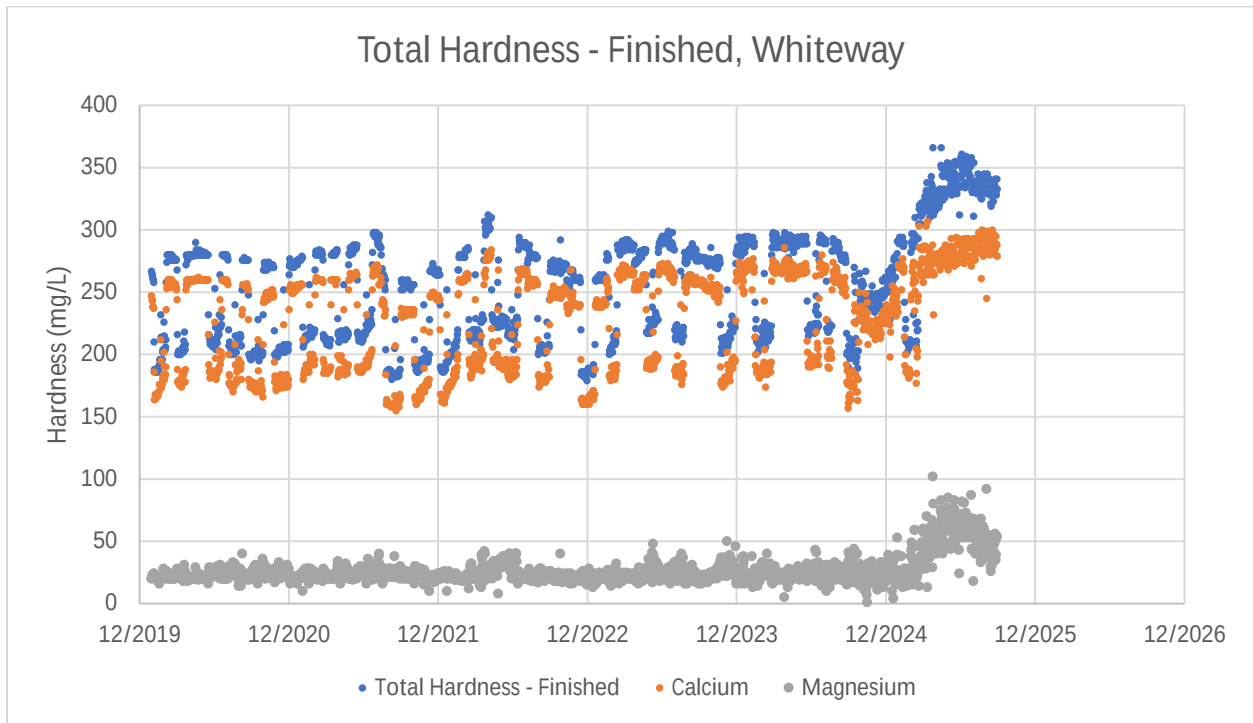
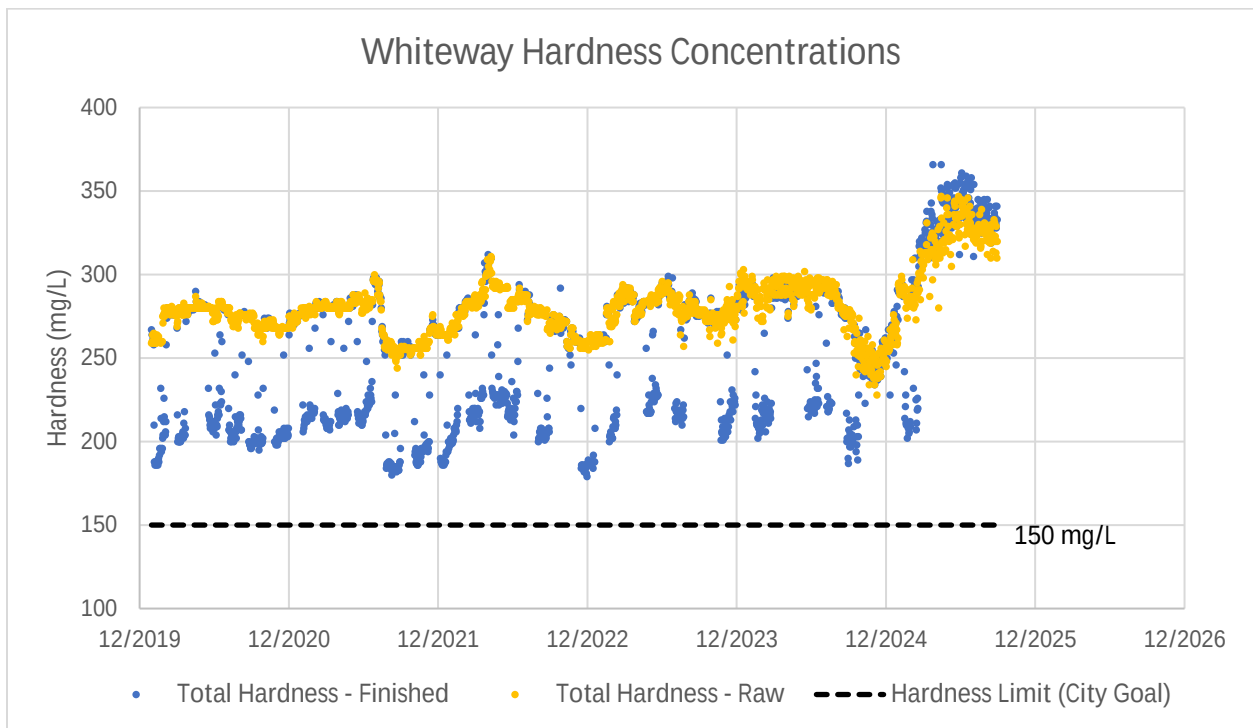


Figure 2-27. Whiteway Total Hardness



EXISTING CONDITIONS

Turbidity, which is a measure of the cloudiness of water and is associated at elevated levels to greater presence of disease causing microbes, is limited to have no samples measuring higher than 1 Nephelometric Turbidity Unit (NTU) and must have 95% of samples in a given month measuring less than 0.3 NTU. At the Whiteway WTP, turbidity in the raw water trends around 0.15 NTU to 0.25 NTU. This is generally reduced to between 0.1 and 0.15 NTU with several data points above this range, but still within the acceptable limit for the primary drinking standard.

Unlike the hardness data, there is no clear distinction between the turbidity readings in the water during periods of lime softening and periods without lime softening. This suggests that even when the lime softening reactors were operational, the filter basins were still able to filter out the increased solids content caused by the lime reactions.

Figure 2-28. Whiteway Raw Turbidity

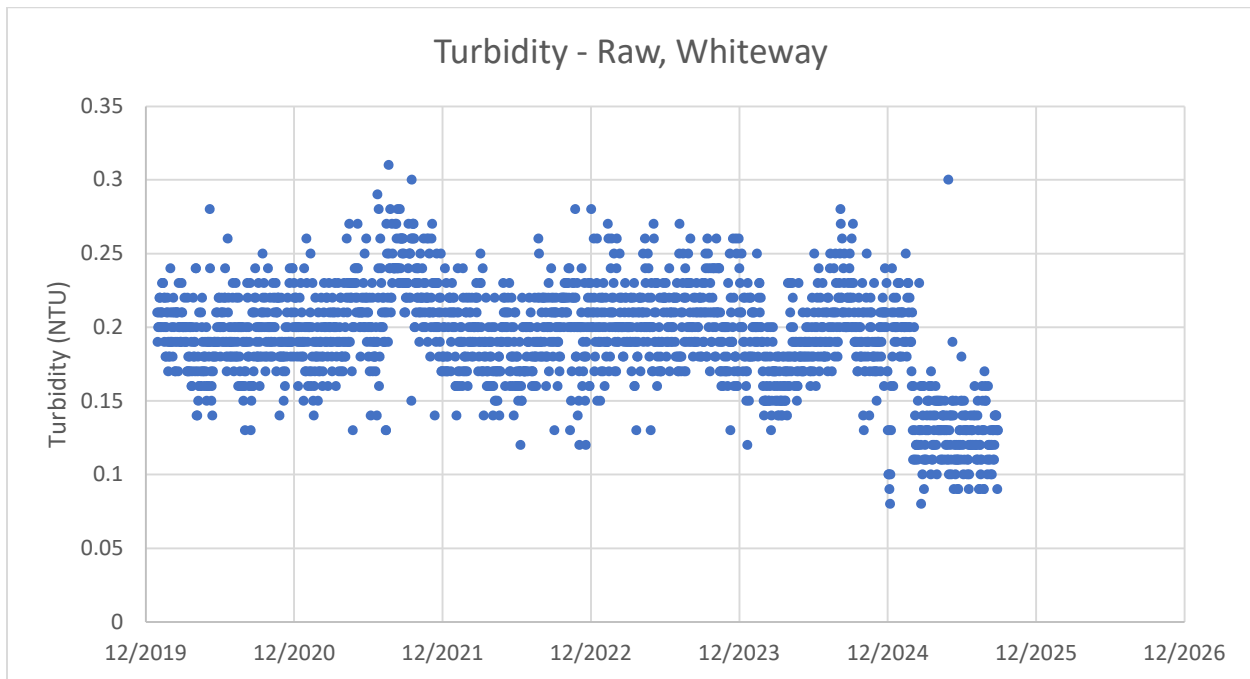


Figure 2-29. Whiteway Finished Turbidity

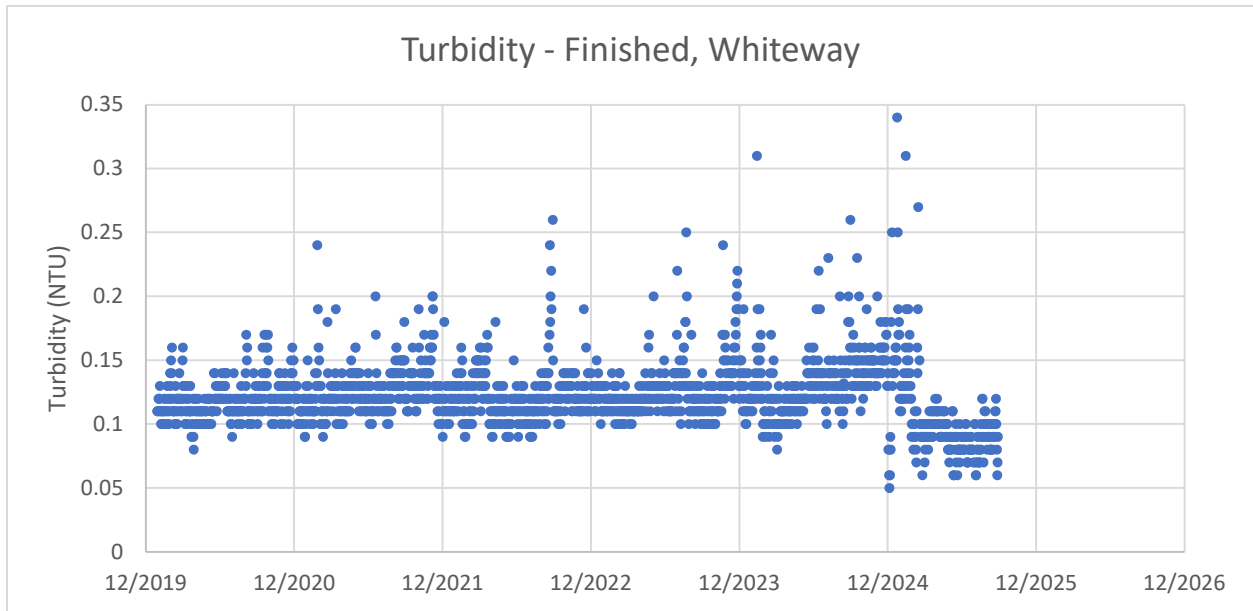
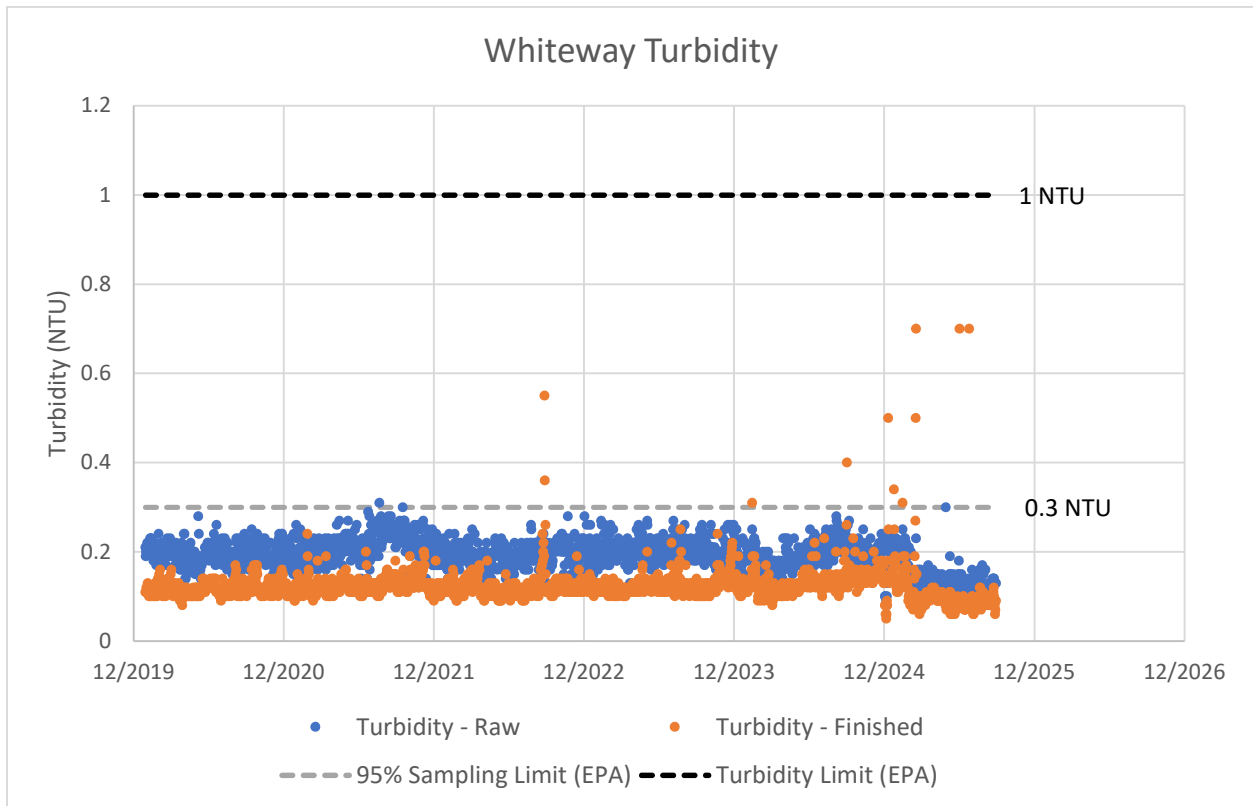


Figure 2-30. Whiteway Turbidity Comparison



EXISTING CONDITIONS

Chlorine, which is commonly used to disinfect potable water prior to distribution, can cause eye irritation and stomach discomfort at high concentrations, and is regulated as a primary drinking standard at a limit of 4 mg/L as Cl₂. The Whiteway WTP injects chlorine after the filter beds. It does not have a proper chlorine contact basin, and instead uses the older 0.2 MG and 0.5 MG ground storage tanks to provide contact time for the chlorine. FDEP requires a minimum contact time of 15 minutes at peak hourly flow. There have been no violations of the standard in the past 5 years at Whiteway.

The Sunningdale plant on the other hand, has a chlorine contact basin on sight, with a packing tower for scrubbing chlorine fumes from the air. The scrubbing system does not have an affect on the concentration in the water however. The chlorine concentration at the Sunningdale plant generally stays between 1.5 and 2 mg/L at the point of discharge, but there was one violation in 2022 where the concentration reached 7.2 mg/L.

Figure 2-31. Whiteway Finished Chlorine

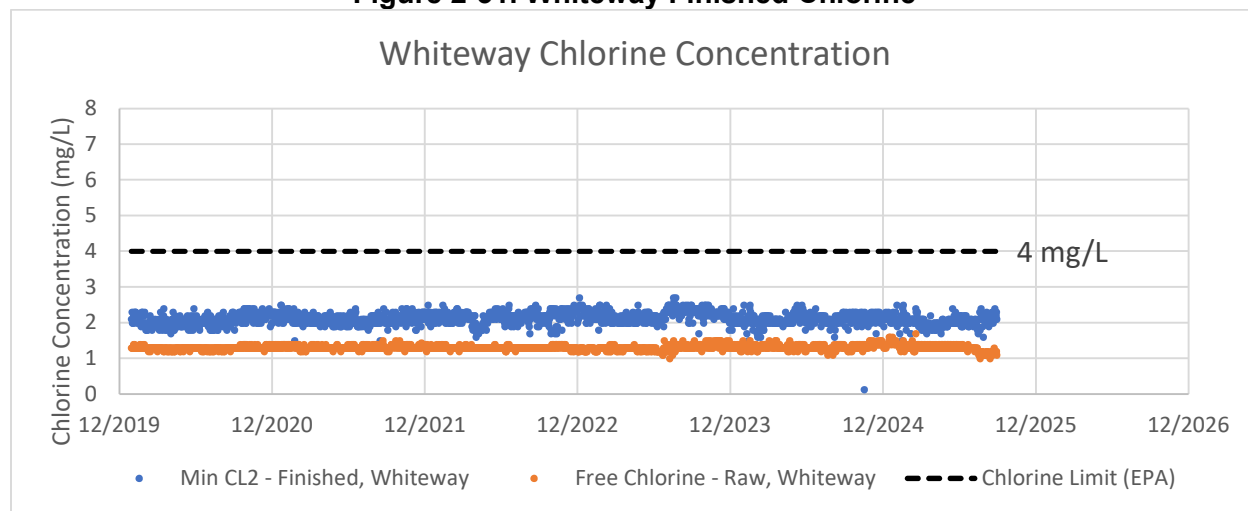
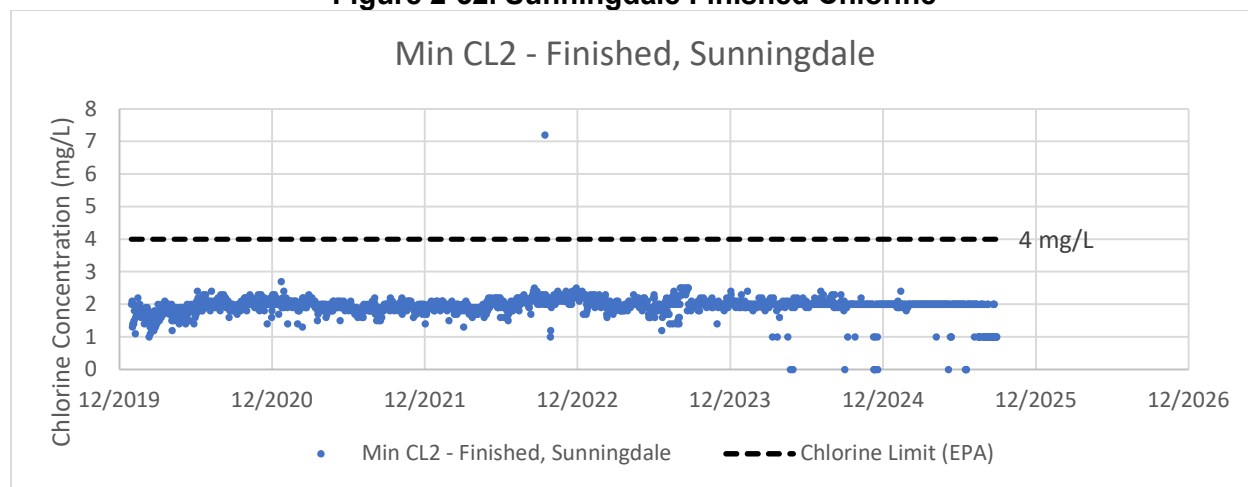


Figure 2-32. Sunningdale Finished Chlorine



EXISTING CONDITIONS

As part of the Master Plan evaluation, CHA Consulting conducted a comprehensive sampling program across all production wells within the City's water supply system. The objective was to analyze raw groundwater for a range of parameters critical to treatment performance and regulatory compliance, including several substances subject to primary drinking water standards, secondary drinking water standards, and ones that are not regulated, but provide greater insight into the overall quality of the water. These substances include for example, but are not limited to, nitrates (primary), arsenic (primary), iron (secondary), chloride (secondary), sodium (unregulated), and total organic carbon (unregulated). Samples were collected in September 2025 following industry-standard protocols and analyzed through a NELAP/NELAC certified laboratory. These results provide a baseline for assessing current water quality conditions and identifying future treatment needs. Tabulated results of the Well Sampling can be seen below in **Figure 2-33**.

There were three instances of a production well exceeding a secondary drinking water standard. There was an exceedance for odor in production well #5, measuring at 20 T.O.N. (Odor: 20 TON>3.0 TON; Threshold Odor Number, the unit for odor, with 3 T.O.N. Additionally, production well #12 exceeded the secondary minimum contaminant level (SMCL) for iron, measuring 0.47 mg/L versus the SMCL of 0.3 mg/L, as well as for Total Dissolved Solids (TDS) measuring 600 mg/L compared to the SMCL of 500 mg/L.

In addition to the aforementioned water sampling of the production wells, three different sampling events were conducted specifically for PFAS contamination of the City's production wells and finished water. Samples were analyzed in March 2025 and May 2025 prior to CHA's involvement, and in July 2025 by CHA. The results of the PFAS sampling events can be seen in **Tables 2-9 through 2-11**. Temple Terrace's water was found to have concentrations exceeding the PMCLs for PFOA and PFOS at all sampled points, and for three of the production wells concentrations exceeded the PMCL for PFHxS in addition. PFAS sampling events were performed by the City to fulfill the quarterly PFAS sampling obligation for FDEP and DOH reporting as well as UCMR5 sampling obligations as required by UCMR5. Results of the UCMR5 sampling will determine the City's compliance status with emerging contaminant limits and guide decisions on PFAS removal needs for the City.

Since November 2024, the City has been monitoring PFAS concentrations in its wells as part of the UCMR5 program. Summary results for the six regulated PFAS compounds are presented in **Table 2-9**. The data show that PFOA, PFOS, and the Hazard Index exceed the EPA's proposed maximum contaminant levels (PMCLs). Notably, PFOS concentrations are of particular concern—the average detected level is twice the PMCL, and the highest detected concentration is about seven times the PMCL.

EXISTING CONDITIONS

Table 2-9. Summary of 2025 PFAS Analysis Results

Contaminants	Minimum (ppt)	Average (ppt)	Maximum (ppt)
PFOA	5.1	7.8	10
PFOS	15	17.3	19.5
PFHxS	6.3	7.8	8.8
PFNA	Not Detected	Not Detected	Not Detected
HFPO-DA ('GenX' chemicals)	Not Detected	Not Detected	Not Detected
PFBS	7.0	10.2	12.2
Mixture of GenX, PFBS, PFNA PFHxS (Hazard Index)	0.75	0.88	1.0

Table 2-10. Summary of 2025 PFAS Analysis Results by WTP

Water Quality Parameter	MCL	MCLG	Whiteway			Sunningdale		
			March 2025	May 2025	July 2025	March 2025	May 2025	July 2025
PFOA	4	0	8.1	8.7	7.2	10	7.7	5.1
PFOS	4	0	19.3	18.8	15	19.5	16.4	15
PFHxS	10	10	8	8.2	6.3	8.8	8.6	6.7
PFNA	10	10	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
HFPO-DA (Gen-X)	10	10	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
PFBS	-	-	12.1	12.2	9.5	11.1	9.2	7.0
Hazard Index	1	1	0.89	0.9	0.79	0.98	1.0	0.75

EXISTING CONDITIONS

Table 2-11. Summary of 2025 PFAS Analysis Results by Production Well

Water Quality Parameter	MCL	MCLG	Sunningdale Plant				Whiteway Plant						Well 16 (Irrigation Well) July 2025
			Well 1	Well 2	Well 6	Well 11	Well 4	Well 5	Well 7	Well 8A	Well 9	Well 12	
			July 2025	July 2025	July 2025	July 2025	July 2025	July 2025	July 2025	July 2025	July 2025	July 2025	
PFOA	4	0	9.1	9.1	6.0	5.0	11	7.1	6.8	6.0	5.1	5.0	5.1
PFOS	4	0	16	17	18	15	18	20	21	13	15	20	11
PFHxS	10	10	6.9	7.0	7.2	6.4	9.4	13	11	4.3	5.5	16	5.7
PFNA	10	10	< 1.7	< 1.7	< 1.7	< 1.7	< 1.8	< 1.7	< 1.7	< 1.7	< 1.7	< 1.6	< 1.7
HFPO-DA (Gen-X)	10	10	< 0.84	< 0.84	< 0.86	< 0.86	< 0.88	< 0.86	< 0.83	< 0.87	< 0.83	< 0.82	< 0.87
PFBS	-	-	8.4	8.9	9.6	6.7	9.1	8.2	11	8.5	10	7.7	6.6
Hazard Index	1	1	0.84	0.85	0.85	0.71	1.15	1.50	1.30	0.55	0.67	1.83	0.71

Figure 2-33. August 2025 Well Water Quality Sampling Results

		Regulations		Lab Detection Limits		Well-4		Well-5		Well-7		Well-8		Well-12		Well-6		Well-11		Well-2		Well-1	
	Unit	MCL	SMCL	PQL	MDL	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier
Atrazine	ug/L	0.003	-	0.097	0.0087	0.0087	U	0.0087	U	0.0087	U	0.0091	U	0.009	U	0.009	U	0.009	U	0.0089	U	0.0088	U
Simazine	ug/L	0.004	-	0.068	0.029	0.029	U	0.029	U	0.029	U	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U	0.029	U
2,4-D	ug/L	0.07	-	0.1	0.022	0.022	U	0.022	U	0.022	U	0.022	U	0.022	U	0.022	U	0.022	U	0.022	U	0.22	U
Bromide	mg/L	-	-	0.2	0.1	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Chloride	mg/L	-	250	0.4	0.2	27		25		17		15		16		26		20		26		23	
Nitrate as N	mg/L	10	-	0.2	0.1	1.2		0.1	U	1.6		1.6		0.22		0.71		1.1		1.7		1.7	
Sulfate	mg/L	-	250	5	2.5	100		140		100		110		210		100		120		120		120	
Glyphosate	ug/L	0.7	-	10	6	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U	6	U
Calcium	mg/L	-	-	0.56	0.064	110		110		94		95		140		100		96		100		100	
Iron	mg/L	-	0.3	0.22	0.0093	0.067	U	0.067	U	0.067	U	0.067	U	0.47		0.067	U	0.067	U	0.067	U	0.067	U
Manganese	mg/L	-	0.05	0.022	0.011	0.0093	U	0.0093	U	0.0093	U	0.0093	U	0.0093	U	0.0093	U	0.0093	U	0.0093	U	0.0093	U
Silicon	mg/L	-	-	0.022	0.011	5.9		6		5.7		5.7		5.8		6.9		9.3		6.8		8.4	
Sodium	mg/L	-	-	0.56	0.14	14		12		11		12		8.6		12		9.5		13		12	
Arsenic	mg/L	0.01		0.0044	0.00043	0.0015	I	0.0015	I	0.00043	U	0.00043	U	0.0028	I	0.0019	I	0.0025	I	0.0012	I	0.0018	I
Total Hardness as CaCO3	mg/L	-	-	0.2	0.2	310		320		270		270		400		290		290		290		290	
Turbidity	NTU	1	-	0.4	0.2	0.25	I	0.75		0.35	I	0.35	I	3.6		0.2	I	0.5		0.4		0.8	
Color	Color Units	-	15	5	5	5		5		5		5		5		5		5		5		5	
Alkalinity as CaCO3	mg/L	-	-	10	10	160		150		150		150		160		160		130		150		150	
Specific Conductance	umho/cm @ 25C	-	-	2	1	630		670		570		580		760		630		600		650		630	
Resistivity	ohm cm	-	-	0.2	0.1	1600	V	1500	V	1800	V	1700	V	1300	V	1600	V	1700	V	1500	V	1600	V
Temperature	C	-	-	0.1	0.1	20	V	20	V	20	V	20	V	20	V	20	V	20	V	20	V	20	V
Total Dissolved Solids	mg/L	-	500	5	5	460		490		370		390		600		460		450		470		460	
Total Suspended Solids	mg/L	-	-	1	1	1	U	1	U	1	U	1	U	4.1		1	U	1	U	1	U	1	U
Ammonia (as N)	mg/L	-	-	0.02	0.014	0.0046		0.11		0.014	U	0.014	U	0.038		0.014	U	0.014	U	0.014	U	0.014	U
pH	SU	-	6.5-8.5			7.5	Q	7.6	Q	7.4	Q	7.5	Q	7.8	Q	7.6	Q	7.8	Q	7.7	Q	7.6	Q
Temperature	C	-	-			20.6	Q	21	Q	21.1	Q	21.2	Q	21.1	Q	21.1	Q	21.1	Q	21.3	Q	21.3	Q
Total Organic Carbon	mg/L	-	-	2	1	1.2	I	1.4	I	1.2	I	1.2	I	1.5	I	1.1		1.1	I	1.3	I	1.3	I
UV254	1/cm	-	-	0.009	0.009	0.021		0.038		0.023		0.023		0.032		0.023		0.022		0.027		0.022	
UV Transmittance	%	-	-	0.001	0.001	95	V	92	V	95	V	95	V	93	V	95	V	95	V	94	V	95	V
Odor	T.O.N.	-	3	1	1	1	U	20		1	U	1	U	1	U	1	U	1	U	1	U	1	U
Sulfide	mg/L	-	0.3?	2	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Disssolved Organic Carbon	mg/L	-	-	2	1	1.5	I	1.6	I	1.3	I	1.7	I	1.6	I	1.6	I	1.6	I	1.7	I	1.9	I
Heterotrophic Plate Count	CFU/mL	500	-	0.5	0.5	0.8		2.8		2.5		82.5		3.8		2.5		26.8		18.8		3.8	
SRBs	CFU/mL	-	-	1	1	ABSENT	U	ABSENT		ABSENT		ABSENT		1-10		ABSENT		1-10		ABSENT		1-10	
Field Temperature	C	-	-			25.3		25.1		25.4		25.7		25.4		24.6		25.2		25.2		25.4	
Oxygen, Dissolved	mg/L	-	-			1.45		1.49		2.53		3.21		2.18		2.6		1.85		1.41		1.23	
Gross Alpha	piC/L	15	-			4		3.4	U	2.3	U	4.3		2.1		3.5		6.5		4.2		2.4	
Radium 226	piC/L	Combined	-			1.8		1		0.9		1.3		0.7		0.9		1.6		1.6		0.8	
Radium 228	piC/L		-			0.8	U	0.9	U	0.9	U	0.9	U	0.7	U	0.7	U	0.7	U	0.8		0.9	U

Qualifier definitions

U: Indicates that the compound was analyzed for but not detected.

V: Indicates that the analyte was detected at or above the method detection limit in both the sample and the associated method blank and the value of 10 times the blank value was equal to or greater than the associated sample value.

I: The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

Q: Sample held beyond the accepted holding time.



EXISTING CONDITIONS

2.10 Treatment Process Performance

A walkthrough of the Whiteway WTP demonstrated that some of the facilities within the plant operate as originally intended, as indicated in **Table 2-12**. The finished water at both WTPs is considered very hard, currently more than 300 mg/L total hardness as CaCO₃ as the lime softening process is currently non-functional. PFAS removal treatment processes would be needed for regulatory compliance as conventional treatment is ineffective for treating PFAS compounds.

Table 2-12. Treatment Process Functionality

Treatment Unit Process	Functional?	Description
Cascade Aeration	Yes	Black deposits present on surface of cascade trays (oxidized sulfur/iron/manganese possibly); normal given age of system
Lime Softening Reactors	No	Out of service: Operators noted difficulty in operating, and presence of higher turbidity when operating
Recarbonation Tank	No	Carbon dioxide and Alum historically added here to accommodate for increased pH from softening; Historically problematic for operators, and not needed due to offline softening
Dual-Media Filters	Yes	Operators noted inability to isolate filter beds, and that backwashing is generally insufficient in one cycle
Chemical Feed	Yes	Chlorine and Zinc Orthophosphate added as normal; Fluoride no longer added due to state legislation

2.11 WTPs Condition Summary

Both the Whiteway and Sunningdale Water Treatment Plants are aging, and several key pieces of equipment are approaching the end of their service life. The City does maintain equipment through its operating and capital budgeting and has kept the WTPs running reliably. Continued reliability will require increased levels of repair and renewal costs.

3.0 TREATMENT PROCESS EVALUATION

The City's Whiteway and Sunningdale WTPs were evaluated for compliance with future demand and delivered water quality needs. The treatment process evaluations include technical, master planning level analyses. The treatment plants' process evaluation results are summarized in this section and organized in subsequent sections the Sunningdale and Whiteway WTPs:



Figure 3-1. Whiteway 3D Model

- Capacity evaluation of individual processes
- Water Quality Goals
- Historical treatment performance
- PFAS treatment technologies
- Total hardness reduction technologies
- Treatment process conclusions

3.1 Treatment Process Overview

The City's upper Floridan aquifer groundwater wellfields supply its Whiteway and Sunningdale WTPs. These plants collectively ensure reliable potable water service for the community. The rated/permitted capacity of the Whiteway WTP is 5 million gallons per day (MGD), while the Sunningdale WTP is rated/permitted for 4 MGD. Under normal operating conditions, historical data focusing on the last three years indicates that Whiteway typically treats an average of approximately 3 MGD, whereas Sunningdale averages about 1 MGD.

The source water is from an Upper Floridan Aquifer (UFA) that is relatively shallow i.e., 300-500'. The Whiteway wellfields can deliver up to 6.0 MGD. The Sunningdale wellfields can deliver up to 4.17 MGD. This raw water availability ensures flexibility in meeting varying demand.

Future demand projections, based on regional growth trends and planning data, estimate an average day demand of 4.38 MGD and a maximum day demand of 5.8 MGD for the City. While the combined permitted capacity of both plants (9 MGD) is sufficient to meet these projected needs (water use permit limitations notwithstanding), the City has asked to also evaluate potential consolidation scenarios capital and operational considerations affect.

3.1.1 Potential WTP Consolidation to Whiteway

If the City were to consolidate treatment operations at the Whiteway facility, Sunningdale would still likely need to operate as a raw water pump station unless a new wellfield was developed. The consolidation would trigger raw water transmission, finished water transmission, pumping improvements and expansion of Whiteway WTP from 5.0 to 6.0 MGD. Connecting the two plants to afford redundancy in case of a shutdown at Sunningdale, the current design capacity of 5 MGD would be insufficient to handle the combined flows of both Whiteway and Sunningdale. Therefore, the plants must either continue operating as separate facilities or undergo significant capacity upgrades at Whiteway to accommodate consolidated treatment. An separate evaluation will need to be completed to determine the impacts and necessary changes at Sunningdale to convert it to a pump station.

3.1.2 Potential New Wellfield

The City currently has available existing well capacity (10.17 MGD) for expanded need but is constrained by the current SWFWMD Water Use Permit (~5 to 6 MGD). The existing well fields are productive and good quality, except for the high hardness and PFAS, which is likely ubiquitous in the area's available fresh groundwater. Going to the deeper, Lower Floridan aquifer would likely require similar and additional treatment for total dissolved solids (TDS), requiring a membrane solution (Nanofiltration or Reverse Osmosis), triggering the need for a deep injection well costing ~\$25M or less to dispose concentrate, if collaborated with the City of Tampa and costs for transmission. The planned treatment system for the existing well supply could be designed to adapt to deeper, higher TDS in the future. The City should pursue an additional well supply evaluation, for an initial, single potable supply well in the Whiteway WTP area, with the possibility of garnering SWFWMD funding as an alternative water supply project to offset the need to increase the City's Water Use Permit levels. Increased permitted water supply, in the 5 to 15% range, may be needed if advanced treatment processes are implemented.

3.1.3 Wholesale Supply from Neighboring Utilities

Consideration for wholesale supply from adjacent City of Tampa and Hillsborough County water systems. Potential issues and cost considerations are included in following sections.

3.2 Treatment Process Component Capacity Analysis

This capacity evaluation assesses the capacities of the existing WTPs for comparison with the projected water demands. Unit treatment processes that are required to treat the maximum daily flow (e.g., aeration, lime softening units, filters, high service pumping units, chemical feed equipment and ancillary equipment) were evaluated. Other factors taken into consideration in the evaluation include regulatory requirements, typical drinking water treatment process loading criteria, operational convenience and hydraulic limitations of the WTPs. The capacity of the unit processes at the plant, the number of units for each stage of the process and the number of units required for meeting the maximum day demand (MDD) (5.9 MGD in Year 2045), rounded up to 6.0 MGD, 2.0 MGD MDD for Sunningdale and 4.0 MGD MDD for Whiteway.

Table 3-1 provides a summary of the Whiteway WTP component capacity evaluation for the MDD condition, comparing needed future capacity with each unit's total and firm capacity. Firm capacity is defined as the largest unit out of service, realizing that firm capacity is not required or recommended for every process, e.g., finished water storage. The Whiteway WTP is currently operating and existing unit processes have shown reliability except for the lime softening and recarbonation systems which have not operated consistently and are currently out of service. The selection of PFAS removal process will impact the treatment requirements moving forward. For example, selection of certain IX PFAS removal systems require advanced softening.

Table 3-1. Whiteway WTP Treatment Process Capacity Evaluation Summary

Component	Equivalent MDD Capacity GPM	Limiting Components GPM	Needed Capacity Increase for 6 MGD (4,167 GPM)
Wells Total	4,403	--	--
Wells Firm	3,522	3,522	+ 645
Aerator	3,500	3,500	+ 667
Raw PS Total	5,250	--	--
Raw PS Firm	3,500	3,500	+ 667
Raw Discharge 10" Header			
Lime	3,500	3,500	+ 667
Recarb*	2,750	2,750	+ 1,417
Filters	3,470	3,470	+ 697
Transfer PS Total	5,200	--	-
Transfer PS Firm	3,600	3,600	+ 567
High Service PS Total MDD Equivalent	4,800	--	--
High Service PS Firm MDD Equivalent	3,800	3,800	+ 367
Finished Storage, MDD Equivalent	4,167	--	--

* Recarb basin limit due to tank hydraulics as identified by City staff, confirmed with master plan hydraulic modeling

From the above table, in order for the Whiteway plant to reach 6 MGD, most components need to have an increase in capacity. The greatest bottleneck for the existing system is with the Recarb tank, which can support a maximum of 3.9 MGD. More details can be found on the conducted hydraulic modeling and testing in the Chapter 5 Condition Assessment.

Table 3-2 provides a summary of the Sunningdale WTP component capacity evaluation for MDD condition, comparing needed future capacity with each unit's total and firm capacity.

Table 3-2. Sunningdale WTP Treatment Process Capacity Evaluation Summary

Component	Equivalent MDD Capacity GPM	Limiting Components GPM	Needed Capacity Increase for 2 MGD (1,388 GPM)
Wells Total	2,750	--	--
Wells Firm	2,063	2,063	--
Chlorination	2,750	--	--
Chlorine Contact Time Storage	2,750	--	--
High Service PS Total MDD Equivalent	2,778	--	--
High Service PS Firm MDD Equivalent	2,083	--	--
Finished Storage, MDD Equivalent	1,278	1,278	+ 110

From the above table, the Sunningdale plant to components are all capable of producing 2 MGD of finished water. The primary bottleneck for Sunningdale is due to the lack of onsite storage, relying on storage via the distribution system and intermediate storage tanks (Chinaberry and Telecom).

3.3 Treatment Process Performance Evaluation

3.3.1 Water Quality Goals

As discussed in **Chapter 2**, the blended source water can be characterized as neutral to slightly alkaline pH, high alkalinity, with low to moderate color, low TOC (1.26 mg/L) and TDS (average 461 mg/L). Raw water color and TOC are direct precursors for the formation of DBPs. Water suppliers classify the hardness of a water as soft (below 60 mg/L as CaCO₃), medium hard (60 to 120 mg/L as CaCO₃), hard (120 to 180 mg/L as CaCO₃), very hard (180 to 350 mg/L as CaCO₃), and brackish (above 350 mg/L as CaCO₃).

Based on this classification, the raw water can also be characterized as very hard water and is primarily composed of calcium hardness. Although higher values of hardness are not dangerous,

public acceptance typically requires a water supply below 150 mg/L as CaCO₃. Hard water also tends to stain bathroom fixtures and leave scale in water heaters. Agencies recommend that suppliers of potable water maintain total hardness levels below 120 mg/L as CaCO₃ when economically feasible. The water quality goals for full-scale treatment include compliance with all primary and secondary water quality standards (see Section 1), as applicable to WTPs. **Table 3-3** below summarizes the finished water quality standards and goals (industry standards) relevant to this project.

The City would like to achieve <150 mg/L, however, neither of its WTPs can achieve this currently. The Whiteway WTP's lime softening Gyrazur process is only capable of 30% hardness removal and given the influent hardness; cannot achieve the City's stated goal of <150 mg/L total hardness.

Table 3-3. Finished Water Quality Goals

Finished Water Quality Goals				
Water Quality Parameter	Significance	Water Quality Goal or Industry Standard	Water Quality Standard	Standard Reference
TOC ¹	• DBP • precursors • Chlorine demand • Stable water quality	(TOC <2.0 mg/L or SUVA <2.0); Higher removals strongly recommended	30% removal	Stage 1 D/DBP Rule
Turbidity	• Filtration effectiveness • Indicator parameter for pathogens	≤1 NTU	≤1 NTU at all times (for surface water plants turbidity ≤0.3 NTU in 95% of samples)	NPDWR/FDEP Treatment Technique
Color	• Aesthetic appearance	<5 color units	<15 color units	NSDWR
pH	• Quantity of chemicals • DBP formation • Concrete erosion, calcification, corrosion potential	7.1-8.5 ²	6.5 – 8.5	NSDWR
Conductivity/TDS	• Lead and Copper • Uptake potential	<500 mg/L as TDS	<500 mg/L as TDS	NSDWR
Iron	• Filter Clogging • Color in finished water	<0.3 mg/L	<0.3 mg/L	NSDWR
Manganese	• Filter Clogging • Color in finished water	<0.05 mg/L	<0.05 mg/L	NSDWR
Hardness	• Distribution System • Scale buildup	<150 mg/L as CaCO ₃ ³	N/A	N/A
Alkalinity	• Surrogate for calcium carbonate/sulfate precipitation potential	120-140 mg/L as CaCO ₃ ³	N/A	N/A
TTHMs	• Disinfection • By-products • Cancer risk	<64 ppb or µg/L ⁴	<80 ppb or µg/L	Stage 1 D/DBP Rule
HAAs	• Disinfection • By-products • Cancer risk	<48 ppb or µg/L ⁴	<60 ppb or µg/L	Stage 1 D/DBP Rule
Sulfate	• Scaling Factor	<200 mg/L	N/A	N/A
Nitrite (measured as Nitrogen)	• Nitrification • Blue-baby syndrome	1.0 mg/L	1.0 mg/L	NPDWR
Nitrate (measured as Nitrogen)	• Nitrification • Blue-baby syndrome	10.0 mg/L	10.0 mg/L	NPDWR

Finished Water Quality Goals				
Water Quality Parameter	Significance	Water Quality Goal or Industry Standard	Water Quality Standard	Standard Reference
Hydrogen Sulfide	• Taste and odor	<0.3 mg/L process feed <0.1 mg/L finished	N/A	N/A
Free Ammonia	• Nitrification	<0.05 mg/L	N/A	N/A
LSI	• Potential for corrosion	>0	N/A	N/A
CCPP	• Potential for corrosion	4-10	N/A	N/A

Notes:

¹ Water quality standard is not applicable to the WTPs as they are considered groundwater plants by FDEP. However, water quality goals (industry standards) are recommended.

² Finished water pH is partly dependent upon source and treatment process; City's goal is pH value at entry and in the distribution system of 7.3.

³ State-designated minimum alkalinity value at entry and in the distribution system is equal to or greater than 111 mg/L as CaCO₃.

⁴ Lower TOC levels in filtered water have additional benefits, such as a lower chlorine demand, less TTHM/HAA formation, more stable chlorine/chloramines residual, and reduced risk of nitrification in the distribution system. Goal is set at 20% below the Standard as an operational target for to provide assurance of 100 percent regulatory compliance.

< = less than

% = percent

µg/L = microgram(s) per liter

CaCO₃ = calcium carbonate

CCPP = Calcium Carbonate Precipitation Potential

DBP = disinfection byproduct

FDEP = Florida Department of Environmental Protection

HAA = haloacetic acid

LSI = Langelier Saturation Index

mg/L = milligram(s) per liter

N/A = not applicable

NPDWR = National Primary Drinking Water Regulations

NSDWR = National Secondary Drinking Water Regulations

NTU = Nephelometric turbidity unit

ppb = part(s) per billion

D/DBP = Disinfection/Disinfection By-product

TTHM = total trihalomethane

3.3.2 Historical Treatment Performance

CHA conducted performance evaluation of the existing processes at the two WTPs including water quality analyses. Water quality evaluations were performed on raw water, finished water quality and compared to City's water quality goals. This water quality assessment was based on an extensive review of the monthly operating reports (MORs), data provided by City, and communications with WTP operators and managers.

The current observations of the treatment processes, based on several site visits and discussions with City operations and engineering staff, are summarized in **Table 3-4** below.

Table 3-4. Observations of Whiteway WTF Operations

Process	Key Findings / Observations
Aeration	Removes 25-40% of influent hydrogen sulfide, raw water sulfide concentrations are low, this removal is sufficient and the remainder of hydrogen sulfide is oxidized with chlorine.
“Gyrazur” Catalytic Lime Softening Reactor	Not currently in service, no lime sludge dewatering facilities, process was discontinued, operated sporadically when in service, removed ~30% of hardness when operating not meeting quality goal, lime hauling location 30+ miles away
Recarbonation	Not currently in service. Since the lime softening reactors are offline, recarbonation is not required.
Predisinfection	Ample capacity, minimal disinfection by-product (DBP) production due to low organic carbon in source water.
Filtration	Filters are functional, in need of complete overhaul and full media changeout, backwash system is defective and needs renewal.
Post-filtration Disinfection	Ample performance and capacity, the system is a 150 lb chlorine gas cylinder system meaning frequent cylinder changeouts. Due to operability and safety, City is planning to replace with sodium hypochlorite
Clear Well	Ample capacity
Water Storage Tanks	Ample capacity, high service pumps can pull from the last big tank or pull from the other 2 upstream tanks if needed.
High Service Pumping	High service pumps function sufficiently, run continuously with two pumps including a variable speed with additional pumps coming on as demand dictates.
Lime Sludge Management	The lime sludge is transferred to a holding area for some dewatering though percolation and hauling to a disposal site. The lime sludge management system is inadequate and likely part of the reason the lime system was not operated continuously.

3.3.3 Aeration Tank

The aeration tank at the City’s water treatment facilities is designed to blend incoming feed water and facilitate aeration for the removal of hydrogen sulfide, a common groundwater constituent that can cause taste and odor issues. The process relies on introducing air into the water stream, promoting oxidation and volatilization of H₂S prior to downstream treatment.

A tank-mounted tray aeration system is used for aerating/degasifying the full influent, prior to softening, for removal of volatile compounds such as hydrogen sulfide and carbon dioxide. Recent sampling of raw water from production wells indicates that sulfide concentrations are low; raw water hydrogen sulfide levels <1 and typically <0.3 mg/L as shown in **Table 3-5**.

The aeration process currently provides some benefit in terms of sulfide removal. In combination with the attached tank continues to serve as a blending point for multiple well sources, and a feed reservoir for downstream processes.

Given these findings, the aeration system remains operational and supplies minimal, yet valuable sulfide reduction to minimize chlorine dosing and sulfur oxidation turbidity. Future considerations should be focused on keeping proper maintenance of the tank and tray aerators, which is explored in the condition assessment portion of the master plan.

Table 3-5. Well Sulfide Levels

Item	Unit	Regs.	MDL	Well -4	Well -5	Well -7	Well -8A	Well -12	Well -6	Well -11	Well -2	Well -1
Sulfide	mg/L	<0.3	1	<1	<1	<1	<1	<1	<1	<1	<1	<1

3.3.4 Lime Softening Reactors

The “Gyratur” process is a type of cold lime softening that removes calcium and magnesium hardness from water in a fluidized bed reactor. The treated water precipitates calcium carbonate onto the surface of fine sand “seeds,” forming dense, easily removable pellets. The accumulated pellets are periodically drained from the bottom of the reactor for disposal or reuse. Softened water, with 30% of the hardness removed, is drawn from the top of the reactor and flows next to the filtration step.

The lime softening system has presented the City with issues consistently over the past 5 years. Historical data shows oscillating periods of activity and inactivity in operating the lime reactors, with the most recent attempt at softening occurring in January 2025. Due to extended periods of inactivity, in addition to staff turnover, there is a lack of knowledge and expertise in operating the system which presents challenges in restoring the system.

Operators noted that when the system was previously in service, the water had a high turbidity, exceeding 1 NTU. This could indicate potential issues with carryover of particulates from the reactors. High turbidity is a concern as it could decrease filter performance downstream, and increase the need for backwashing, requiring more water usage.

Historically, the City’s raw water has had a hardness concentration averaging between 250-300mg/L. During periods of active lime softening, the hardness concentration was reduced by as much as 30%, averaging approximately 175-210 mg/L in the finished water, however, intermittent lime system run times increased annual averages well above these levels.

Starting from January 2025, the City has seen a sharp increase in the hardness concentration of the raw water, reaching as high as 350 mg/L. Even if the lime softening reactors were restored, the hardness may only be reduced to approximately 245 mg/L (assuming 30% reduction). A possible cause for this increase in hardness could be due to the combination in which the City draws water from the production wells. In particular, during analyses of the raw water

characteristics, all of the production wells had hardness levels ranging from 270 to 320 mg/L, except for Well #12 which measured 400 mg/L.

Figure 3-2. Whitway Raw Total Hardness

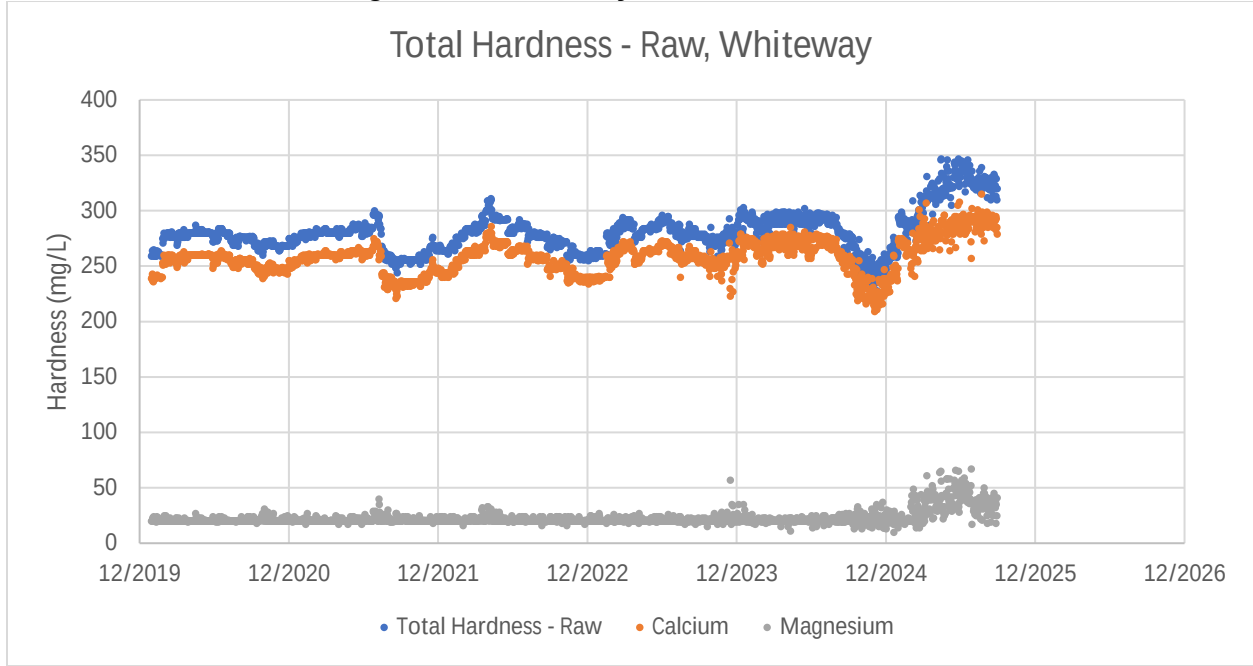


Figure 3-3. Whitway Finished Total Hardness

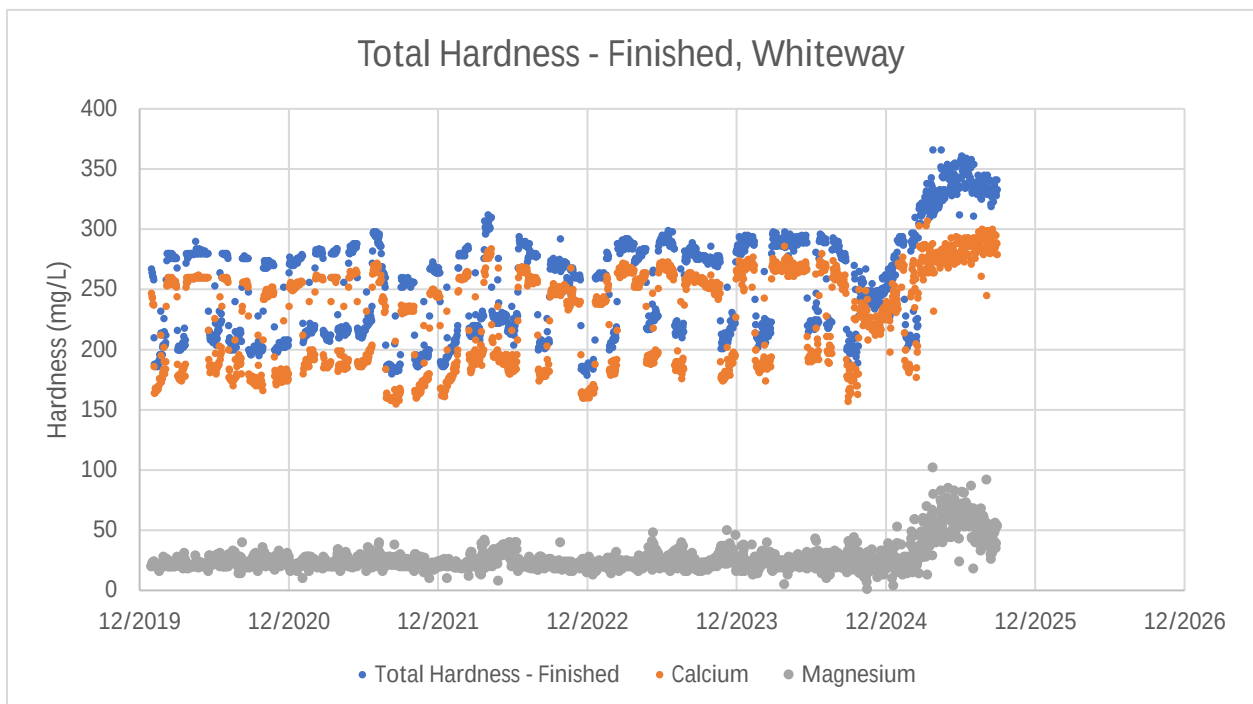
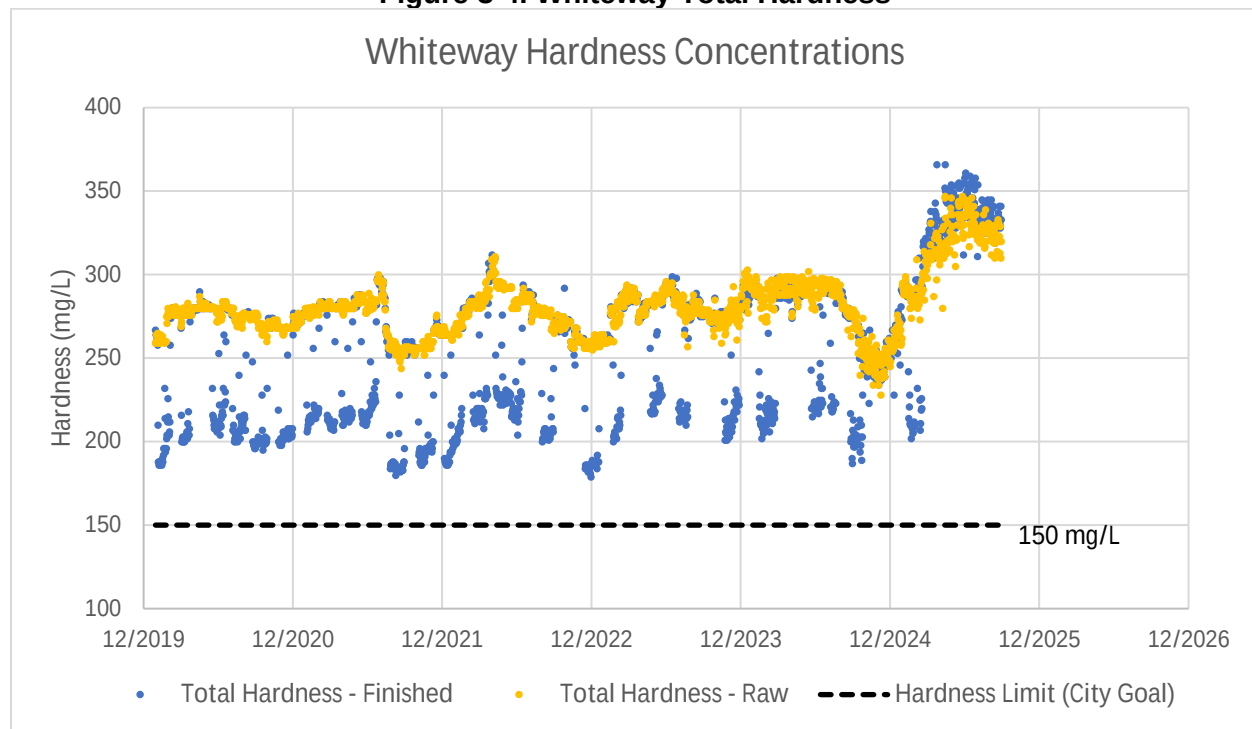


Figure 3-4. Whiteway Total Hardness

3.3.5 Recarbonation Tank

The recarbonation tank, like the lime softening reactors, is not functional. The original intent of the tank was to inject alum and carbon dioxide into the water after lime softening to adjust pH and control turbidity. Historical records as far back as 2005 describe the City as having difficulty operating the recarbonation tank, so it has been non-operational for a long time.

If the City can restore the lime softening process, it may be worth evaluating the recarbonation tank to reduce pH and address the reported turbidity issues.

3.3.6 Dual-Media Filters

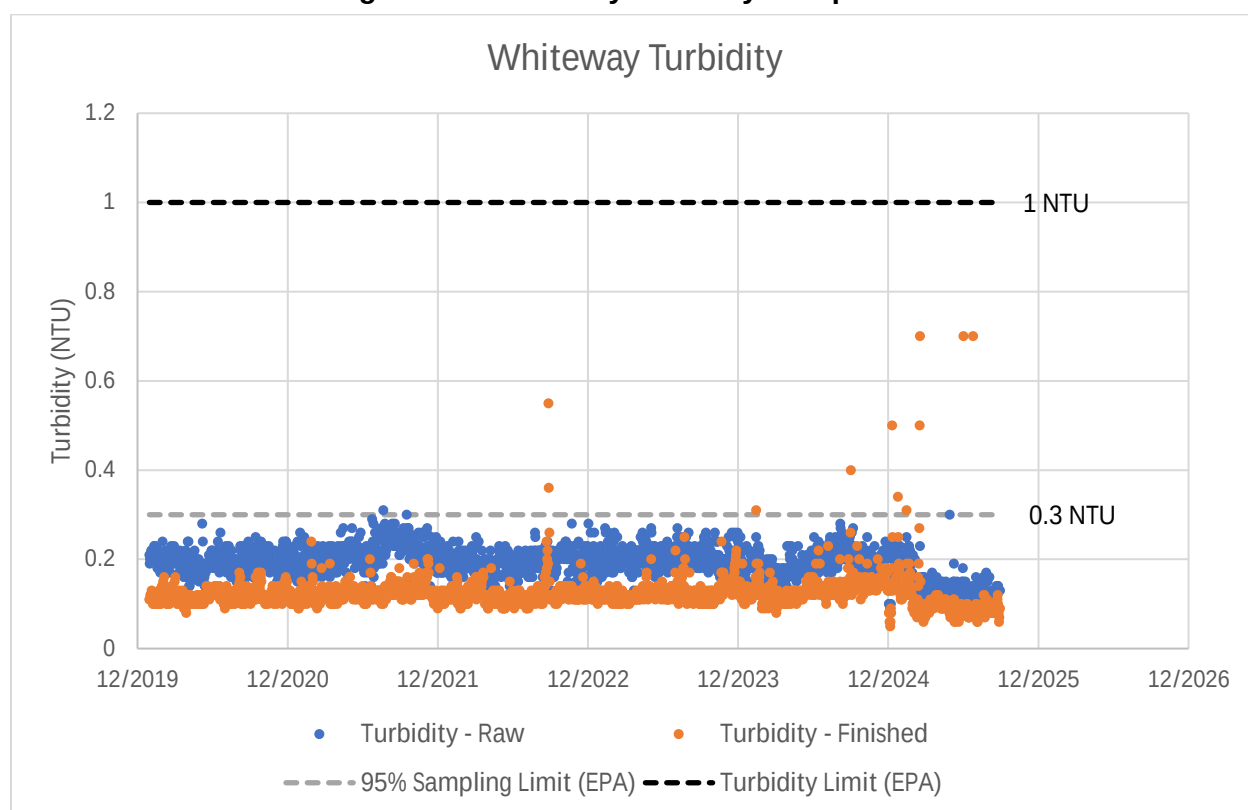
The performance of the filters was assessed based on historical data and operator feedback. The operators reported that they were unable to isolate the individual filter beds. This complicates maintenance and flexibility in operation when problems arise. In addition, the operators reported that the backwash pump is generally not sufficient in backwashing the filters to completion in one cycle. In addition, multiple backwash cycles are typically not performed. This may cause a buildup of sediment within the media, decreasing filter performance and efficiency over time.

Historically, the City has produced water that has a turbidity between 0.1 and 0.2 NTU, with periods where it increases up to 0.25 NTU, and few instances where it reached above 0.3 NTU in the past 5 years. There is no clear indication in the finished water turbidity measurements that

distinguish periods of time with lime softening from periods without lime softening. This suggests that even with the operator's reports of high turbidity during softening, the filters managed to filter solids and maintain a high-quality finished water.

Addressing the issues of the filter backwash pump being insufficient, and the filters being unable to be isolated are both key issues that should be addressed in the future to increase reliability of the treatment process. In its current state the filter basin is a critical single point of failure which can be amended by solving the issue of isolating the filter beds to provide redundancy and ease of maintenance.

Figure 3-5. Whiteway Turbidity Comparison

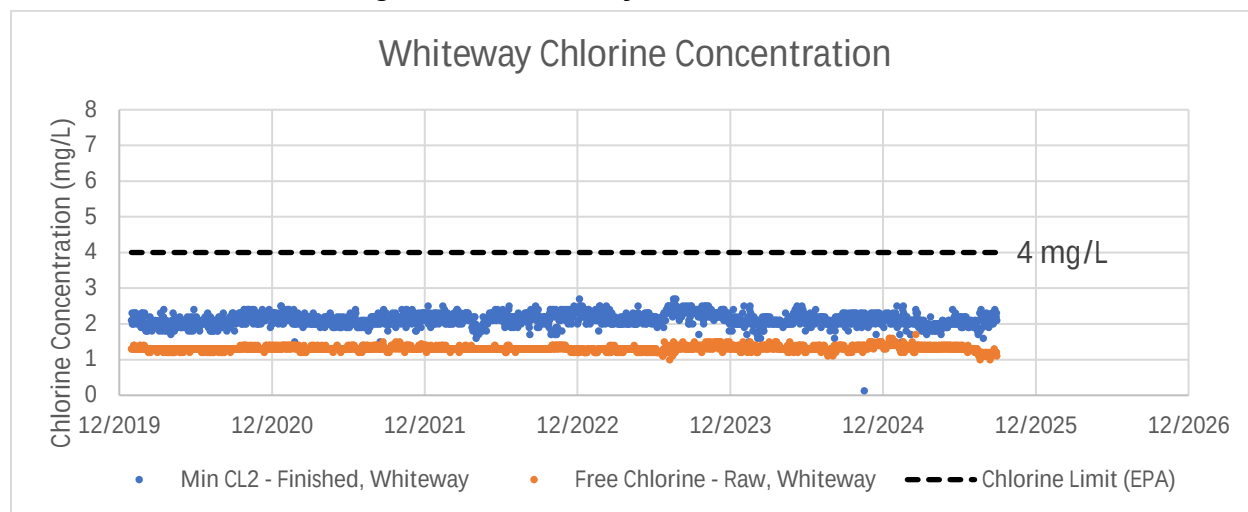


3.3.7 Chemical Feed at Whiteway WTP

At Whiteway, pre-chlorination is applied at the aeration tank to provide initial disinfection and control biological growth early in the treatment process. Post-chlorination occurs at the clearwell following filtration to maintain a stable disinfectant residual throughout the distribution system. Chlorine concentrations at this facility are consistently measured at approximately 2 mg/L, aligning with regulatory requirements for potable water to stay below MRDL of 4 mg/L.

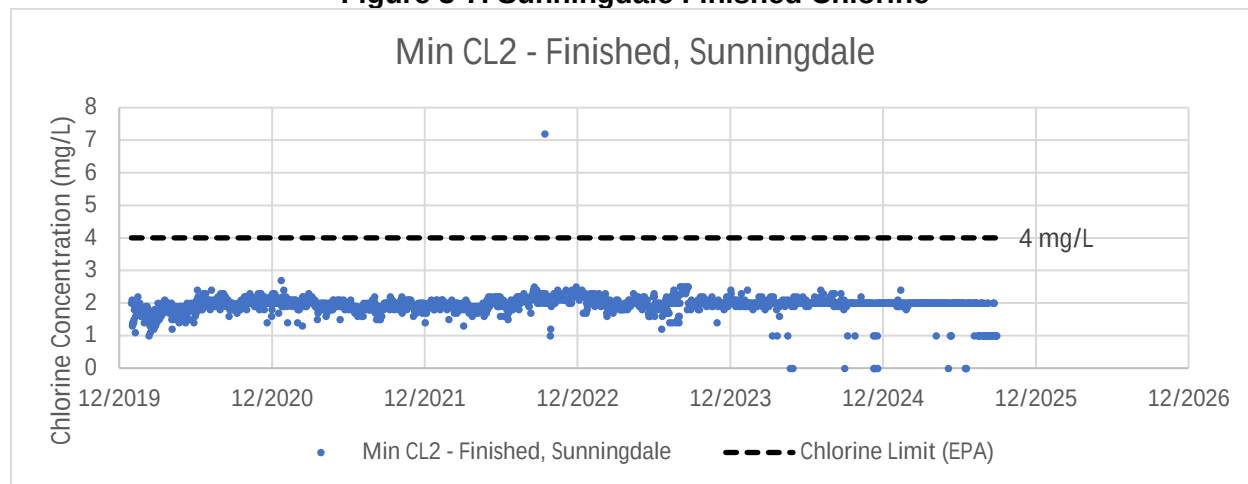
Additionally, zinc orthophosphate is dosed at the recarbonation tank to provide corrosion control within the distribution network, reducing the potential for lead and copper leaching from plumbing systems. Since the 1980's Whiteway upgrade, fluoride was added for dental health benefits, however this practice has been discontinued in compliance with 2025 Florida legislation prohibiting fluoride addition.

Figure 3-6. Whiteway Finished Chlorine



3.3.8 Chemical Feed at Sunningdale WTP

The only treatment process at the Sunningdale facility is disinfection via chlorine gas injection. There is also a dedicated chlorine scrubbing tower to control chlorine fumes coming from the chlorine contact basin. Chlorine residuals at this plant also average around 2 mg/L, ensuring consistent disinfection throughout the system and remaining below the EPA MRDL of 4.0 mg/L. There was one instance in 2022 where chlorine was measured at 7.2 mg/L, which is well above the MRDL and that City operations staff quickly resolved the issue.

Figure 3-7. Sunningdale Finished Chlorine

3.3.9 Measured pH at both WTPs

The pH levels at both plants remain within the EPA secondary drinking water standard range of 6.5–8.5. Whiteway maintains a fairly stable average finished water pH of 7.9. Sunningdale maintains a lower average pH of 7.5. There is a trend in Sunningdale's data of increasing from approximately 7 pH to 8 pH over the course of several months, then dropping back down to 7, seen in **Figure 3-9**.

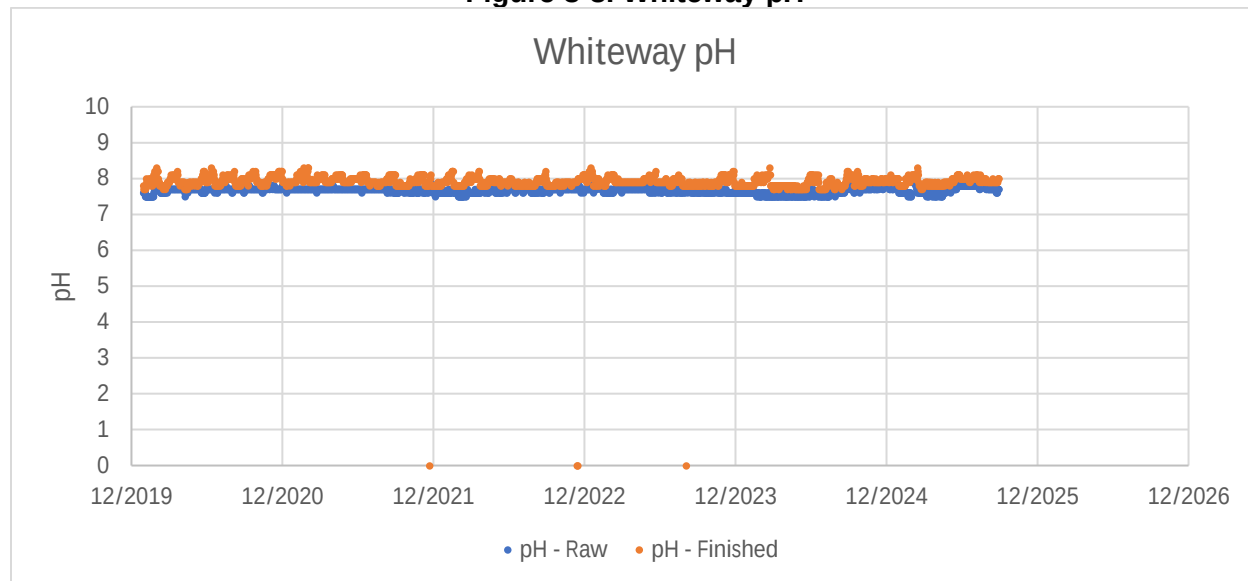
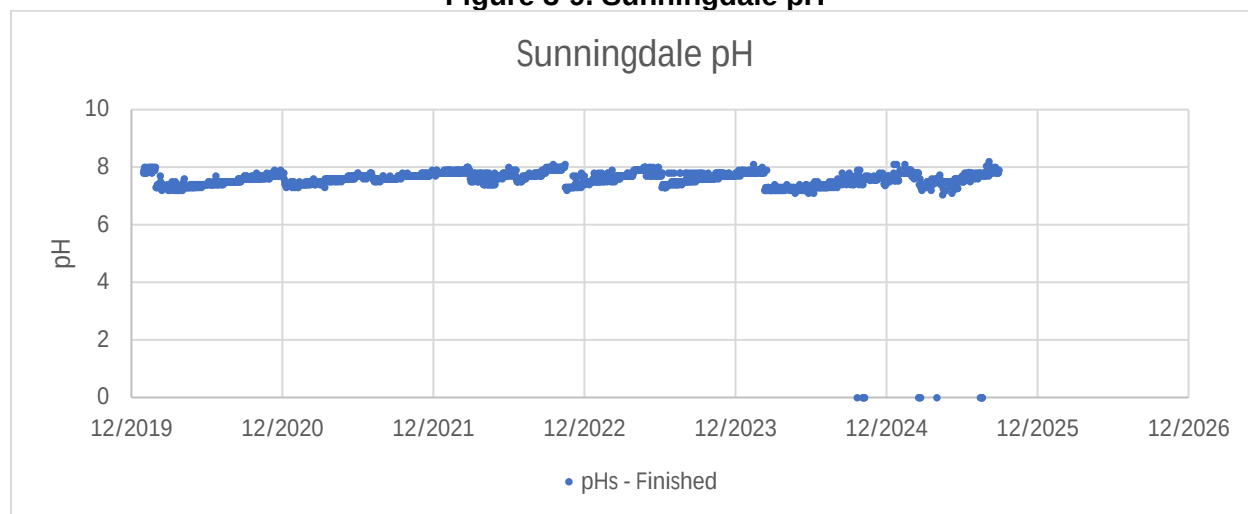
Figure 3-8. Whiteway pH

Figure 3-9. Sunningdale pH

3.3.10 Disinfection

Filtered water flows to the clearwell, where chlorine, and zinc orthophosphate are added, and then flows into several storage tanks (0.2, 0.5, 1.0 Million gallon-capacities). To meet contact time requirements for the 4-log virus inactivation by disinfection, the City uses the contact time provided by its three storage tanks downstream of the filter, while Sunningdale has a dedicated chlorine contact basin; Questions were raised by the City for the capacity of the chlorine contact basin, on whether it was 60,000 gal or 40,000 gal, so both volumes were analyzed. Calculations for the chlorine contact time (CT) of both WTPs can be seen below in **Tables 3-6 and 3-7**.

The CT time required for virus inactivation is a function of both pH and temperature, requiring more contact time as pH increases and as temperature decreases. Values for several temperatures in the typical pH operating range of the WTPs are listed in **Table 3-8**. The City's WTPs have ample contact time to achieve 4-log virus inactivation with free chlorine and Florida groundwater temperatures.

Table 3-6. CT Calculations for Whiteway

Parameter	Quantity	Unit
Combined Tank Volume	0.7	MG
	700000	Gal
Peak Hour Flow	5.04	MGD
	3500	gpm
Baffle Factor	0.1	<i>*very conservative</i>
Contact Time	20	min
Chlorine	2	mg/L
Chlorine Contact (CT)	40	min*mg/L

Table 3-7. CT Calculations for Sunningdale

Parameter	Quantity (0.06 MG)	Quantity (0.04 MG)	Unit
Tank Volume	0.06	0.04	MG
	60000	40000	Gal
Peak Hour Flow	4	4	MGD
	2778	2778	gpm
Baffle Factor	0.7	0.7	
Contact Time	15	10	min
Chlorine	1.5	1.5	mg/L
Chlorine Contact (CT)	23	15	min*mg/L

Table 3-8. CT Requirements (min*mg/L) for virus inactivation by free chlorine (pH 6-9)

Inactivation (Log)	Water Temperature (°C)															
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2	3.0	2.8	2.6	2.4	2.2	2.0	1.8	1.6	1.4	1.2	1.0	1.0	1.0	1.0	1.0	1.0
3	4.0	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.2	2.0	1.8	1.6	1.4	1.2	1.0
4	6.0	5.6	5.2	4.8	4.4	4.0	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.2	2.0

3.3.11 Residuals Handling and Disposal

The lime solids handling and disposal is inadequate for this system; larger lime retention/thickening ponds are needed to operate the process continuously and there is no room on the Whiteway WTP site for expansion. Alternate lime solids handling strategies are likely required that could include additional offsite property or complete retirement of the lime softening system.

3.4 Total Hardness Reduction Technologies

Lime softening, as well as other processes such as ion exchange, electrodialysis, nanofiltration (NF), reverse osmosis (RO), distillation and freezing may be employed to soften water. However, only the most widely used treatment alternatives such as lime softening, ion exchange and NF/RO are described here.

The main purpose of water softening by means of lime-soda ash or lime softening is to reduce the levels of calcium and magnesium in the finished water to a total hardness of 80 mg/l as CaCO₃. There are several alternatives to the softening process. These depend on the type of hardness, degree of softening, operational convenience, degree to which the lime sludge must be produced and desired savings in chemical costs. The alternatives include partial softening as practiced at the Whiteway WTF (hardness removal up to 30%), enhanced lime softening

(hardness removal 30% to 60%); lime-soda ash softening, caustic soda softening and softening with both lime and caustic soda.

Based on the functional groups bonded to the resin backbone, the four general types of ion exchange resins are (1) strong-acid cation (SAC), (2) weak-acid cation (WAC), (3) strong-base anion (SBA), and (4) weak-base anion (WBA). SAC resins are used for removing cations (e.g., calcium hardness) whereas SBA exchangers are increasingly being used to treat waters contaminated with nitrate, arsenic, and perchlorate ions and are usually operated in the chloride cycle, where the resin is regenerated with NaCl. More details on the PFAS selective SBA resins are provided in later sections. The ion exchange units can also be used to deionize water by allowing the water to flow continuously through a cation resin column and then through a strong base anionic resin column. The application of cation exchange to municipal systems for hardness reduction has been limited, with a few plants operational in Florida.

Nanofiltration (NF) is a pressure-driven membrane purification process whose characteristics fall between those of ultrafiltration and reverse osmosis. Unlike reverse osmosis, which accomplishes separation through a solution-diffusion process driven by osmotic pressure, NF accomplishes rejection by controlling diffusion, size exclusion, and electrostatic attraction/repulsion. NF is a proven advanced treatment technology implemented often for softening, removal of inorganic compounds, and synthetic organic compounds. NF is typically used in municipal drinking water applications for groundwater treatment, or in industrial applications to produce high-purity water. The capabilities of NF to remove organics are well documented. Many lime softening plants in Florida have incorporated NF in their treatment processes, primarily for softening and removal of dissolved organic carbon (DOC).

3.5 Treatment Process Conclusions

Whiteway WTP is providing aeration, filtration, and disinfection to their water. The facilities that are operational are doing a good job at treating the water to comply with drinking water regulations. Sunningdale WTP is providing disinfection and corrosion inhibition, with no other treatment.

In their current states, neither WTP is providing treatment that is effective in reducing emerging contaminant concentrations, nor are they reducing hardness, which is not a regulated water quality parameter, but causes quality of life issues for the end user. This makes addressing these two parameters a key focus for developing WTP upgrade alternatives.

4.0 PROCESS ALTERNATIVES

Process alternatives were developed to address key water treatment process concerns including, but are not limited to:

1. Required rehabilitations to the existing facility to maintain the facilities and/or upgrading the capacity of Whiteway to 6 MGD.
2. Comply with existing and future water quality regulations, with an importance on meeting the 2031 EPA PFAS MCL.
3. Incorporating solutions for reducing hardness to below 150 mg/L at both facilities.

As discussed in Chapter 1, EPA has released a compliance deadline for the implementation of solutions for PFAS reduction in public water systems by 2031. The existing processes at Whiteway and Sunningdale do not have a treatment process designed to remove PFAS from the source groundwater. It is important to note that future upgrades to the facilities should consider processes that treat PFAS to comply with the EPA deadline. Water treatment process alternatives were analyzed as follows to clarify required rehabilitation options and address non-treatment (PFAS) as well as PFAS treatment alternatives:

- Non-PFAS treatment alternatives are discussed in this Chapter 4.
- PFAS treatment process alternatives are presented in Appendix B, in conjunction with additional compliance discussion and PFAS bench- and pilot-testing results.

4.1 Process Alternatives (Non-PFAS) Overview

Several emerging and established technologies are available for removing hardness. Lime softening, as well as other processes such as ion exchange, electrodialysis, nanofiltration (NF), reverse osmosis (RO), distillation and freezing may be utilized to soften water. Established technologies for softening such as lime softening, ion exchange and NF/RO are the focus for the City of Temple Terrace's municipal potable water treatment.

With NF/RO membranes, the characteristics of brine/concentrates are predictable, and handling and treatment options are well understood. Hardness concentrations in NF/RO are approximately 6 to 12 times the concentration in influent water with some other dissolved solids removed from the treated water. For disposal of membrane concentrate, systems use surface water discharge, discharge to sanitary sewer or deep well injection, as is common in Florida. A small percentage of systems use land application, evaporation ponds, or recycling.

4.2 Baseline Design Assumptions and Criteria

Assumptions and criteria that factored into consideration for each alternative can be seen below in Table 4-1.

Table 4-1. Baseline Design Assumptions and Criteria

Table 1-2: Existing Design Assumptions and Criteria		
Design Criteria	Value	Notes/ Assumptions
Average Influent Hardness	329 mg/L	Based on Feb-Aug 2025 MORs; Average concentration prior to 2025 was approximately 275 mg/L. See Chapters 2 and 3.
Expected Design Flows		
Whiteway	4.0 MGD / 6.0 MGD	4.0 MGD is expected based on historical flows and demand projections; 6.0 MGD alternatives were evaluated for the City in addition. 95 th percentile historical flows were used for projections. See Chapter 2
Sunningdale	2.0 MGD	
Historical Average Daily Flow		
Whiteway	3.0 MGD	MORs report an average of 4.05 MGD of raw water pumped, and 3.91 MGD of treated water produced. 4.0 MGD was used for projections.
Sunningdale	1.0 MGD	
SWFWMD Permitted Withdrawal		
Averaged Daily	5.15 MGD	Based on flow projections, City will need to increase the permitted withdrawal in order to meet future demands.
Peak Monthly	5.817 MGD	
FDEP Rated Capacity		
Whiteway	5.04 MGD	
Sunningdale	3.96 MGD	

4.3 Alternatives Development

Alternatives were developed to meet the City's water quality goals primarily focused on reducing PFAS and hardness. Bench and pilot-studies conducted by CHA focusing on PFAS reduction is discussed in Appendix B. Only the most widely used treatment alternatives such as lime softening, ion exchange and NF/RO are described here.

The main purpose of water softening by means of lime-soda ash or lime softening is to reduce the levels of calcium and magnesium in the finished water to a total hardness of 150 mg/l as CaCO₃. There are several alternatives to the existing lime softening process depending on the type of hardness, degree of softening, operational convenience, solids handling limitations, site constraints and capital and operating costs. The alternatives include partial softening as practiced at the Whiteway WTP (hardness removal up to 30%), enhanced lime softening (hardness removal 30% to 60%); lime-soda ash softening, caustic soda softening and softening with both lime and caustic soda. It is important to note that alternatives that focus on hardness removal with no NF implementation will not be able to treat PFAS.

PROCESS ALTERNATIVES

Based on the functional groups bonded to the resin backbone, the four general types of exchange resins are (1) strong-acid cation (SAC), (2) weak-acid cation (WAC), (3) strong-base anion (SBA), and (4) weak-base anion (WBA). SAC resins are used for removing cations (e.g., calcium hardness) whereas SBA exchangers are increasingly being used to treat waters contaminated with nitrate, arsenic, and perchlorate ions and are usually operated in the chloride cycle, where the resin is regenerated with NaCl. More details on the PFAS selective SBA resins are provided in Appendix B. The ion exchange units can also be used to deionize water by allowing the water to flow continuously through a cation resin column and then through a strong base anionic resin column. The application of cation exchange to municipal systems for hardness reduction has been limited, with a few plants operational in Florida.

Nanofiltration (NF) and Reverse Osmosis (RO) NF are pressure-driven membrane purification processes whose characteristics fall between those of ultrafiltration and reverse osmosis. Unlike reverse osmosis, which accomplishes separation through a solution-diffusion process driven by osmotic pressure, NF accomplishes rejection by controlling diffusion, size exclusion, and electrostatic attraction/repulsion. NF is a proven advanced treatment technology implemented often for softening, removal of inorganic compounds, and synthetic organic compounds. NF is typically used in municipal drinking water applications for groundwater treatment, or in industrial applications to produce high-purity water. The capabilities of NF to remove organics are well documented. Many lime softening plants in Florida have incorporated NF in their treatment processes, primarily for softening and removal of dissolved organic carbon. To minimize concentrate volumes and minimize supply quantities, NF will focus on high recovery (90+%), e.g., Three-Stage RO, CCRO – Closed Circuit RO and FRRO – Flow Reversal RO.

Given the costs and challenges of managing PFAS in waste streams, it is critical to evaluate both established and emerging technologies in selecting processes for incorporation at the WTP(s). Ongoing RSSCT and pilot studies will help finalize the preferred treatment process and the master plan will be updated once these studies have concluded.

Key water quality parameters of concern in the City's groundwater include hardness and emerging contaminants. Alternatives were developed to meet the City's water quality goals primarily focused on reducing hardness and addressing pending emerging contaminant limits. WTP improvement alternatives were categorized as follows:

- Supply:
 - o Stay with existing wellfield
 - o Move wellfield to deeper groundwater zone, starting with one test well
 - o Potable water interconnection with City of Tampa or Hillsborough County
- Treatment:
 - o Softening treatment processes, hardness removal to goal of <150 mg/L

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- o Disinfection process (converting legacy chlorine gas systems to safer options)
 - o Emerging contaminant treatment processes
 - o Reliability and number of treatment trains
- Operational Efficiency, Asset Renewal Risk Reduction:
 - o WTP pressure coordination and optimize Telecom and Chinaberry optimization

Whiteway WTP

- **Common to All Alternatives**
 - o Rehabilitate non-softening treatment processes (i.e. gravity filters), controls, instruments
 - o Reconfigure into two dedicated treatment trains
 - o Upgrade plant electrical, security, communications and SCADA systems
 - o Convert the chlorine gas disinfection system to a safer sodium hypochlorite
- **Alternative WW-A (Status Quo)**
 - o Abandon Whiteway softening process for 0% total hardness removal
 - o No emerging contaminant removal
- **Alternative WW-B (Rehab Existing Lime Softening)**
 - o Rehabilitate existing lime softening process for 30% hardness removal
 - o No emerging contaminant removal
- **Alternative WW-C (New Pelletized, Ballasted Sand or IX-CO₂ Softening)**
 - o Replace lime softening/filtration process with two dedicated trains of pelletized lime softening or ion exchange softening with CO₂ regeneration to meet hardness goal
 - o No emerging contaminant removal
- **Alternative WW-D (New Hybrid Conventional and NF trains)**
 - o Replace lime softening/filtration process with one dedicated NF train and one train of pelletized or ballasted sand lime softening or IX softening with CO₂ regeneration
 - o Incidental NF emerging contaminant removal, concentrate management
- **Alternative WW-E (New ½ NF Softening, ½ Bypass to Filters)**
 - o Replace lime softening/filtration with two NF trains sized to treat 50% of flow
 - o Incidental NF emerging contaminant removal, concentrate management
- **Alternative WW-F (Full NF for PFAS AND Softening)**
 - o Replace lime softening/filtration with two NF trains to meet hardness goals
 - o Softening to meet city goals Sand , concentrate management
- **Alternative WW-G (Upgrade to 6 MGD Capacity)**

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- o No emerging contaminant removal
- o Rehabilitate existing filters to achieve production
- o Increase Capacity to 6 MGD
- **Alternative WW-H (Full NF for Softening and Upgrade to 6 MGD Capacity)**
 - o Replace lime softening/filtration with two NF trains to meet hardness goals
 - o Hardness contaminant removal, concentrate management
 - o Increase Capacity to 6 MGD

Sunningdale WTP

- **Common to All Alternatives**
 - o Rehabilitate existing treatment processes, controls, instruments
 - o Upgrade plant electrical, security, communications and SCADA systems
 - o Convert the chlorine gas disinfection system to a safer disinfection system, such as liquid sodium hypochlorite.
- **Alternative SD-A** – Continue with no softening process until the new NF plant comes online
- **Alternative SD-B** – Install two 1.0-mgd NF trains with supporting cartridge filtration, antiscalant, cleaning and concentrate treatment

While variations exist, these core alternatives represent solutions for consistent, PFAS compliance and reducing calcium/magnesium hardness. Consolidating the WTPs to the Whiteway WTP site is estimated to add \$10M to \$15M to any alternative capital cost due to expansion in well pumping/piping, distribution piping, pumping, lime softening and filtration processes to go from a max day capacity of 5.0 mgd to 6.0 mgd. Consolidation would fit well with initial nanofiltration skids that could be located at Sunningdale WTP and later moved, when needed to the Whiteway WTP to fully displace Sunningdale. WTP consolidation would reduce operations cost marginally.

Figure 4-1. Whiteway WTP Alternatives Process Flow Diagrams

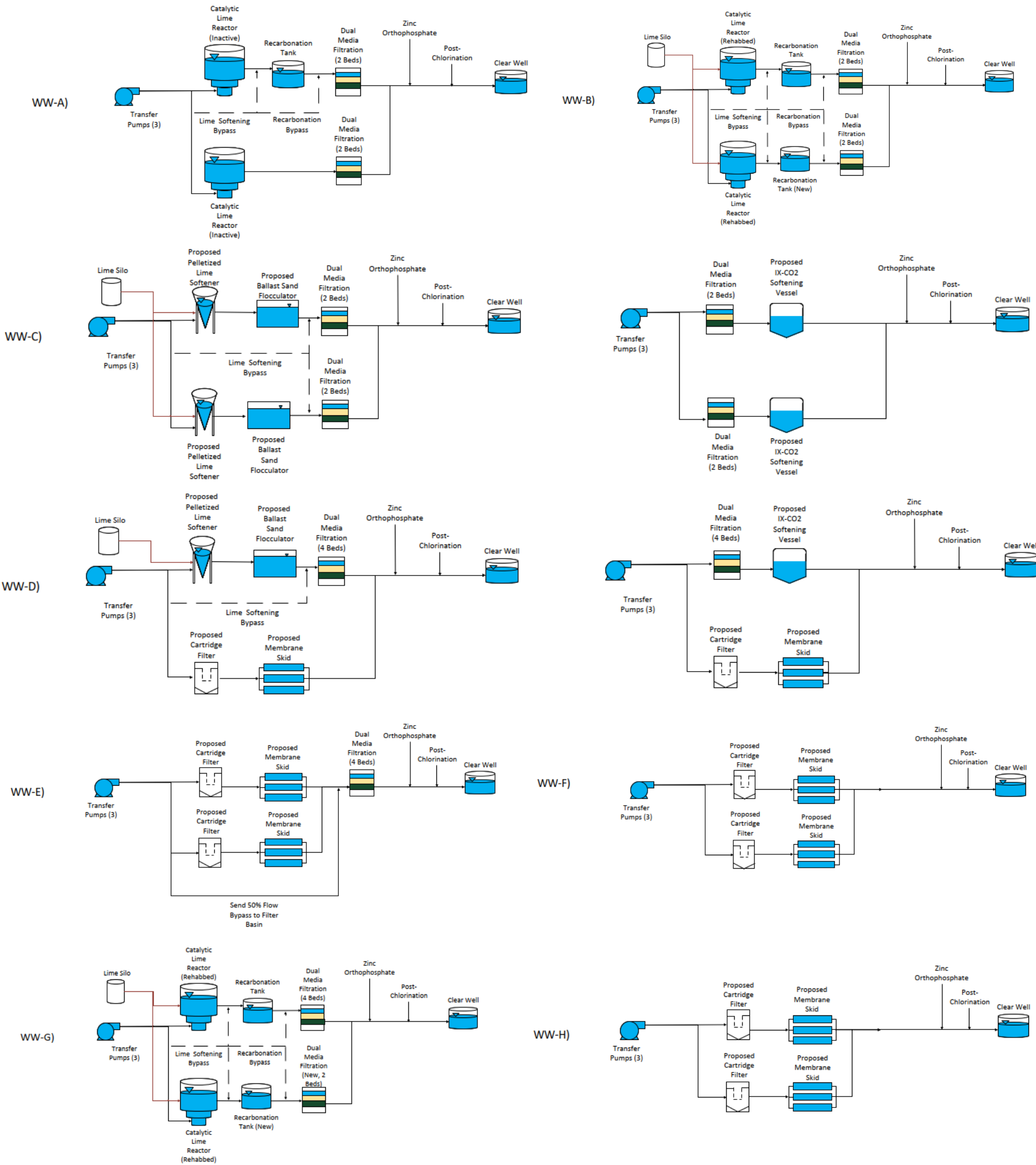
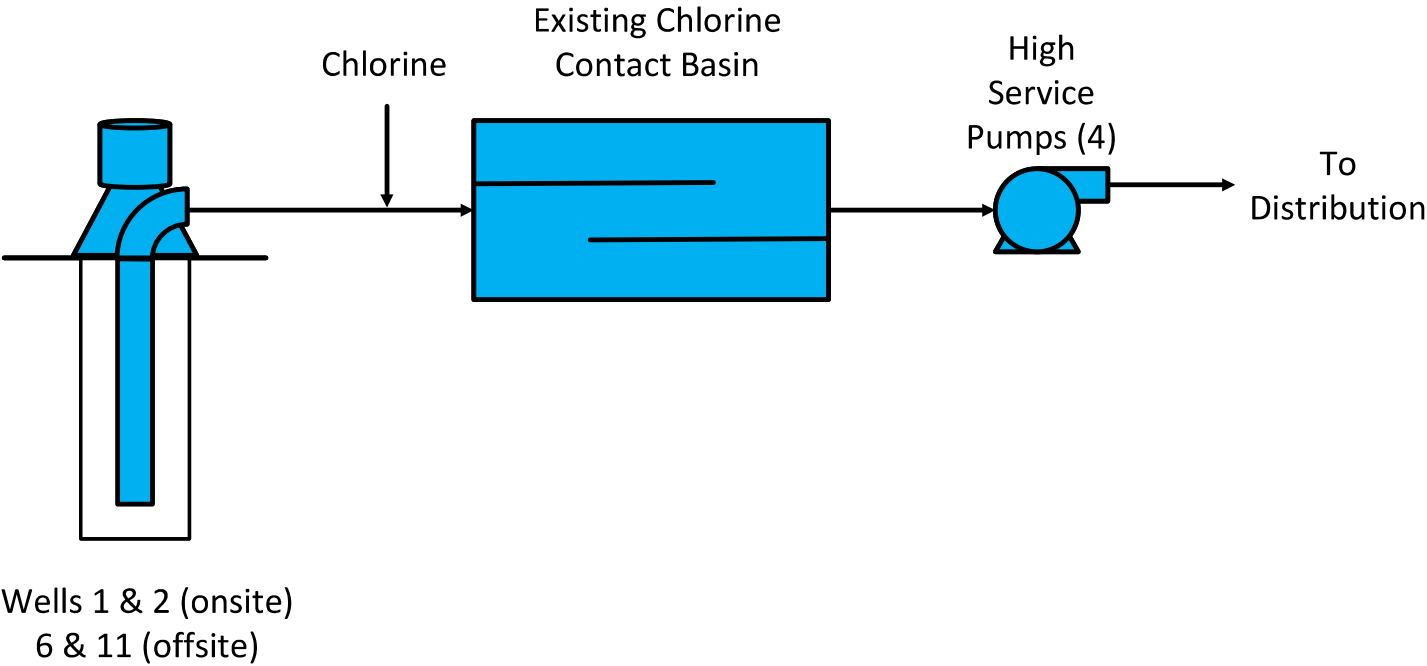
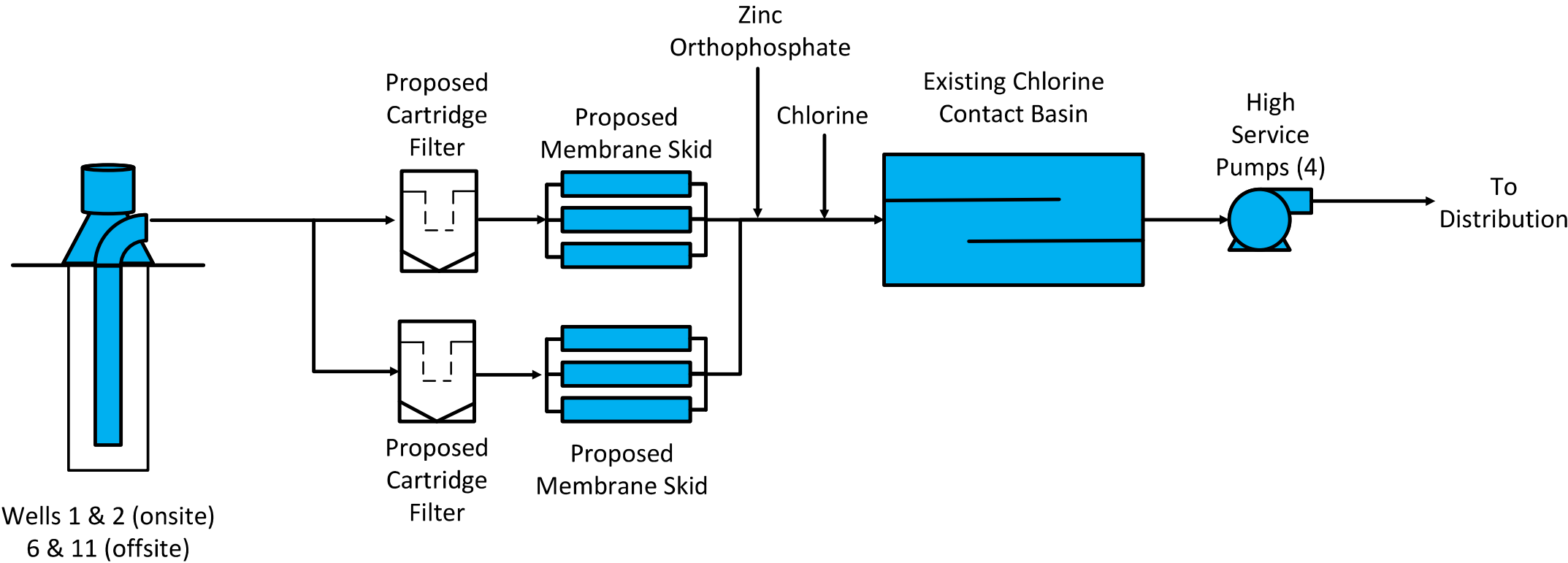


Figure 4-2. Alternative SD Process Flow Diagrams

SD-A)



SD-B)



4.4 Alternatives Evaluation (Non-PFAS)

4.4.1 Capital Cost Evaluation

Capital costs were estimated for each plant with established softening treatment alternatives. Also, note that costs for deep well injection of NF/RO concentrate are not included as PFAS removal is discussed in Appendix B. A deep well for the City of Temple Terrace would have a capital cost in the \$20M to \$25M range to accommodate up to 0.5 MGD of concentrate and \$0.2M/year operating cost.

4.4.2 Life Cycle Cost Evaluation

Capital costs were estimated for each WTP with established treatment alternatives. The alternative evaluation compared alternatives on life cycle costs and non-cost factors. Based on decision support tools, recent project costs and opinion estimates, the following alternatives and costs are provided. The life cycle cost analysis for Whiteway WTP is provided in Table 4-2 and Sunningdale WTP in Table 4-3.

Table 4-2. Whiteway WTP Process (sans PFAS) Alternative Life Cycle Cost Evaluation

Cost Category	WW-A Status Quo	WW-B Rehab Lime	WW-C Other Conv Soften	WW-D Hybrid Conv + NF	WW-E Full NF	WW-F Split NF	WW-G 6MGD Lime	WW-H 6MGD Full NF
MDD Treatment Capacity	5.0 mgd	5.0 mgd	5.0 mgd	5.0 mgd	5.0 mgd	5.0 mgd	6.0 mgd	6.0 mgd
Number of Trains	1	2	2	2	2	2	2	2
Capital Cost	\$4.0M	\$15.5M	\$21.5M	\$23.5M	\$24.0M	\$17.5M	\$36.5M	\$34.5M
Annual Operational Cost	\$0.6M	\$1.4M	\$1.6M	\$1.8M	\$2.0M	\$1.4M	\$1.7M	\$2.4M
Present Value	\$12.2M	\$34.5M	\$43.2M	\$48.0M	\$51.2M	\$36.5M	\$59.3M	\$67.1M
Equivalent Annual Cost (\$/Yr)	\$0.9M/Yr	\$2.5M/Yr	\$3.2M/Yr	\$3.5M/Yr	\$3.8M/Yr	\$2.7M/Yr	\$4.4M/Yr	\$4.9M/Yr
Equivalent Annual Cost (\$/kGal)	\$0.49/kGal	\$1.39/kGal	\$1.74/kGal	\$1.93/kGal	\$2.06/kGal	\$1.47/kGal	\$1.99/kGal	\$2.25/kGal

ASSUMPTIONS:

* NF Concentrate Disposal to DIW assumed for comparative purposes as this analysis does not include emerging contaminant removal (see PFAS appendix)

- Capital costs include furnishing and installing equipment and non-cost factors including 25% contingency
- Present values assume 20-year life with 4% inflation
- ADD = Average Daily Demand
- MDD = Maximum Daily Demand
- Does not include other WTP major R&R to existing equipment which is common to all alternatives

Table 4-3. Sunningdale WTP Process Alternative Life Cycle Cost Evaluation

Cost Category	SD-A Continue Status Quo	SD-B Add Nanofiltration*
MDD Treatment Capacity	3.96 mgd	2.20 mgd
Capital Cost	\$2.5M	\$15.0M
Annual Operational Cost	\$0.4M	\$0.8M
Present Value	\$7.9M	\$25.9M
Equivalent Annual Cost (\$/Yr)	\$0.6M/Yr	\$1.9M/Yr
Equivalent Annual Cost (\$/kGal)	\$0.40/kGal	\$2.37/kGal

ASSUMPTIONS:

**Assumed that concentrate would be discharged to sewer.
 -Capital costs include furnishing and installing equipment
 and non-cost factors including 25% contingency*

4.4.3 Non-Cost Factors

The non-cost factors boil down to providing the City's customers with high-quality potable water that they can feel proud of and safe to drink. Pros and cons of the two alternatives categories are provided in the table below.

- **Alternative WW-A (Status Quo)** provides no hardness reduction or emerging contaminant removal and therefore results in the lowest finished water quality performance, despite its operational simplicity and low capital and O&M costs. This alternative presents a high long-term risk of customer complaints, scaling in the distribution system, and limited flexibility to respond to evolving regulatory requirements.
- **Alternative WW-B (Rehabilitation of Existing Lime Softening)** provides modest hardness reduction of approximately 30%. This approach leverages existing infrastructure and avoids NF concentrate management; however, the level of hardness reduction may be insufficient to achieve long-term water quality objectives. In addition, this alternative does not address emerging contaminants and retains ongoing sludge

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handling and disposal requirements, although capital and O&M costs are lower than those NF alternatives.

- **Alternative WW-C (New Advanced Softening Processes)** achieves substantial hardness reduction without introducing NF concentrate management and represents a balanced solution between performance and cost. Capital and O&M costs are moderate relative to other alternatives; however, the absence of emerging contaminant treatment limits its ability to address potential future regulatory requirements.
- **Alternative WW-D (Hybrid Conventional and NF Trains)** provides strong overall water quality performance and partial mitigation of emerging contaminants but requires higher capital and O&M expenditures due to the dual-process configuration. Increased operational complexity and the need to manage both softening residuals and NF concentrate represent key implementation challenges.
- **Alternative WW-E (Partial NF with Blending)** provides a phased approach to NF implementation, with NF treating approximately 50 percent of plant flow and the remaining flow bypassing softening. This alternative achieves moderate hardness reduction through blending and partial emerging contaminant mitigation but still requires concentrate management and is sensitive to raw water variability and blending ratios.
- **Alternative WW-F (Full NF Softening)** achieves the highest level of hardness reduction and provides the strongest positioning for potential emerging contaminant compliance. This alternative involves the highest capital and O&M costs and requires comprehensive concentrate management strategies; however, it delivers the most robust and consistent long-term finished water quality among the evaluated options.
- **Alternative WW-G (Rehabilitation of Existing Lime Softening)** provides modest hardness reduction of approximately 30%. This approach leverages existing infrastructure and avoids NF concentrate management; however, the level of hardness reduction may be insufficient to achieve long-term water quality objectives. In addition, this alternative does not address emerging contaminants and retains ongoing sludge handling and disposal requirements, O&M costs are lower than those NF alternatives. Capital costs are quite high, associated with expanding the plant to 6 MGD.
- **Alternative WW-H (Full NF for Softening and Upgrade to 6 MGD Capacity)** achieves the highest level of hardness reduction and provides the strongest positioning for potential emerging contaminant compliance. This alternative involves the highest capital and O&M costs and requires comprehensive concentrate management strategies; however, it delivers the most robust and consistent long-term finished water quality among the evaluated options, with plenty of capacity for future growth.
- **Alternative SD-A (Continue with No Softening Process)** represents the lowest capital and operating cost option and maintains operational simplicity. However, this alternative provides no hardness reduction or emerging contaminant removal, resulting in limited improvement in finished water quality. Over the long term, it will face risk of scaling in the distribution system, potential customer complaints, and reduced flexibility to respond to

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evolving regulatory requirements. While financially attractive in the near term, this alternative does not support long-term water quality resiliency goals.

- **Alternative SD-B (Install Two 1.0-mgd NF Trains)** provides substantial reduction of hardness and emerging contaminants, significantly improving finished water quality and positioning the facility for potential future regulatory requirements. This alternative requires higher capital and O&M costs and introduces additional operational complexity, particularly related to NF system operation and concentrate management. This alternative offers the most robust long-term solution from a water quality and regulatory resilience perspective.

4.5 Alternatives Evaluation Conclusions

Multiple categories of alternatives are available to improve finished potable water quality and comply with 2031 PFAS regulations. The available alternatives include multiple dimensions of system planning, including facility location, source water development, treatment process enhancements, and residuals management. Conclusions from the evaluation are summarized by alternative component as follows:

Supply Sources

1. Existing wellfields are productive and produce a water conducive to NF/RO treatment with low turbidity, hydrogen sulfide and total organic carbon.
2. Exploring a new well/wellfield may be beneficial as a non-treatment alternative, comes at a capital cost of \$5M per well and may also create need for additional treatment processes including hydrogen sulfide and total organic carbon removal.

Treatment Locations

3. Space is an issue at the Sunningdale WTP site, and the City has indicated that acquiring more land is not a feasible option and Sunningdale does not currently have any facilities for removing hardness.
4. Retiring Sunningdale WTP and consolidating to Whiteway WTP is feasible, but costly with Whiteway requiring permitted capacity expansion from 5.0 to 6.0 MGD as well as wellfield pump and transmission modifications and finished water distribution improvements adding several million dollars to the cost.
5. An alternative way to handle Sunningdale is to locate hardness removal skids that could be relocated to Whiteway WTP when the City is ready and has funds to consolidate.

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Softening Technologies

6. Lime softening is fading from water treatment industry due to its large footprint, high chemical usage, difficult chemical handling and solids disposal issues. Many of the softening treatment plants on the east and west coast of Florida have been replaced by membrane (nanofiltration) softening systems.
7. A secondary concentration process to treat membrane concentrate or high PFAS concentration source waters.

Cost Factors

8. At Whiteway, the lower cost softening option will be to keep the existing lime softening reactors in place. The \$5.5M capital cost estimate to rehabilitate the lime, filtration and recarbonation system makes the existing lime rehab cost relatively equal with the ½ flow NF option.

Non-Cost Factors

9. Nanofiltration accomplishes the City's treatment goals in one single process, eliminating the need for the lime softening process and far outperforming in softening capabilities.

5.0 CONDITION ASSESSMENT

5.1 Methodology

An asset-management framework analogous to those used in transportation infrastructure—such as the rating, deterioration, and renewal principles—can be directly applied to complex water-treatment facilities. The components of a water-treatment plant (pumps, tanks, mixers, blowers, injection systems, and controls) experience predictable deterioration, occasional sudden failures, and gradual obsolescence. For high-reliability systems such as potable water treatment, maintaining effective serviceability requires:

- A standardized condition-rating system
- A method to convert condition into capital risk and estimated renewal cost
- Deterioration curves that can forecast future needs
- A process for identifying critical vulnerabilities and potential hazards
- A means to evaluate capital spending strategies (e.g., like-new reconstruction vs. targeted rehabilitation)

Available drawings, equipment data, and maintenance data were collected from the City and reviewed to gain understanding of the WTPs systems and equipment. A visual inspection of each unit process in the WTPs and interviews with operational staff were performed to assess condition, focusing on the physical condition and remaining lifespan of different components. Remaining life expectancy was estimated by comparing install date with current date versus life expectancy and adjusting based on physical inspection. Inputs were collated and processed to assess the likelihood of failure, which, combined with the criticality of the component to the overall treatment process, calculates a risk score to help determine component needs and priority for replacement.

The condition assessment focuses on four major aspects: Structure and foundation, Process (capacity and condition of process equipment), electrical (compliance, capacity, condition), and instrumentation and control. Due to budget constraints the structural and foundation assessment was cursory; configured to identify obvious needs and areas for future, detailed evaluations.

The CHA team performed a walkthrough of the Whiteway WTP accompanied by operators and several of the City's staff, getting a thorough description of how the plant operates, what parts are working and what parts are not. Photos were taken to document all the observations made during the walkthrough. Sunningdale WTP had a separate walkthrough performed following the same principles.

5.2 Existing Asset Management Program

The City tracks WTP maintenance needs to annually develop a capital improvements plan. The City prioritizes based on safety and operational needs.

5.3 Whiteway WTP Condition Assessment Findings

5.3.1 Wellfields and Raw Water Transmission Infrastructure Condition

According to City records, wellfield pumps were last rebuilt ranging from 1998 to 2008, with an estimated remaining rebuild life of 5-10 years. The motors are much newer, being replaced between 2016-2022. The blending and aeration tank exhibits several signs of deterioration. Paint bubbling and concrete spalling are visible on tank's north side, suggesting a possible leak. The tank sub-base tank shows evident wear, and previous base grouting repairs are crumbling. The overflow pipe junction has severely corroded fittings, and flange housing is warping. The main cut-off valve to the tank is also corroded, with nearly all paint stripped away.

It is recommended that the City schedule rebuilds for the pump motors, given that the average age of the current rebuilds is approximately 20 years. Attention should be given to addressing the erosion observed at the aeration tank sub-base, especially on the north side where previous repair efforts have not been successful. The corroded fittings at the overflow pipe junction and the warped flange housing require inspection and appropriate repairs to restore their integrity. The main cut-off valve to the tank, which is heavily corroded and has lost nearly all of its protective paint, should be replaced or refurbished to prevent further deterioration and ensure reliable operation.



Figure 5-1. Aeration Tank Deficiencies

5.3.2 Plant Hydraulics

The plant hydraulics were reviewed for condition-related items that could affect the capacity of the plant. The existing system was evaluated based on as-built drawings, input from operations staff, and field measurement in Visual Hydraulics. Plant hydraulics were calculated at intervals of 3, 3.5, 3.9, 4, 5, and 6 MGD. It should be noted that 5 and 6 MGD were evaluated as possible future expansion scenarios to determine hydraulic constraints in the system.

The output from the model was used to build the Plant Hydraulics figure in **Figure 5-3**. The hydraulic profile outlines typical flow through the plant at various flows.

Based on analysis of the model results, there are several possible constraints with both the existing flow and potential future flow scenarios as outlined below.

- The existing raw water pumps conveying water from the raw storage tank to the lime tanks have a firm capacity of 5 MGD.
- Additionally, the raw water pumps discharge into 10-inch lines which are designed to handle up to 4 MGD of flow. After 4 MGD, the flows inside the 10-inch pipes can reach velocities greater than 6 ft/s. The existing piping has a 10-inch bypass pipe that conveys water to the 16-inch lime reactor bypass. This bypass can be used to relieve flows from the 10-inch pipe reducing the flows to 5.7 ft/s at full flow through the three ten-inch pipes at 6 MGD. This would require bypassing of the lime reactors, which may increase hardness in the system if the reactors are in operation.
- The existing lime reactors are rated for 2.52 MGD, with a combined rating of approximately 5.04 MGD. Currently, the lime reactors are run without lime softening; after starting the system back up the hydraulics of the system may change depending on the efficiency of the reactors. With the existing configuration, each reactor is able to handle approximately 2.6 MGD before the weirs are overloaded and the tanks are at risk of overflowing.
- The recarbonation (recarb) tank is used for water storage and dosing of orthophosphate while the lime reactors are not in operation. The existing bypass for the recarbonation tank is non-operational due to valve into the bypass being broken. Based on model results and field observations, the tank launders get overloaded at 3.1 – 3.2 MGD. Analysis of model results indicated that the tank overflows the top of the basin at approximately 3.9 MGD. Potential issues causing the flow are listed below.
 - o The launders in the tanks have invert elevations of 108.85-ft, with the top of the tank being approximately 110.0-ft. Based on model analysis, the tank is rated for

flows of 3.4 MGD, additional flows into the basin will overload the launders and potentially overflow the tank.

- o The recarbonation basin's effluent box is a potential constraint on the system, the cross-sectional area of the effluent box is less than the cross-sectional area of a 16-inch pipe resulting in a potential back up of water in the tank.
- o After a field visit for model calibration, it was determined that the flow from the tank is being backed up at the effluent of the tank. A potential cause of this is scaling in the 16-inch effluent pipe resulting in lower discharge from the tank.
- The existing Greenleaf filter is constrained to 5 MGD, additional flow to the basin may result in higher loading rates for the filters and reducing filter efficiency.

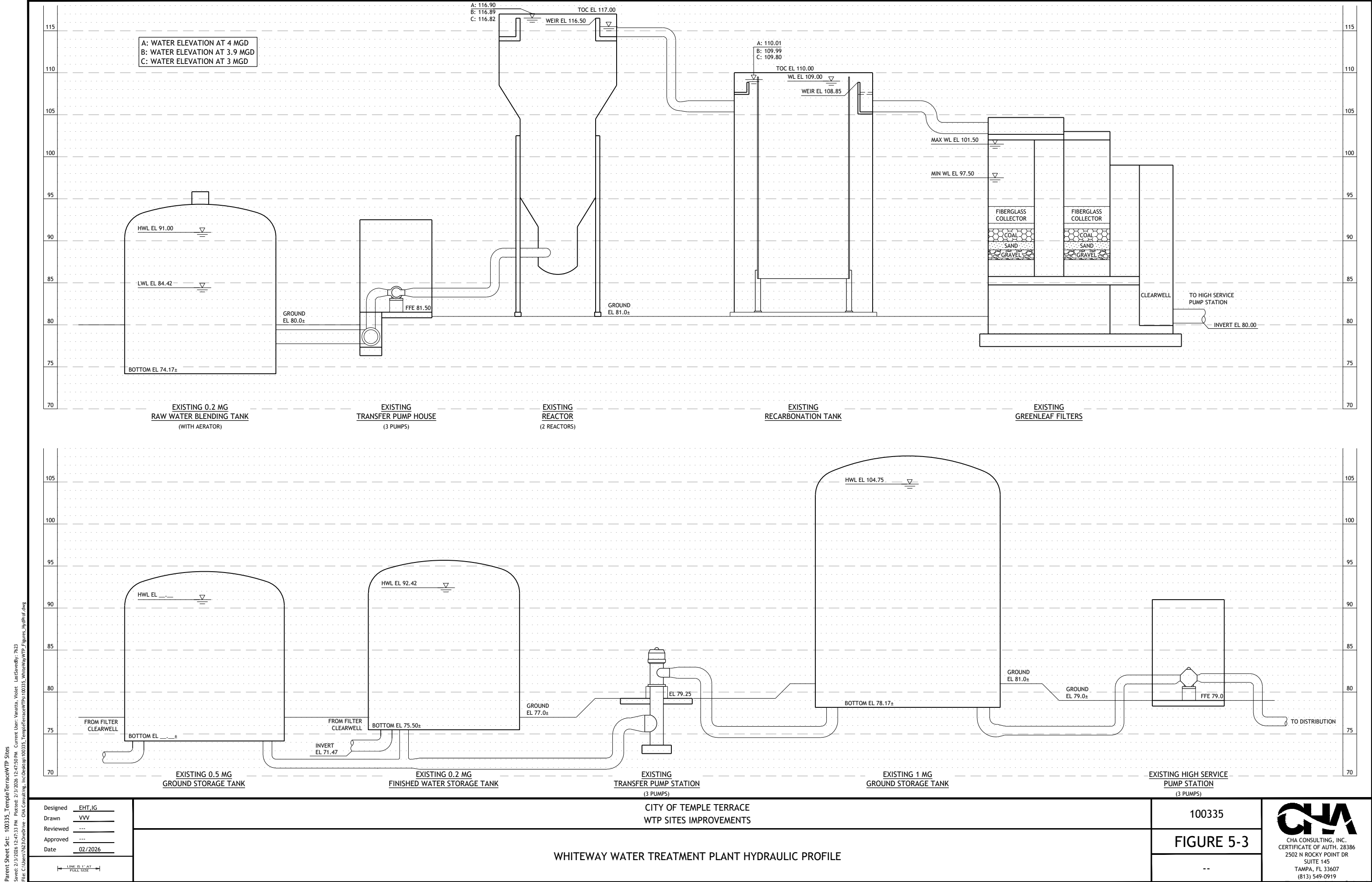
5.3.3 Lime Softening Infrastructure Condition

The lime storage and handling systems show significant corrosion on electrical equipment, control panels, and devices, many of which appear to have exceeded their useful electrical lifespan. PVC conduits inside the warehouse exhibit strapping deficiencies. The lime slakers and mixing equipment are housed in a confined space with no ventilation for dry lime, resulting in heavy lime powder accumulation throughout the room. Numerous support beams are corroded at their bases. The clarifiers and softening basins include two reactors, with sludge removal achieved through sand dredging via a bottom pipe based on pressure or operational timing.

The lime softening system currently requires restoration of functionality, as both reactors are offline, and water is bypassing treatment entirely. Note that even when functional, the lime reactors are unlikely to be able to reduce hardness from the current levels to the City's goal, from 350 mg/L to below 150 mg/L. It is necessary to replace or refurbish the corroded electrical equipment and to ensure that the PVC conduits inside the warehouse are properly strapped to prevent deficiencies. Improving ventilation in the lime slaker room is important to reduce the accumulation of lime powder, which has become heavy due to the confined space and lack of airflow. Additionally, the corroded support beams, particularly at their bases, should be inspected and reinforced as needed to maintain the structural integrity of the system.



Figure 5-2. Lime Slaker & Slurry System



5.3.4 Filtration Infrastructure Condition

The filtration system consists of four dual-media filter beds. Two pillars supporting the walkway above the filter beds are completely rusted and detached, posing a structural hazard and should be replaced or repaired to ensure safety and stability. The turbidity meters associated with the filters are currently non-functional, which prevents monitoring of effluent quality; therefore, replacement of these meters is recommended to maintain effective filtration performance. Additionally, the filtration system lacks the capability to isolate individual filter beds in the event of a failure, and implementing such isolation capability would improve operational flexibility. The filter basin is limited to 5 MGD at full capacity, or 3.75 MGD with one unit out of service. As the filter basin is not modular, extensive construction would be required in order to increase its capacity to 6 MGD.

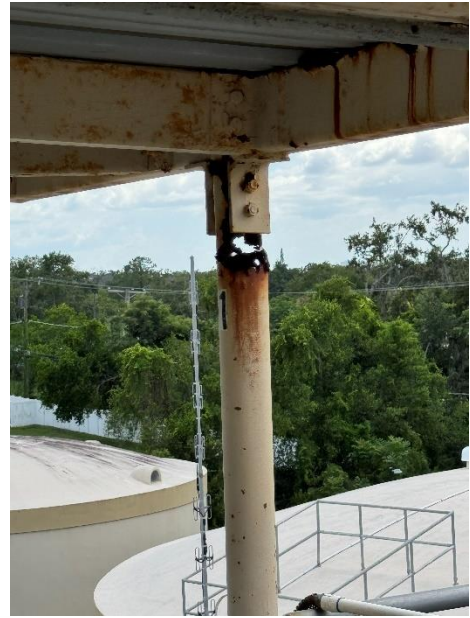


Figure 5-4. Rusted Support on Filter Basin Catwalk

5.3.5 Backwash Pumping and Air Scour Infrastructure Condition

The backwash system includes four pumps: one backwash pump, one surface wash pump, and two filter control vacuum pumps. Current capacity of the backwash pump is insufficient, requiring multiple backwash cycles to achieve the intended effectiveness. However, these additional cycles are typically not performed. Turbidity meters remain non-functional.

Upgrading the backwash pump capacity is recommended, along with developing a protocol to ensure multiple backwash cycles are performed when necessary to maintain filtration effectiveness.

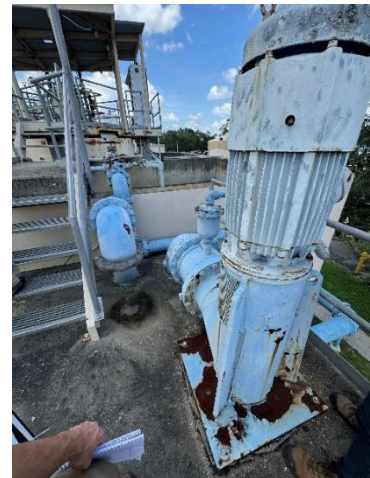


Figure 5-5. Filter Backwash Pump

5.3.6 Finished Water Storage Infrastructure Condition

The filtered water moves over an overflow weir to the clearwell, where post-chlorine injection occurs. The water then is transported to two tanks which provide chlorine contact time: a 0.2 MG tank, and a 0.5 MG tank. Water is pumped to a 1.0 MG tank for storage before being pumped to the distribution system. The finished water storage tanks are in good condition.

5.3.7 High Service Pumping Infrastructure Condition

- High Service Pumps
 - o Number: 6 high service pumps
 - o Age range: Motors serviced between 2019 and 2023
 - o Evidence of wear, cavitation, vibration: Pinhole Leak observed from one of the high service pumps. Some pressure gauges are leaking.
- Transfer Pumps (Finished Water)
 - o Transfer pumps and panelboards are in open air. Pumps and electrical equipment are exposed to hazards such as lightning and wind-borne debris.
- Motor Control Centers
 - o Code compliance: Some panelboards show signs of corrosion; most of the electrical equipment seems to have exceeded their electrical lifespan; 1000A Main Breaker passed two Factory Tests, the second one being dated on 06/15/20 as per a label shown on the Front Door of the cabinet; exterior luminaire cover is missing; there are control and/or security cables which are not properly supported; communication and control cables are installed without proper support and disorganized.

Notes

Leak observed from one high service pump; electrical equipment shows signs of corrosion and exceeded lifespan; cables not properly supported; transfer pumps and high service pump coatings generally in good condition with some minor defects.

Infrastructure Condition

The high service pumps, raw transfer pumps, and finished transfer pumps have firm capacities of 5.47 MGD, 5.04 MGD, and 5.18 MGD, respectively. Upgrading the existing pumps or installing an additional pump at each station would be necessary to accommodate 6 MGD of production.

There are four transfer pumps which transfer water between the smaller and larger ground storage tanks, in addition to the high service pumping system which includes six pumps that send water to the distribution system; motors were last serviced between 2019 and 2023. Signs of cavitation, wear, or vibrations were detected in the high service pumps as a pinhole leak was observed on one pump, and some pressure gauges were leaking. Transfer pumps and panelboards are located outdoors, exposing them to hazards such as lightning and wind-borne debris. Motor control centers show corrosion, and most electrical equipment appears to have exceeded its lifespan. Additional issues include missing luminaire covers and improperly supported control and security cables.

Recommended Actions

1. Repair pinhole leak on the affected high service pump and address leaking pressure gauges.
2. Replace or refurbish corroded electrical equipment and panelboards.
3. Ensure proper support and organization of control and communication cables.
4. Evaluate protective measures for outdoor pumps and electrical equipment to mitigate environmental hazards.

5.3.8 Chemical Storage and Feed Systems

Infrastructure Condition

Chemical storage includes pre-chlorination prior to the aeration tank, post-chlorination after filtration, and zinc orthophosphate dosing in the recarbonation tank. Fluoride is no longer injected; conduits, junction boxes, straps, and luminaires are also corroded, and the cable feeding the Fluoride Transfer Pump lacks proper support. There is no backup containment for chemical tanks, which are generally stored in small CMU buildings with single entrances or roll-down shop doors. Eyewash stations are located outside chemical buildings. No spill response equipment was noted.

- Chemical Storage Tanks
 - o Chemical types: Pre-Chlorination (injected before aeration tank, back corner behind aeration tank); Post-chlorine (injected after filter in clear well); Zinc Orthophosphate corrosion inhibitor (added in Recarb tank). Fluoride no longer injected to clearwell.
 - o Containment integrity: No backup containment for chemical tanks.
 - o Additional observations: Fluoride Room - most of the electrical equipment seems to have exceeded their electrical lifespan; conduits, electrical equipment, junction boxes, straps, and luminaires exhibit signs of corrosion; there is a cable feeding the Fluoride Transfer Pump which is not supported.

Safety Systems

- Ventilation Systems
 - o Chemical tanks stored in CMU buildings small footprints; most have with single exit/entrances or roll-down shop doors.
- Emergency Equipment
 - o Eyewash/shower stations: Eyewash stations located outside of chemical buildings.
 - o Spill response equipment: None noted.

Notes

Fluoride Transfer Pump cable is not supported; electrical equipment in Fluoride Room shows corrosion and has exceeded lifespan. It is understood that the City is retiring the fluoride system at both WTPs.

The City will need to evaluate if the existing chlorine system can feed the required chlorine dosage for 6 MGD of production in the current treatment process. The City has expressed desires to move to liquid sodium hypochlorite or chlorine gas. If the City chooses to implement nanofiltration, this will be a necessary change; the City should size the system for 6 MGD when converting.

Recommended Actions

1. Due to legislation preventing fluoride addition to drinking water, the city is in the process of removing the fluoride equipment, making these issues less urgent.
2. Install secondary containment for chemical tanks to prevent environmental hazards.
3. Provide spill response equipment in chemical storage areas.

5.3.9 Electrical System

The main electrical service throughout the facility shows widespread signs of corrosion on most electrical equipment, with many components appearing to have exceeded their expected electrical lifespan. Several electrical conduits and cabinets are heavily rusted, indicating the need for attention and maintenance. The backup power generation system includes a 600 kW CAT engine generator supported by a 1,000-gallon aboveground diesel fuel tank, which shows signs of aging. The generator is used frequently during hurricane season, and as a result, routine testing is typically not performed.

Regarding the distribution panels, visual inspection reveals code compliance issues such as missing knockout seals on equipment and junction boxes, and some panelboards lack their latches. Additionally, a stepdown transformer feeding a panelboard located in the corridor of the office area exhibits a broken metallic greenfield, which requires repair. From a safety and compliance perspective, the main distribution panel located in the electrical closet at the office corridor exhibits a cut-out ground conductor, posing a risk in the event of a short circuit. Furthermore, the presence of the required electrode grounding conductor in the main disconnect switch on the west wall of the building could not be verified, indicating a potential safety concern that should be addressed.

Notes

1. Main Distribution Panel ground conductor cut out creating short circuit risk; grounding system requires immediate revision; recommendation is revision of all grounding system in Administration Building as soon as possible
2. Widespread corrosion throughout facility
3. Equipment exceeded electrical lifespan
4. Missing knockout seals; missing panelboard latches
5. Several conduits and cabinets very rusted
6. There is a disconnect switch near two Condensing Units by East exterior wall of Administration Building that has a broken flexible conduit with potential conductors laying on the grass
7. PVC conduits with strapping deficiencies; fluorescent luminaires in warehouse without covers and/or lamps need replacement, internal wiring not covered; communication and control cables installed without proper support and disorganized
8. Two conduits from original electrical building service missing required caps (Dungeon Building)
9. Conduits, equipment, junction boxes, straps and luminaires exhibit severe grade of corrosion in Filter Tank (Elevated)
10. Recarb Tank electrical equipment shows signs of corrosion

The Whiteway and Sunningdale WTPs electrical feed systems' capacities will likely need to be upgraded to handle future treatment pumping and potentially higher capacity flows. Electrical feed upgrades will be good opportunity to explore benefits of redundant feeds and potential medium voltage loop to increase efficiency and redundancy.

Figure 5-6. Whiteway Electrical Riser Diagram

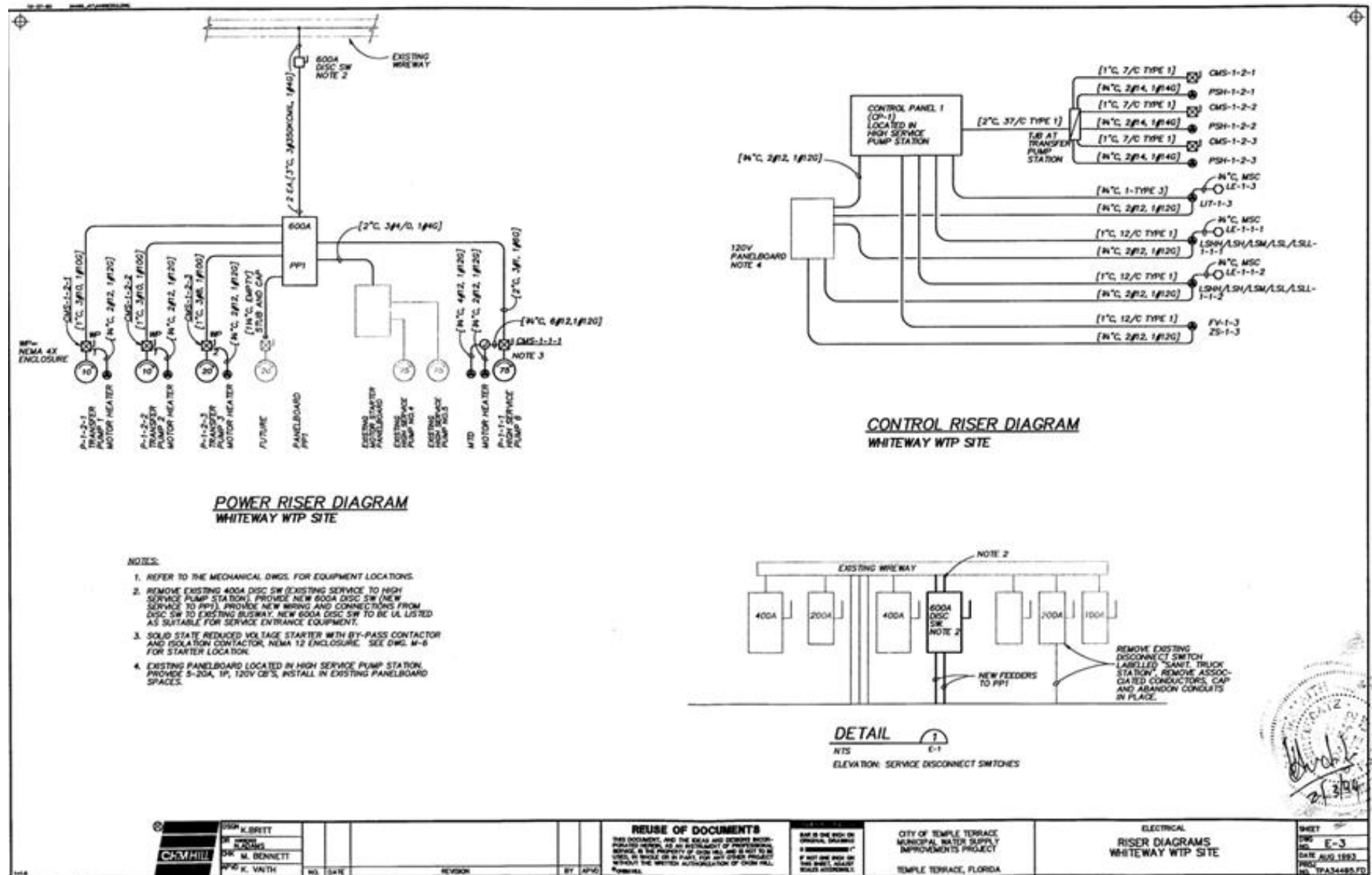


Table 5-1. Urgent Whiteway Electrical Deficiencies

Whiteway Urgent Electrical Action Items	Photos
Fix electrode grounding conductor on main service at administration building	
Disconnect Switch on exterior wall of administration building has broken conduit with a conductor lying in grass -- potential shock hazard	
Multiple electrical equipment such as junction boxes, disconnect switches and lighting fixtures need knockout seals and bulb replacement for proper functioning through the Whiteway WTP facility.	

5.4 Whiteway WTP Condition Evaluation

The uploaded methodology emphasizes that condition ratings are a combination of technical measurement and expert judgement, and that they are essential for forecasting future needs. In the Whiteway WTP context, each major asset was rated on a 1–5 scale, where:

- 5 = Excellent
- 4 = Good
- 3 = Fair
- 2 = Poor
- 1 = Failed or Critical

The asset rating scores reflect mechanical integrity, remaining useful life, functional adequacy, and operational risk, consistent with the rating-descriptive systems discussed in the methodology.

Each asset was given an additional scoring for “consequence of failure” (1-5), based largely on the resilience of the system – i.e., the redundancy of the system and whether the treatment system would be shut down in the event of failure. The condition score and consequence of failure score were then averaged to get an overall risk score for each asset (**Table 5-2**).

The average condition across all inventoried assets at Whiteway WTP is: Average Condition Score = 3 (“Fair”). A “Fair” score indicates:

- Whiteway WTP continues to function as designed.
- Some components show observable deterioration affecting performance or reliability.
- Without intervention, a number of assets will fall into “Poor” condition within the next 5–10 years.
- Operational risks (unplanned downtime, reduced treatment resilience, and costly emergency repairs) begin to increase.

The resulting score is the anchor for the capital-planning scenarios presented in Figure 5-1.

5.4.1 Renewal Cost Curve and Capital Planning Scenarios

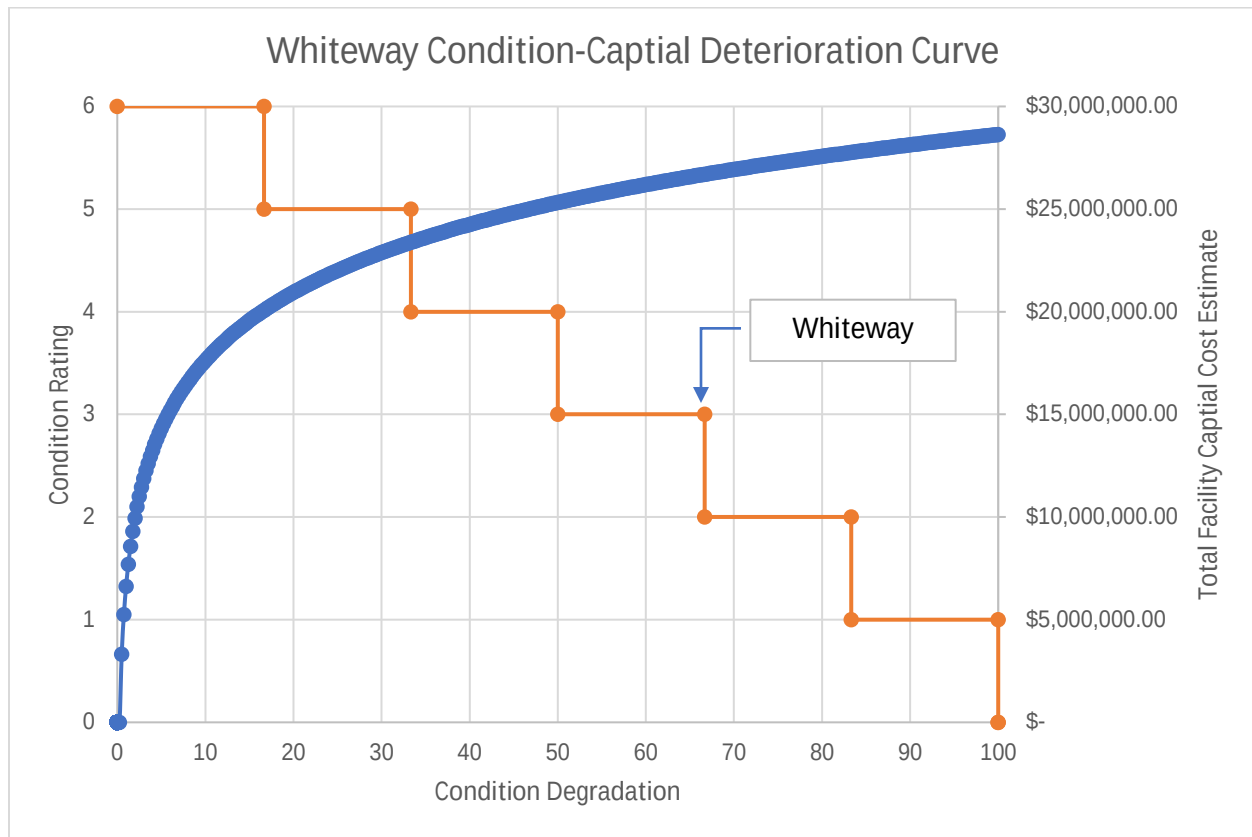
Figure 5-7 represents a convex deterioration-cost relationship. As conditions decline, the marginal cost of restoring the facility to higher performance levels increases rapidly. This is typical for treatment plants:

- Minor wear early in the lifecycle can be corrected with low-cost rehabilitation.
- Mid-life deterioration requires component renewal.
- Late-life deterioration requires full replacement, which is exponentially more expensive.

This convex shape mirrors the physical deterioration curves discussed in the methodology, where

structure (or asset) condition drops slowly at first, then accelerates as age accumulates.

Figure 5-7. Whiteway Condition-Capital Deterioration Curve



Each step corresponds to a renewal action:

- Score 6 → 5: Light rehabilitation
- Score 5 → 4: Mechanical refurbishment
- Score 4 → 3: Subsystem-level renewal
- Score 3 → 2: Major refurbishment
- Score 2 → 1/0: Full replacement

The stepwise renewal action ranking mirrors the defect/action methodology where each condition state triggers a specific response window.

5.4.2 Position of the WTP on the Deterioration Curve

Analysis has identified Whiteway WTP's **current condition state as (Score 3)** on the cost curve. This confirms:

WTP CONDITION ASSESSMENT

- The plant is at a **mid-life turning point**.
- Rehabilitation costs to reach “Good” condition are **≈ \$4.9M**.
- Replacement-level investment (“Like New”) would require **≈ \$14.3M**.

This mirrors structural-asset principles: once a facility reaches the mid-deterioration zone, capital investments become necessary to avoid high-cost terminal deterioration (see “Convex deterioration models” in the methodology).

The step transitions (6→5→4→3→2→1) reflect the “action-oriented” inspection philosophy:

- **Scores 5–6:** Routine maintenance
- **Score 4:** Preventive rehabilitation window
- **Score 3:** Major rehabilitation window
- **Scores 1–2:** Emergency renewal or replacement

Whiteway WTP is already in the major rehabilitation window, meaning capital action is timely and appropriate.

5.4.3 Capital Investment Strategy Implications

The methodology emphasizes comparing strategies such as:

- Steady-State Capital Investment
- Deferred maintenance
- Preventive rehabilitation
- Full replacement

Steady-State Rehabilitation Capital Investment

- \$2.0M investment over the next 10 years
- Does not improve the existing condition of assets, only maintains their current state.
- Lower short-run capital investment strategy that will increase O&M expenditure in response to maintaining lower asset condition scores.

Condition Improvement Rehabilitation Strategy

- \$4.9M investment to raise condition from **Fair** → **Good**
- Lower long-term costs
- Reduced service disruption
- Avoidance of costs associated with equipment failures and reduced need for O&M.

Reconstruction Strategy

- \$14.3M for “Like-New” condition
- Higher upfront cost
- Longer service life extension

- May exceed short-term budget capacity

Do-Minimum Strategy

- Delays capital expenditure
- Pushes plant into “Poor” condition zone within a few years
- Increases likelihood of:
- Forced outages
- Emergency repairs
- Higher lifecycle cost

5.4.4 Whiteway WTP Condition-Based Capital Needs

“Like-New” Reconstruction Cost

From **Figure 5-7**: like-New Reconstruction Cost = \$14,340,000, representing the total expected replacement value (ERV) required to raise the entire facility to a condition rating of 5 (Excellent). It approximates the “full rebuild cost.” The rebuild cost represents equipment cost; installation and non-construction costs would capitalize.

“Good” Condition Rehabilitation Cost

Target Condition Score = 4 (Good) Cost to Achieve Good = \$4,973,333

This target aligns with the asset-management principle that facilities do not need to be rebuilt to new condition, but should be maintained in a high-functioning, low-risk state. As the methodology emphasizes, “Good” or “Excellent” ratings generally provide safe, reliable service with no significant performance limitations.

Comparison to Average Condition (Score 3)

The plant’s average score of 3 (“Fair”) sits precisely at the transition point where:

- Deterioration begins accelerating.
- Maintenance becomes increasingly reactive.
- Costs rise sharply if intervention is deferred.

Whiteway WTP scoring aligns with the concave-to-convex deterioration transition behaviors described in the methodology.

Steady-State Maintenance

Table 5-2 was developed to analyze the risk of Whiteway WTP on a component basis, both quantitatively and qualitatively. The “Financial Risk Score” was determined by comparing the estimated rebuild price compared to the total price of the plant, and doing a linear interpolation based on the remaining useful life of the component. The components with higher “Financial Risk Scores” would see more favorable cost-benefit ratios. This does not necessarily align with the components which are in critical condition and classified as high risk, nor does it align with the recommended actions the City should pursue in rehabilitating and upgrading the plant.

Table 5-3 was developed to estimate the capital investment needs of the Whiteway plant to obtain a steady state condition rating. The rehab cost for each component was assumed to be equal to the capital cost amortized to the lifespan of the component. The rehab frequency of the component was based on the condition score in 2025, with components with a lower condition rating requiring a more frequent investment rate. The 10-year capital needs for this strategy are estimated to be \$2,027,942.

It should be noted that upgrades to lime softening system will not be able to reduce PFAS and, depending on the chosen technology, may be obsolete after construction of new treatment plant.

Table 5-2. Whiteway WTP Risk Assessment

Process	Type	Item	Quantity	Useful Life	Install Date	Rehab Date	Useful Life Remaining	Condition Score	Total Rebuild Cost	Financial Risk Score	Likelihood of Failure	Consequence of Failure	Combined Risk Score
Treatment	Tank	Catalytic Lime Silo	1	20	1981	2015	9	Poor	\$ 1,500,000.00	0.00465	High	High	High
Treatment	Tank	Catalytic Lime Reactors	1	20	1981	2015	9	Poor	\$ 1,500,000.00	0.00465	High	Med	High
Post Treatment	Tank	1.0 MG Ground Storage Tank	1	50	1993	2025	49	Excellent	\$ 6,000,000.00	0.00409	Very Low	Low	Very Low
Treatment	Tank	Filter Basin	1	25	1981	2020	19	Good	\$ 2,250,000.00	0.00329	Low	Very High	High
Post Treatment	Tank	Clearwell	1	35	1981	2025	34	Excellent	\$ 3,000,000.00	0.00292	Very Low	Med	Low
Treatment	Tank	Recarbonation Tank	1	25	1981	2015	14	Fair	\$ 1,500,000.00	0.00273	Med	Med	Med
Raw Water	Pump	Production Well No. 4	1	25	1956	2020	19	Good	\$ 1,800,000.00	0.00263	Low	Very Low	Very Low
Raw Water	Pump	Production Well No. 5	1	25	1983	2020	19	Good	\$ 1,800,000.00	0.00263	Low	Very Low	Very Low
Pretreatment	Tank	Aeration and Blending Tank	1	25	1981	2020	19	Good	\$ 1,500,000.00	0.00219	Low	Med	Med
Post Treatment	Tank	0.5 MG Ground Storage Tank	1	50	1981	2025	49	Excellent	\$ 3,000,000.00	0.00204	Very Low	Low	Very Low
Treatment	Media	Filter Media Core	4	10	1981	2020	4	Poor	\$ 300,000.00	0.00203	High	High	High
Post Treatment	Tank	0.2 MG Ground Storage Tank	1	50	1981	2025	49	Excellent	\$ 2,250,000.00	0.00153	Very Low	Low	Very Low
Post Treatment	Pump	Transfer Pumps to GST (10-25 HP)	4	25	1981	2017	16	Fair	\$ 900,000.00	0.00153	Med	Low	Med
Post Treatment	Pump	High Service Pumps No. 4, 5, 6 (75 HP)	3	25	1981	2019	18	Good	\$ 675,000.00	0.00100	Low	Very Low	Very Low
Post Treatment	Pump	High Service Pumps No. 2, 3 (60 HP)	2	25	1993	2019	18	Good	\$ 450,000.00	0.00067	Low	Very Low	Very Low
Treatment	Meter	Filter Effluent Turbidimeter	2	15	1981	2020	9	Fair	\$ 225,000.00	0.00066	Med	Low	Med
Pretreatment	Pump	Lime Catalyst Transfer Pump (40 HP)	3	15	1981	2015	4	Critical	\$ 45,000.00	0.00038	Very High	Med	High
Treatment	Mixer	Lime Slurry Mechanical Mixers	3	15	1981	2015	4	Critical	\$ 45,000.00	0.00038	Very High	High	Very High
Treatment	Pump	Recarb Chlorine Injector	1	15	1981	2015	4	Critical	\$ 37,500.00	0.00032	Very High	Very High	Very High
Post Treatment	Pump	High Service Pump No. 1 (50 HP)	1	25	1993	2022	21	Excellent	\$ 225,000.00	0.00031	Very Low	Very Low	Very Low
Treatment	Pump	Filter Surface Wash Pump	1	25	1981	2020	19	Good	\$ 150,000.00	0.00022	Low	High	Med
Treatment	Pump	Recarb Tank Air Blower	1	20	1981	2015	9	Poor	\$ 37,500.00	0.00012	High	Med	High
Pretreatment	Pump	Aeration Tank Chlorine Injector	1	15	1981	2020	9	Fair	\$ 37,500.00	0.00011	Med	Low	Med
Treatment	Mixer	Lime Slakers	2	20	1981	2015	9	Poor	\$ 30,000.00	0.00009	High	High	High
Treatment	Pump	Lime Slurry Pumps	2	20	1981	2015	9	Poor	\$ 30,000.00	0.00009	High	High	High
Pretreatment	Tank	Chlorine Tank	1	20	1981	2020	14	Good	\$ 37,500.00	0.00007	Low	Very High	High
Treatment	Splitter	Lime Slurry Flow Splitter	1	20	1981	2015	9	Poor	\$ 15,000.00	0.00005	High	High	High



Table 5-3. Whiteway Steady State Rehab 10-Year Capital Needs Estimation

Component	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	10 Year CIP
Production Well No. 4	\$ -	\$ -	\$ -	\$ -	\$ 60,000.00	\$ 60,000.00	\$ 60,000.00	\$ 60,000.00	\$ -	\$ -	\$ -	\$ 180,000.00
Production Well No. 5	\$ -	\$ -	\$ -	\$ -	\$ 60,000.00	\$ 60,000.00	\$ 60,000.00	\$ 60,000.00	\$ -	\$ -	\$ -	\$ 180,000.00
Aeration and Blending Tank	\$ -	\$ -	\$ -	\$ -	\$ 50,000.00	\$ 50,000.00	\$ 50,000.00	\$ 50,000.00	\$ -	\$ -	\$ -	\$ 150,000.00
Chlorine Tank	\$ -	\$ -	\$ 1,666.67	\$ 1,666.67	\$ 1,666.67	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,000.00
Aeration Tank Chlorine Injector	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7,500.00
Lime Catalyst Transfer Pump	\$ 2,000.00	\$ 2,000.00	\$ 2,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 6,000.00
Catalytic Lime Silo	\$ 100,000.00	\$ 100,000.00	\$ 100,000.00	\$ 100,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 400,000.00
Catalytic Lime Reactors	\$ 100,000.00	\$ 100,000.00	\$ 100,000.00	\$ 100,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 400,000.00
Lime Slakers	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,000.00
Lime Slurry Pumps	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,000.00
Lime Slurry Flow Splitter	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,000.00
Lime Slurry Mechanical Mixers	\$ 2,000.00	\$ 2,000.00	\$ 2,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 6,000.00
Recarbonation Tank	\$ 66,666.67	\$ 66,666.67	\$ 66,666.67	\$ 66,666.67	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 266,666.67
Recarb Tank Air Blower	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 10,000.00
Recarb Chlorine Injector	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 15,000.00
Filter Basin	\$ -	\$ -	\$ -	\$ -	\$ 75,000.00	\$ 75,000.00	\$ 75,000.00	\$ 75,000.00	\$ -	\$ -	\$ -	\$ 225,000.00
Filter Media Core	\$ 10,000.00	\$ 10,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 20,000.00
Filter Surface Wash Pump	\$ -	\$ -	\$ -	\$ -	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ -	\$ -	\$ -	\$ 15,000.00
Filter Effluent Turbidimeter	\$ 7,500.00	\$ 7,500.00	\$ 7,500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 22,500.00
Clearwell	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
0.5 MG Ground Storage Tank	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.0 MG Ground Storage Tank	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
0.2 MG Ground Storage Tank	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Transfer Pumps to GST (40 HP)	\$ 8,823.53	\$ 8,823.53	\$ 8,823.53	\$ 8,823.53	\$ 8,823.53	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 44,117.65
High Service Pump No. 1 (50 HP)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
High Service Pumps No. 2, 3 (60 HP)	\$ -	\$ -	\$ -	\$ 7,894.74	\$ 7,894.74	\$ 7,894.74	\$ 7,894.74	\$ -	\$ -	\$ -	\$ -	\$ 31,578.95
High Service Pumps No. 4, 5, 6 (75 HP)	\$ -	\$ -	\$ -	\$ 7,894.74	\$ 7,894.74	\$ 7,894.74	\$ 7,894.74	\$ -	\$ -	\$ -	\$ -	\$ 31,578.95
10 Year CIP Estimate:												\$ 2,027,942.21



5.4.5 Whiteway Summary and Recommendations

Asset inventory findings for Whiteway WTP indicate:

- Mix of 1981-vintage assets nearing the end of their useful life.
- A substantial set of components requiring major rehabilitation within the next 5–10 years.
- Total facility value of \$29,340,000, consistent with the **Figure 5-7** right-hand axis.
- A few assets already rated Critical, indicating immediate renewal or replacement needs.

Key Observations

1. Treatment Process Assets (Tanks, Reactors, Basins) Most are 40+ years old, approaching or exceeding typical concrete and mechanical useful lives. Condition scores range from Good down to Critical, with associated capital costs between \$500,000 and \$3 million per asset.
2. Pump Stations and Blowers Many pumps and injectors installed in the early 1980s have had significant rebuilds in the past 5 years, showing Good to Excellent condition and require constant renewal to ensure operational resiliency based on the criticality of these assets.
3. Instrumentation and Meters Shorter useful lives (7–10 years) mean these components have cycled through multiple renewals and represent an ongoing capital requirement.
4. Criticality Weighting Certain assets represent single points of failure (e.g., surface wash pumps, chlorine injectors, air blowers). Their renewal should be prioritized.

Overall Whiteway Condition

- Whiteway WTP is currently rated 3 (“Fair”), indicating significant mid-life deterioration.
- Asset conditions align closely with the stepped deterioration and convex cost models described in the methodology.
- Achieving target condition states will require:
 - o \$4.9M to reach “Good” condition
 - o \$14.3M to achieve “Like-New” condition
 - o \$2.0M to achieve “Steady-State” condition
- Several assets exhibit Critical or Salvage condition ratings and should be prioritized.

Recommendations

- Given that the City must meet EPA PFAS regulations, as discussed previously in this report, the treatment process should be modified to meet EPA regulations
- It is not recommended for the City invest large amounts of money into the existing lime softening system beyond maintaining it until a solution for PFAS removal is implemented (such as nanofiltration) to upgrade treatment processes

- **Prioritize assets rated Critical or Poor (Scores 1–2)**, especially treatment processes, high-criticality pumps, mixers, blowers, and injection systems.
- **Implement a structured rehabilitation program** to maintain the facility rating as Fair (3) condition over the next 5-10 years.
- **Plan phased capital projects** aligned with the \$4.9M rehabilitation scenario.
- **Avoid deferred maintenance** to prevent entering the high-cost end of the deterioration curve.
- **Continue annual condition reassessments** using the **Figure 5-8** flowchart logic to guide preventative maintenance strategy.

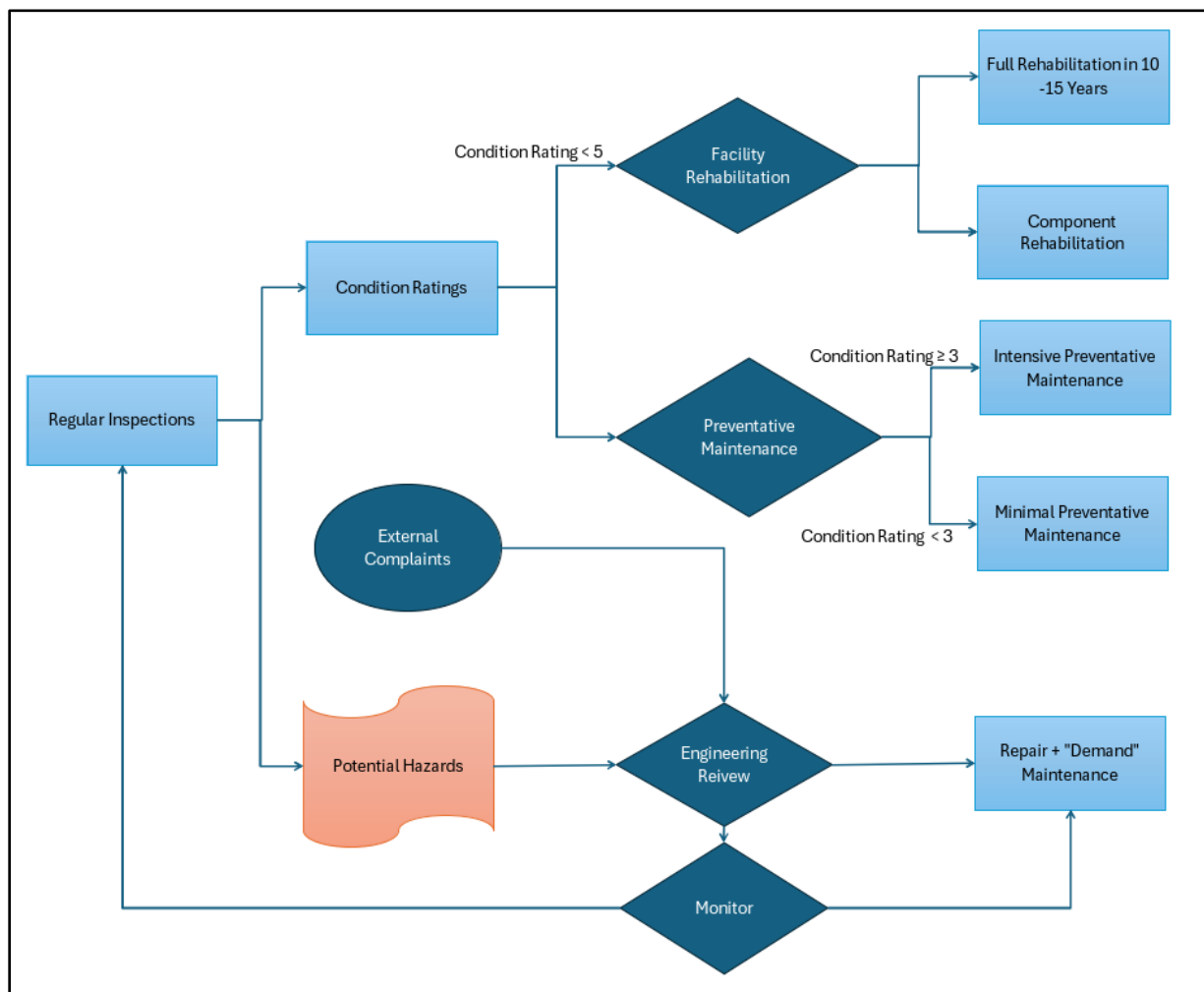


Figure 5-8. Preventative maintenance activities condition equilibrium flowchart

5.5 Sunningdale WTP Condition Assessment Findings

5.5.1 Wellfields and Raw Water Transmission Mains

Infrastructure Condition

- Well Pumps and Motors
 - o Age: 22 Years
 - o Estimated remaining rebuild useful: 5-10 Years

The well pumps and motors have an average age of 22 years, with an estimated remaining useful rebuild life of 5 to 10 years. Given that the wells are contained in pump houses, both well pumps on site show little rusting or wear in the paint.

Notes/Recommended Actions

Pump motor rebuilds required based on reported average age of current rebuilds is 20 years.

5.5.2 Plant Hydraulics

The plant hydraulics were reviewed for condition-related items that could affect plant hydraulics. Hydraulic components are in good condition and require normal level maintenance; no major issues requiring a capital project level investment were observed and Sunningdale WTP is typically operated below its intended design capacity.

5.5.3 High Service Pumping

Infrastructure Condition

- High Service Pumps
 - o Number: 4 vertical high service pumps
 - o Age range: Motors serviced between 2019 and 2023

The high service pumping system includes four vertical high service pumps, with motors that have been serviced between 2016 and 2024

There is a conduit entering in a chart cabinet which exhibits electrical conductors capped with wire nuts which are exposed with no junction box installed (pictured in **Table 5-4**).

Notes/Recommended Actions

Install a junction box for the exposed conductors in the high service pump room

5.5.4 Chemical Storage and Feed Systems

Infrastructure Condition

The chlorine piping and pressure gauges look

Safety Systems

- Ventilation Systems
 - o Chemical tanks stored in CMU buildings with small footprints and their own HVAC systems and shutters on the exterior walls
- Emergency Equipment
 - o Eyewash/shower stations: Eyewash station located outside of the chlorine room

The chlorine tank, piping, and cylinders are stored in a dedicated, separate building and injected into the influent within the chlorine contact chamber. However, the existing chlorine meter located at the contact chamber effluent is currently offline, limiting continuous monitoring at that point in the process. The chlorine contact basin has signs staining and a worn liner.

In addition, the fluoride system is no longer in service, as the fluoride room has been fully decommissioned along with Whiteway's fluoride system.

The influent valve and flowmeter are located in an open pit adjacent to the sidewalk, which poses an accessibility hazard for operating the plant.

Notes/Recommended Actions

1. Repair/Replace chlorine meter at contact basin effluent
2. Encase flowmeter with meter box & concrete
3. Re-line chlorine contact basin



Figure 5-9. Flow meter box



Figure 5-10. Chlorine Contact Basin

5.5.5 Electrical System

Infrastructure Condition

- Main Electrical Service
 - o Observations: Most of the electrical equipment seems to have exceeded their electrical lifespan; A few electrical conduits and cabinets are rusted
- **HS Pump Room:**
 - o There is a conduit entering in a chart cabinet which exhibits electrical conductors capped with exposed wire nuts which with no junction box installed.
- **Generator Area:**
 - o There is a potential Clearance Code issue between the East side of the generator door and the existing fence. According to NEC, for 480V voltage, Three Phase, the required clearance is 42 inches. If that door (which we could not open) is to access the electrical components, there is a violation since the distance is 30 inches.
- **Sunningdale Pump Room:**
 - o An Instrumentation cabinet shows signs of corrosion.
 - o There are two luminaires located on the top of two interior doors that are missing covers.
 - o Chlorine Room: No electrical deficiencies were noted.
- **Office:**
 - o A plate of a junction box shows signs of corrosion

From a safety and compliance perspective, the main hazards are the presence of the uncovered conductors in the High Service Pump Room, as well as the potential clearance issue for the on-site generator.

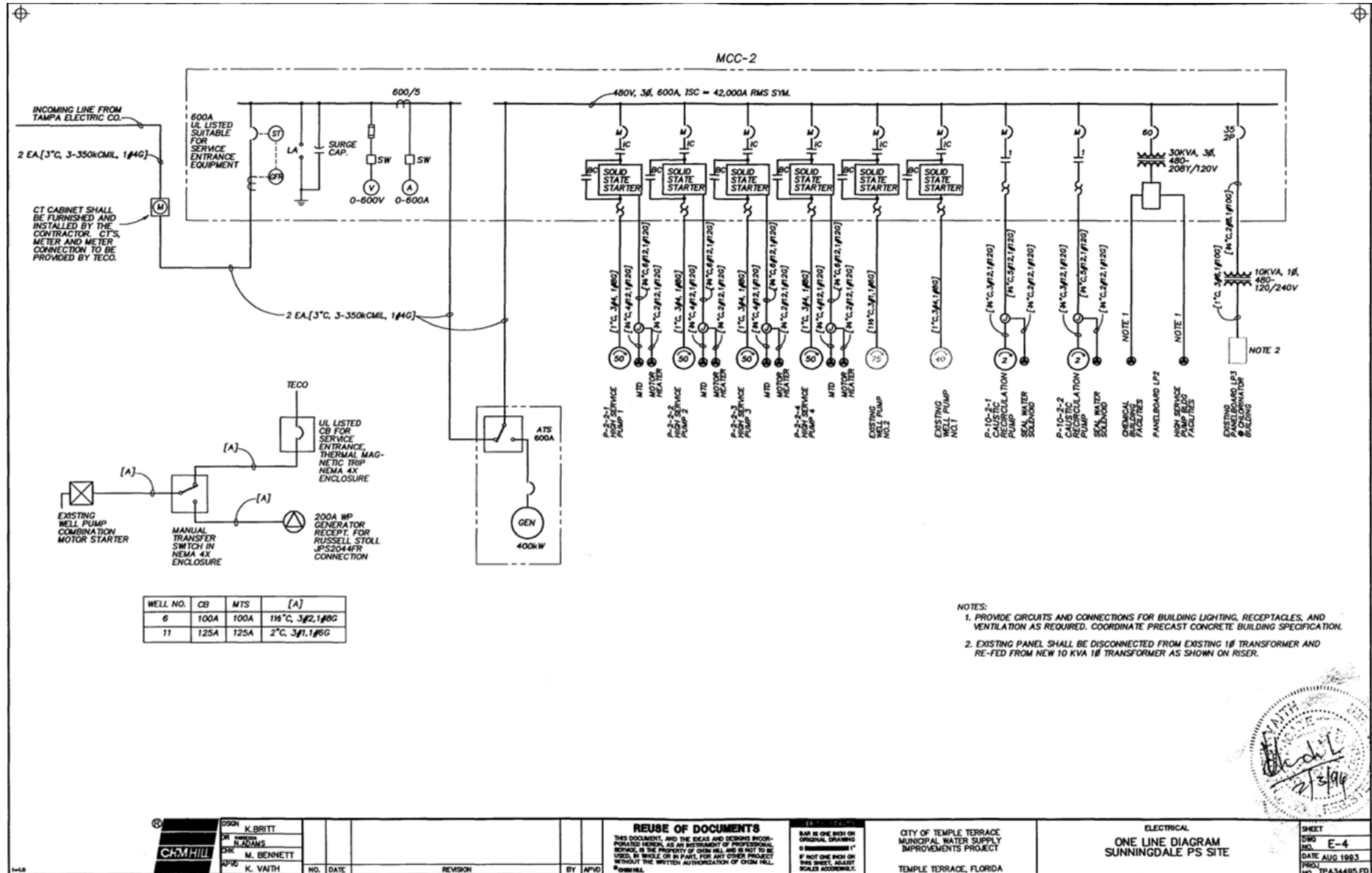
Notes/Recommended Actions

1. Install junction boxes to cover the exposed conductors and wire nuts
2. Investigate the clearance deficiency of the access door to the generator

Table 5-4. Urgent Sunningdale Electrical Deficiencies

Sunningdale Urgent Electrical Action Items	Photos
Remediation is required for exposed conductors in HSP room at Sunningdale facility.	

Figure 5-11. Sunningdale Electrical One-Line Diagram



5.6 Sunningdale WTP Site Condition Evaluation

The uploaded methodology emphasizes that condition ratings are a combination of technical measurement and expert judgement, and that they are essential for forecasting future needs. In the Sunningdale WTP context, each major asset was rated on a 1–5 scale, where:

- 5 = Excellent
- 4 = Good
- 3 = Fair
- 2 = Poor
- 1 = Failed or Critical

These scores reflect mechanical integrity, remaining useful life, functional adequacy, and operational risk, consistent with the rating-descriptive systems discussed in the methodology.

Each asset was given an additional scoring for “consequence of failure” (1-5), based largely on the resilience of the system – i.e., the redundancy of the system and whether the treatment system would be shut down in the event of failure. The condition score and consequence of failure score were then averaged to get an overall risk score for each asset (**Table 5-5**).

The average condition across all inventoried assets at Sunningdale WTP is: Average Condition Score = 3 (“Fair”)

A “Fair” score—consistent with the bridge-management interpretation—indicates:

- The plant continues to function as designed.
- Some components show observable deterioration but do not affect performance or reliability.
- Without intervention, the chlorine contact chamber may fall into the “Poor” condition within the next 5-10 years.
- Operational risks (unplanned downtime, reduced treatment resilience, and costly emergency repairs) being to increase.

The resulting score is the anchor for the capital-planning scenarios presented below.

5.6.1 Renewal Cost Curve and Capital Planning Scenarios

Figure 5-10 represents a convex deterioration-cost relationship. As conditions decline, the marginal cost of restoring the facility to higher performance levels increases rapidly. This is typical for treatment plants:

- Minor wear early in the lifecycle can be corrected with low-cost rehabilitation.
- Mid-life deterioration requires component renewal.
- Late-life deterioration requires full replacement, which is exponentially more expensive.

This convex shape mirrors the physical deterioration curves discussed in the methodology, where structure (or asset) condition drops slowly at first, then accelerates as age accumulates.

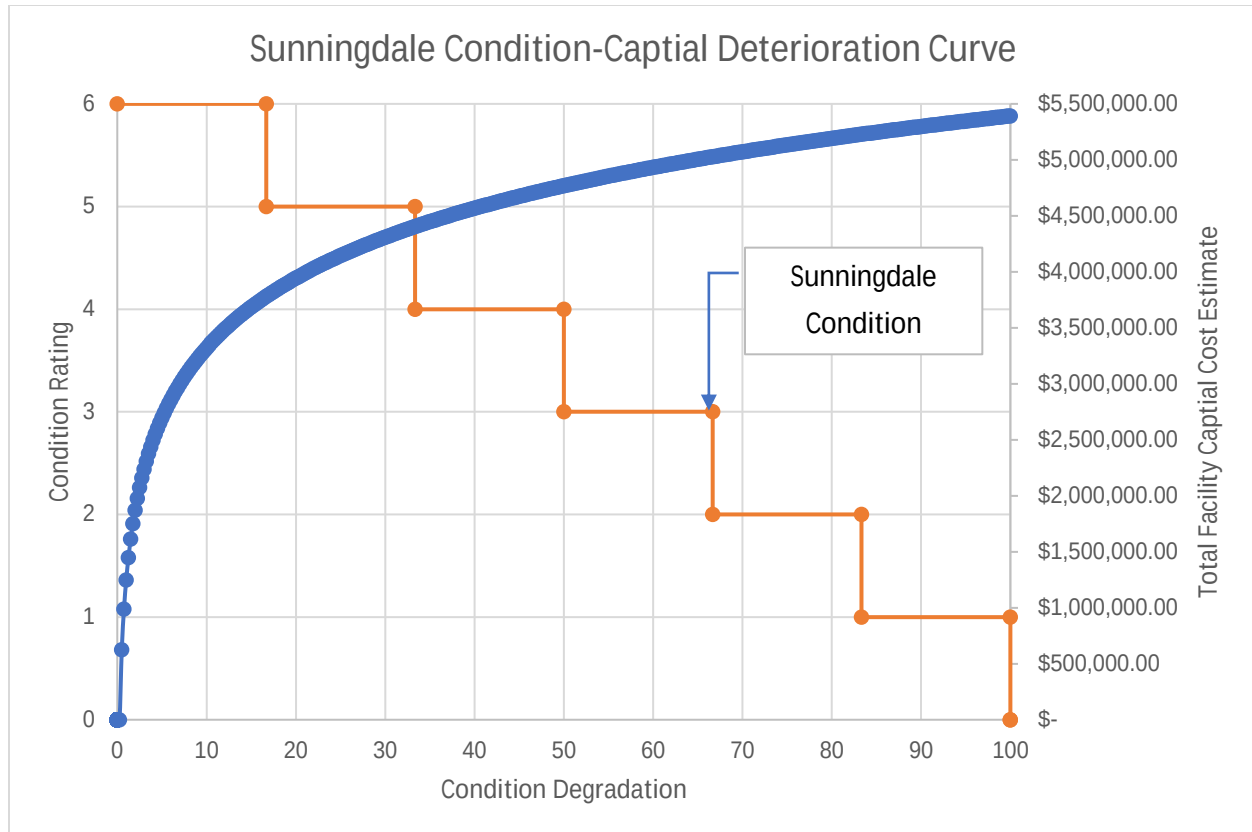


Figure 5-12. Sunningdale Condition-Capital Deterioration Curve

Each step corresponds to a **renewal action**:

- **Score 6 → 5**: Light rehabilitation
- **Score 5 → 4**: Mechanical refurbishment
- **Score 4 → 3**: Subsystem-level renewal
- **Score 3 → 2**: Major refurbishment
- **Score 2 → 1/0**: Full replacement

The stepwise scoring progression mirrors the defect/action methodology where each condition state triggers a specific response window.

5.6.2 Position of the WTP on the Deterioration Curve

Sunningdale WTP has been identified by the plant's **current condition state as (Score 3)** on the cost curve. This confirms:

- The plant is at a **mid-life turning point**.
- Rehabilitation costs to reach "Good" condition are **≈ \$1.4M**.
- Replacement-level investment ("Like New") would require **≈ \$2.4M**.

This mirrors structural-asset principles: once a facility reaches the mid-deterioration zone, capital investments become necessary to avoid high-cost terminal deterioration (see "Convex deterioration models" in the methodology).

The step transitions (6→5→4→3→2→1) reflect the "action-oriented" inspection philosophy:

- **Scores 5–6:** Routine maintenance
- **Score 4:** Preventive rehabilitation window
- **Score 3:** Major rehabilitation window
- **Scores 1–2:** Emergency renewal or replacement

5.6.3 Capital Investment Strategy Implications

The methodology emphasizes comparing strategies such as:

- Steady-State Capital Investment
- Deferred maintenance
- Preventive rehabilitation
- Full replacement

Steady-State Rehabilitation Capital Investment

- \$400,000 investment over the next 10 years
- Does not improve the existing condition of assets, only maintains their current state.
- Lower short-run capital investment strategy that will increase O&M expenditure in response to maintaining lower asset condition scores.

Condition Improvement Rehabilitation Strategy

- \$1.4M investment to raise condition from Fair → Good
- Lower long-term costs
- Reduced service disruption
- Avoidance of costs associated with equipment failures and reduced need for O&M.

Reconstruction Strategy

- \$2.4M for "Like-New" condition
- Higher upfront cost
- Longer service life extension
- May exceed short-term budget capacity

Do-Minimum Strategy

- Delays capital expenditure
- Pushes plant into “Poor” condition zone within a few years
- Increases likelihood of:
 - Forced outages
 - Emergency repairs
 - Higher lifecycle cost

5.6.4 Sunningdale WTP Condition-Based Capital Needs

“Like-New” Reconstruction Cost

From **Figure 5-11**:

Like-New Reconstruction Cost = \$2,392,500.00

This represents the total expected replacement value (ERV) required to raise the entire facility to a condition rating of **5 (Excellent)**. It approximates the “full rebuild cost.”

“Good” Condition Rehabilitation Cost

Target Condition Score = 4 (Good) Cost to Achieve Good = \$1,397,833

This target aligns with the asset-management principle that facilities do not need to be rebuilt to new condition, but should be maintained in a high-functioning, low-risk state. As the methodology emphasizes, “Good” or “Excellent” ratings generally provide safe, reliable service with no significant performance limitations.

Comparison to Average Condition (Score 3)

The plant’s average score of 3 (“Fair”) sits precisely at the transition point where:

- Deterioration begins accelerating.
- Maintenance becomes increasingly reactive.
- Costs rise sharply if intervention is deferred.

This condition scoring aligns with the concave-to-convex deterioration transition behaviors described in the methodology.

Steady State Maintenance

Table 5-5 was developed to analyze the risk of the Sunningdale WTP on a component basis, both quantitatively and qualitatively. The “Financial Risk Score” was determined by comparing the estimated rebuild price compared to the total price of the plant, and doing a linear interpolation based on the remaining useful life of the component. The components with higher “Financial Risk Scores” would see more favorable cost-benefit ratios. This does not necessarily align with the components which are in critical condition and classified as high risk, nor does it align with the recommended actions the City should pursue in rehabilitating and upgrading the plant.

Table 5-6 was developed to estimate the capital investment needs of the Sunningdale WTP to obtain a steady state condition rating. The rehab cost for each component was assumed to be equal to the capital cost amortized to the lifespan of the component. The rehab frequency of the component was based on the condition score in 2025, with components with a lower condition rating requiring a more frequent investment rate. The 10-year capital needs for this strategy are estimated to be \$410,647.

It should be noted that maintenance of the existing system will not be able to reduce PFAS and, depending on the chosen technology, may be obsolete after construction of new treatment plant.

Table 5-5. Sunningdale WTP Risk Assessment

Process	Type	Item	Quantity	Useful Life	Install Date	Rehab Date	Useful Life Remaining	Condition Score	Total Rebuild Cost	Financial Risk Score	Likelihood of Failure	Consequence of Failure	Combined Risk Score
Raw Water	Pump	Production Well No. 2 (75 HP)	1	25	1993	2020	19	Good	\$ 1,800,000.00	0.01430	Low	Very Low	Very Low
Raw Water	Pump	Production Well No. 1 (30 HP)	1	25	1993	2024	23	Excellent	\$ 1,800,000.00	0.01335	Very Low	Very Low	Very Low
Post Treatment	Pump	High Service Pumps No. 1-4 (50 HP)	4	25	1993	2016	15	Fair	\$ 900,000.00	0.00862	Med	Low	Med
Treatment	Pump	Chlorine Scrubber	1	20	2022	2022	16	Good	\$ 750,000.00	0.00735	Low	High	Med
Treatment	Pump	Chlorinator	2	15	1993	2020	9	Fair	\$ 75,000.00	0.00120	Med	Very High	High
Treatment	Pump	Caustic Recirculation Pump	2	15	1993	2020	9	Fair	\$ 30,000.00	0.00048	Med	Very High	High
Pretreatment	Tank	Chlorine Contact Chamber	1	20	1993	2020	14	Good	\$ 37,500.00	0.00042	Med	High	High



Table 5-6. Sunningdale Steady State Rehab 10-Year Capital Needs Estimation

Component	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	SUM
Production Well No. 1 (30 HP)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Production Well No. 2 (75 HP)	\$ -	\$ -	\$ -	\$ -	\$60,000.00	\$60,000.00	\$60,000.00	\$60,000.00	\$ -	\$ -	\$ -	\$240,000.00
Chlorine Contact Chamber	\$ -	\$ -	\$ 1,666.67	\$ 1,666.67	\$ 1,666.67	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,000.00
Chlorine Scrubber	\$ -	\$ -	\$ -	\$ -	\$ -	\$29,411.76	\$29,411.76	\$29,411.76	\$29,411.76	\$ -	\$ -	\$117,647.06
Chlorinator	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7,500.00
Caustic Recirculation Pump	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,000.00
High Service Pumps No. 1-4 (50 HP)	\$ 9,375.00	\$ 9,375.00	\$ 9,375.00	\$ 9,375.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 37,500.00
												\$410,647.06



5.6.5 Sunningdale Summary and Recommendations

Asset inventory findings for Whiteway WTP indicate:

- Mix of 1993-vintage assets that have been maintained.
- A few assets are rated as “fair,” indicating immediate renewal or replacement needs.
- Estimated total facility value of \$5,392,500.

Key Observations

1. Treatment Process and Pump assets are in good condition, with motors for the pump station being replaced in 2016-2024 and minor repairs to the wells for concrete cracks and mechanical seals being completed in 2020-2025. Condition Scores range from fair to excellent, with associated capital costs between \$5,000 and \$900,000 per asset.
2. Existing Effluent Pump Station motors have been replaced within the last 10 years. Well 1 and 2 have recently been serviced with updated motors and coatings in 2024.
3. It is noted that the coatings on the inside of the chlorine contact chamber seem to be at the end of the service life and should be repaired. During the site visits, the below ground influent valve and flow meter to the contact chamber were excavated and a potential safety hazard.

Overall Sunningdale Condition

- Sunningdale WTP is currently rated 3 (“Fair”), indicating significant mid-life deterioration.
- Asset conditions align closely with the stepped deterioration and convex cost models described in the methodology.
- Achieving target condition states will require:
 - o \$1.4M to reach “Good” condition
 - o \$2.4M to achieve “Like-New” condition
 - o \$400,000 to achieve “Steady-State” condition
- Most assets are in “fair” condition and should be monitored for replacement.

Recommendations

- Given that the City must meet EPA PFAS regulations, as discussed previously in this report, the treatment process should be modified to meet the regulations
- It is not recommended for the City to invest large amounts of money, beyond maintaining functionality, into assets that may be removed as a part of removing PFAS (i.e. the chlorine gas system would convert to liquid sodium hypochlorite for nanofiltration)
- **Implement a structured rehabilitation program** to maintain the facility rating as Fair (3) condition over the next 5-10 years.
- **Plan phased capital projects** aligned with the \$1.4M rehabilitation scenario.
- **Avoid deferred maintenance** to prevent entering the high-cost end of the deterioration

curve.

- **Continue annual condition reassessments** using the **Figure 5-8** flowchart logic to guide preventative maintenance strategy.

5.7 Modernization Sequencing

Phased migration reduces operational risk, but it increases the need for clear rules: what will be migrated when, what will be re-platformed versus retired, and what will be frozen. An ISO-native perspective, for example, can illustrate how modernization can turn coexistence into a liability if native processing cannot be fully implemented over time.

Phase 1: Strategic Assessment and Diagnosis

Finalize an inventory and dependency map. Application retirement guidance consistently highlights that decommissioning begins with knowing what exists, how it is used, and to what it is connected. Automated discovery and dependency mapping reduce reliance on operator knowledge and surface “hidden” risks such as undocumented interfaces, embedded credentials, and shadow integrations. Inventory discipline also clarifies which systems are true candidates for retirement and which are effectively part of critical service delivery. Scope regulatory and retention obligations in this initial phase. Retention, privacy, and security constraints determine archive requirements, what can be deleted, and what must remain accessible under defined conditions.

Phase 2: Modernization and Coexistence

Develop a progressive migration strategy with clear coexistence limits. Phased migration reduces operational risk, but it increases the need for clear rules: what will be migrated when, what will be re-platformed versus retired, and what will be frozen. ISO migration guidelines reinforce dependency on the City’s usage patterns, highlighting the need for precise scoping rather than assumptions. Sequencing should modernize risk and monitoring controls in parallel with platform change. Data archiving is an operating capability emphasizing maintaining secure, searchable, auditable access to historical records. Streamlined archiving allows the modernized system to remain lean, performant, and easier to control. Run parallel operations to prove key equivalence.

Phase 3: Engineering and Component Selection

Based on the diagnosis, detailed engineering components will be identified, sized and specified. Standardization of key equipment, such as motor control centers, should be dictated if compliant with City purchasing requirements to ease maintenance, spare parts and equipment replacement and compatibility. Circuits and contactors with improved breaking capacity, modern VFDs with advanced thermal protection, high-precision signaling and monitoring devices and high-efficiency and compatible motors would be specified. Decisions prioritize safety, efficiency, and compatibility

with existing equipment. Security road maps increasingly require institutions to plan for increased security, for sequencing, the implication is practical: systems that cannot be upgraded to modern security standards should be prioritized for retirement or isolation, and new platforms should be designed with agility in mind to avoid repeating historic hard-coded dependencies.

Phase 4: Testing, Installation and Commissioning

Implement Factory Acceptance Testing (FAT) on new electrical panel, paying attention to organized wiring and complete labeling, continuity and insulation testing and simulations to validate communication and response. During testing, protection parameters and response times were adjusted to ensure stable performance. Once validated, the upgraded electrical components are installed at the WTPs. During commissioning, perform functional tests, verifying that each signal and device responded correctly.

The result of modernization sequencing is a more reliable electrical system, with precise monitoring and ready for future expansion. Modernization is about maintaining continuity and reliability in every connection thereby significantly reducing operational risks.

6.0 WATER TREATMENT FACILITIES RENEWAL PLAN

This section presents a plan to renew the City's water treatment facilities and continue reliable operation in compliance with current and future State and Federal regulations. The plan identifies improvements required to address treatment process water quality and facilities' rehabilitation and replacement (R&R) needs including PFAS regulatory compliance. Initial bench- and pilot-scale testing on the City's water, technical/cost evaluations and City staff inputs yielded a prioritized, scheduled list of improvements with planning level (Class 5) cost estimates. The renewal plan includes capital recommendations prioritized by treatment facilities' needs and long-term site layout plans for both City WTPs depicting new facilities and traffic flow for continued access for deliveries and maintenance as well as parking areas.

The City's WTPs have served well for 40+ years and are near the end of their service lives. Near complete renewal or treatment facilities combined with PFAS removal will precipitate large capital costs and significant increase in operating cost. Capital funding support and phasing will help mitigate increases in the cost of water, however, water rates will need to increase. The City's ongoing funding pursuits, coupled with the funding plan additions identified herein, will help minimize capital needs and support a future City rate study to fully define financial constraints. The Water Treatment Facilities Renewal Plan is organized as follows:

- Treatment Process Improvements
- Capacity Improvements
- R&R Improvements
- Funding
- Recommended WTP Renewal Plan

6.1 Treatment Process Improvements

As discussed in detail in previous sections, the U.S. Environmental Protection Agency (EPA) has set further regulations that establish primary maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) for six PFAS substances in drinking water. The National Primary Drinking Water Regulation PFAS compliance date is currently set for April 2029, but the EPA has proposed an extension to 2031. Further details on regulatory framework can be found in **Chapter 1**. Combining EPA's requirement with the high hardness source water, the City's treatment process needs are:

- Reliable and effective total hardness reduction to < 150 mg/L CaCO₃
- PFAS reductions to meet EPA MCLs and eliminate/minimize exposure

Improvement alternatives were evaluated to meet City goals based on City's water supply options, the most effective treatment processes, and operational efficiency. Details for evaluated options regarding WTP rehab can be seen in **Chapter 4** and options regarding PFAS reduction to meet EPA regulations can be found in **Appendix B**.

Limited pilot testing conducted by CHA focusing on PFAS reduction did not find granular activated carbon (GAC) or ion exchange (IX) as feasible treatment alternatives (**Appendix B**) due to the PFAS breakthrough frequency, limited removal of smaller chain PFAS present and the multi-contaminant (+hardness) removal required. Bench-testing done using nanofiltration (NF) membranes, showed excellent reduction of PFAS compounds below PMCL. As such, CHA recommends nanofiltration as the preferred treatment process to reduce hardness, currently regulated contaminants (e.g. PFAS) and future emerging contaminants.

The modular nature of membranes and small footprint make it suitable for both WTPs and production capacity can be easily expanded in an incremental fashion. The NF concentrate containing PFAS would need to be disposed or further reduced and treated. Several alternatives were explored, including deep well injection, hauling away the liquid waste to an approved disposal facility, and emerging technologies such as aqueous electrostatic concentration (AEC) and foam fractionation followed by photocatalytic destruction. Due to the volume of concentrate that would be produced (between 0.3 and 1 MGD) hauling is not recommended. CHA recommends the City consider deep well injection for concentrate disposal as a placeholder, as it is practiced in Florida, and is approved by FDEP. This will give the City time to fully develop a more cost-effective concentrate concentration and destruction management option.

Further treatment process improvement recommendations include:

1. Due to the high capital cost of consolidating treatment to Whiteway, it is recommended to keep Sunningdale WTP in service. The modular nature of NF membranes allows for the equipment to be reused in the future if consolidation is implemented in the future.
2. Continue compliance implementation for State and Federal drinking water emerging contaminant regulations as outlined in **Chapter 1**.
3. As funds are available, plan to replace the gas chlorination process with a liquid sodium hypochlorite system to improve safety for City staff, operators and neighboring public. This is also something that is needed for the NF upgrade.

6.2 Capacity Improvements

The analysis of existing component capacities for both Whiteway and Sunningdale can be seen in **Chapter 3**. Further investigation of the hydraulic bottlenecks experienced at Whiteway can be seen in **Chapter 5**. In order to facilitate upgrading the Whiteway WTP to 6 MGD while maintaining

the existing lime softening treatment system, nearly every component of the plant would need to be upgraded to increase capacity, with the exception of the finished storage.

Upgrading the Whiteway WTP to nanofiltration relieves some of the burden in upgrading the plant to 6 MGD, as the lime softening system would no longer be required. The aeration system and transfer pumps would still need to be upgraded to meet the demand requirements.

At the Sunningdale WTP, the existing process has sufficient capacity to meet projected demands, as Sunningdale acts as a peaking facility in support of the Whiteway WTP rated for 4 MGD by FDEP. Sunningdale's capacity lacks softening and PFAS removal capabilities.

The Whiteway and Sunningdale WTPs are currently operating in compliance with applicable FDOH and FDEP capacity requirements. Based on permitted/rated capacities, the combined treatment capacity of the WTPs is sufficient to meet projected average and peak day demands throughout the planning horizon as shown in **Table 6-1**.

Table 6-1. Existing WTP Flow Characteristics

WTP	FDEP Rated Max Day Capacity MGD	Historical Average Day Flows (2020-2025) MGD	Historical Peak Day Flows (2020-2025) MGD	95th Percentile Max Day Flows (2020-2025) MGD	95th Percentile Max Day/ Max Day WTP Capacity %
Whiteway	5.04	3.0	3.86	3.13	62%
Sunningdale	3.96	1.0	3.31	1.81	46%
Combined	9.00	4.0	6.62	4.74	53%

Note: 95th percentile of historical 6-year data span used to dampen effect of extraordinary events such as pipe breaks, plant maintenance, flushing events, etc.

In their current states, judging with 95th percentile historical 6-year WTP flows, Whiteway operates at 62% of its rated capacity, Sunningdale operates at 46% of its rated capacity, and collectively, both plants operate at 53% of total WTP rated capacity. While treatment capacity is adequate, the governing constraint on future system supply is the permitted groundwater withdrawal set by the SWFWMD. As summarized in **Table 6-2**, demand projections indicate that by approximately 2045, projected peak day withdrawals are expected to exceed the existing SWFWMD permitted allocation, despite adequate treatment plant capacity.

In terms of maintaining compliance, the City will need to explore increasing the permitted withdrawal rate with SWFWMD. The necessary increase to permitted withdrawal rates based on projected flows are listed in **Table 6-2** as "permit deficit". If the treatment process is upgraded to membrane filtration for reducing hardness and other contaminants (e.g., organics, PFAS), the

corresponding water supply and deficit will increase as presented in the table. In order to produce 6 MGD of finished water, the City will need to be permitted to withdraw 7.1 MGD from the production wells, given an 85% recovery rate. While higher NF recovery rates are targeted, 85% is conservative for supply quantification.

Table 6-2. Projected Flows vs. Permitted Withdrawal

Future Condition	WTP ADF MGD	ADF WUP Surplus/Deficit MGD	Peak Month Flow MGD	Peak Month WUP Deficit MGD
SWFWMD Permitted Withdrawal	5.15	--	5.817	--
Projected Flows (2031, PFAS Compliance Deadline)	4.26	+ 0.89	5.66	+ 0.155
Flows Required for Membrane Treatment at 85% recovery (2031)	5.01	+ 0.14	6.66	- 0.84
Projected Flows (2045)	4.47	+ 0.68	5.95	- 0.133
Flows Required for Membrane Treatment at 85% recovery (2045)	5.26	- 0.11	6.99	- 1.173

Based on the observed constraints at Whiteway and Sunningdale WTPs, the following capacity upgrades are recommended:

1. Immediately resolve the recarbonation basin hydraulic bottleneck. Solutions include repairing the recarbonation basin bypass valve or extending a new 16" bypass pipe/valve, and resolving potential valve and piping obstructions between the recarbonation basin and filters.
2. Coordinate with the SWFWMD on:
 - a. Increased Water Use Permit needs due to treatment
 - b. Developing a test/exploratory production well to evaluate alternative aquifer sources to increase supply and improve water quality
 - c. Exploring deep injection well viability in conjunction with FDEP and FDOH
3. Perform flow and total dynamic head calibration on all WTP pumps and identify deficiencies.
4. Work with the FDOH and SWFWMD to protect the City's wellfield from further contamination of emerging contaminants.

6.3 R&R Improvements

The condition, risk assessment and operations review yielded the following recommendations to renew Whiteway and Sunningdale WTPs assets:

1. Replace and repair high risk electrical issues immediately including grounding issues and motor control centers. Implement modernization sequencing to ensure compatibility and focus on processes that will remain at and serve the WTPs in the future. Critical electrical repairs can be found in Chapter 5.
2. Begin a wholesale replacement of key electrical components that will remain in service for the proposed WTPs treatment process upgrades.
3. Investigate with TECO the feasibility of installing a secondary power feed at each WTP from another substation or from another switch gear at the current substations, and the feasibility of having electrical looping around the WTPs to provide power to all components.
4. Add VFDs to Whiteway process pumps to allow better operational controls. If installed prior to NF plant upgrades, VFDs should be sized according to the future pumping requirements in order to allow reuse.
5. Update full WTPs equipment inventory with information provided herein and current asset registries.
6. People, Plant, Process – prioritize safety improvements to protect operations staff, empower operations staff by adding key monitoring locations in SCADA, begin a systematic effort to renew the plant components starting with the most critical and those that will remain as part of an upgraded plant.
7. Add instrumentation, including remote chlorine monitoring to optimize distribution and remote storage/pumping operations.
8. Resolve Telecom storage and pump station operational challenges as follows:
 - a. Step 1: Remove the pipe obstruction between recarbonation and filters and get Whiteway capable of producing 4 mgd again.
 - b. Step 2: Review Telecom flows and pressure data on a 10-minute basis for a historical peak demand month (April).
 - c. Step 3: Review distribution hydraulic model and develop hydraulic alternatives to current fill and draw patterns and possibly move to a continuous fill/draw with some minor distribution improvements.
 - d. Step 4: Perform water quality modeling to determine best operational alternative.
9. For the SCADA system, it is recommended to continue with the current system, upgrading and adding instrumentation and monitoring economically in the short term to empower operations staff with key information both plants and distribution to operate effectively. For the treatment upgrade project evaluate moving to a new SCADA system that fits the proposed treatment process and remaining components.

6.4 Funding

A funding opportunities and strategy review was completed by CHA in partnership with Hale Innovations, LLC to identify realistic pathways to finance PFAS-related treatment improvements and associated water treatment facility upgrades. The funding memorandum notes that grant-style funding for PFAS projects is currently limited, with federal Bipartisan Infrastructure Law and Infrastructure Investment and Jobs Act funding largely expiring in the FY2026 window. As a result, the recommended approach is to pursue Florida Drinking Water State Revolving Fund (DWSRF) financing as the primary funding vehicle, while maintaining project readiness for other opportunities that may emerge.

The funding memorandum (attached in **Appendix B**) recommends structuring the City's capital program as a multi-year implementation plan to align with DWSRF funding capacity, which is noted as approximately \$20M per year. In practical terms, pursuing SRF as the primary funding source requires packaging the recommended improvements into discrete, fundable phases that align with the program's annual capacity. Findings indicate that the City may be eligible for the minimum principal forgiveness level (20%) and emphasize that principal forgiveness applies solely to construction, not facilities planning/design. It also notes that PFAS above the Maximum Contaminant Level (MCL) may support strong SRF scoring under the chronic public health risk criteria, and that adding water conservation elements may provide additional scoring benefit.

To complement the SRF strategy, CHA's recommendation is to treat storm-readiness as an ongoing funding posture: proactively design resiliency projects based on the City's CIP, and meticulously document storm impacts such as pressure drops, boil water notices, outages especially the duration and coverage of these impacts. Doing so can position Master Plan capital improvements, including wells, transfer pumps, and high service pumps, to compete for emergency response or hazard mitigation/hardening funds such as the Florida Commerce's Development Block Grant – Disaster Recovery (CDBG-DR).

Funding recommendations are summarized as follows:

1. Pursue SRF funding by structuring the City's capital program as a multi-year implementation plan to align with DWSRF funding capacity (\$20M/year).
2. Treat storm-readiness as an ongoing funding posture: proactively design resiliency projects based on the City's CIP, and meticulously document storm impacts such as pressure drops, boil water notices and outages, especially the duration and coverage of these impacts. to compete for emergency response or hazard mitigation/hardening funds such as the Florida CDBG – Disaster Recovery (CDBG-DR).
3. Perform/update rate analysis with proposed capital expenditures and operating cost increases to maximize the affordability of the proposed WTP upgrades and renewal.

4. Formulate a comprehensive legislative appropriations strategy (including use of lobbying services) and advancing planning/design to keep priority projects “shovel ready” for appropriations or future grant cycles.

6.5 Recommended WTP Renewal Plan

The recommended City of Temple Terrace Water Treatment Facilities Renewal Plan is summarized as follows:

2026

1. Make Whiteway WTP recarbonation tank bypass repairs
2. Continue coordination with SWFWMD and move to application for increased water use permit and proposed additional well scope, location, depths and objectives
3. Continue funding coordination and actions
4. Initiate Whiteway and Sunningdale Electrical R&R Project preliminary design/design
 - a. Upgrading components to handle future improvements’ loads
 - b. Additional SCADA distribution monitoring locations
5. Telecom and Chinaberry remote storage and pump station flow/operating modifications
6. Confirm funding availability and financial constraints (e.g., rate study)

2027

7. Bid/Contract/Construct WTP Electrical R&R Project
 - a. Cost saving measures such as direct equipment purchase to minimize cost
8. Permit/Design New Well Project
9. Initiate Whiteway WTP General Project preliminary design/design
 - a. Two full trains through Whiteway WTP
 - b. High recovery NF system
 - c. WTPs non-electrical equipment renewal and capacity increases as needed
 - d. Expand and refine NF concentrate treatment systems including deep well injection and emerging, cost-effective technologies
 - e. Begin evaluation of consolidating Sunningdale WTP to Whiteway WTP.

2028-2031

10. Bid/Contract/Construct New Well Project
11. Bid/Contract/Construct Whiteway and Sunningdale WTPs General Project
 - a. Finalize NF concentrate management method
12. Start and operate the renewed WTPs
13. Continue budgeting WTPs R&R into the future

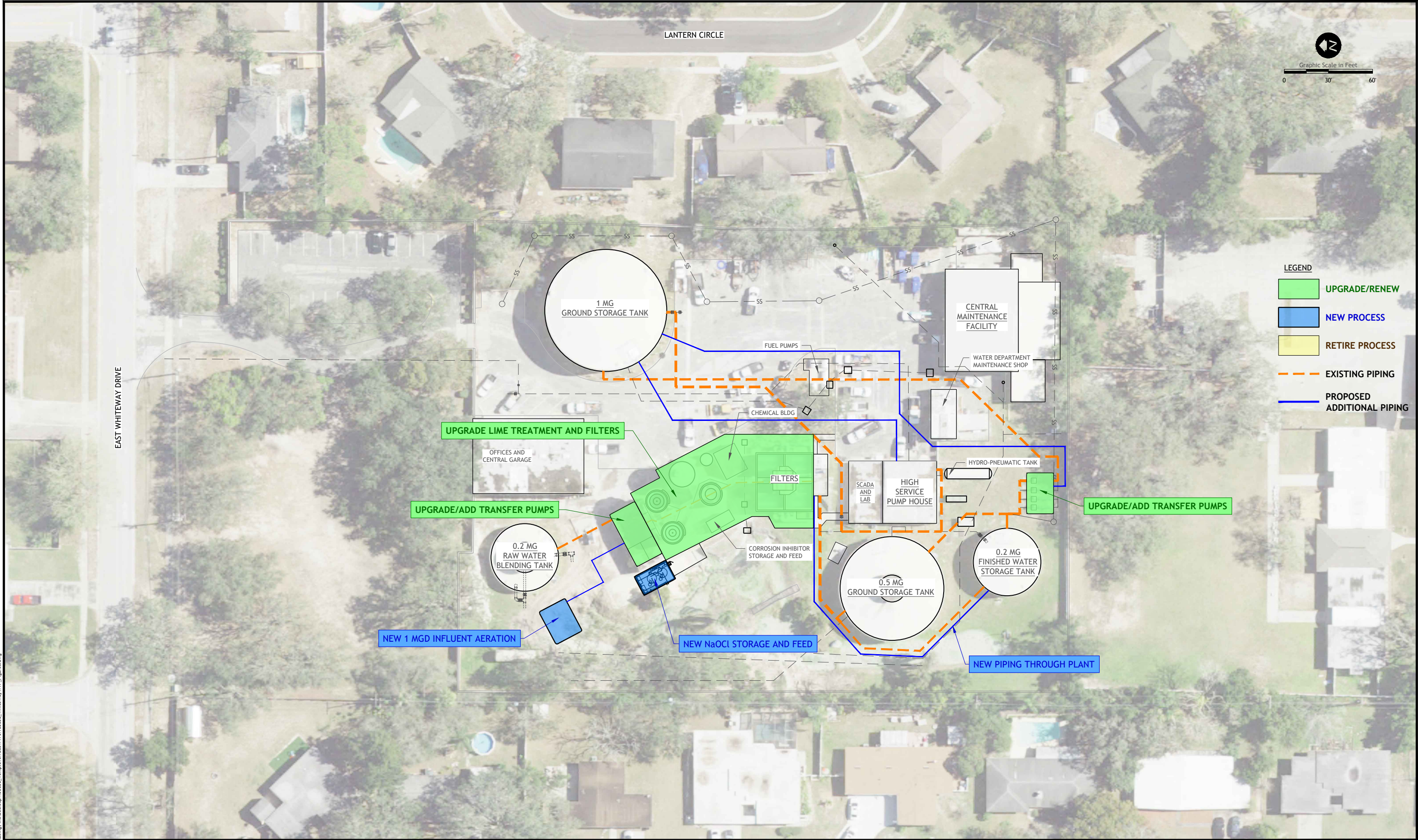
Although it is not recommended to upgrade the Whiteway WTP to 6 MGD while maintaining lime softening as the primary treatment process, the site plan showing what improvements would be needed are shown below in **Figure 6-1**. Note that the system shown in this site plan would not be capable of reducing PFAS, as required by EPA regulations by 2031. The associated cost estimate for upgrading the plant to 6 MGD can be seen in **Table 6-3**.

The suggested Whiteway site plan (**Figure 6-2**) proposes installation of the nanofiltration skids within the existing office building garage, which will be vacated once construction of the new office building is completed. Together, these factors make the Whiteway layout highly constrained, requiring detailed logistics planning and phased construction to remain feasible. This site plan features a conversion of the existing filter basin to a NF concentrate storage tank, which could provide approximately 150,000 gallons of concentrate storage. Further capacity may be required depending on the selected concentrate management process.

The Whiteway layout presents significant traffic-flow and constructability constraints due to its tight configuration and the presence of only one site entrance located at the northeast corner of the property. With all construction access funneled through this single point, careful scheduling and flagging coordination will be required to maintain safe entry and exit of equipment and deliveries. The internal circulation path is narrow and does not allow for looping or turnaround space for heavy machinery, meaning large vehicles will need to back out or rely on controlled, staged movements, which increases both safety risks and construction duration. This also further opposes hauling away NF concentrate as a solution for disposal.

The Sunningdale plant has a similar accessibility issue due to the compact layout and small size of the site, however it does have a single access road located along the north side of the site providing direct entry for equipment and deliveries. No internal roads pass through the plant, which helps limit construction-related interference with ongoing operations but also makes it difficult to navigate construction equipment deeper into the site. **Figure 6-3** details the Alternative 2 proposal nanofiltration installations on the northern side of the site which provides a clear advantage, as it positions major construction activities closest to the point of entry and minimizes the need for heavy machinery to navigate deeper into the plant.

The cost estimate for upgrading Whiteway WTP to nanofiltration, in addition to installing a deep injection well can be seen in **Table 6-4**. It is anticipated that Sunningdale will be evaluated under a different project for conversion to a booster pump station.



EAST WHITEWAY DRIVE

LANTERN CIRCLE



LEGEND

UPGRADE/RENEW

NEW PROCESS

RETIRE PROCESS

EXISTING PIPING

PROPOSED ADDITIONAL PIPING

UPGRADE LIME TREATMENT AND FILTERS

UPGRADE/ADD TRANSFER PUMPS

UPGRADE/ADD TRANSFER PUMPS

NEW 1 MGD INFLUENT AERATION

NEW NaOCl STORAGE AND FEED

NEW PIPING THROUGH PLANT

1 MG
GROUND STORAGE TANK

OFFICES AND
CENTRAL GARAGE

0.2 MG
RAW WATER
BLENDING TANK

FILTERS

CHEMICAL BLDG

FUEL PUMPS

CENTRAL
MAINTENANCE
FACILITY

WATER DEPARTMENT
MAINTENANCE SHOP

SCADA
AND
LAB

HIGH
SERVICE
PUMP HOUSE

HYDRO-PNEUMATIC TANK

0.5 MG
GROUND STORAGE TANK

CORROSION INHIBITOR
STORAGE AND FEED

0.2 MG
FINISHED WATER
STORAGE TANK

CITY OF TEMPLE TERRACE
WTP SITES IMPROVEMENTS

WHITEWAY WATER TREATMENT PLANT
WHITEWAY SITE PLAN - LIME

100335

FIGURE 6-1

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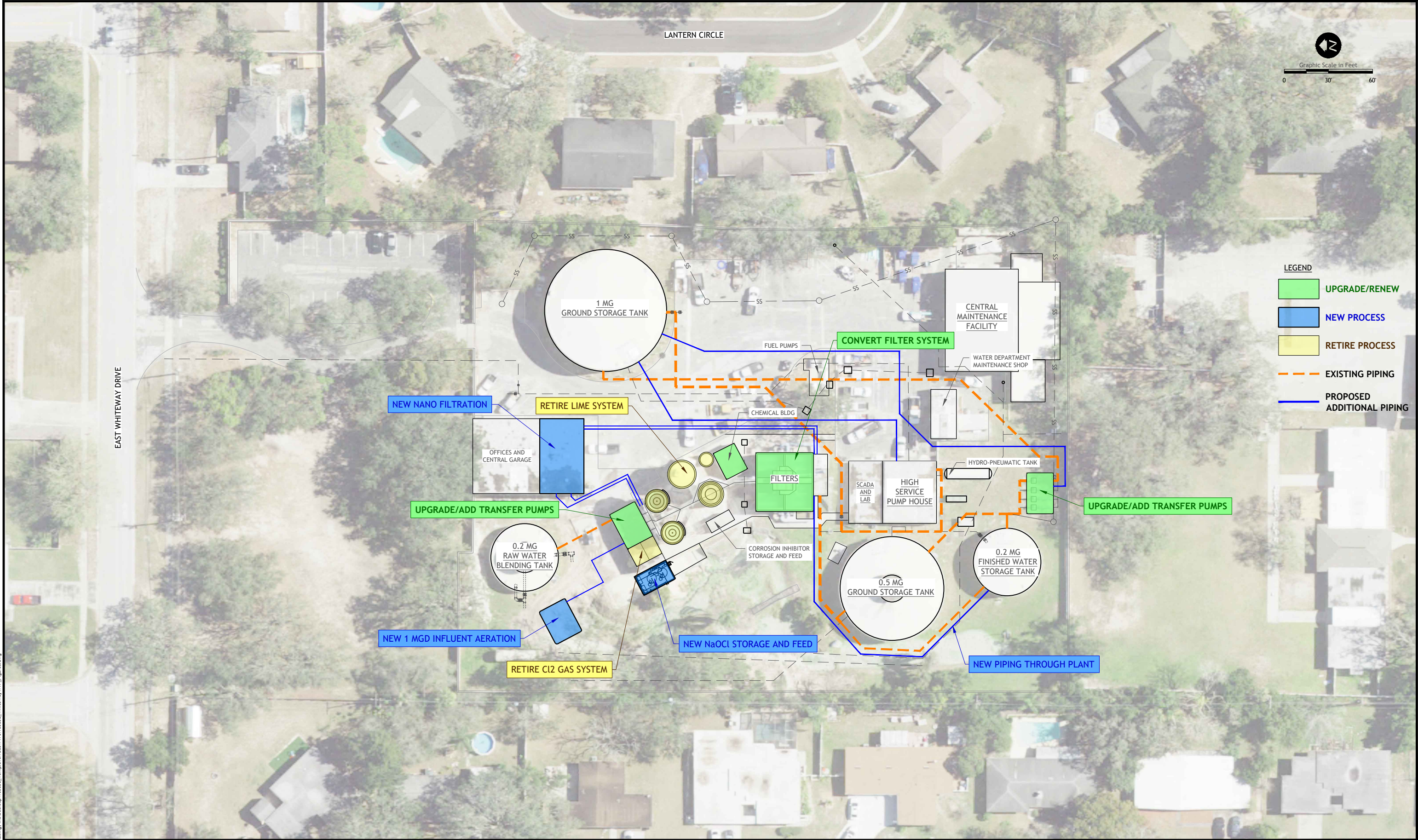
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Designed EHT,IG
Drawn VVV
Reviewed ---
Approved ---
Date 02/2026

LINE IS 1" AT
FULL SIZE

Table 6-3. Needs to Reach 6 MGD @ Whiteway

Needs to Reach 6 MGD @ Whiteway			
Feature	Current Capacity (MGD)	Required Improvements	Improvements Cost Estimate
Wells Total	6.34	-	\$0
Wells Firm Capacity	5.07	1 additional production well (1500 gpm / 1 MGD)	\$5,000,000
Aerator	5.04	Install 1 Bypass with Sulfide Treatment technology	\$800,000
Raw PS Total	7.56	-	\$0
Raw PS Firm	5.04	1 additional raw transfer pump (1500 gpm) / New Transfer Pumps	\$750,000
Lime	5.04	N/A - Bypass can be utilized to reduce flow to lime reactors	\$0
Recarb*	3.96	Bypass rehab	\$150,000
Filters	5.00	2 additional filter cells, assuming same size as current greenleaf filters	\$3,250,000
Transfer PS Total	7.49	-	\$0
Transfer PS Firm	5.18	1 additional Transfer Pump (1500gpm)	\$900,000
High Service PS Total MDD Equivalent	6.91	-	\$0
High Service PS Firm MDD Equivalent	5.47	1 additional High Service PS Firm (1000gpm)	\$1,350,000
Finished Storage, MDD Equivalent	6.00	-	\$0
Demolition		Demolition needed to install piping and upgrade equipment	\$500,000
Liquid Chlorine System		Convert disinfection system to liquid sodium hypochlorite	\$1,500,000
16" Parallel Process Piping		Install 16" main parallel to existing process piping for redundancy	\$2,000,000
Electrical Capacity		Rehab and upgrading of existing electrical equipment	\$1,265,000
Permitted Withdrawal (SWFWMD) Average	5.15	Increase permit capacity with SWFWMD to 6 MGD average	\$0
Process/Civil Subtotal			\$17,465,000
Incidental Electrical/Mechanical	% of Process/Civil	15%	\$2,620,000
Construction Subtotal			\$20,085,000
General Conditions	% of const subtotal	10%	\$2,009,000
Contractor Overhead and Profit	% of const subtotal	12%	\$2,411,000
Opinion of Probable Construction Cost (PCC):			\$24,505,000
Contingency	% of PCC	25%	\$6,127,000
Survey and Engineering Fees	% of PCC	8%	\$1,961,000
Opinion of Probable Construction Cost			\$32,593,000



- LEGEND
- UPGRADE/RENEW
 - NEW PROCESS
 - RETIRE PROCESS
 - EXISTING PIPING
 - PROPOSED ADDITIONAL PIPING

Parent Sheet Set: 100335_TempleTerraceWTP_Sites
Saved: 3/19/2026 9:24:06 AM Plotted: 3/19/2026 9:25:12 AM Current User: Vanara, Violet Last Saved By: 7623
File C:\Users\7623\OneDrive - CHA Consulting, Inc\Desktop\100335_TempleTerraceWTP\100335_WhiteWayWTP_Figures.dwg

Designed EHT,IG
Drawn VVV
Reviewed ---
Approved ---
Date 02/2026

LINE IS 1"=AT
FULL SIZE

CITY OF TEMPLE TERRACE
WTP SITES IMPROVEMENTS

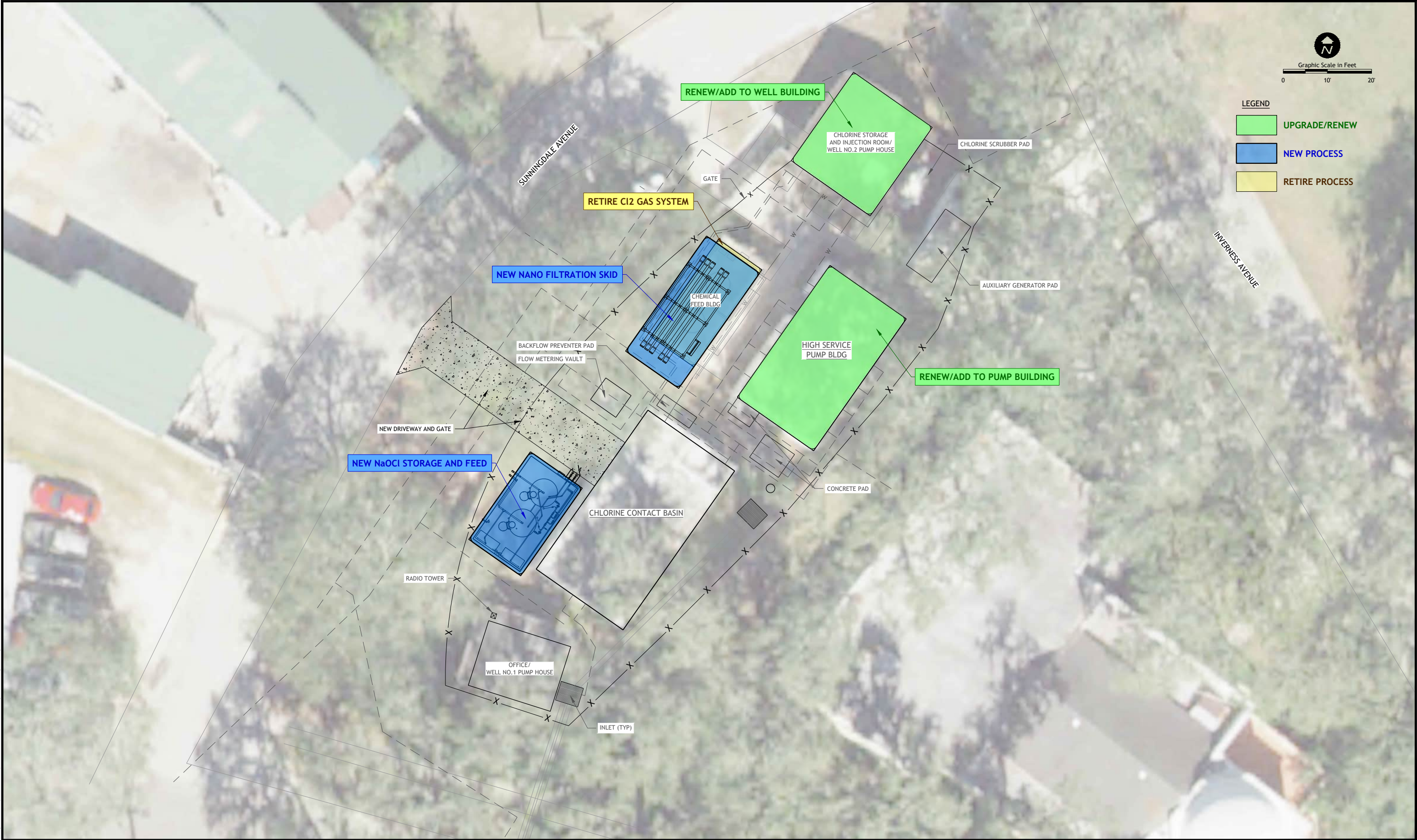
WHITEWAY WATER TREATMENT PLANT
WHITEWAY SITE PLAN - NF

100335

FIGURE 6-2

--

CHA
CHA CONSULTING, INC.
CERTIFICATE OF AUTH. 28386
2502 N ROCKY POINT DR
SUITE 145
TAMPA, FL 33607
(813) 549-0919



Parent Sheet Set: 100335_TempleTerraceWTP_Sites
Saved: 11/21/2025 1:22:02 PM, Plotted: 11/21/2025 1:22:34 PM, Current User: Yonatta, Violet, LastSavedBy: 7023
File C:\Users\7023\OneDrive - CHA Consulting, Inc\Desktop\100335_TempleTerraceWTP\100335_SunningdaleWTP_Figures.dwg

Designed <u>EHT</u>	CITY OF TEMPLE TERRACE WTP SITES IMPROVEMENTS	100335	 CHA CONSULTING, INC. CERTIFICATE OF AUTH. 28386 2502 N ROCKY POINT DR SUITE 145 TAMPA, FL 33607 (813) 549-0919	
Drawn <u>VVV</u>		SUNNINGDALE WATER TREATMENT PLANT SUNNINGDALE SITE PLAN		FIGURE 6-3
Reviewed <u>---</u>				--
Approved <u>---</u>				
Date <u>11/2025</u>				
LINE IS 1" AT FULL SIZE				

Table 6-4. Needs for Nanofiltration PFAS Removal (Whiteway @ 6 MGD)

Whiteway NF Treatment Full Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>NF Membrane Skid & Appurtenances</i>						
2 MGD Three-Stage NF Skid	EA	3	\$2,000,000	\$200,000	\$2,200,000	\$6,600,000
Cartridge Filtration	LS	1	\$250,000	\$100,000	\$350,000	\$350,000
Acid Cleaning System	LS	1	\$220,000	\$100,000	\$320,000	\$320,000
Transfer Pump Station Head Improvements	LS	1	\$400,000	\$150,000	\$550,000	\$550,000
NF Connection Piping, Valving, Metering	LS	1	\$400,000	\$200,000	\$600,000	\$600,000
NF Area Sitework	EA	10,000	\$12	\$12	\$24	\$240,000
Liquid Chlorine System	EA	1	\$1,200,000	\$300,000	\$1,500,000	\$1,500,000
16" Parallel Process Piping	EA	1	\$1,500,000	\$500,000	\$2,000,000	\$2,000,000
Additional Production Well	EA	1	\$4,000,000	\$1,000,000	\$5,000,000	\$5,000,000
Process/Civil Subtotal						\$17,160,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$17,160,000			\$1,716,000
Construction Subtotal						\$18,876,000
General Conditions	% of const subtotal	10%	\$18,876,000			\$1,888,000
Contractor Overhead and Profit	% of const subtotal	12%	\$18,876,000			\$2,266,000
Opinion of Probable Construction Cost (PCC):						\$23,030,000
Contingency	% of PCC	25%	\$23,030,000			\$5,758,000
Survey and Engineering Fees	% of PCC	8%	\$23,030,000			\$1,843,000
Opinion of Probable Construction Cost						\$30,631,000
Deep Injection Well						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
Deep Injection Well	EA	1	\$10,000,000	\$5,000,000	\$15,000,000	\$15,000,000
Process/Civil Subtotal						\$15,000,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$15,000,000			\$1,500,000
Construction Subtotal						\$16,500,000
General Conditions	% of const subtotal	10%	\$16,500,000			\$1,650,000
Contractor Overhead and Profit	% of const subtotal	12%	\$16,500,000			\$1,980,000
Opinion of Probable Construction Cost (PCC):						\$20,130,000
Contingency	% of PCC	25%	\$20,130,000			\$5,033,000
Survey and Engineering Fees	% of PCC	8%	\$20,130,000			\$1,611,000
Opinion of Probable Construction Cost						\$26,774,000
Nanofiltration Installation Subtotal						\$30,631,000
Deep Injection Well Subtotal						\$26,774,000
Total Cost						\$57,405,000

6.6 Phasing, Sequencing, and Overall CIP

Phasing and sequencing were prepared based on Master Plan investigations and is provided in year-by-year recommendations over the next 20 years in the following figure. Components are itemized in the table below and are grouped together in a recommended sequencing of projects. Estimated combined costs of each project can be found in **Table 6-5**.

Recommended phasing is as follows (note that projects can and should be done simultaneously in order to facilitate meeting the EPA 2031 deadline for PFAS removal):

- Inhouse: Recurring maintenance to upkeep the WTPs (i.e. pond maintenance, renewing paintings and coatings, replacing valves regularly, pump rebuilds). These items can be done in-house or subbed out to contractors (**Ongoing**).
- Priority repairs Make Whiteway WTP recarbonation tank bypass repairs (**2026**)
- Exploratory Well Project (**2026-2031**)
- Electrical WTPs Project (**2026-2028**)
- General WTPs Project (i.e., general water treatment plant contractor) (**2027-2030**)
- Minor engineering/hydrogeological support (**2026-2028**)
 - SWFWMD WUP capacity increase
 - Telecom and Chinaberry Alt Operation
 - NF concentrate PFAS treatment testing

Table 6-5. Estimated 5-Year Projects Costs

Project	Whiteway	Sunningdale	Total
Priority Repairs	\$300,000	--	\$300,000
Exploratory Well	\$7,152,500	--	\$7,152,500
Electrical R&R, Feed/Loop, NF	\$6,094,013	\$1,572,010	\$7,666,023
General WTP	\$52,953,375	\$4,191,013	\$57,144,389
WTP R&R	\$3,071,375	\$4,191,013	\$7,262,389
NF Softening+PFAS Removal	\$23,082,000	--	\$23,082,000
Concentrate Management	\$26,800,000	--	\$26,800,000
Total	\$66,499,888	\$5,763,023	\$72,262,912

Table 6-6. Proposed WTP Improvements CIP 2026-2045

Project	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Whiteway Plant																				
Phase 0: General Maintenance																				
Percolation Pond Maintenance	\$ 852,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Air Release Valve Replacement	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575	\$ 25,575
Electrical Distribution Breaker/Starter Replacement	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150
Wear Plate Replacements	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150	\$ 51,150
Rebuild Turbine Pumps	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970	\$ 57,970
Rebuild Water Supply Wells	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250	\$ 85,250
Chlorine Tank	\$ -	\$ -	\$ 5,683	\$ 5,683	\$ 5,683	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Clearwell	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
0.5 MG Ground Storage Tank	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1.0 MG Ground Storage Tank	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
0.2 MG Ground Storage Tank	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Transfer Pumps to GST (40 HP)	\$ 30,088	\$ 30,088	\$ 30,088	\$ 30,088	\$ 30,088	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
High Service Pump No. 1 (50 HP)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 23,250	\$ 23,250	\$ 23,250	\$ 23,250	\$ -	\$ -	\$ -	\$ -
High Service Pumps No. 2, 3 (60 HP)	\$ -	\$ -	\$ -	\$ 26,921	\$ 26,921	\$ 26,921	\$ 26,921	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
High Service Pumps No. 4, 5, 6 (75 HP)	\$ -	\$ -	\$ -	\$ 26,921	\$ 26,921	\$ 26,921	\$ 26,921	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Production Well No. 4	\$ -	\$ -	\$ -	\$ -	\$ 204,600	\$ 204,600	\$ 204,600	\$ 204,600	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Production Well No. 5	\$ -	\$ -	\$ -	\$ -	\$ 204,600	\$ 204,600	\$ 204,600	\$ 204,600	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Aeration and Blending Tank	\$ -	\$ -	\$ -	\$ -	\$ 170,500	\$ 170,500	\$ 170,500	\$ 170,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Phase 1: Priority Repairs																				
Recarb Bypass Valve Repair/Replace	\$ 300,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Aeration Tank Chlorine Injector	\$ 8,525	\$ 8,525	\$ 8,525	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 8,525	\$ 8,525	\$ 8,525
Main Distribution Panel	\$ 35,464	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dry Type Transformer	\$ 30,690	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel C	\$ 15,004	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel A1	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel A2	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel Board	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch (By Ice Maker)	\$ 2,728	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Local Control Station	\$ 3,410	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch (By compressor units area)	\$ 1,364	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch (By compressor units area)	\$ 2,728	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Meter Can	\$ 27,280	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 27,280	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Disconnect Switch	\$ 5,115	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Load Center (Chemical BLDG and Transfer Pumps)	\$ 11,935	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
L/V Panel Board	\$ 11,935	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dry Type Transformer	\$ 25,575	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pump Motor	\$ 17,050	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch (For 7.5HP Pump Motor)	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch (For 0.25HP Pump Motor)	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Local Control Station (For 0.25HP Pump Motor)	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch (For 5 HP Motor)	\$ 3,137	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch	\$ 3,137	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Local Control Station 1 (For 3HP motor)	\$ 2,728	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Local Control Station 2 (For 3HP motor)	\$ 2,728	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pump Motor Control Panel	\$ 51,150	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Low Voltage Panel #29	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Low Voltage Panel #30	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Freestanding Control Panel	\$ 85,250	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Vacuum Pump No.1 safety Disconnect Switch	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Vacuum Pump No.2 safety Disconnect Switch	\$ 1,705	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Cat. Generator and Day Tank	\$ 954,800	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
ATS	\$ 78,430	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel PP1	\$ 30,690	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pump Starters (Pump 4,5 and 6)	\$ 27,280	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 27,280	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
HOA	\$ 5,115	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Equalization Valve Safety Disconnect Switch	\$ 3,410	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel Board (Pump Motor Starter Center)	\$ 40,920	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 40,920	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pump Controller	\$ 8,525	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 8,525	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Disconnect Switch	\$ 3,069	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -



Lighting Panel	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Generator Panel	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Lighting Transformer	\$ 25,916	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
High Service Pump 1 Time Delay	\$ 3,410	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
High Service Pump 2 Time Delay	\$ 3,410	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Flow Recorder Panel 1	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Flow Recorder Panel 2	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CP- 1 Transfer Pump Station	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Disconnect Switch	\$ 28,644	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Transfer Room Safety Switch	\$ 15,004	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Offices and Maint. Shop Safety Switch	\$ 8,184	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
HS Room Safaty Switch	\$ 15,004	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Disconnect Switch (Service to PP1 Panel)	\$ 28,644	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
T.E.CO Safety Switch	\$ 8,184	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Wells 4-5 Safety Switch	\$ 8,184	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safaety Switch	\$ 3,137	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Electrical Penel	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safaety Switch	\$ 3,137	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Well 4 Starter	\$ 6,820	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 6,820	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Well 5 Starter	\$ 6,820	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 6,820	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Well 5 Safety Switch	\$ 5,115	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dry Type Transformer	\$ 24,552	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
MDP	\$ 18,414	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dry Type Transformer	\$ 24,552	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Panel P	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Battery Charger	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Aux. Battery Charger	\$ 24,211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Phase 2: Exploratory Well																				
New Wellfield Hydrogeo Design/Permit	\$ -	\$ 852,500		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
New Well Supply Well #1	\$ -	\$ -	\$ 800,000	\$ 5,500,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Phase 3: Whiteway NF Expansion																				
Liquid Chlorine System	\$ -	\$ 1,500,000	\$ 1,200,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
VFDs for Transfer Pumps and HSPs		\$ 700,000	\$ 700,000	\$ 700,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Parallel Feed, Loop, NF MCCs	\$ 400,000	\$ 800,000	\$ 700,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Whiteway WTP Nanofiltration Process (Softening and PFAS Removal)	\$ 800,000	\$ 3,000,000	\$ 6,800,000	\$ 7,300,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
PFAS Disposal Destruction Preliminary Design/Design	\$ 170,500	\$ 511,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Whiteway Demolitions	\$ -	\$ -	\$ -	\$ 900,000	\$ 900,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Deep Injection Well	\$ 1,000,000	\$ 5,000,000	\$ 10,000,000	\$ 10,000,000	\$ 800,000	\$ -	\$ -	\$ -	\$ -	\$ 200,000	\$ -	\$ -	\$ -	\$ -	\$ 200,000	\$ -	\$ -	\$ -	\$ -	\$ 200,000
Sunningdale Plant																				
Phase 0: General Maintenance																				
Production Well No. 1 (30 HP)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 170,500	\$ 170,500	\$ 170,500	\$ 170,500
Production Well No. 2 (75 HP)	\$ -	\$ -	\$ -	\$ -	\$ 204,600	\$ 204,600	\$ 204,600	\$ 204,600	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Chlorine Contact Chamber	\$ 5,683	\$ 5,683	\$ 5,683	\$ 5,683	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Chlorine Scrubber	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 100,294	\$ 100,294	\$ 100,294	\$ 100,294	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Chlorinator	\$ 8,525	\$ 8,525	\$ 8,525	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 8,525	\$ 8,525	\$ 8,525
Caustic Recirculation Pump	\$ 3,410	\$ 3,410	\$ 3,410	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,410	\$ 3,410	\$ 3,410
High Service Pumps No. 1-4 (50 HP)	\$ 31,969	\$ 31,969	\$ 31,969	\$ 31,969	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Phase 1: Priority Repairs																				
Safety Switch	\$ 6,479	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
LP-3	\$ 10,230	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Dry Type Transformer	\$ 12,276	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Generator	\$ 1,193,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
ATS	\$ 85,250	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Service Cntrance Circuit Breaker	\$ 17,050	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
MCC-2	\$ 136,400	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
CP-2	\$ 34,100	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Safety Switch	\$ 8,525	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
RTU	\$ 68,200	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Phase 2: Expansion/Conversion																				
Improvements/Demo/Conversions	\$ -	\$ -	\$ -	\$ 1,900,000	\$ 1,900,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 7,531,268	\$ 12,723,295	\$ 20,564,979	\$ 26,698,361	\$ 4,745,009	\$ 1,209,531	\$ 1,209,531	\$ 1,155,689	\$ 371,389	\$ 471,095	\$ 390,445	\$ 271,095	\$ 294,345	\$ 294,345	\$ 494,345	\$ 294,345	\$ 441,595	\$ 462,055	\$ 462,055	\$ 662,055



APPENDIX A

PFAS Decision Trees

Temple Terrace WTPs Master Plan

PFAS Decision Tree Requested by the City-Draft

CHA Consulting, Inc.

November 12, 2025

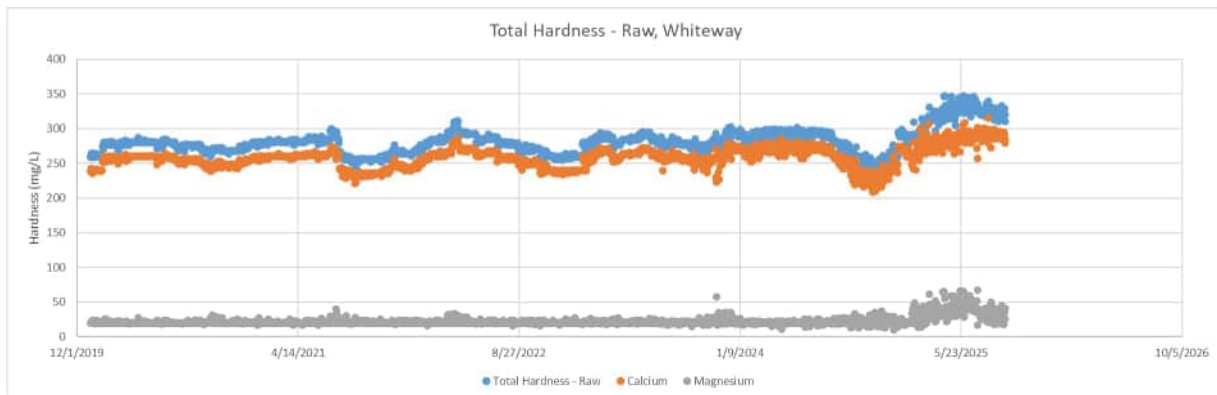
Contents

Based on the City's desire for additional detail, existing PFAS decision trees from the Arizona Department of Environmental Quality (ADEQ) and Department of Defense (DoD) were utilized with highlights and markups used to designate Temple Terrace applicability. References for the ADEQ and DoD decision trees are at the end of this document.

Temple Terrace Decision Tree Assumptions

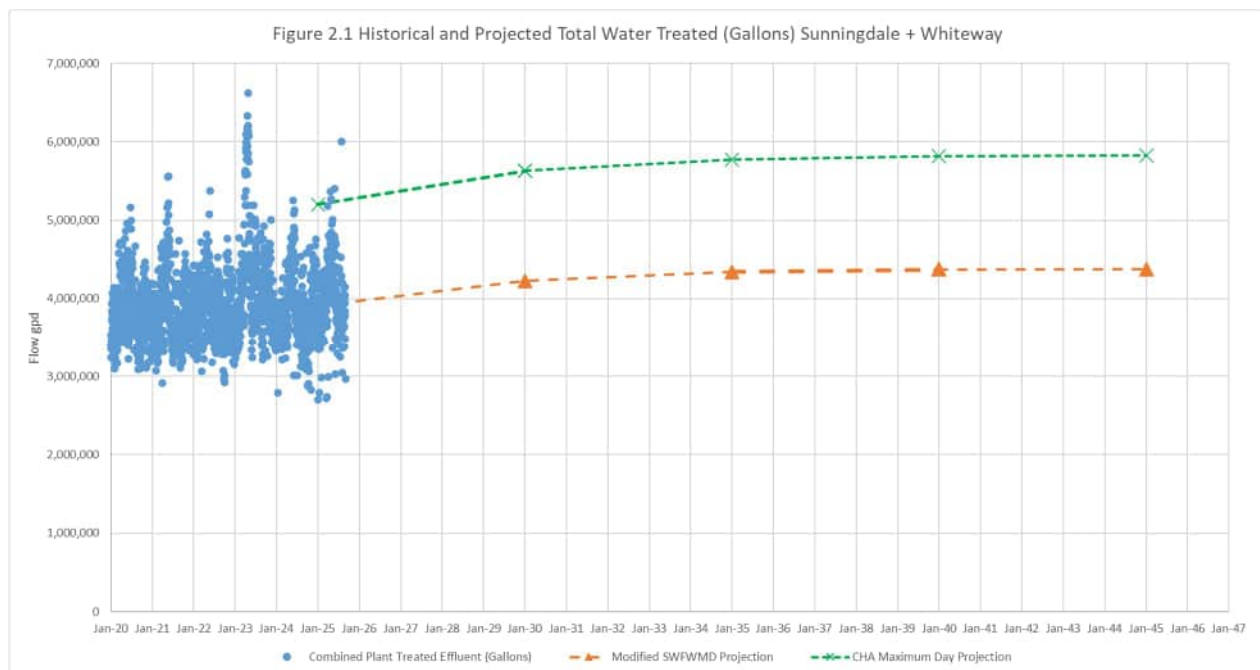
Starting Assumptions/Conditions

- Average Influent Hardness (from Feb 2025-Aug 2025; 329 mg/L)
 - Elevated hardness has occurred over the last 8 months, previous Whiteway average influent hardness was approximately 275 mg/L.
 - Individual well operating protocols should be reviewed by the City.



- Maximum Influent PFAS Concentration:
 - PFOA: 11 ppt
 - PFOS: 21 ppt
 - PFHxS: 16 ppt
 - Treatment goal of 100% removal

- Expected Flows (Based Flow Data from 2020-2025 MORs):
 - o Maximum Day
 - Whiteway Historical Max Day: 3.856 MGD (3/26/2025)
 - Sunningdale Historical Max Day: 3.310 MGD (4/28/2023)
 - These events could have been due to an extreme event, CHA would propose a combined max day PFAS treatment in the 6 MGD range
 - o Average Day
 - Whiteway Historical Avg Day: 3.0 MGD
 - Sunningdale Historical Avg Day: 1.0 MGD
 - There is some disagreement in the MOR data for total flow (3.9 to 4.3 MGD total for both WTPs)
 - o PFAS Treatment capacity if raw water stays separated at each WTP:
 - Whiteway WTP Max Day: 4 MGD
 - Sunningdale WTP Max Day: 2 MGD
 - Flows could bypass PFAS treatment to maintain WTP FDEP capacities
- Current Permit Limits
 - o SWFWMD Water Use
 - Average Permitted Withdrawal: 5,150,000 gallons per day
 - Peak Permitted Withdrawal: 5,817,400 gallons per day
 - o FDEP/Health Dept WTP Design (Max Day) Capacity
 - Whiteway: 5.04 MGD
 - Sunningdale: 3.96 MGD



Pilot Results and Considerations

- The pilot runtime is set at 1 month
 - The pilot protocol is defined in a separate document previously submitted to the City.
- If multiple media show similar effectiveness, interference with existing constituents and capital and O&M would be deciding factors.
- If all the piloted media were to show inconclusive PFAS removal results under both hard water and soft water conditions, additional media/processes would be tested under a Phase 2 pilot effort.
 - Under such circumstances where both GAC and IX are showing ineffectiveness, membrane technology (RO/NF) would become a top contender for PFAS removal and already is for softening water quality goals greater than 30% and due to space constraints.

Additional Notes

1. Current EPA Regulations list compliance thresholds for 6 PFAS species with a deadline of 2029, with plans to extend to 2031. Temple Terrace's finished water exceeds the limit for PFOA and PFOS, with elevated levels of PFHxS in select production wells.
2. New water supply is dependent on SWFWMD water supply plan/policy constraints and the feasibility of drilling new deeper wells that may also have PFAS and higher levels of H₂S and total organic carbon.
3. Current wells are relatively shallow (150-505 feet in depth). The depth needed to produce PFAS free water is unknown at this time. Other characteristics of the new source water would need to be evaluated (i.e. sulfides, organic content, hardness, etc.) to make treatment decisions
4. The City's finished water frequently has over 300 mg/L of hardness. Each technology that removes hardness has a practical amount that it can remove. The City's softening goal will guide hardness removal treatment decisions.
5. 30 percent hardness removal would result in a finished water content in the range of 190 to 250 mg/L based on the City's historical influent hardness concentrations. Lime softening typically has a limit of 30% hardness removal, which is backed by City historical data. Cation Exchange may be impractical above this limit due to increased salt concentration in the brine and disposal options.
6. 60 percent hardness removal would result in a finished water content in the range of 108 to 140 mg/L based on the City's historical influent hardness concentrations. Membranes can effectively remove hardness in this range and greater. Calcium,

2.2 Water Quality Parameters Built into Decision Trees

The quality of the source water drives treatment goals and influences the efficacy of PFAS removal processes. This affects treatment train design, process performance, O&M needs, and the disposal of residuals, that all together determine the viability of a specific treatment approach. Therefore, it is critical for all mitigation strategies to be based on a known quality of water matrix and its variations. The water quality parameters should be monitored multiple times over the course of the year to capture variability in concentrations and temporal or seasonal changes in source water quality. In addition to PFAS monitoring, background water quality parameters should be analyzed. It is recommended to include both PFAS and background water quality parameters during the same sampling events (paired samples). Although sampling focused on EPDS locations serves as indicator of a potential PFAS issue, mitigation strategies should expand the sampling locations to include raw water sources and significant points within the existing treatment trains. Only comprehensive sampling allows accurate use of the decision trees, preparation for evaluation of technology performance through pilot testing, optimization of treatment trains, operational parameters, and cost analysis.

The background water quality parameters that influence PFAS treatment selection and drive the need for pre-treatment or technology combination are as follows:

- **Cations:** Calcium, Magnesium, Sodium, Potassium, Iron, Manganese, Total Hardness, Ammonium
- **Anions:** Sulfate, Nitrate, Arsenic, Fluoride, Perchlorate, Bicarbonate, Uranium, Chloride
- **Other:** TSS, TOC, DOC, TDS, pH, Temperature, Silica, Alkalinity, Oil and Grease, Chlorine and Other Oxidants Residual, Total Coliform, Heterotrophic Plate Count (HPC), Langelier Saturation Index (LSI), silt density index (SDI) for membrane application, and turbidity.

3.0 Navigating Decision Trees

This document provides six decision trees for PFAS mitigation purposes which are intended to be used iteratively.

- **Tree 1:** Non-Treatment Selection
- **Tree 2:** General Treatment Selection
- **Tree 3:** GAC Treatment
- **Tree 4:** IX Treatment
- **Tree 5:** RO/NF Treatment
- **Tree 6:** Simultaneous Compliance for Non-Treatment and Treatment Alternatives
- **-Tree 7:** PFAS Disposal (DoD)

The user should start with Tree 1 to first assess the suitability of non-treatment alternatives, which are often preferred to treatment. If non-treatment is not an option for meeting the utility's goals, the user should proceed to Tree 2 for general selection of the most suitable BATs. Each treatment alternative is

further analyzed individually in Trees 3-5 (GAC, IX and RO). Finally, Tree 6 should be used to evaluate simultaneous compliance and, as such, applies to both non-treatment and all three treatment options.

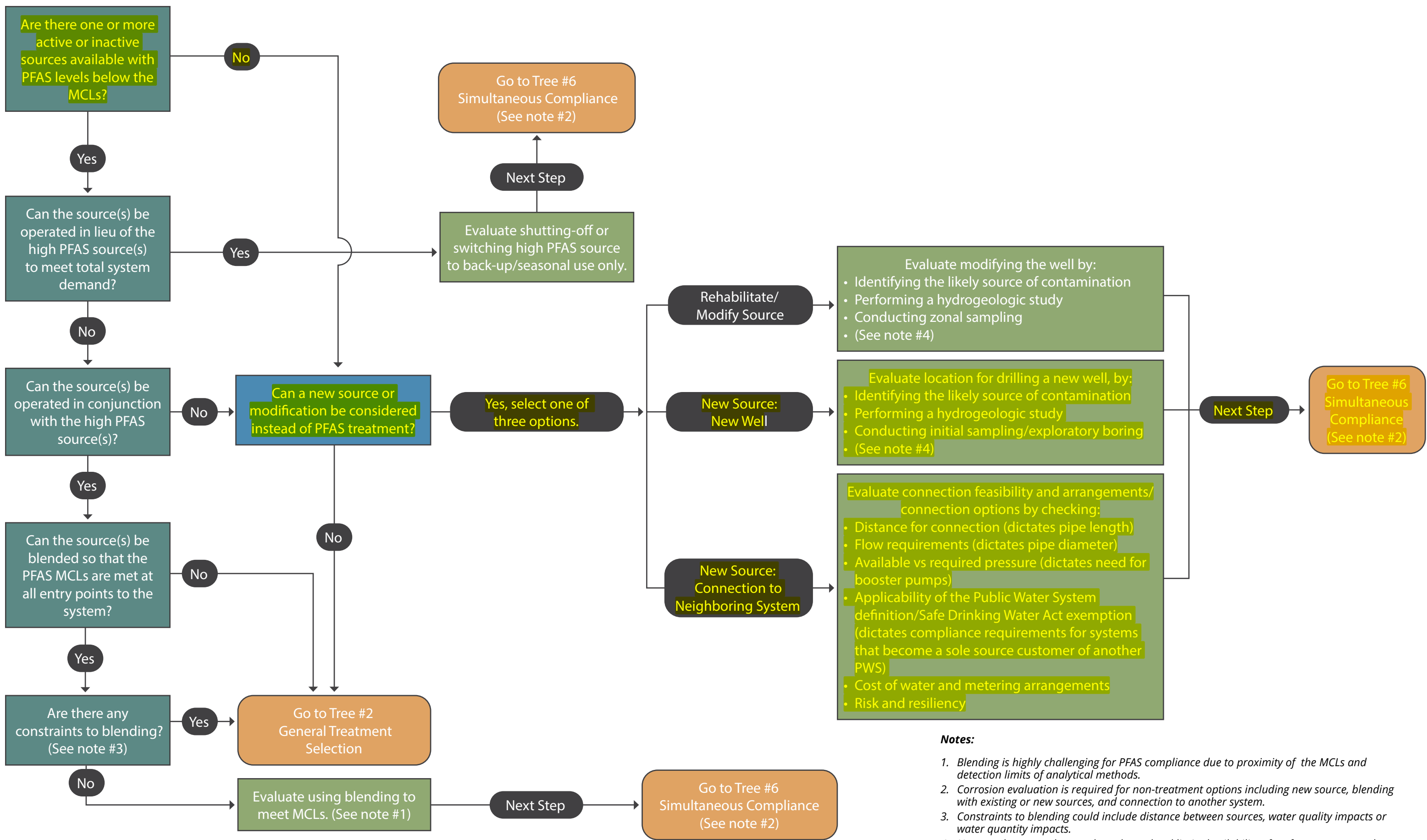
Colors and shapes within the decision trees help the user navigate them. Teal boxes are initial questions and black boxes are switches. Olive green boxes instruct the user to evaluate various factors. Blue boxes pose follow up questions to the user. Orange boxes with rounded corners indicate the user should refer to another tree.

The decision tree process is based upon information or utility preferences and typically relies upon yes or no responses, but at times includes multiple choice responses. Following the most likely flow path will lead to other questions, including information and recommendations to implement for these given scenarios. From this, the utility will reach an action box where the next step will be contingent upon the utility's willingness and ability to impose a particular change in their operating scheme. This will either point the user to another decision tree or make a final recommendation for a PFAS mitigation selection. It should not be forgotten that all final process recommendations lead to Tree 6 to check if additional actions for simultaneous compliance are needed. Ultimately, the decision trees are intended for use as an iterative tool which may not always lead to a single solution but will enable quick exclusion of certain options that are impractical for a particular application.

Additional steps that are recommended to be followed in this order but are outside the scope of this document and decision trees are summarized below:

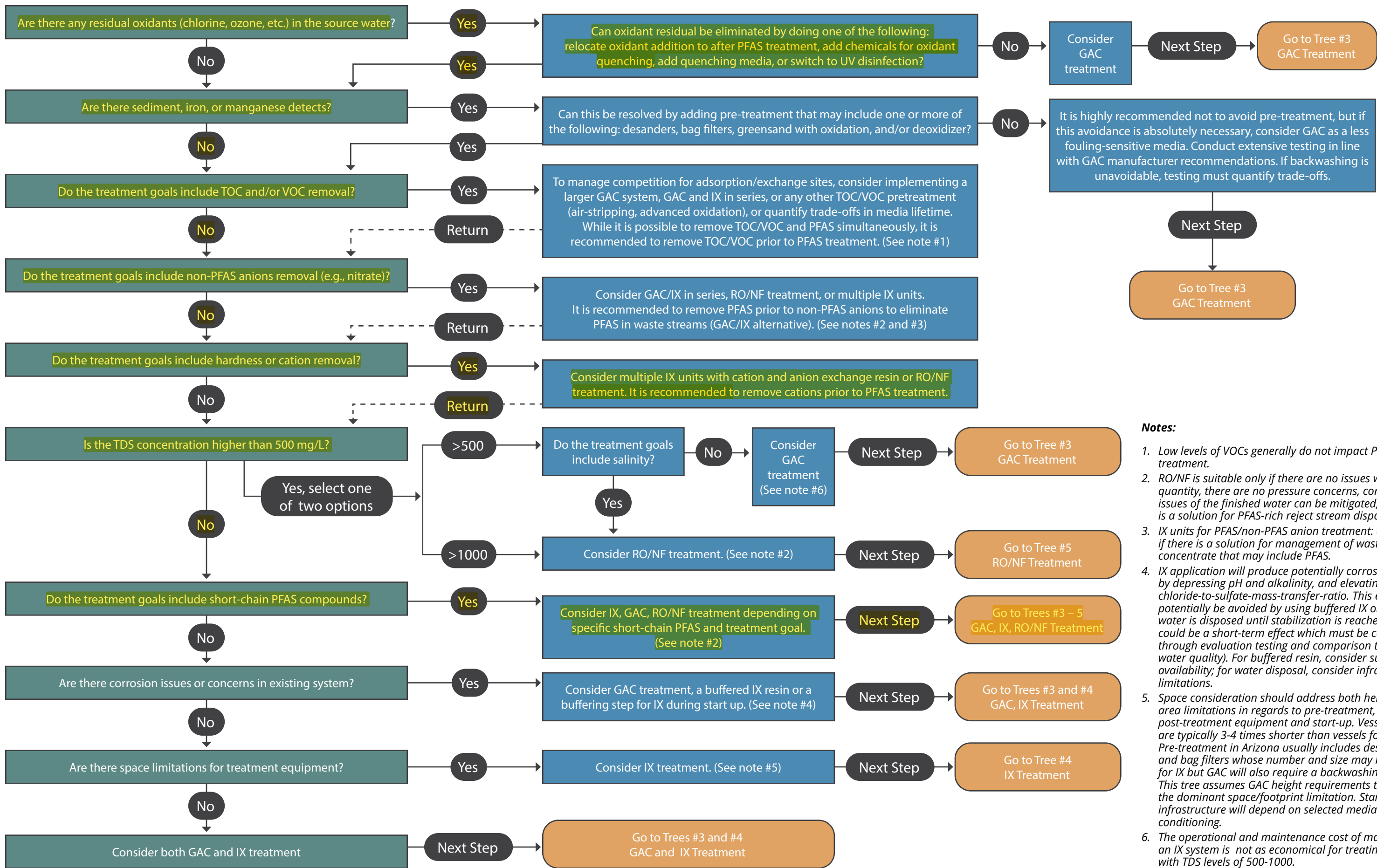
- 1. Estimate planning-level costs.** This involves capital and O&M costs for the mitigation strategy using cost modeling tools | [View Tool >](#) To satisfy input requirements for treatment cost estimates, the utility should work with manufacturers to get WQPs-based initial media life estimates. The cost estimates should differentiate between capital and O&M costs which, at the very minimum, will include sediment pre-treatment, lead-lag configurations, post-treatment disinfection and PFAS-specific waste handling. If this planning level cost is not within a range that is financially possible, the user should consider using different alternatives in the decision tree process.
- 2. Evaluate treatment mitigation strategies.** Evaluation (preferably long-term (>6 months) pilot testing) is necessary in optimizing treatment variables and avoiding implementing a strategy that will not work for unforeseen reasons. This evaluation is indicated in Trees 3 and 4. Pilot testing protocols are not provided by this document but will be added in the future.
- 3. Develop a detailed construction-level and O&M cost estimates.** Refer to AACE International, Cost Estimate Classification System, 2005 | [View Document >](#)
- 4. Develop the final design and submit for permitting.**

Tree 1: Non-Treatment Selection



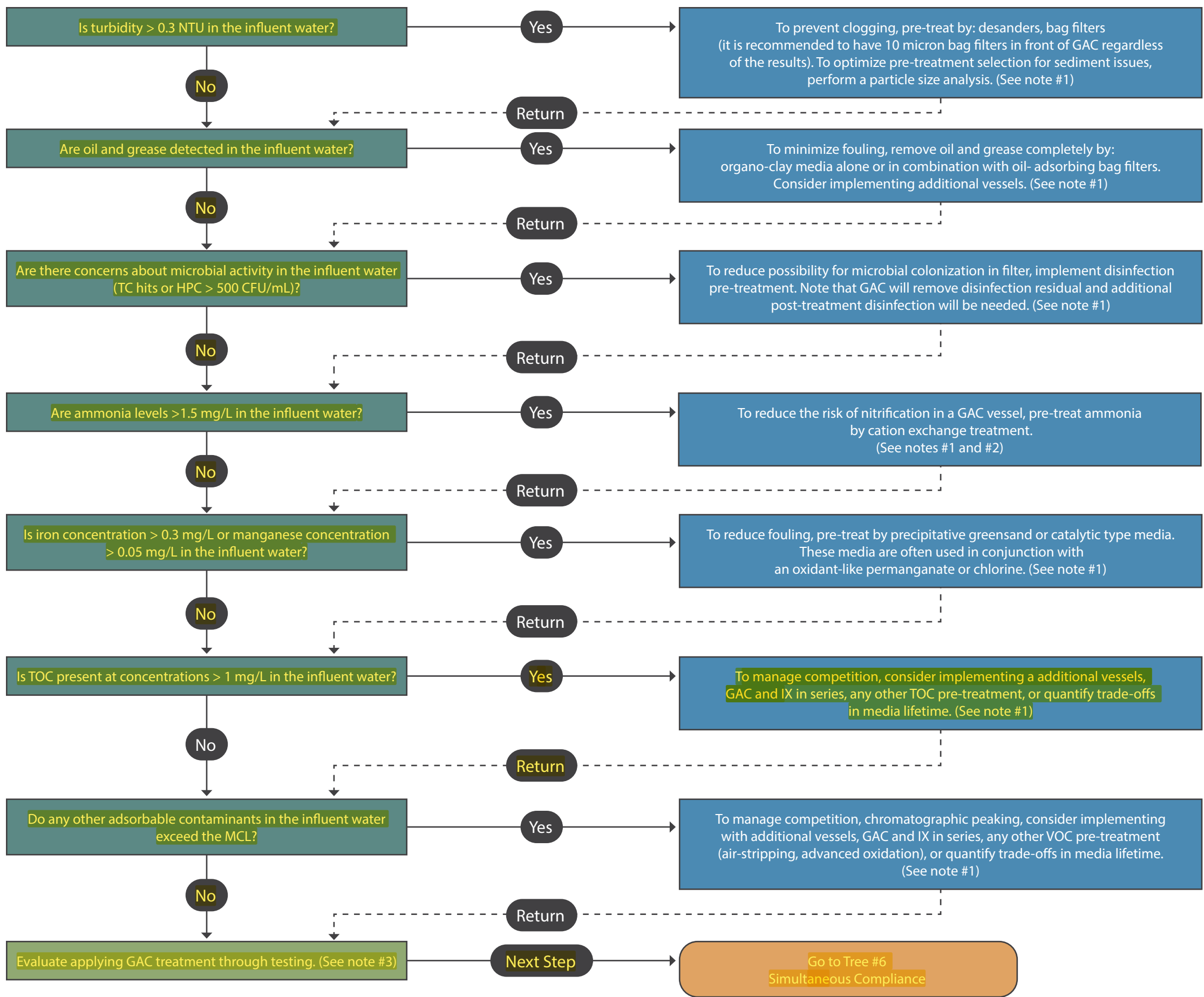
- Notes:**
1. Blending is highly challenging for PFAS compliance due to proximity of the MCLs and detection limits of analytical methods.
 2. Corrosion evaluation is required for non-treatment options including new source, blending with existing or new sources, and connection to another system.
 3. Constraints to blending could include distance between sources, water quality impacts or water quantity impacts.
 4. Narrowed to groundwater alone due to local limited availability of surface water, prevalence of small systems with limited capacity for treatment that is inevitable with this type of source.
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Tree 2: General Treatment Selection



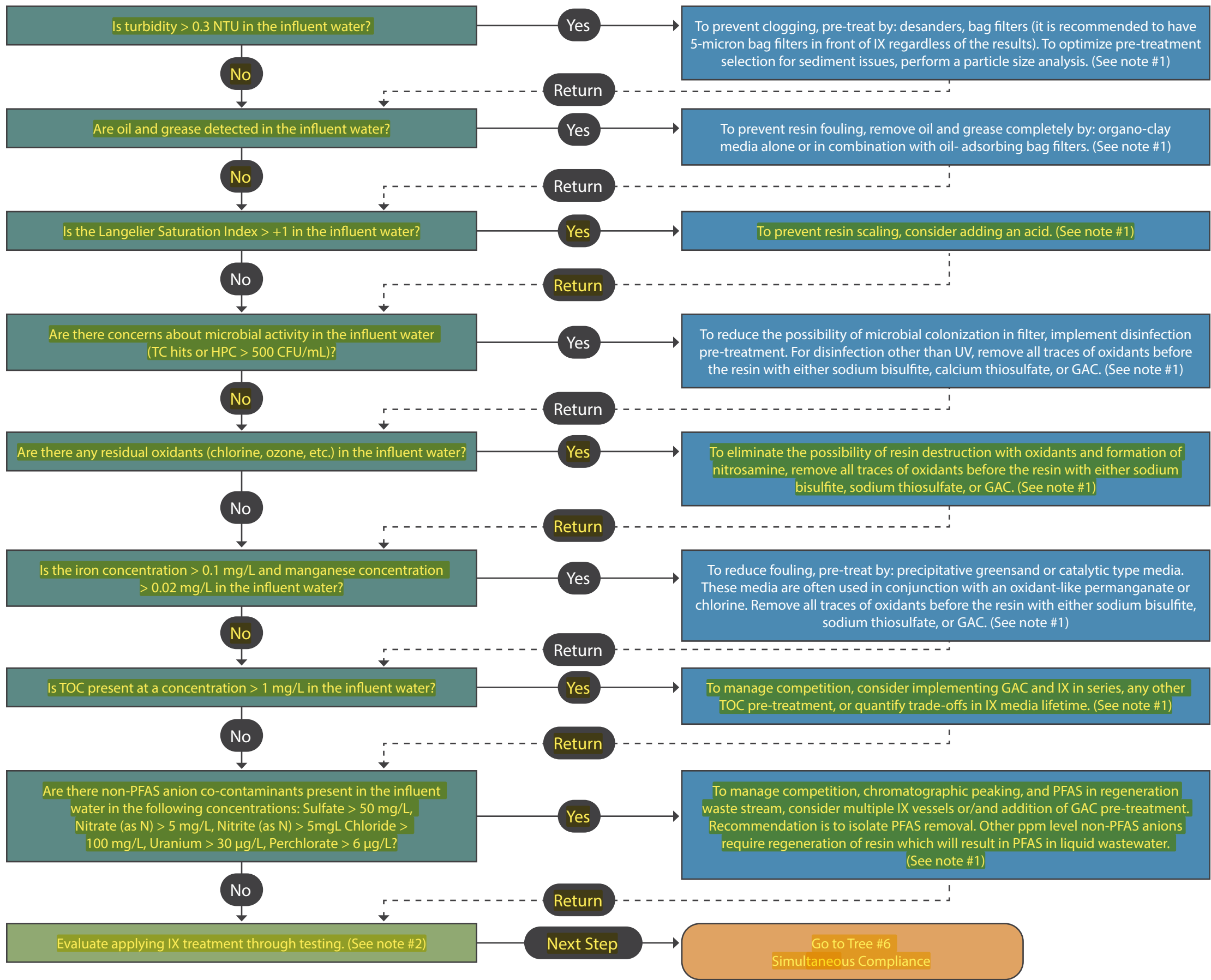
- Notes:**
- 1. Low levels of VOCs generally do not impact PFAS treatment.
 - 2. RO/NF is suitable only if there are no issues with water quantity, there are no pressure concerns, corrosion issues of the finished water can be mitigated, and there is a solution for PFAS-rich reject stream disposal.
 - 3. IX units for PFAS/non-PFAS anion treatment: only if there is a solution for management of waste concentrate that may include PFAS.
 - 4. IX application will produce potentially corrosive water by depressing pH and alkalinity, and elevating the chloride-to-sulfate-mass-transfer-ratio. This effect may potentially be avoided by using buffered IX or if treated water is disposed until stabilization is reached (this could be a short-term effect which must be confirmed through evaluation testing and comparison to previous water quality). For buffered resin, consider supply availability; for water disposal, consider infrastructure limitations.
 - 5. Space consideration should address both height and area limitations in regards to pre-treatment, treatment, post-treatment equipment and start-up. Vessels for IX are typically 3-4 times shorter than vessels for GAC. Pre-treatment in Arizona usually includes desanders and bag filters whose number and size may be larger for IX but GAC will also require a backwashing tank. This tree assumes GAC height requirements to be the dominant space/footprint limitation. Start-up infrastructure will depend on selected media and its conditioning.
 - 6. The operational and maintenance cost of maintaining an IX system is not as economical for treating streams with TDS levels of 500-1000.

Tree 3: GAC Treatment



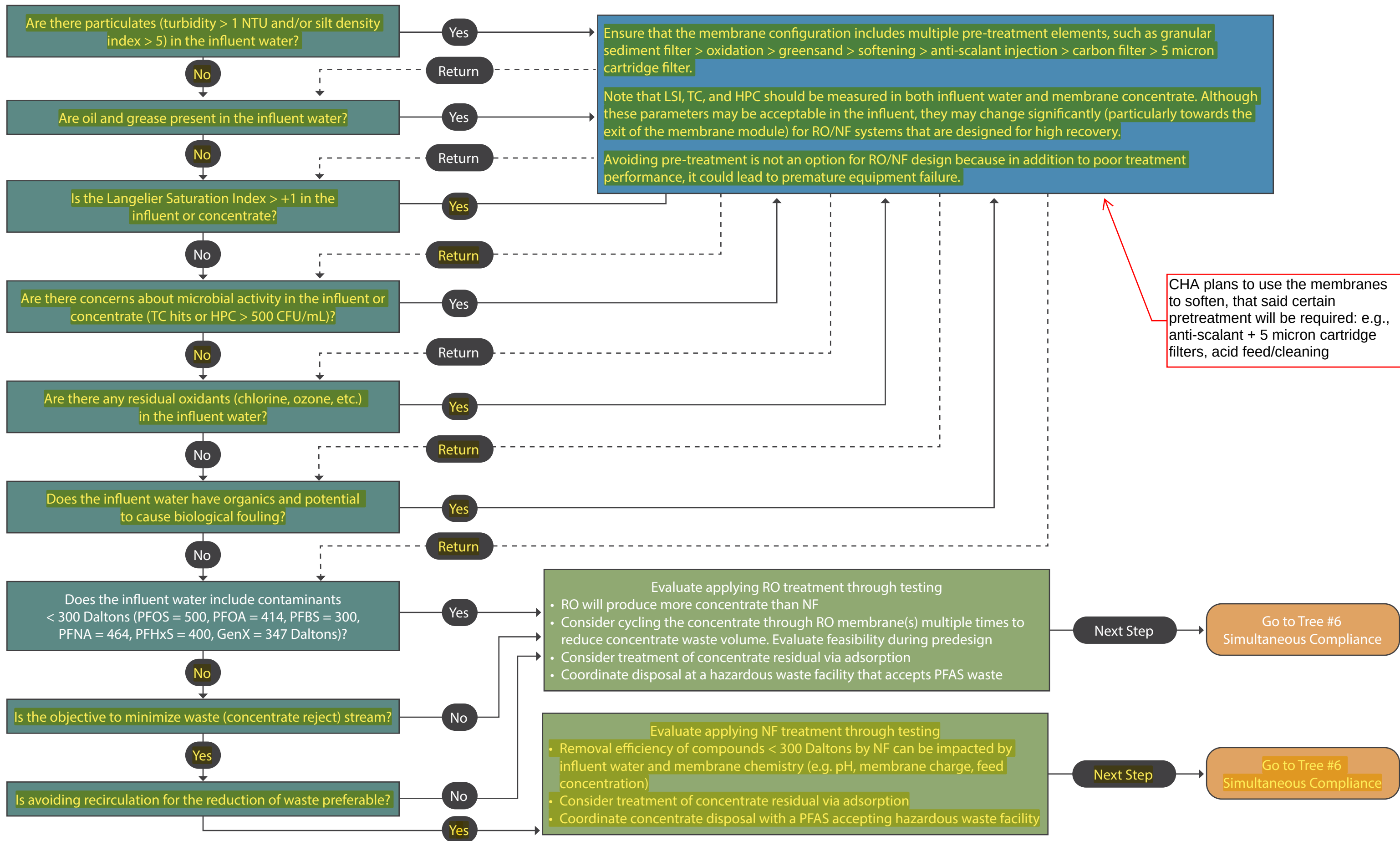
- Notes:**
1. It is highly recommended not to avoid pre-treatment, but if this avoidance is absolutely necessary, conduct extensive testing in line with manufacturer recommendations to quantify trade-offs resulting from not adding pre-treatment or choosing alternative GAC design.
 2. Addition of chlorine to convert ammonia to chloramine may not be suitable because GAC will just strip the chlorine off of the chloramine in the first few minutes of the bed and ammonia/nitrification potential will still remain in the rest of the bed.
 3. Evaluation through testing should mimic full scale as closely as possible and should include all needed pre-treatment steps identified through decision tree process.

Tree 4: IX Treatment

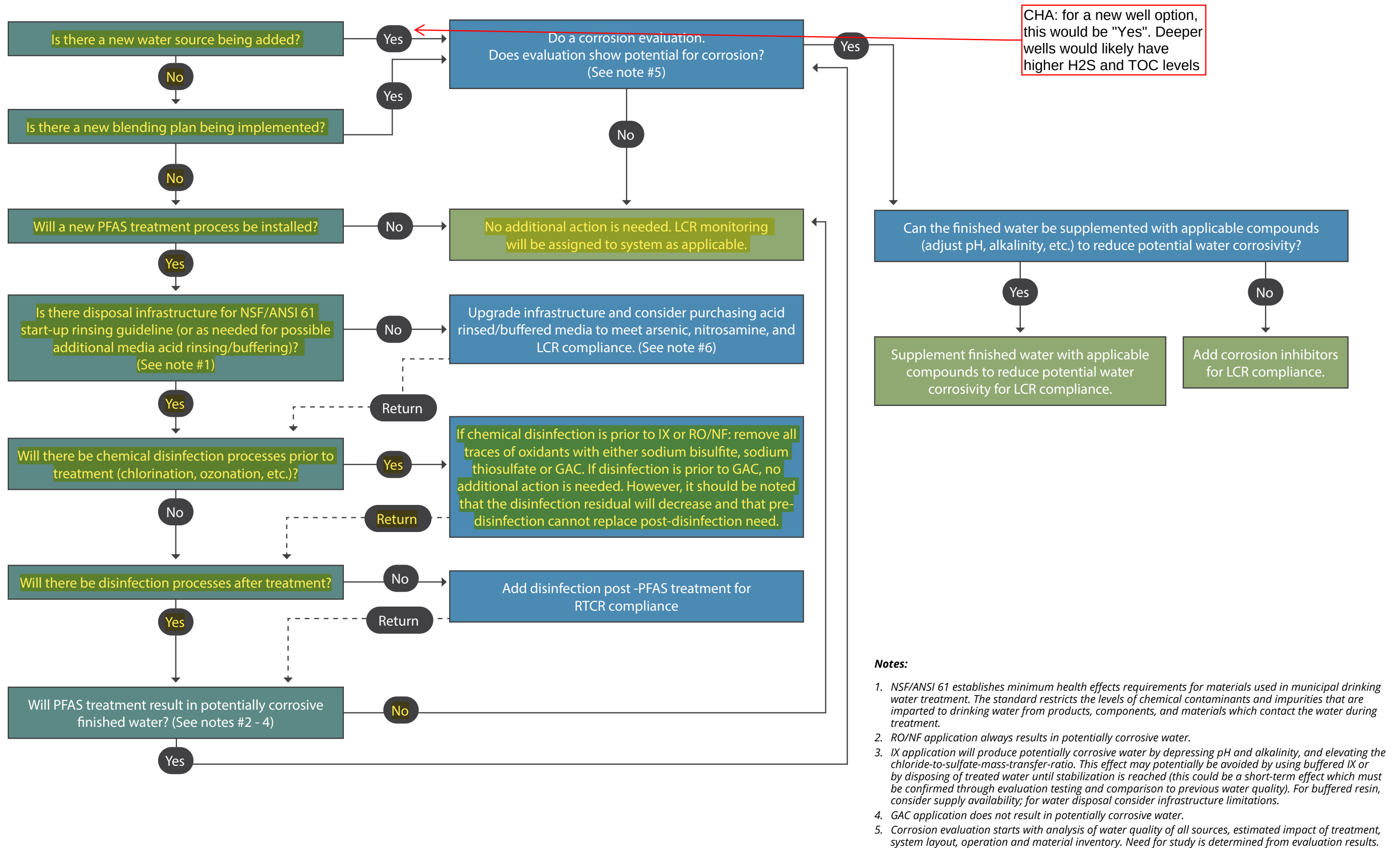


- Notes:**
- 1. It is highly recommended not to avoid pre-treatment, but if this avoidance is absolutely necessary, conduct extensive testing in line with manufacturer recommendations to quantify trade-offs resulting from not adding pre-treatment or choosing alternative IX design.
 - 2. Evaluation through testing should mimic full scale as closely as possible and should include all needed pre-treatment steps identified through decision tree process.

Tree 5: RO/NF Treatment

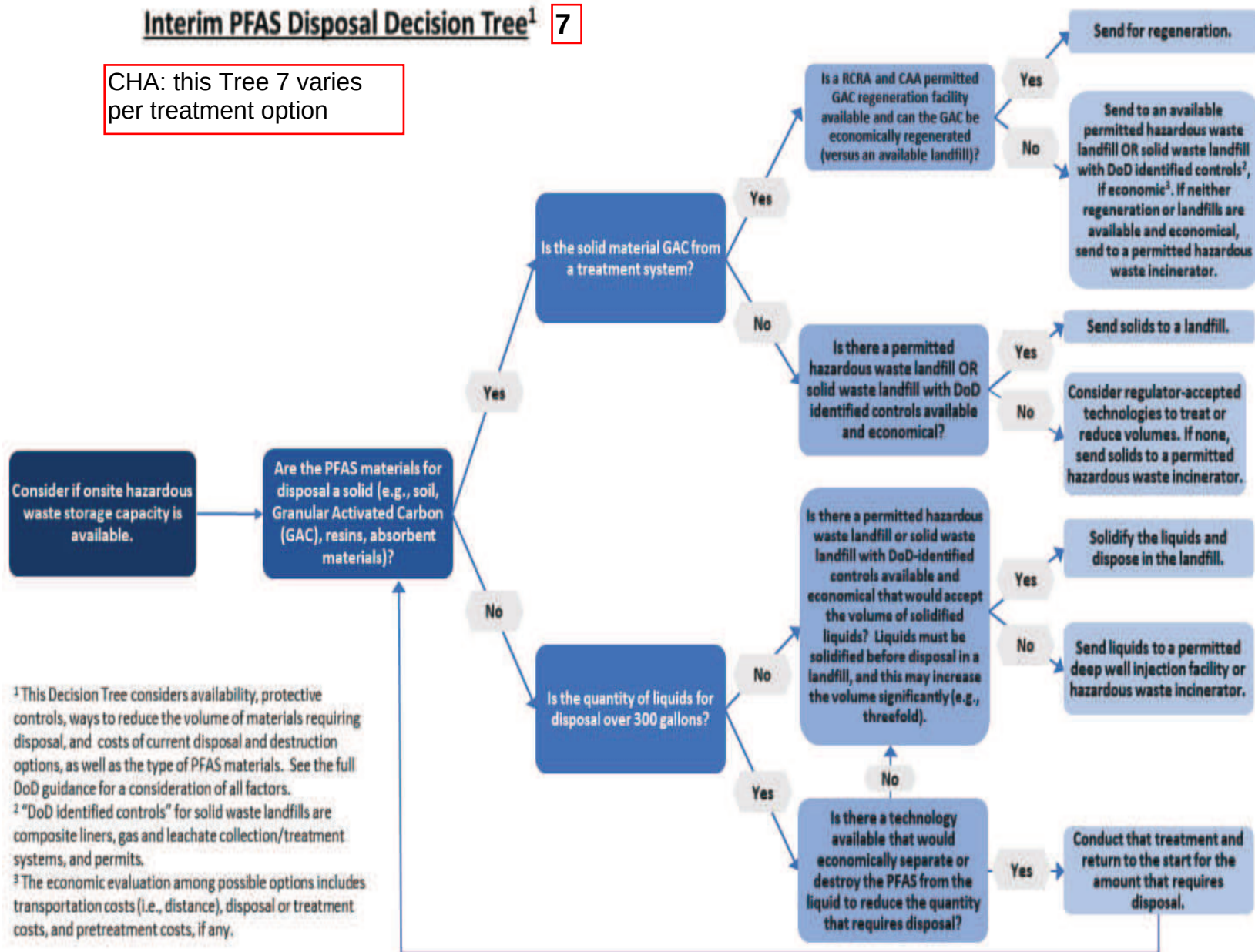


Tree 6: Simultaneous Compliance for Non-Treatment and Treatment Alternatives



Interim PFAS Disposal Decision Tree¹ 7

CHA: this Tree 7 varies per treatment option



Acronyms

ADEQ	Arizona Department of Environmental Quality
BAT	Best Available Technology
CFU	Colony Forming Units
CSMR	Chloride to Sulfate Mass Ratio
DOC	Dissolved Organic Carbon
EBCT	Empty Bed Contact Time
EPA	U.S. Environmental Protection Agency
EPDS	Entry Point to the Distribution System
GAC	Granular Activated Carbon
HPC	Heterotrophic Plate Count
IX	Ion Exchange
LCR	Lead and Copper Rule
LSI	Langelier Saturation index
MCL	Maximum Contaminant Level
µm	Micron or Micrometer
MWCO	Molecular Weight Cut-off
NF	Nanofiltration
NTU	Nephelometric Turbidity Units
O&M	Operations and Maintenance
PFAS	Per- and Polyfluoroalkyl Substances
PFBA	Perfluorobutanoic Acid
PFBS	Perfluorobutane Sulfonate
PFHxS	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonic AAcid
ppt	Parts Per Trillion
psi	Pounds Per Square Inch
PWS	Public Water System
RO	Reverse Osmosis
RTCR	Revised Total Coliform Rule
SDI	Silt Density Index
TC	Total Coliform
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
VOC	Volatile Organic Compound
WQP	Water Quality Parameter

DECISION TREES FOR

PFAS



**MITIGATION SELECTION
IN DRINKING WATER**

DECISION TREES FOR PFAS MITIGATION SELECTION IN DRINKING WATER

This document was prepared by ADEQ staff and reviewed by regulatory and manufacturer peers. Kimley-Horn assisted ADEQ in the development of this tool. Mention of trade names or commercial products does not constitute an endorsement or recommendation of use.

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1. EPA Office of Water, 2003, (4606M) 816-R-03-014, Arsenic Treatment Technology Evaluation Handbook for Small Systems | [View Source >](#)
2. AWWA, Drinking Water Treatment for PFAS Selection Guide | [View Source >](#)
3. Purolite Design and Operational Guidelines: PFAS-Selective Single Use Ion Exchange Resin for Drinking Water Systems | [View Source >](#)
4. EPA, 2020, Simultaneous Compliance Workbook: Key Questions to Consider When Adding or Changing Treatment — A Simplified Approach | [View Source >](#)
5. 5. Drinking Water Treatment Technology Unit Cost Models | [View Source >](#)
6. 6. AACE International, Cost Estimate Classification System, 2005 | [View Source >](#)



ASSISTANT SECRETARY OF DEFENSE

3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY, INSTALLATIONS,
AND ENVIRONMENT

7/11/23

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS,
ENERGY AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY (ENERGY,
INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE
(INSTALLATIONS, ENVIRONMENT AND ENERGY)
DIRECTOR, DEFENSE LOGISTICS AGENCY (LOGISTICS
OPERATIONS)

SUBJECT: Interim Guidance on Destruction or Disposal of Materials Containing Per- and Polyfluoroalkyl Substances in the United States

The DoD Per- and Polyfluoroalkyl Substances (PFAS) Task Force issues this interim guidance to help DoD make informed decisions in the evaluation of existing destruction and disposal options, and to comply with section 343 of the FY 2022 National Defense Authorization Act (NDAA). Section 343 requires DoD to prohibit the incineration of covered DoD PFAS-containing materials¹ until DoD issues guidance implementing the U.S. Environmental Protection Agency (EPA) “Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances,” December 18, 2020 (hereinafter referred to as the EPA guidance), and section 330 of the FY 2020 NDAA.

Concurrent with its compliance with these requirements on PFAS destruction and disposal, DoD is transitioning to a PFAS-free firefighting agent for land-based applications over the next few years. DoD has determined that this transition, which requires the removal of PFAS-containing firefighting foam (i.e., Aqueous Film Forming Foam (AFFF)) from installation fire protection inventories, will generate large quantities of PFAS-containing concentrate and rinsate for which DoD must find a safe disposal solution. In addition, quantities of PFAS-containing material are generated from DoD’s nationwide cleanup program, and recovery of emergency use discharges or spills of AFFF. Given these combined quantities, DoD’s long-term storage capabilities will be exceeded and thus DoD requires a comprehensive destruction and disposal strategy.

In choosing among disposal options, one of the most significant factors for DoD was the additional oversight and controls provided at disposal and destruction facilities with

¹ PFAS-containing materials covered under this guidance includes all “covered material” under Section 343 of the FY 2022 NDAA, which means “any [Aqueous Film Forming Foam] AFFF formulation containing PFAS, material contaminated by AFFF release, or spent filter or other PFAS-contaminated material resulting from site remediation or water filtration that—

- (A) has been used by the Department of Defense or a military department;
- (B) is being discarded for disposal by the Department of Defense or a military department; or
- (C) is being removed from sites or facilities owned or operated by the Department of Defense.”

magnesium, and other ions may be selectively removed via membrane selection to reach target concentrations.

7. Existing Lime Reactor Restoration dependent on assessment by Veolia (original manufacturers of the reactors). Projected cost is unknown at this time.
8. Foam Fractionation is a newer PFAS concentration technology and would need to be coupled with a liquid PFAS removal/destruction process.
9. GAC regeneration and PFAS incineration would be handled by a specialty contractor. Permitting may be required for handling the PFAS-laden GAC. See the DoD PFAS Disposal Decision Tree (7).
10. Permitting would be required for handling PFAS bearing resin and brine. Permitted treatment, storage, and disposal facility (TSDF) would handle disposing spent IX resin. Brine can also be sent to the TSDF or treated with GAC / Foam Fractionation
11. Spent Fluoro-sorb may be sent to a landfill permitted for PFAS waste. Permitting may be required for City to be handling PFAS-laden Fluoro-sorb.
12. Constructing a new Deep Well is \$20M to \$30M in capital cost. Space available for the City is very limited, so membrane concentrate would potentially need to be piped a significant distance depending on the deep well site, or whether a City of Tampa Deep Well can be used.
13. Permitting for PFAS liquid discharge to a water reclamation facility would be required and possibly infeasible.

APPENDIX B

PFAS Report & Pilot Attachment (Pending)

PFAS COMPLIANCE EVALUATION OF ALTERNATIVES DRAFT REPORT

CITY OF TEMPLE TERRACE WATER TREATMENT FACILITIES

City of Temple Terrace Master Plan
6009 Whiteway Drive
Temple Terrace, FL 33617

CHA Project Number: 100335

March 2026

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1.0 PFAS TREATMENT PROCESS EXECUTIVE SUMMARY

INTRODUCTION

PFAS have been detected in the City of Temple Terrace's (City's) groundwater supply at concentrations above the EPA's established maximum contaminant levels, and the existing treatment processes are not designed to achieve effective PFAS removal. Given the age of the facilities, non-functioning or constrained processes, and emerging treatment needs, this is an appropriate time to holistically assess both Water Treatment Plants (WTPs) and develop a prioritized capital improvement plan aligned with the City's operational and water quality objectives.

Of the 6 PFAS species regulated by the U.S. Environmental Protection Agency (US EPA), the City has shown through sampling events, detailed in Chapter 2, to have elevated levels of PFOA, PFOS, and PFHxS. The goal for the City is to remove PFAS to below the MCL for each species, and to approach the MCLG of 0 ppt. **Table ES-1** presents the maximum measured PFAS concentrations.

Table ES-1: Maximum Measured Concentrations of PFAS Species of Concern

PFAS Species	Maximum Influent Concentration
PFOA	15 ppt
PFOS	25 ppt
PFHxS	20 ppt

The current WTP systems are not adequate at removing PFAS and would need to be supplemented with additional processes such as Granular Activated Carbon (GAC), Ion Exchange (IX), or Reverse Osmosis (RO) / Nanofiltration (NF) treatment.

IMPROVEMENT ALTERNATIVES FOR WHITEWAY AND SUNNINGDALE WTPS

Key water quality parameters of concern in the City's groundwater include hardness and PFAS. Alternatives were developed to meet the City's water quality goals primarily focused on reducing hardness and addressing pending PFAS limits. WTP improvement alternatives were categorized as follows:

- Non-treatment:
 - Supply sources: existing wellfields, new wells/wellfield, neighboring utility (City of Tampa)
- Treatment
 - PFAS Physical/Chemical Separation Processes: GAC, IX, NF/RO
 - PFAS Concentration: Foam fractionation
 - Managing PFAS Waste Streams: Several alternatives are available: High-temp incineration, plasma excitation, brine concentrator/crystallizer, UV photolytic reduction, sonolysis, electrochemical oxidations or hauling to a certified waste collection location.

Whiteway WTP

- **Alternative WW-1** – Rehabilitate lime softening/filtration process and install four 1 mgd GAC or IX vessels with supporting piping/valving/metering, backwash and regen (for IX only) systems, depending on pilot study results, certain IX may need softening pre-treatment leading to increased potential cost
- **Alternative WW-2** – Retire lime softening, install three 1.5 mgd high-recovery nanofiltration skids with supporting cartridge filtration, antiscalant, cleaning and concentrate treatment

Sunningdale WTP

- **Alternative SD-1** – Continue with no softening process and install two 1 mgd GAC/IX vessels with supporting piping/valving/metering, backwash and regen (for IX only) systems, depending on pilot study results, certain IX may need softening pre-treatment leading to increased potential cost
- **Alternative SD-2** – Install two 1.0 mgd high-recovery nanofiltration skids with supporting cartridge filtration, antiscalant, cleaning and concentrate treatment

ALTERNATIVES EVALUATION

The study has focused on established technologies (GAC, IX, NF). Emerging technologies or solutions are discussed but would need more piloting to confirm. For now, NF concentrate treatment using foam fractionation & destruction was assumed for cost comparison. For the City, testing/piloting will be required to confirm applicability under a separate implementation phase.

The alternative evaluation compared alternatives on life cycle costs and non-cost factors including those that citizens provided in the PFAS public meeting in Aug-2025. Alternatives evaluation is ongoing and will incorporate pilot results to assist with capital and operating costs. Based on knowledge in hand including decision support tools, recent project costs and opinion estimates, the following costs are provided as draft. **Table ES-2** summarizes the life-cycle costs of the proposed alternatives.

Table ES-2. WTP Process Alternative Life Cycle Cost Evaluation

Cost Category	WW-1 Rehab Lime/Filters Add GAC or IX*	WW-2 Retire Lime/Filters Add Nanofiltration**	SD-1 Continue No Softening Add GAC or IX*	SD-2 Add Nanofiltration**
PFAS MDD Treatment Capacity	4.4 mgd	4.5 mgd	2.2 mgd	2.2 mgd
WTP ADD	3.0 mgd	3.0 mgd	1.0 mgd	1.0 mgd
Capital Cost	\$16.7M (GAC) \$13.7M No lime \$12.4M (IX)	\$26.3M	\$7.5M (GAC) \$7.2M (IX)	\$14.1M
Annual Operational Cost	\$1.8M/Yr \$1.2M no lime \$1.7M/Yr (IX)	\$1.0 M/Yr	\$0.5 M/Yr-GAC \$0.5M/Yr-IX	\$0.6 M/Yr
Present Value	\$47.8M (GAC) \$41.8M (IX)	\$43.6M	\$16.1M (GAC) \$15.8M (IX)	\$24.5M
Equivalent Annual Cost (\$/Yr)	\$2.8M/Yr (GAC) \$2.4M/Yr (IX)	\$2.5M/Yr	\$0.9M/Yr (GAC) \$0.9M/Yr (IX)	\$1.4M/Yr
Equivalent Annual Cost (\$/kGal at 4.0 mgd ADD)	\$1.72/kGal (GAC) \$1.24 no lime \$1.50/kGal (IX)	\$1.53/kGal	\$1.16/kGal (GAC) \$1.14/kGal (IX)	\$1.76/ kGal

ASSUMPTIONS:

**IX assumes no softening based on preliminary pilot results. If softening is required, costs will have to be revised using cation IX as pre-treatment to PFAS anion IX.*

*** Assumes Invicta Foam Fractionation/PhotoCatalytic Destruction for treatment of concentrate laden PFAS, Deep well injection costs to be included in the next version of Masterplan*

- Capital costs include furnish and install equipment and non-cost factors including 25% contingency
- Present values assume 30-year life with 4% inflation
- ADD = Average Daily Demand
- MDD = Maximum Daily Demand
- Does not include other WTP major R&R to existing equipment which is common to all alternatives

PFAS Compliance Evaluation of Alternatives

While variations exist, these core alternatives represent a low-cost solution and a more robust one that includes consistent, effective reductions in calcium/magnesium hardness. While considerations were made for consolidating the WTPs to the Whiteway WTP site, this would likely be infeasible for Alternative 1 due to expansion in well pumping/piping, distribution piping, pumping, lime softening and filtration processes to go from a max day capacity of 5.0 mgd to 6.0 mgd. Consolidation would fit better with Alternative 2, where initial nanofiltration skids could be located at Sunningdale WTP and later moved, when needed, to the Whiteway WTP to fully displace Sunningdale. Detailed site layouts are provided in Section 4.

RECOMMENDATIONS

Based on the evaluation of treatment performance, operations and maintenance requirements, capital cost, and other considerations discussed, GAC, IX and NF alternatives are technically feasible options for PFAS treatment at the Lime Softening WTF. All three systems are capable of achieving compliance with the EPA drinking water standards for long-chain PFAS compounds, including PFOA and PFOS. Without further evaluation, a preferred technology cannot be identified, as treatment performance, media life, and overall lifecycle costs are highly site-specific.

Before the final decision is made to proceed to a full-scale design, a pilot study evaluating NF is recommended as the performance is site-specific and cannot be predicted accurately. It is also recommended that the City continue monitoring the PFAS levels in the wells and analyze if there is a trend or increase.

2.0 REGULATORY REQUIREMENTS AND SOURCE WATER QUALITY

2.1 EPA Drinking Water Standards on PFAS

In April 2024, the U.S. Environmental Protection Agency (EPA) announced the final National Primary Drinking Water Regulation (NPDWR) that establishes Primary Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for six PFAS substances in drinking water. Individual MCLs are set for Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), Perfluorohexanesulfonic acid (PFHxS), Perfluorononanoic acid (PFNA), Hexafluoropropylene dimer acid (HFPO-DA) and its ammonium salt, and a combined Hazard Index (HI) MCL is set for the mixture of PFHxS, PFNA, HFPO-DA, and Perfluorobutanesulfonic acid (PFBS). Details are summarized in **Table 1-3**.

Table 2.1. EPA Drinking Water Standards on PFAS

Contaminants	Critical Health Impact	MCL (ppt)	MCLG(ppt)
PFOA	Cancer	4.0	Zero
PFOS	Cancer	4.0	Zero
PFHxS	Thyroid Effects	10.0	
PFNA	Developmental Effects	10.0	
HFPO-DA ('GenX' chemicals)	Liver Effects	10.0	
Mixture of GenX, PFBS, PFNA PFHxS	Multiple	Hazard Index* of 1	

$$*Hazard\ Index = \left(\frac{[GenX]}{[10\ ppt]} \right) + \left(\frac{[PFBS]}{[2000\ ppt]} \right) + \left(\frac{[PFNA]}{[10\ ppt]} \right) + \left(\frac{[PFHxS]}{[10\ ppt]} \right)$$

EPA also released the compliance timeline with a phased approach, as listed below:

- By 2027, public water systems must complete initial monitoring of the regulated PFAS, followed by ongoing compliance monitoring.
- Beginning in 2027, public water systems must provide the public with information on the PFAS levels in their drinking water.
- By 2031, public water systems must implement solutions to reduce PFAS if monitoring shows that drinking water levels exceed these MCLs.
- Beginning in 2031, public water systems that have PFAS in drinking water above one or more of these Primary MCLs (PMCLs) must take action to reduce levels of PFAS in their drinking water and provide Tier 2 notification (long-term exposure, potential health risk but no immediate threat) to the public of the violation.

In May 2025, EPA announced the agency will keep the current NPDWR for PFOA and PFOS with an intent to rescind and reconsider the regulatory determinations for PFHxS, PFNA, HFPO-DA (commonly known as GenX), and the Hazard Index mixture of these three plus PFBS, to ensure that the determinations and any resulting drinking water regulation follow the legal process laid out in the Safe Drinking Water Act. On May 14, 2025, EPA announced it will delay SDWA PFAS

compliance deadlines for two PFAS chemicals, PFOS and PFOA, by two years, until 2031. On Jan. 21, 2026, the District of Columbia Circuit Court denied EPA's Sept. 11, 2025 request to vacate the other four previous SDWA PFAS rules for PFNA, PFHxS, HFPO-DA, and the Index PFAS.

2.2 Fifth Unregulated Contaminant Monitoring Rule

The Safe Drinking Water Act (SDWA) amendments require that once every 5 years, EPA issue a new list of no more than 30 unregulated contaminants to be monitored by public water systems. EPA collects data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the SDWA, to fill the occurrence data gaps in the CCL.

The fifth Unregulated Contaminant Monitoring Rule (UCMR5) was published on December 27, 2021. The UCMR5 requires monitoring of 30 chemical contaminants between 2023 and 2025 using analytical methods developed by EPA and consensus organizations. This action provides EPA and other interested parties with scientifically valid data on the national occurrence of these contaminants in drinking water. Consistent with EPA's PFAS Strategic Roadmap, UCMR 5 will provide new data that is critically needed to improve EPA's understanding of the frequency that 29 per- and polyfluoroalkyl substances (PFAS) and lithium are found in the nation's drinking water systems.

2.3 Source Water Quality

2.3.1 PFAS

The City conducted three rounds of PFAS sampling on finished water in March, May, and July 2025, as well as one round of sampling across the groundwater wells. Results for the six regulated PFAS are summarized in **Table 2.2**. PFOA and PFOS concentrations exceeded EPA standards at all locations, while PFHxS and Hazard Index exceeded EPA standards at certain production wells. More rounds of sampling have been scheduled to meet the EPA monitoring requirement.

Table 2.2 PFAS Analysis Results

Facility	Well No.	PFOA	PFOS	PFHxS	PFNA	Gen-X	PFBS	Hazard Index
Sunningdale	1	9.1	16	6.9	< 1.7	< 0.84	8.4	0.84
	2	9.1	17	7.0	< 1.7	< 0.84	8.9	0.85
	6	6.0	18	7.2	< 1.7	< 0.86	9.6	0.85
	11	5.0	15	6.4	< 1.7	< 0.86	6.7	0.71
	POE*	8.0	17.7	7.5	< 3.7	< 4.7	11.3	0.87
Whiteway	4	11	18	9.4	< 1.8	< 0.88	9.1	1.15
	5	7.1	20	13	< 1.7	< 0.86	8.2	1.50
	7	6.8	21	11	< 1.7	< 0.83	11	1.30

PFAS Compliance Evaluation of Alternatives

Facility	Well No.	PFOA	PFOS	PFHxS	PFNA	Gen-X	PFBS	Hazard Index
	8	6.0	13	4.3	< 1.7	< 0.87	8.5	0.55
	9	5.1	15	5.5	< 1.7	< 0.83	10	0.67
	12	5.0	20	16	< 1.6	< 0.82	7.7	1.83
	POE*	7.6	17.0	8.0	< 4.1	< 5.2	9.1	0.90
Irrigation	16	5.1	11	5.7	< 1.7	< 0.87	6.6	0.71

*Average of three rounds of sampling results.

PFAS treatment can be influenced by the presence of other water quality constituents. This evaluation considered additional water quality parameters beyond PFAS. For instance, the source water exhibits high hardness, exceeding 300 mg/L as CaCO₃.

2.4 Treatment Goal

Comparing the newly released EPA standards and the source water analysis results, PFOA and PFOS in the raw water feeding the WTFs are significantly higher than the MCLs. The current treatment process does not provide adequate removal of PFAS, therefore additional treatment is required to meet or beyond the drinking water standards.

The current MCLs are considering the adverse health impacts of PFAS, but were set based on the instrumentation detection limits. These promulgated MCLs are significantly more stringent than the Health Advisories (HAs) previously established by EPA (70 ppt for PFOA and PFOS). Therefore, even tighter regulations could be on the way with the development of lower detection limit. To provide safe drinking water to the water users and ensure compliance in the future, the MCLGs (zero for PFOA & PFOS, 10 ppt for PFHxS, PFNA, GenX, and HI <1) are set as the treatment goal for this project.

Other regulated drinking water constituents should remain below their respective primary and secondary standards. Additionally, hardness should be reduced to 120- mg/L as CaCO₃ to improve taste and control scaling in the distribution system

3.0 PFAS TREATMENT TECHNOLOGY ALTERNATIVES

3.1 PFAS Treatment Technologies

3.1.1 Potential Treatment Technologies

Numerous treatment technologies have been studied to remove or reduce PFAS from water. PFAS are not effectively removed by conventional water treatment processes (removal below 25%). Based on current knowledge and technology evaluations conducted by EPA and others in the water industry, three processes are proven to be very effective: Granular Activated Carbon (GAC), Ion Exchange (IX), and Reverse Osmosis (RO) / Nanofiltration (NF). Physicochemical breakdown (for example, advance oxidation processes (AOP)) requires substantial energy input and is currently under development. Biodegradation using bacteria produced enzymes has shown some extent of removal but will not meet the drinking water standards and the process is normally slow, also the study is only in laboratory stage.

3.1.2 RO/NF

RO/NF is a filtration process that uses a semi-permeable membrane to remove ions, molecular, and larger particles from water. Pressure is applied on the feed water side to overcome the osmotic pressure and force the water molecular passing through and leave the impurities behind. RO/NF systems can address most known water quality concerns including TDS, hardness, TOC and disinfection byproducts (DBPs) precursors, taste & odor, and a wide range of PFAS. Typically, the cost of membrane treatment for PFAS is higher than other known and effective treatment technologies because of the membrane & skid cost, and the high energy consumption to operate the feed pump. RO/NF concentrate/reject will contain high concentrations of PFAS and will need to be properly discharged or managed. Rejects can be up to 25 percent of the water coming to the treatment process which requires a commensurate larger amount of source water. If RO is used, the plant may need to treat more water to meet the production demand.

RO/NF concentrate is classified as a hazardous waste. RO/NF treatment systems in Florida commonly use deep well injection to dispose of RO/NF concentrates. The presence of PFAS in the concentrate complicates this issue and possible further PFAS concentration, adsorption or destruction can be used for the smaller concentrate flows.

3.1.3 GAC

GAC is the most studied and relatively cost-effective PFAS removal technology. The high porous media is made from coal, wood, coconut shells, etc., and has large contact surface (up to 1,000 ft²/gram) for adsorption. It is very efficient at removing organics, chlorine, taste & odor, and long-chain PFAS, such as PFOS and PFOA, after water has been treated by the conventional coagulation/flocculation/filtration process. However, GAC is not as effective on short-chain PFAS removal, for example PFBS. GAC systems normally cost less than RO, and the spent media can

be easily regenerated or hauled offsite by the GAC vendors/suppliers at a reasonable price. The nearest GAC reactivation facilities are located in Catlettsburg, KY, Big Sandy, TX, Pittsburg, CA (all maintained by Calgon), and Pryor, OK (maintained by Norit). The GAC vendors typically handle transportation and replacement of media through contract.

3.1.4 IX

IX is also commercially available, and the mechanism is similar to GAC which uses adsorption for contaminant removal. IX process has been proven to be effective in treating ions such as calcium, magnesium, chloride, heavy metals, and nitrates with special resins, and is suitable for water softening and demineralization. In PFAS treatment, feed water passes through the positively charged anion exchange resins (AER) and the negatively charged PFAS will be attached to the resins and remain in the vessels. Like GAC, IX is less effective removing short-chain PFAS. IX normally requires significantly shorter empty bed contact time (EBCT, 1.3 to 5 minutes) compared to GAC (10 to 20 minutes), which means less capital cost. However, the resin regeneration process is more complicated than the disposal of the spent GAC media and requires higher operation skills and costs. Specifically, the brine resulting from resin regeneration will likely be considered a hazardous waste with associated disposal requirements. In cases where disposal facilities are not readily available, FDEP recommends on-site interim storage or treating the brine the same as a high-strength liquid PFAS waste, similar to RO concentrate.

In addition to activated carbon and IX resin, alternative adsorbents, such as FLUORO SORB® and Foam Fractionation, are considered as emerging treatment alternatives for PFAS removal. The next Section discusses these emerging treatment alternatives.

3.1.5 Foam Fractionation

Foam fractionation is a relatively new technology that has less application compared to RO, GAC or IX. In this process, air is injected into the water, generating bubbles that PFAS molecules preferentially adsorb due to their hydrophobic fluorinated tails and hydrophilic heads. The PFAS-enriched foam is then collected at the surface and removed, effectively reducing PFAS concentrations in the treated water.

While it has demonstrated good PFAS removal, its performance can be influenced by water chemistry, including hardness, natural organic matter, and the presence of other surfactants. Foam fractionation is generally more efficient for treating waters with higher PFAS concentrations, such as wastewater, landfill leachate, or reverse osmosis concentrate. To date, there are only a few full-scale implementations of foam fractionation for drinking water treatment in the U.S.

3.1.6 Fluoro-Sorb Adsorption

In addition to activated carbon and IX resin, alternative adsorbents, such as CETCO FLUORO-SORB® 200 and Cyclopure DEXSORB+® are considered emerging treatment alternatives for PFAS removal in drinking water. FLUORO-SORB® 200 is a National Science Foundation (NSF) certified, proprietary, surface-modified bentonite clay material. FLUORO-SORB® 200 has shown to have promise in removing both long- and short-chain PFAS from groundwater in pilot-scale treatment studies. These adsorbents are less impacted by chlorine and higher TOC source waters than IX or GAC.

At present, there are only 2-3 drinking water treatment installations of FLUORO-SORB® in the US. Due to limited installations, there is a need for understanding of the design and operation requirements for FLUORO-SORB and its long-term, life-cycle cost for PFAS treatment. While emerging adsorbents have limited records in full-scale drinking water applications, both IX vessels and GAC contactors can be designed to accept alternative adsorbents in the future if they prove to be advantageous as the technology matures.

3.1.7 Emerging PFAS Technology

Several emerging PFAS treatment technologies have been developed as alternatives or complements to conventional GAC, IX, and RO/NF. Electrostatic concentrators use electrically charged fields to attract and concentrate PFAS species onto collection surfaces, potentially reducing chemical usage and waste volumes. Electrochemical oxidation applies direct current across specialized electrodes to generate strong oxidants (e.g., hydroxyl radicals) capable of breaking down PFAS molecules, offering a destructive pathway rather than concentrate or transfer. Supercritical water oxidation (SCWO) operates at elevated temperature and pressure where water becomes a supercritical fluid, enabling rapid and near-complete mineralization of PFAS; however, the process is energy-intensive and requires robust materials to withstand corrosive conditions. Plasma-based technologies create highly reactive species (radicals, electrons, UV photons) within a plasma field at the gas–liquid interface to degrade PFAS, showing promise for concentrate streams though scale-up and energy efficiency remain active research areas.

In practice, these technologies can be integrated as part of hybrid treatment trains, particularly for managing PFAS concentrates generated from RO/NF. A representative hybrid approach combines membrane filtration for bulk separation with foam fractionation and/or electrostatic concentration to further reduce concentrate volumes and increase PFAS strength prior to final destruction. Such integrated systems aim to balance capital and operating costs while minimizing residual waste and improving overall treatment effectiveness.

Although pilot and demonstration projects are expanding, most of these methods remain at the developmental or early-commercial stage, and full-scale implementation typically requires site-specific testing to validate performance, energy demand, by-product formation, and long-term reliability.

To understand the current alignment between PFAS occurrence and installed treatment, the table below shows information from the U.S. EPA UCMR5 (Oct. 2024) on what treatment technologies community water systems have implemented in response to PFAS.

Table 3.1 Community Water System Responses to PFAS Detection

Reported Response to PFAS Detection	Number of CWS with Available Data	Total Population, millions
Not Modified	3614	181
Granular Activated Carbon	139	7
Ion Exchange	52	4
Powdered Activated Carbon	14	0.9
Reverse Osmosis	12	0.5
Biologically Activate Carbon	7	0.3
Total	3691	

3.1.8 PFAS Treatment Technology Comparisons

The most effective PFAS treatment approaches in drinking water are RO/NF, GAC, and IX. These three technologies are widely applied and proven to be effective. **Table 3.2** shows the comparison rankings based upon evaluation of performance, reliability, costs, and operation difficulties (the lower score the better). Based on the ranking, RO/NF and GAC are the two most promising technologies for the WTPs and are further discussed and compared in detail in the next chapter. Anion ion exchange can be incorporated to reduce PFAS if it can withstand high hardness or may need a cation exchange process to soften the water, which will increase capital and O&M costs.

Table 3.2 Evaluation of Suitable PFAS Treatment Technology

Technology Summary	Assurance of PFAS Removal	Capital Cost*	Operating Cost	Operator Involvement	Finished Water Quality
Membrane-RO/NF - Pre-treatment (Acid/polymer) 2-stage ~80% recovery - Post-treatment (caustic/lime) to adjust pH, alkalinity, and calcium concentration - Disposal of concentrate - Deep well injection	1 st	3 rd	3 rd	2 nd	1 st
GAC 2-unit in series (lead-lag) - Offsite regeneration 8.5-min EBCT each unit - Loading 6 gpm/ft²	2 nd	2 nd	2 nd	1 st	2 nd
IX 2-unit in series (lead-lag) - Single use resin (most common) - Regenerable resin - brine required for regeneration. Disposal of waste streams by deep well injection or hauled off-site 4-min EBCT (usually 3 min) - Loading 10 gpm/ft²	3 rd	1 st	1 st	3 rd	3 rd

4.0 PFAS COMPLIANCE ALTERNATIVE EVALUATION

4.1 Process Alternatives Overview

Key water quality parameters of concern in the City's groundwater include hardness and PFAS. Several emerging and established technologies are available for treating hardness and PFAS. Given the costs and challenges of treating PFAS and managing PFAS in waste streams, it is important to evaluate established technologies like GAC, IX and membranes (NF/RO). Several emerging technologies for PFAS are noted here, however, they are not discussed in detail. Lime softening, as well as other processes such as ion exchange, electrodialysis, NF/RO, distillation and freezing may be utilized to soften water. Established technologies for softening such as lime softening, ion exchange and NF/RO are the focus of this Section. PFAS process alternatives include the most widely used for PFAS: GAC, IX, and NF/RO. Each of these treatment alternatives have waste generation and residual management needs which need to be considered when selecting the appropriate alternative for the City's WTPs.

The most likely management option in drinking water applications for spent GAC or IX containing adsorbed PFAS is single-use/replacing spent media with virgin media. Spent GAC can be potentially regenerated, reactivated, and reused at the facility; reactivation is most frequently handled by the GAC media supplier and can be included in the cost of media changeout. While using PFAS-selective resin, the accepted approach is single-use where the spent resin is disposed and replaced with fresh resin. Regeneration of selective resins may be possible using organic solvents or proprietary methods; however, their performance and cost effectiveness needs to be studied at full-scale. Also, spent rinse water may need to be held in holding tanks and would require disposal with vendor assistance or deep well injection.

With NF/RO membranes, the characteristics of brine/concentrates are predictable, and handling and treatment options are well understood. PFAS concentrations in this waste stream would be approximately 6 to 12 times the concentration in influent water with other dissolved solids removed from the treated water. For disposal of membrane concentrate, systems use surface water discharge, discharge to sanitary sewer or deep well injection, as is common in Florida. A small percentage of systems use land application, evaporation ponds, or recycling. In the case of PFAS removal, the high PFAS concentration in the residuals might limit the disposal options or require additional treatment prior to disposal, depending on state and local discharge regulations, leading to an increase in treatment costs. For a detailed description of these alternatives, merits and demerits, reader is referred to the following published paper in AWWA Water Science (Reference "Managing PFAS in Membrane Concentrates" Emily Tow, et.al. with Mysore C.S., AWWA Water Science 2021).

At present, CHA is conducting RSSCT and pilot studies to evaluate the preferred treatment process. Preliminary results from the pilot indicate that GAC lag column is showing good removal (> 92%) of all the PFAS compounds tested including PFBS. IX as lead is exhibiting good removal similar to GAC except for PFBS (~69%) whereas GAC exhibits PFBS > 92%. Pilot testing is anticipated to end in December. These ongoing RSSCT and pilot studies, when complete, will help finalize the preferred treatment process. This “Draft” masterplan will be updated with more accurate level 5 opinion of probable construction costs (OPCC Level 5-AACEI) upon pilot effort completion.

4.2 Baseline Design Assumptions and Criteria

- Average Influent Hardness (from Feb 2025-Aug 2025; 329 mg/L)
 - Elevated hardness has occurred over the last 8 months, previous Whiteway average influent hardness was in the 275 mg/L range
 - see graphs in Sections 2 and 3
 - Individual well operating protocols should be reviewed by the City
- Maximum Influent PFAS Concentration:
 - PFOA: 15 ppt
 - PFOS: 25 ppt
 - PFHxS: 20 ppt
 - PFAS Treatment goal of 90% to 100% removal (Reference-Sections 1 and 2)
- Expected Design Flows (Based Flow Data from 2020-2025 MORs):
 - Maximum Day: 6.0 MGD total flow (4.0 MGD-Whiteway, 2.0 MGD-Sunningdale)
 - 95+ percentile of historical flow records (see Section 2 graphs)
- Average Day
 - Whiteway Historical Avg Day: 3.0 MGD
 - Sunningdale Historical Avg Day: 1.0 MGD
 - There is some disagreement in the MOR data for total flow (3.9 to 4.3 MGD total for both WTPs), 4.0 MGD was assumed for this analysis.
- PFAS Treatment capacity if raw water stays separated at each WTP:
 - Whiteway WTP Max Day: 4.0 MGD
 - Sunningdale WTP Max Day: 2.0 MGD
 - Flows could bypass PFAS treatment to maintain WTP FDEP capacities
- Current Permit Limits
 - SWFWMD Water Use
 - Average Permitted Withdrawal: 5,150,000 gallons per day
 - Peak Permitted Withdrawal: 5,817,400 gallons per day
 - Needs to be increased to match flow projections and treatment needs
 - FDEP/Health Dept WTP Design (Max Day) Capacity
 - Whiteway: 5.04 MGD
 - Sunningdale: 3.96 MGD

4.3 Alternatives Development

Alternatives were developed to meet the City's water quality goals primarily focused on reducing hardness and PFAS. Lime softening, as well as other processes such as ion exchange, electrodialysis, nanofiltration (NF), reverse osmosis (RO), distillation and freezing may be employed to soften water. However, only the most widely used treatment alternatives such as lime softening, ion exchange and NF/RO are described here.

The main purpose of water softening by means of lime-soda ash or lime softening is to reduce the levels of calcium and magnesium in the finished water to a total hardness of 150 mg/l as CaCO₃. There are several alternatives to the existing lime softening process depending on the type of hardness, degree of softening, operational convenience, solids handling limitations, site constraints and capital and operating costs. The alternatives include partial softening as practiced at the Whiteway WTP (hardness removal up to 30%), enhanced lime softening (hardness removal 30% to 60%); lime-soda ash softening, caustic soda softening and softening with both lime and caustic soda.

Based on the functional groups bonded to the resin backbone, the four general types of exchange resins are (1) strong-acid cation (SAC), (2) weak-acid cation (WAC), (3) strong-base anion (SBA), and (4) weak-base anion (WBA). SAC resins are used for removing cations (e.g. calcium hardness), whereas SBA exchangers are increasingly being used to treat waters contaminated with nitrate, arsenic, and perchlorate ions and are usually operated in the chloride cycle, where the resin is regenerated with NaCl. More details on the PFAS selective SBA resins are provided in later sections. The ion exchange units can also be used to deionize water by allowing the water to flow continuously through a cation resin column and then through a strong base anionic resin column. The application of cation exchange to municipal systems for hardness reduction has been limited, with a few plants operational in Florida.

NF and RO are pressure-driven membrane purification processes whose characteristics fall between those of ultrafiltration and reverse osmosis. Unlike reverse osmosis, which accomplishes separation through a solution-diffusion process driven by osmotic pressure, NF accomplishes rejection by controlling diffusion, size exclusion, and electrostatic attraction/repulsion. NF is a proven advanced treatment technology implemented often for softening, removal of inorganic compounds, and synthetic organic compounds. NF is typically used in municipal drinking water applications for groundwater treatment, or in industrial applications for the production of high-purity water. The capabilities of NF to remove organics are well documented. Many lime softening plants in Florida have incorporated NF in their treatment processes, primarily for softening and removal of dissolved organic carbon. To minimize concentrate volumes and minimize supply quantities, NF will focus on high recovery (90+%), e.g., Tree-Stage RO, CCRO – Closed Circuit RO and FRRO – Flow Reversal RO.

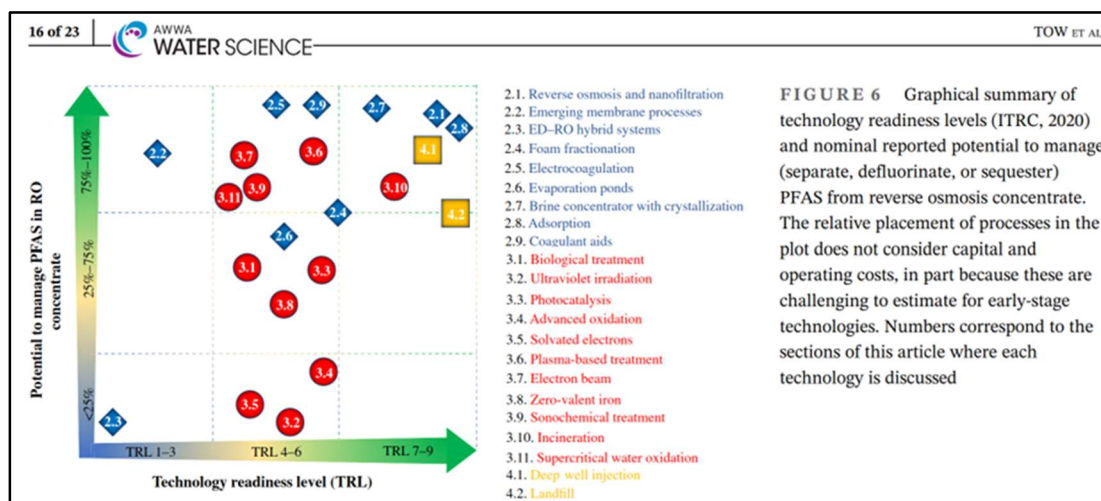
PFAS Compliance Evaluation of Alternatives

Physical/chemical processes do not destroy PFAS, but rather produce a residual stream that has PFAS and other dissolved constituents. PFAS-laden liquids including membrane process concentrate and aqueous solutions used for resin regeneration can both be sequestered within confined aquifers by deep well injection. U.S. EPA Class I wells are commonly used for sequestering both hazardous and nonhazardous waste streams. Deep-well injection is commonly used in Florida and the decision to utilize this approach is a function of the proximity of the well, the volume of waste streams produced, the capacity of the well, whether the well can be used for the lifetime of the facility, permitting and redundancy.

Given the costs and challenges of managing PFAS in waste streams, it is critical to evaluate both established and emerging technologies in selecting processes for incorporation at the WTP(s). Ongoing RSSCT and pilot studies will help finalize the preferred treatment process and the master plan will be updated once these studies have concluded.

Multiple categories of PFAS alternatives were considered including:

- Non-treatment:
 - Supply sources: existing wellfields, new wells/wellfield, neighboring utility
 - Treatment locations: keep 2 WTPs, consolidate to Whiteway WTP
- Treatment
 - PFAS Physical/Chemical Separation Processes: Ion exchange (reversible process), nanofiltration/RO
 - PFAS Concentration: foam fractionation
 - Managing PFAS Waste Streams: Several alternatives are available: High-temp incineration, plasma excitation, brine concentrator/crystallizer, UV photolytic reduction, sonolytic and electrochemical oxidations For a detailed description of these alternatives, merits and demerits, reader is referred to the following published paper (Reference-“Managing PFAS in Membrane Concentrates” Emily Tow, et.al. AWWA Water Science 2021).



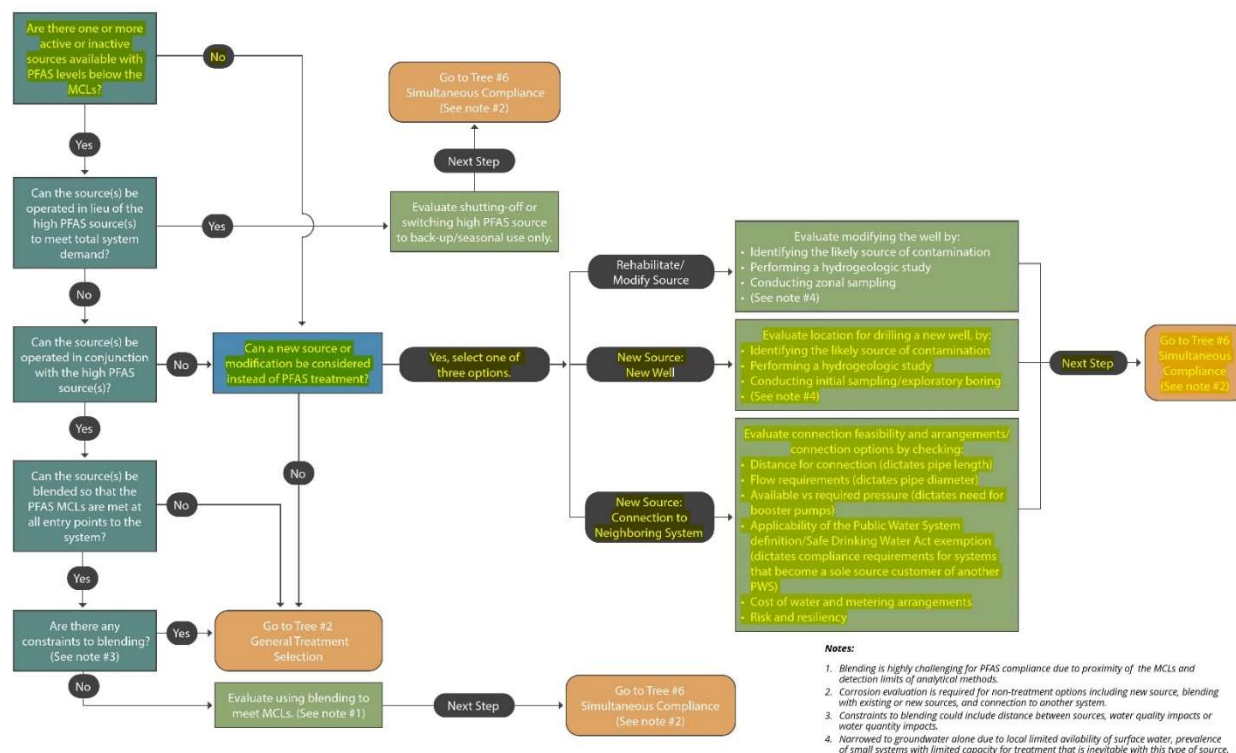
PFAS Compliance Evaluation of Alternatives

Given the daunting number of variables, combination into alternatives was challenging. City staff in a workshop suggested developing a decision tree to assist. Decision trees are useful tools that help focus the decision-making process on specific questions pertaining to the City's water quality and needs and directing the user to the most appropriate solution via a flow diagram. For the City's case, a decision tree exercise was completed and proved highly productive crystallizing the key project questions and simplifying the alternative evaluation. A decision tree published by the Arizona Department of Environmental Quality (ADEQ) was selected due to its preparation by a team of national experts with equally high-level peer input (See Appendix A). The ADEQ decision tree was supplemented with a PFAS disposal/destruction decision tree from the US Department of Defense (DoD), also presented in Appendix A.

One key point from the ADEQ analysis, combined with the City's source water quality and treatment goals supported alternatives development:

*"Although membranes are likely not necessary for the sole purpose of treating PFAS, RO and NF membranes are the most viable treatment alternatives when: (1) PFAS concentrations are high enough to make GAC or IX adsorbent replacement too frequent and cost-prohibitive; (2) PFAS treatment goals are too low to be met by adsorption/exchange technologies; or (3) **treatment goals include removal of non-PFAS anions (arsenic, nitrate, uranium, fluoride), cations (hardness and radium), total dissolved solids, or TOC to below detection levels to minimize disinfection by-products (DBP) formation.**"*

Tree 1: Non-Treatment Selection



PFAS Compliance Evaluation of Alternatives

The decision tree flow paths for the City of Temple were highlighted and supported helped provide clarity for alternatives combination. The key decision boils down to two alternative categories for the City, assuming 90% to 100% PFAS removal:

1. Continue with 0% to 30% total hardness removal
2. Improve hardness removal to 50+% to goal of <150 mg/L

Two alternative paths were created based on the answer to the softening question, narrowing and grouping the PFAS treatment options:

Whiteway WTP

- **Alternative WW-1** – Replace/retrofit lime softening/filtration process with more robust conventional softening process and install four 1 mgd GAC or IX vessels with supporting piping/valving/metering, backwash and regen (for IX only) systems, depending on pilot study results, certain IX may need softening pre-treatment leading to increased potential cost
- **Alternative WW-2** – Retire lime softening, install three 1.5 mgd high-recovery nanofiltration skids with supporting cartridge filtration, antiscalant, cleaning and concentrate treatment

Sunningdale WTP

- **Alternative SD-1** – Continue with no softening process and install two 1 mgd GAC/IX vessels with supporting piping/valving/metering, backwash and regen (for IX only) systems, depending on pilot study results, certain IX may need softening pre-treatment leading to increased potential cost
- **Alternative SD-2** – Retire lime softening, install two 1.0 mgd high-recovery nanofiltration skids with supporting cartridge filtration, antiscalant, cleaning and concentrate treatment

While variations exist, these core alternatives represent a low-cost solution and a more robust one that includes consistent, effective reductions in calcium/magnesium hardness. While consolidating the WTPs to the Whiteway WTP site, this would likely be infeasible for Alternative 1 due to expansion in well pumping/piping, distribution piping, pumping, lime softening and filtration processes to go from a max day capacity of 5.0 mgd to 6.0 mgd. Consolidation would fit better with Alternative 2, where initial nanofiltration skids could be located at Sunningdale WTP and later moved, when needed to the Whiteway WTP to fully displace Sunningdale.

Figure 4-1. Alternative WW-1 Potential Site Layout

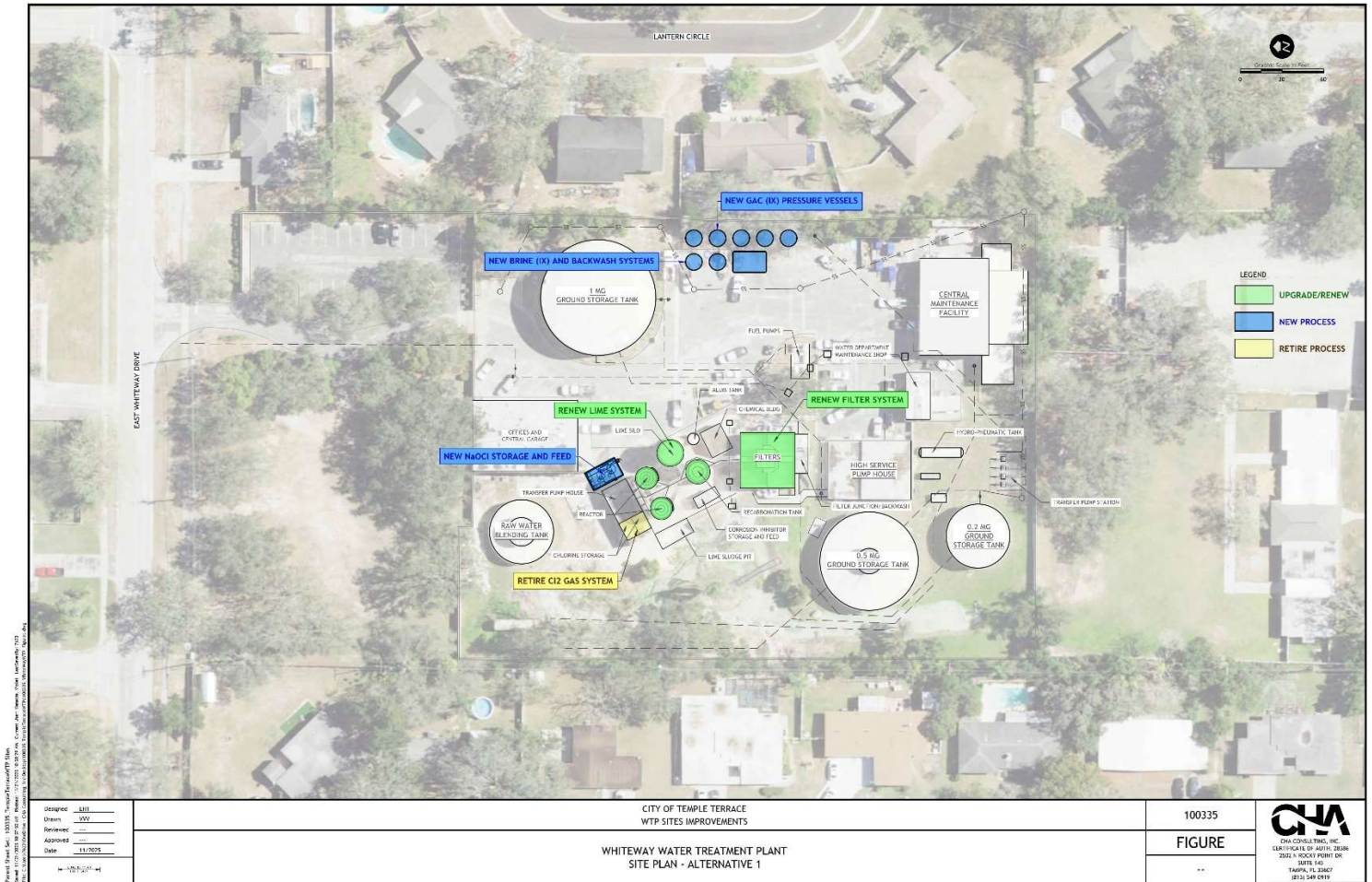
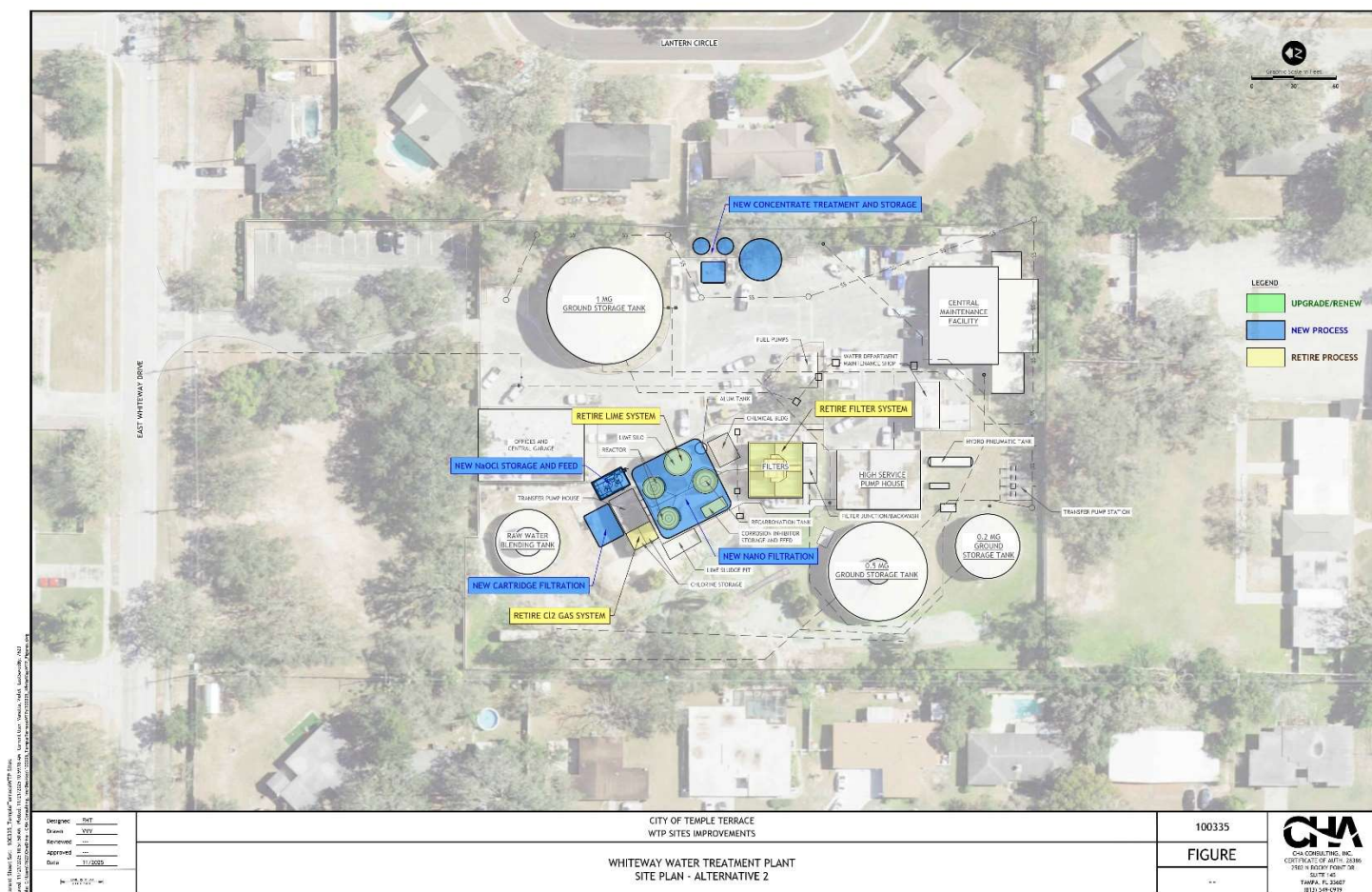


Figure 4-2. Alternative WW-2 Potential Site Layout



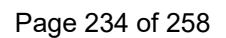


Figure 4-4. Alternative SD-2 Potential Site Layout



4.4 Alternatives Evaluation

4.4.1 Capital Cost Evaluation

Capital costs were estimated for each plant with established treatment alternatives (GAC, IX, NF) as shown in Tables 4-1 and 4-2. Ion exchange costs will be provided in the next draft following pilot conclusions.

Master plan has focused on established technologies (GAC, IX, NF) and presented emerging technologies or solutions that would need more piloting to confirm. For now, NF concentrate GAC treatment was assumed for cost comparison, realizing concentrate management likely will be a more robust process possibly involving PFAS destruction as the concentrate has 6-12 times TOC and PFAS concentrations as the raw water. For the City, testing/piloting will be required to confirm applicability under a separate implementation phase.

Also, note that costs for deep well injection will be developed and presented in the next master plan draft version. Emerging technologies such as foam fractionation and destruction technologies need to be piloted to confirm applicability, develop design criteria, and costs in a future, preliminary design phase.

Table 4-1. Whiteway WTP Alternative Cost Breakdown

1. Whiteway GAC Full Flow Treatment Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>GAC Contactors and Transfer Pump Improvements</i>						
1.1 MGD Capacity Steel Pressure Vessel	EA	4	\$1,400,000	\$150,000	\$1,550,000	\$6,200,000
Backwash System	LS	1	\$400,000	\$100,000	\$500,000	\$500,000
Transfer Pump Station Head Improvements	LS	1	\$400,000	\$140,000	\$540,000	\$540,000
GAC Connection Piping, Valving, Metering	LS	1	\$400,000	\$200,000	\$600,000	\$600,000
GAC Vessel Access Sitework	SF	8,000	\$12	\$12	\$24	\$192,000
Process/Civil Subtotal						\$8,032,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$8,032,000			\$804,000
Construction Subtotal						\$8,836,000
General Conditions	% of const subtotal	10%	\$8,836,000			\$884,000
Contractor Overhead and Profit	% of const subtotal	12%	\$8,836,000			\$1,061,000
Opinion of Probable Construction Cost (PCC):						\$10,781,000
Contingency	% of PCC	25%	\$10,781,000			\$2,696,000
Survey and Engineering Fees	% of PCC	8%	\$10,781,000			\$863,000
Opinion of Probable Construction Cost						\$14,340,000

2. Whiteway IX Full Flow Treatment Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>IX Reactors and Transfer Pump Improvements</i>						
1.5 MGD Capacity IX Steel Pressure Vessels	EA	3	\$1,400,000	\$150,000	\$1,550,000	\$4,650,000
Backwash System/Regen Storage/Delivery System	LS	1	\$800,000	\$400,000	\$1,200,000	\$1,200,000
Well Pump Head Improvements	LS	1	\$400,000	\$140,000	\$540,000	\$540,000
Softening Pre-treatment	LS	0	\$8,000,000	\$2,500,000	\$10,500,000	\$0
IX Connection Piping, Valving, Metering	LS	1	\$500,000	\$200,000	\$700,000	\$700,000
IX Vessel Access Sitework	SF	8,000	\$12	\$12	\$24	\$192,000
Process/Civil Subtotal						\$7,282,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$7,282,000			\$729,000
Construction Subtotal						\$8,011,000
General Conditions	% of const subtotal	10%	\$8,011,000			\$802,000
Contractor Overhead and Profit	% of const subtotal	12%	\$8,011,000			\$962,000
Opinion of Probable Construction Cost (PCC):						\$9,775,000
Contingency	% of PCC	25%	\$9,775,000			\$2,444,000
Survey and Engineering Fees	% of PCC	8%	\$9,775,000			\$782,000
Opinion of Probable Construction Cost						\$13,001,000

3. Whiteway NF Treatment Full Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>NF Membrane Skid & Appurtenances</i>						
1.5 MGD Three-Stage NF Skid	EA	3	\$1,500,000	\$200,000	\$1,700,000	\$5,100,000
Cartridge Filtration	LS	1	\$250,000	\$100,000	\$350,000	\$350,000
Acid Cleaning System	LS	1	\$220,000	\$100,000	\$320,000	\$320,000
Transfer Pump Station Head Improvements	LS	1	\$400,000	\$150,000	\$550,000	\$550,000
NF Connection Piping, Valving, Metering	LS	1	\$400,000	\$200,000	\$600,000	\$600,000
NF Building	EA	1	\$800,000	\$250,000	\$1,050,000	\$1,050,000
Concentrate PFAS Treatment-1.0 MGD Invicta	EA	1	\$3,500,000	\$3,000,000	\$6,500,000	\$6,500,000
NF Area Sitework	EA	10,000	\$12	\$12	\$24	\$240,000
Process/Civil Subtotal						\$14,710,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$14,710,000			\$1,471,000
Construction Subtotal						\$16,181,000
General Conditions	% of const subtotal	10%	\$16,181,000			\$1,619,000
Contractor Overhead and Profit	% of const subtotal	12%	\$16,181,000			\$1,942,000
Opinion of Probable Construction Cost (PCC):						\$19,742,000
Contingency	% of PCC	25%	\$19,742,000			\$4,936,000
Survey and Engineering Fees	% of PCC	8%	\$19,742,000			\$1,580,000
Opinion of Probable Construction Cost						\$26,258,000

Table 4-2. Sunningdale WTP Alternative Cost Breakdown

4. Sunningdale GAC Full Flow Treatment Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>GAC Contactors and Transfer Pump Improvements</i>						
1.1 MGD Capacity GAC Steel Pressure Vessels	EA	2	\$1,400,000	\$150,000	\$1,550,000	\$3,100,000
Backwash System	LS	1	\$220,000	\$100,000	\$320,000	\$320,000
Well Pump Head Improvements	LS	1	\$400,000	\$140,000	\$540,000	\$540,000
GAC Connection Piping, Valving, Metering	LS	1	\$200,000	\$140,000	\$340,000	\$340,000
GAC Vessel Access Sitework	SF	4,000	\$12	\$12	\$24	\$96,000
Process/Civil Subtotal						\$4,396,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$4,396,000			\$440,000
Construction Subtotal						\$4,836,000
General Conditions	% of const subtotal	10%	\$4,836,000			\$484,000
Contractor Overhead and Profit	% of const subtotal	12%	\$4,836,000			\$581,000
Opinion of Probable Construction Cost (PCC):						\$5,901,000
Contingency	% of PCC	25%	\$5,901,000			\$1,476,000
Survey and Engineering Fees	% of PCC	8%	\$5,901,000			\$473,000
Opinion of Probable Construction Cost						\$7,850,000

5. Sunningdale IX Full Flow Treatment Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>IX Reactors and Transfer Pump Improvements</i>						
1.1 MGD Capacity IX Steel Pressure Vessels	EA	2	\$1,200,000	\$150,000	\$1,350,000	\$2,700,000
Backwash System/Regen Storage/Delivery System	LS	1	\$400,000	\$100,000	\$500,000	\$500,000
Well Pump Head Improvements	LS	1	\$400,000	\$140,000	\$540,000	\$540,000
Softening Pre-treatment	LS	0	\$4,000,000	\$2,000,000	\$6,000,000	\$0
IX Connection Piping, Valving, Metering	LS	1	\$250,000	\$150,000	\$400,000	\$400,000
IX Vessel Access Sitework	SF	4,000	\$12	\$12	\$24	\$96,000
Process/Civil Subtotal						\$4,236,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$4,236,000			\$424,000
Construction Subtotal						\$4,660,000
General Conditions	% of const subtotal	10%	\$4,660,000			\$466,000
Contractor Overhead and Profit	% of const subtotal	12%	\$4,660,000			\$560,000
Opinion of Probable Construction Cost (PCC):						\$5,686,000
Contingency	% of PCC	25%	\$5,686,000			\$1,422,000
Survey and Engineering Fees	% of PCC	8%	\$5,686,000			\$455,000
Opinion of Probable Construction Cost						\$7,563,000

6. Sunningdale NF Treatment Full Train						
Capital Construction Costs						
Project/Item	Unit	Quantity	Unit Price	Installation	Total Unit Price	Total Costs
<i>NF Membrane Skid & Appurtenances</i>						
1.1 MGD High Recovery NF Skid	EA	2	\$1,100,000	\$200,000	\$1,300,000	\$2,600,000
Cartridge Filtration	LS	1	\$200,000	\$80,000	\$280,000	\$280,000
Acid Cleaning System	LS	1	\$100,000	\$100,000	\$200,000	\$200,000
Well Pump Head Improvements	LS	1	\$400,000	\$150,000	\$550,000	\$550,000
NF Connection Piping, Valving, Metering	LS	1	\$180,000	\$140,000	\$320,000	\$320,000
NF Enclosure	EA	1	\$240,000	\$100,000	\$340,000	\$340,000
Concentrate PFAS Treatment-0.3 MGD In-vic-ta	EA	1	\$2,000,000	\$1,500,000	\$3,500,000	\$3,500,000
NF Area Sitework	EA	4,000	\$12	\$12	\$24	\$96,000
Process/Civil Subtotal						\$7,886,000
Incidental Electrical/Mechanical	% of Process/Civil	10%	\$7,886,000			\$788,600
Construction Subtotal						\$8,674,600
General Conditions	% of const subtotal	10%	\$8,674,600			\$868,000
Contractor Overhead and Profit	% of const subtotal	12%	\$8,674,600			\$1,041,000
Opinion of Probable Construction Cost (PCC):						\$10,583,600
Contingency	% of PCC	25%	\$10,583,600			\$2,646,000
Survey and Engineering Fees	% of PCC	8%	\$10,583,600			\$847,000
Opinion of Probable Construction Cost						\$14,076,600

4.4.2 Life Cycle Cost Evaluation

The alternative evaluation compared alternatives on life cycle costs and non-cost factors including those that citizens provided in the PFAS public meeting. Alternatives evaluation is ongoing and will incorporate pilot results to assist with capital and operating costs. Based on knowledge in hand including decision support tools, recent project costs and opinion estimates, the following costs are provided as draft.

Table 4-3. WTP Process Life Cycle Cost Evaluation

Cost Category	WW-1 Rehab Lime/Filters Add GAC or IX*	WW-2 Retire Lime/Filters Add Nanofiltration**	SD-1 Continue No Softening Add GAC or IX*	SD-2 Add Nanofiltration**
PFAS MDD Treatment Capacity	4.4 mgd	4.5 mgd	2.2 mgd	2.2 mgd
WTP ADD	3.0 mgd	3.0 mgd	1.0 mgd	1.0 mgd
Capital Cost	\$16.7M (GAC) \$13.7M No lime \$12.4M (IX)	\$26.3M	\$7.5M (GAC) \$7.2M (IX)	\$14.1M
Annual Operational Cost	\$1.8M/Yr \$1.2M no lime \$1.7M/Yr (IX)	\$1.0 M/Yr	\$0.5 M/Yr-GAC \$0.5M/Yr-IX	\$0.6 M/Yr
Present Value	\$47.8M (GAC) \$41.8M (IX)	\$43.6M	\$16.1M (GAC) \$15.8M (IX)	\$24.5M
Equivalent Annual Cost (\$/Yr)	\$2.8M/Yr (GAC) \$2.4M/Yr (IX)	\$2.5M/Yr	\$0.9M/Yr (GAC) \$0.9M/Yr (IX)	\$1.4M/Yr
Equivalent Annual Cost (\$/kGal at 4.0 mgd ADD)	\$1.72/kGal (GAC) \$1.24 no lime \$1.50/kGal (IX)	\$1.53/kGal	\$1.16/kGal (GAC) \$1.14/kGal (IX)	\$1.76/ kGal

ASSUMPTIONS:

*IX assumes no softening based on preliminary pilot results. If softening is required, costs will have to be revised using cation IX as pre-treatment to PFAS anion IX.

** Assumes Invicta Foam Fractionation/PhotoCatalytic Destruction for treatment of concentrate laden

PFAS Compliance Evaluation of Alternatives

PFAS, Deep well injection costs to be included in the next version of Masterplan

- Capital costs include furnish and install equipment and non-cost factors including 25% contingency
- Present values assume 30-year life with 4% inflation
- Does not include other WTP major R&R to existing equipment which is common to all alternatives

4.4.3 Non-Cost Factors

The non-cost factors boil down to providing the City's customers with high-quality potable water that they can feel proud of and safe to drink. Pros and cons of the two alternatives categories are provided in the table below.

Table 4-4. WTP Process Non-Cost Factors

Cat.	WW-1 Rehab Lime/Filters Add GAC or IX	WW-2 Retire Lime/Filters Add Nanofiltration	SD-1 Continue No Softening Add GAC or IX	SD-2 Add Nanofiltration
Pros	• Lower cost option • 90-100% PFAS removal • No liquid PFAS waste stream • GAC/IX can be re-generated • Finished water would comply with federal regulations including PFAS • Proven in Florida, proving in Temple Terrace pilot	• Cost competitive with Alt. WW-1 • 90-100% PFAS removal • One process concentrates hardness and PFAS • Highly proven in similar FL groundwaters • Compact process • Liquid PFAS waste can be further concentrated and destructed	• Lower cost option • 90-100% PFAS removal • No liquid PFAS waste stream • GAC/IX can be re-generated • Finished water would comply with federal regulations including PFAS • Proven in Florida, proving in Temple Terrace pilot	• Cost competitive with Alt. SD-1 • 90-100% PFAS removal • One process concentrates hardness and PFAS • Highly proven in similar FL groundwaters • Compact process • Liquid PFAS waste can be further concentrated and destructed
Cons	• Lime softening still leaves water in "very hard" ranking • Pouring capital into a lime softening process that has not operated consistently • Lime softening does not meet goals to achieve reasonable hardness • High O&M, lime handling issues • GAC disposal may have RCRA and hazardous waste categorizations	• PFAS/hardness concentrate to treat/dispose of • 90-100% PFAS removal • Higher energy consumption, tho NF is low pressure • Additional treatment components/higher cost to process liquid PFAS waste stream	• Finished water still in "very hard" ranking • 90-100% PFAS removal • GAC disposal may have RCRA and hazardous waste categorizations • Site constraints	• PFAS/hardness concentrate to treat/dispose of • 90-100% PFAS removal • Higher energy consumption, tho NF is low pressure • Additional treatment components/higher cost to process liquid PFAS waste stream • Site constraints

4.5 Alternatives Evaluation Conclusions

Multiple categories of alternatives are available to improve finished potable water quality and comply with 2031-2 PFAS regulations. The available alternatives include multiple dimensions of system planning, including facility location, source water development, treatment process enhancements, and residuals management. Conclusions from the evaluation are summarized by alternative component as follows:

Supply Sources

1. Existing wellfields are productive and produce a water conducive to GAC a nanofiltration treatment with low turbidity, hydrogen sulfide and total organic carbon.
2. Exploring a new well/wellfield may be beneficial and may also create need for additional treatment processes including hydrogen sulfide and total organic carbon removal.

Treatment Locations

3. Space is an issue at the Sunningdale WTP site, and the City has indicated that acquiring more land is not a feasible option and Sunningdale does not currently have any facilities for removing hardness.
4. Retiring Sunningdale WTP and consolidating to Whiteway WTP is feasible, but costly with Whiteway requiring permitted capacity expansion from 5.0 to 6.0 MGD, as well as wellfield pump and transmission modifications and finished water distribution improvements adding several million dollars to the cost.
5. An alternative way to handle Sunningdale is to locate PFAS/hardness removal skids that could be relocated to Whiteway WTP when the City is ready and has funds to consolidate.

Softening Technologies

6. Lime softening is fading from water treatment industry favor due to its large footprint, high chemical usage, difficult chemical handling and solids disposal issues. Many of the softening treatment plants on the east and west coast of Florida have been replaced by membrane (nanofiltration) softening systems.

PFAS Adsorption

7. GAC and Fluorosorb are proven PFAS adsorption processes and are testing in the City's ongoing pilot.

PFAS Concentration

8. Ion exchange, NF/RO, foam fractionation are proven PFAS concentration processes and are being tested and considered by the City. Foam fractionation is typically a secondary concentration process to treat membrane concentrate or high PFAS concentration source waters.

PFAS Destruction

9. High-temp incineration, plasma excitation, UV photolytic reduction, sonolytic and electrochemical oxidations have shown promise in PFAS destruction. The Invictus treatment process has a 1 mgd industrial facility operating in Cary, NC, Komline-Harn is offering an integrated PFAS concentration and destruction system, and the City is considering similar processes to handle liquid PFAS/hardness waste streams in the identified alternatives.

Cost Factors

10. At Whiteway, the lower cost softening option will be to keep the existing lime softening reactors in place. The plant can then be retrofitted with GAC or Ion Exchange vessels to treat up to 4 MGD of flow (depending on which media performs better in the pilot study). The \$3M to \$4M cost estimate to rehabilitate the lime, filtration and recarbonation system makes the GAC-Lime rehab cost relatively equal with the nanofiltration option.
11. GAC could be used to treat nanofiltration concentrate; the GAC vessels would be smaller and fewer; however, the annual GAC replacement cost would be similar to full GAC treatment without nanofiltration.

Non-Cost Factors

12. Nanofiltration accomplishes the City's treatment goals in one single process, eliminating the need for the lime softening process and far outperforming in softening capabilities.
13. There are temporary versions of GAC, IX and nanofiltration available to use in the interim until PFAS permanent facilities are constructed and operating and \$1+M/year to rent the equipment and replace media, etc.

5.0 PFAS COMPLIANCE ALTERNATIVE RECOMMENDATIONS

Based on the evaluation of treatment performance, operations and maintenance requirements, capital cost, and other considerations discussed, GAC, IX and NF alternatives are technically feasible options for PFAS treatment. All three systems are capable of achieving compliance with the EPA drinking water standards for long-chain PFAS compounds, including PFOA and PFOS. Based on the existing applications and initial bench and pilot-scale testing results, NF is the preferred technology due to the multi-contaminant removal required (PFAS + hardness), GAC and IX limitations on regeneration frequencies and GAC and IX limitations on removal of the short chain PFAS.

Before the final decision is made to proceed to a full-scale design, additional engineering evaluating NF maximum recovery rates and concentrate management is recommended. It is also recommended that the City continue monitoring the PFAS levels in the wells and analyze if there is a trend or increase.

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APPENDIX C

Funding Strategy



To: City of Temple Terrace, c/o CHA Consulting, Inc.
From: Lawrence “Lee” Hale, Assoc. DBIA, PE
Date: February 1, 2026
Topic: Water Treatment Facility Funding Opportunities/Strategies DRAFT

Project Background

The City of Temple Terrace is undertaking a comprehensive program to upgrade its drinking water treatment facilities to address per- and polyfluoroalkyl substances (PFAS) and to maintain compliance with newly finalized U.S. Environmental Protection Agency (EPA) drinking water standards. PFAS have been detected in the City’s groundwater supply at concentrations exceeding EPA Maximum Contaminant Levels, requiring treatment improvements at the Whiteway and Sunningdale Water Treatment Plants. The City is advancing completion of its Water Treatment Facilities Master Plan and has facilitated pilot testing, led by CHA, of granular activated carbon (GAC) and ion exchange (IX) technologies to identify the most effective and sustainable PFAS treatment solution. These improvements are necessary to protect public health, ensure long-term regulatory compliance, and maintain reliable potable water service for approximately 33,000 residents.

The total estimated cost for PFAS treatment improvements, associated process upgrades, and supporting infrastructure is approximately \$125 million, including roughly \$88 million at the Whiteway WTP and \$37 million at the Sunningdale WTP over the first 5-years, with additional costs for pilot testing, design, and residuals management. Due to the magnitude of these capital investments and the City’s limited rate-based financial capacity, external funding assistance is essential to implement the required improvements without placing an undue burden on customers. As a result, Hale Innovation services were provided to research appropriate funding opportunities.

The information reviewed was drawn from the November 2025 draft of the Water Treatment Facilities Master Plan Report compiled by CHA Consulting, Inc. Additional information reviewed includes the PFAS Treatment Pilot Plan provided by CHA as well. The FY 2023-24 Capital Requests Summary was also reviewed.

Executive Summary

Funding for PFAS related treatment projects is severely limited with the BIL and IIJA Funding mostly expiring for FY2026. Therefore, the primary objectives considered for the City are outlined below. Three programmatic approaches are outlined. Utilizing these approaches will position the City to best capitalize on funding currently available:

1. Extend the project to 7-years and utilize DWSRF funds.
2. Create a comprehensive lobbying approach for Legislative Appropriations.
3. Consider a CMAR delivery method and continue to fund design out of pocket to ensure shovel ready project elements and to have accurate costs estimates from the contract.
4. There may be potential for minor funding through emergency or hazard mitigation grants. Consider that with the production of plans and document storm impacts meticulously.

Strategic Funding Roadmap

The Bipartisan Infrastructure Law (BIL) and the Infrastructure Investment and Jobs Act (IIJA) passed funding in 2021 for over \$50B for the State Revolving Fund at the federal level. The primary issue with this funding is that it expired during the 2025 pursuit schedule, which provides funding for the FY2026. While not formal, through communication with FDEP and other SRF contacts, the “last year of IIJA Emerging Contaminants is not known.” State Revolving Fund Emerging Contaminants funding (SRF EC) provided 100% loan forgiveness and represents the best opportunity for non-match required funding. Pursuing regular FDEP SRF funding is the best way to be prepared to pursue this funding. Additionally, the regular SRF funding has an opportunity to obtain principal forgiveness from the state.



Using the DW Master Project Cost Worksheet, the City should be able to get 20% principal forgiveness for DWSRF. Verify that the Median Household Income for Temple Terrace is \$65,756 and the State of Florida Median Household Income is \$71,711. The formula for DWSRF Principal Forgiveness (PF) is as follows:

- $$PF\% = 1760/9 - 160x(MHI/SMHI) - Px(7/4500) = 195.56 - 146.71 - 51.02 = -2.17$$

Since that number is not above 20%, the City would be applying for the minimum 20% forgiveness. The City would only get 20% priority scoring after all disadvantaged communities have received their allotment of forgiveness. While not guaranteed, this is realistically the only forgivable/grant money available outside of appropriations.

PFAS above the MCL should count as a weighted score of 600. PFAS is not considered an Acute Public Health Risk or Potential Acute Public Health Risk, which are the 800- and 700-point scoring criteria. Therefore, the Chronic Public Health Risk is the highest available scoring criteria. An additional 100 points may be awarded if water conservation is included in the project.

Based on the first 5 years of the CIP from CHA, the total value pursued should be \$125M. That total may be broken down through FDEP with annual requests for funding based on the actual CIP amounts. A 20% forgiveness loan would break down to \$25M in principal forgiveness with the rest of the money borrowed at a low interest rate, which is typically far lower than interest rates available in the private market. It is important to note that principal forgiveness is only available for construction. The Facilities Plan and design would not be eligible for principal forgiveness.

There are several reasons to rely on DWSRF funding. First, numerous state grant programs have minor scoring criteria that state if the state has spent money on the project, the scoring for the grant ranking is increased. If a future grant program is made available, then having minor financing through DWSRF would better position the City for funding. Additionally, having planning and design documents ready would make this project eligible for funding through legislative appropriations. For legislative appropriations, it is recommended that the City utilize lobbying services to pursue appropriations. A multi-year approach, complete with a rate study comparison of rates making the argument that upgrades make water bills unaffordable is another route towards helping appropriations and DWSRF scoring.

DWSRF has a funding cap of approximately \$20M per year. It is recommended to transition the project into a 6- to 7-year program instead of loading the improvements over 5 years. One possibility would be to deliver the project as a CMAR delivery method. This would allow for rapid construction and shovel ready construction phases. Having a contractor working simultaneously with the design team would also allow for more accurate cost estimates to go along with funding requests.

Another loan option could be using the EPA Water Infrastructure Finance and Innovation Act (WIFIA) funding. However, at \$125M over 5 years, WIFIA has two major pitfalls. First, WIFIA funding may only cover up to 49% of the project, leaving the City to self-fund \$62.5M. Secondly, the fees to pursue WIFIA typically run \$300,000-\$500,000 just to apply because of application fees and required plans. For a third point, WIFIA interest rates are typically considerably higher than SRF. Therefore, WIFIA is not considered a preferred approach.

Using an SRF funding strategy also positions the City for emergency response money. However, to obtain emergency response money such as FDEM HMGP funding, DWSRF SAHM funding, or Florida Commerce CDBG-DR funding, storm impacts, water outages, and other items must be well documented. Drops in water pressure and boil water notices should be documented for duration and should outline the causes in great detail to be considered for such funding. During the DWSRF SAHM funding for hurricanes Milton and Helene. Potential items that could serve as emergency response items at a water include the CIP items from CHA's master plan such as water supply wells, transfer pumps to ground storage tanks, and high service pumps, provided the plan for these items would decrease



the likelihood of failure during a storm event. These items are not a great fit, could provide the potential for several hundred thousand dollars in offset costs should a natural disaster occur.

Programs Researched

The following grant programs were considered but are not considered aligned with this project. A short description of the reason for not considering the program is attached. This should facilitate an opportunity to consider modifications or alternatives that would make the program eligible. For example, if new wells are needed and brackish water is utilized as the source, Alternative Water Supply grants may now be an option.

1. **FDEP Clean Water State Revolving Fund (CWSRF)**
Not applicable because this project addresses drinking water treatment, not wastewater, stormwater, or surface water quality improvements.
2. **FDEP Water Quality Improvement Grants (WQIG)**
Primarily focused on nutrient (nitrogen/phosphorus) reduction; PFAS drinking water treatment is outside program intent.
3. **FDEP Nonpoint Source Management (Section 319) Grants**
Targets nonpoint source pollution in surface waters, not groundwater-based potable water treatment.
4. **FDEP Springs Restoration Grants**
Limited to projects that reduce nutrient impacts to Outstanding Florida Springs; PFAS treatment at municipal WTPs is not eligible.
5. **FDEP Alternative Water Supply (AWS) Grants**
Intended for new water supply development (reuse, desalination, brackish water), not treatment of existing potable groundwater sources.
6. **FDEP Water Protection and Sustainability Program (WPSP) Grants**
Focused on watershed protection and conservation initiatives rather than regulatory drinking water treatment compliance.
7. **USEPA Clean Water SRF Emerging Contaminants (CWSRF-EC)**
Limited to wastewater and stormwater PFAS; cannot be used for drinking water treatment plants.
8. **USEPA Brownfields Grants**
Restricted to site cleanup and redevelopment; drinking water infrastructure is explicitly excluded.
9. **USEPA Superfund / CERCLA Programs**
Applicable only to contaminated site remediation, not municipal drinking water treatment system upgrades.
10. **USEPA Nonpoint Source (Section 319) Grants**
Surface water focused; does not fund drinking water treatment facilities.
11. **USEPA Lead Reduction in Drinking Water Grants (Schools/Childcare)**
Program scope limited to premise plumbing and fixtures, not centralized WTP treatment.
12. **USEPA Tribal Drinking Water Infrastructure Grants**
Eligibility restricted to federally recognized tribes.
13. **USEPA Drinking Water Resilience / Emergency Preparedness Grants**
Focused on climate resilience, natural disasters, and system hardening, not contaminant-specific treatment compliance.
14. **USEPA Technical Assistance Programs (WaterTA, TEC)**
Provide planning and advisory support only; no construction or capital funding.
15. **Florida Commerce CDBG Programs**
Temple Terrace has a low-to-moderate income base of 46%. This does not meet the funding criteria for primary eligibility of CDBG. Secondary eligibility would be centered around an urgent need criteria. The only pot of CDBG funding that would be of value for this project would be CDBG-DR. Water quality is not a primary scoring factor, so minor items such as emergency generators and other water resilience options are potentially available.



16. FDEM Hazard Mitigation Grant Programs

This program includes minor items, such as emergency generators, which are not included in the proposed CIP.

Alternative Options

USEPA has launched the PFAS OUT initiative. While not a direct line to funding, programs like this collect data and start to create and communicate funding shortfalls nationally to legislative bodies. This memo recommends communicating this memo and the master plan created by CHA to PFAS OUT representatives for potential funding alternatives that don't currently exist. Additionally in September of 2025, USEPA discussed additional liability and passive receiver issues. Participating in these conversations may result in legal rewards from the pollution agreements at the state and federal levels.

For fully fundable projects, due to the lack of grant programs currently available, State of Florida Legislative Appropriations are potentially the largest pot of available money. The largest legislatively approved appropriation was \$46M for the Indiantown Reverse Osmosis Water Treatment Plant., although that funding was later amended to approximately \$9.3M for the plant. A comprehensive lobbying pursuit of funding is the most likely. Highlighting documents, like this funding plan, to demonstrate lack of funding options for the City, is critical to a successful appropriations process.

Summary

In summary, the City of Temple Terrace faces a significant and unavoidable need to invest in drinking water treatment improvements to address PFAS contamination and comply with newly established EPA regulations. With an estimated capital cost exceeding \$125 million over the initial five-year implementation period, these improvements represent a substantial financial challenge that cannot reasonably be addressed through rate-based funding alone without imposing undue burden on customers. The analysis performed confirms that Florida Drinking Water State Revolving Fund (DWSRF) financing—particularly Emerging Contaminants funding and base SRF loans with limited principal forgiveness—represents the most viable and defensible funding strategy currently available to the City.

Accordingly, it is recommended that the City pursue a phased DWSRF funding approach aligned with the adopted Capital Improvement Program, while advancing planning and design activities to maintain project readiness for future funding opportunities. Maintaining eligibility and participation in SRF financing will also position the City favorably for potential legislative appropriations or future grant programs should additional federal or state funding become available. This proactive, multi-year funding strategy provides the best opportunity to advance critical PFAS treatment improvements while protecting public health and preserving long-term financial sustainability for the City's water utility.

APPENDIX D

Electrical Asset Inventory

Asset Inventory - Whiteway WTP

This worksheet provides a template for the user to record attribute information collected during the inventory and condition assessment process. This template can be used as the inventory or a tool to help load information into an asset management software system.

Select level 4 (process), level 5 (group) and Asset Classification from drop-downs. Service life will automatically populate based on classification chosen. If you enter a new classification, enter service life in column J. The user may not have every attribute listed in the template or some attributes may not apply. The purpose is to populate as much relevant information as possible for each asset and estimate values for attributes that are required to complete future tasks. Name plate data on mechanical equipment will often provide many of the important attributes, such as manufacturer, size, serial number, model number, horsepower, voltage, etc. User may add attributes if necessary.

Asset ID	Asset Description	Physical Location	Elevation (feet)	Level 4 (Process)	Level 5 (Group)	Installation Year	Replacement Cost (Current year)	Status (operating, decommissioned)	Asset Classification	Service Life	Condition Assessment Classification	Quantity	Notes	Manufacturer	Model	Vendor	Type	Horsepower	Rating	Speed (RPM)	Voltage	Size
1	Main Distribution Panel	CMU Building, DPW Offices & Shop (Electrical Closet)	5,400.00	Electrical Distribution	Electrical Equipment	1981	\$10,400	OPERATING	Panel	20	Electrical Switchboard	1		Citler Hammer			3 PH		200 A		480/277V	
2	Dry Type Transformer	CMU Building, DPW Offices & Shop (Electrical Closet)	9,000.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Transformer	20	Electrical / Instrumentation Eq	1		Square D			3 PH		75KVA		480-120/208V	
3	Panel C	CMU Building, DPW Offices & Shop (Electrical Closet)	4,400.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		Gould			3 PH		100A		480/277V	
4	Panel A1	CMU Building, DPW Offices & Shop (Electrical Closet)	7,100.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1							225A		120/208V	
5	Panel A2	CMU Building, DPW Offices & Shop (Electrical Closet)	7,100.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1							225A		120/208	
6	Panel Board	CMU Building, DPW Offices & Shop (Waiting Area)		Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1	20 Spaces. Located at waiting area	Westignouse					125A			
7	Safety Switch (By Ice Maker)	CMU Building, DPW Offices & Shop (Waiting Area)	800.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Gould					60A		120/240	
8	Local Control Station	CMU Building, DPW Offices & Shop (Waiting Area)		Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D								
9	Safety Switch (By compressor units area)	CMU Building, DPW Offices & Shop (Outdoor Area)	400.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D			1 PH		30A		240	
10	Safety Switch (By compressor units area)	CMU Building, DPW Offices & Shop (Outdoor Area)	800.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D			1 PH		60A		240	
11	Meter Can	CMU Building, DPW Offices & Shop (Outdoor Area)		Electrical Distribution	Electrical Equipment	1981		OPERATING	General Meter	10	Electrical / Instrumentation Eq	1	Located outdoor									
12	Disconnect Switch	CMU Building, DPW Offices & Shop (Outdoor Area)		Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1	Located outdoor									
13	Load Center (Filter BLDG, Chemical BLDG Lime Silo and Transfer Pumps)	Transfer Pump House		Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1					3 PH				480/277	
14	L/V Panel Board	Transfer Pump House	3,500.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		General Electric			1 PH		225A		120/240	
15	Dry Type Transformer	Transfer Pump House	7,500.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Transformer	20	Electrical / Instrumentation Eq	1					1 PH		25 KVA		480/240-120	
16	Pump Motor	Transfer Pump House		Electrical Distribution	Electrical Equipment	1981		OPERATING				3					3 PH	40			480	
17	Safety Switch (For 7.5HP Pump Motor)	Fluoridation Building	500.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1									480	
18	Safety Switch (For 0.25HP Pump Motor)	Fluoridation Building		Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
19	Local Control Station (For 0.25HP Pump Motor)	Fluoridation Building		Electrical Distribution	Electrical Equipment	1981		OPERATING	Controller	10	Electrical / Instrumentation Eq	1										
20	Safety Switch	Recarbonation Tank Area	500.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1					3 PH	20			600	

21	Safaty Switch (For 5 HP Motor)	Lime Silo Tank Area (Top)		Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
22	Safaty Switch	Lime Silo Tank Area (Top)	920.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					60A		600	
23	Local Control Station 1 (For 3HP motor)	Lime Silo Tank Area		Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
24	Local Control Station 2 (For 3HP motor)	Lime Silo Tank Area		Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
25	Pump Motor Control Panel	Lime Silo Tank Area (Outdoor area)	TBD	Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
26	Low Voltage Panel #29	Lime Silo Tank Area		Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		Syntron								
27	Low Voltage Panel #30	Lime Silo Tank Area		Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		Syntron								
28	Lime Slaker System Control Panel	Lime Silo Tank Area		Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
29	Slaker System Control Panel 1	Lime Silo Tank Area		Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
30	Freestanding Control Panel	Filter Tank (Top)	TBD	Electrical Distribution	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
31	Vacuum Pump No.1 safety Disconnect Switch	Filter Tank (Top)	500.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1							30A		600	
32	Vacuum Pump No.2 safety Disconnect Switch	Filter Tank (Top)	500.00	Electrical Distribution	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1							30A		600	
33	Cat. Generator and Day Tank	High Service Pump Room	280,000.00	Electrical Equipment	Electrical Equipment	1981		STAND-BY	Electric Generator	25	Generators	1							600KW			
34	ATS	High Service Pump Room	23,000.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		Kohler					600A		480	
35	Panel PP1	High Service Pump Room	9,000.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1							600A		480/277	
36	Pump Starters (Pump 4,5 and 6)	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Motor Starter	10	Electrical / Instrumentation Eq	1										
37	HOA	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
38	Equalization Valve Safety Disconnect Switch	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
39	Panel Board (Pump Motor Starter Center)	High Service Pump Room	12,000.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Motor Starter	10	Electrical / Instrumentation Eq	1							600A			
40	Pump Controller	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Electrical Other	10	Electrical / Instrumentation Eq	1										
41	Safety Disconnect Switch	High Service Pump Room	900.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1							60A		480	
42	Lighting Panel	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1									120/240	
43	Generator Panel	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1							70A			
44	Lighting Transformer	High Service Pump Room	7,600.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Transformer	20	Electrical / Instrumentation Eq	1		Acme					25KVA		480/240-120	

45	High Service Pump 1 Time Delay	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
46	High Service Pump 2 Time Delay	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1										
47	Flow Recorder Panel 1	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
48	Flow Recorder Panel 2	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
49	CP- 1 Transfer Pump Station	High Service Pump Room		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1										
50	Disconnect Switch	Dungeon Building (Outdoor)	8,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					600A		480/277	
51	Transfer Room Safety Switch	Dungeon Building (Outdoor)	4,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1							400A		480/277	
52	Offices and Maint. Shop Safety Switch	Dungeon Building (Outdoor)	2,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					200A		480/277	
53	HS Room Safaty Switch	Dungeon Building (Outdoor)	4,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					400A		480/277	
54	Disconnect Switch (Service to PP1 Panel)	Dungeon Building (Outdoor)	8,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1	Does not have nameplate						600A		480/277	
55	T.E.CO Safety Switch	Dungeon Building (Outdoor)	2,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1							200A		480/277	
56	Wells 4-5 Safety Switch	Dungeon Building (Outdoor)	2,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1							200A		480/277	
57	Safaety Switch	Dungeon Building (Outdoor)		Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1	Does not have nameplate	Square D								
58	Electrical Panel	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1	12 Space	Square D								
59	Safaety Switch	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					100A			
60	Well 4 Starter	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Motor Starter	10	Electrical / Instrumentation Eq	1		Square D								
61	Well 5 Starter	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Motor Starter	10	Electrical / Instrumentation Eq	1		Square D								
62	Well 5 Safety Switch	Sewer Shop Building	1,500.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					100A		600	
63	Dry Type Transformer	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Transformer	20	Electrical / Instrumentation Eq	3		Square D					1.5KVA			
64	MDP	Sewer Shop Building	5,400.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		Square D					225A			
65	Dry Type Transformer	Sewer Shop Building	7,200.00	Electrical Equipment	Electrical Equipment	1981		OPERATING	Transformer	20	Electrical / Instrumentation Eq	1		Square D			3 PH		45KVA		480/208-120	
66	Panel P	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		Square D								
67	Battery Charger	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		La Marche	A46-20-24V-A1	La Marche			10A		120	
68	Aux. Battery Charger	Sewer Shop Building		Electrical Equipment	Electrical Equipment	1981		OPERATING	Panel	20	Electrical Switchboard	1		La Marche		Lester Equipment MFG. CO., INC			10A		115	

Asset Inventory - Sunningdale WTP

This worksheet provides a template for the user to record attribute information collected during the inventory and condition assessment process. This template can be used as the inventory or a tool to help load information into an asset management software system.

Select level 4 (process), level 5 (group) and Asset Classification from drop-downs. Service life will automatically populate based on classification chosen. If you enter a new classification, enter service life in column J. The user may not have every attribute listed in the template or some attributes may not apply. The purpose is to populate as much relevant information as possible for each asset and estimate values for attributes that are required to complete future tasks. Name plate data on mechanical equipment will often provide many of the important attributes, such as manufacturer, size, serial number, model number, horsepower, voltage, etc. User may add attributes if necessary.

Asset ID	Asset Description	Physical Location	Elevation (feet)	Level 4 (Process)	Level 5 (Group)	Installation Year	Replacement Cost (Current year)	Status (operating, decommissioned)	Asset Classification	Service Life	Condition Assessment Classification	Quantity	Notes	Manufacturer	Model	Vendor	Type	Horsepower	Rating	Speed (RPM)	Voltage	Size
1	Safety Switch	Chlorinator Building	70.42	Electrical Distribution	Electrical Equipment	1983	\$1,900	OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D					200 A		600	
2	LP-3	Chlorinator Building	70.42	Electrical Distribution	Electrical Equipment	1983	\$3,000	OPERATING	Panel	20	Electrical Switchboard	1	12 Space	Square D							120/240	
3	Dry Type Transformer	Chlorinator Building	70.42	Electrical Distribution	Electrical Equipment	1983	\$3,600	OPERATING	Transformer	20	Electrical / Instrumentation Eq	1		Square D					10KVA		480/240-120	
4	Generator	Sunnigdale Site		Electrical Distribution	Electrical Equipment	1983	\$200,000	OPERATING	Electric Generator	25	Generators	1							400KW		480	
5	ATS	Sunnigdale Site		Electrical Distribution	Electrical Equipment	1983	\$25,000	OPERATING	Panel	20	Electrical Switchboard	1							600A		480	
6	Service Cntrance Circuit Breaker	High Service Pump Building	69.00	Electrical Distribution	Electrical Equipment	1983	\$5,000	OPERATING	Circuit Breaker	30	Electrical / Instrumentation Eq	1							600A		480	
7	MCC-2	High Service Pump Building	69.00	Electrical Distribution	Electrical Equipment	1983	TBD	OPERATING	Motor Control Center	35	Electrical / Instrumentation Eq	1	Include starter, 30KVA, 3PH, 480/208-120 V DDT and electrial panel LP2	Square D					600A		480	
8	CP-2	High Service Pump Building	69.00	Electrical Distribution	Electrical Equipment	1983	TBD	OPERATING	Panel	20	Electrical Switchboard	1										
9	Safety Switch	Well No.1 Pump House	62.00	Electrical Distribution	Electrical Equipment	1983	\$2,500	OPERATING	Switch	20	Electrical / Instrumentation Eq	1		Square D								
10	RTU	Well No.1 Pump House	62.00	Electrical Distribution	Electrical Equipment	1983	TBD	OPERATING	Panel	20	Electrical Switchboard	1										

Process	Type	Item	Quantity	Useful Life	Install Date	Rehab Date	Useful Life Remaining	Condition Score	Condition Rating	Likelihood of Failure	Consequence of Failure	Combined Risk Score	Capital Cost	Construction Cost	Total Rebuild Cost	Rehab Cost		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	SUM
Electrical Distribution	Switch	Safety Switch	1	20	1983	1983	0	Salvage	0	Very High	Very High	Very High	\$ 1,900.00	\$ 950.00	\$ 2,850.00	\$ 95.00		\$ 1,900.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,900.00
Electrical Distribution	Panel	LP-3	1	20	1983	1983	0	Salvage	0	Very High	Med	High	\$ 3,000.00	\$ 1,500.00	\$ 4,500.00	\$ 150.00		\$ 3,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,000.00
Electrical Distribution	Transformer	Dry Type Transformer	1	20	1983	1983	0	Salvage	0	Very High	Med	High	\$ 3,600.00	\$ 1,800.00	\$ 5,400.00	\$ 180.00		\$ 3,600.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 3,600.00
Electrical Distribution	Electric Generator	Generator	1	25	1983	1983	0	Salvage	0	Very High	Very High	Very High	\$ 350,000.00	\$ 175,000.00	\$ 525,000.00	\$ 14,000.00		\$ 350,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 350,000.00
Electrical Distribution	Panel	ATS	1	20	1983	1983	0	Salvage	0	Very High	Very High	Very High	\$ 25,000.00	\$ 12,500.00	\$ 37,500.00	\$ 1,250.00		\$ 25,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 25,000.00
Electrical Distribution	Circuit Breaker	Service Cntrance Circuit Breaker	1	30	1983	1983	0	Salvage	0	Very High	Med	High	\$ 5,000.00	\$ 2,500.00	\$ 7,500.00	\$ 166.67		\$ 5,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,000.00
Electrical Distribution	Motor Control Center	MCC-2	1	35	1983	1983	0	Salvage	0	Very High	Very High	Very High	\$ 40,000.00	\$ 20,000.00	\$ 60,000.00	\$ 1,142.86		\$ 40,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 40,000.00
Electrical Distribution	Panel	CP-2	1	20	1983	1983	0	Salvage	0	Very High	Med	High	\$ 10,000.00	\$ 5,000.00	\$ 15,000.00	TBD		\$ 10,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 10,000.00
Electrical Distribution	Switch	Safety Switch	1	20	1983	1983	0	Salvage	0	Very High	Very High	Very High	\$ 2,500.00	\$ 1,250.00	\$ 3,750.00	\$ 125.00		\$ 2,500.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,500.00
Electrical Distribution	Panel	RTU	1	20	1983	1983	0	Salvage	0	Very High	Med	High	\$ 20,000.00	\$ 10,000.00	\$ 30,000.00	TBD		\$ 20,000.00	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 20,000.00
			Avg											Total	\$ 691,500.00														\$ 461,000.00

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Item Cover Page

City Council Item Report

Date: May 19, 2026
From: Jeannie Barlow, Senior Executive Assistant
Item Type: Reports
Subject: Funding Options for Proposed Water Plant Improvements
Presenter: Andy Ross, Mayor

Recommendation:

Discussion:

Stantec Financial Services Senior Manager Peter Napoli will present funding options for the proposed water plant improvements to the Council.

Resolution/Ordinance Information:

Appropriation Code:

Requirements:

Cost:

Attachments:

None