2024 Water Quality Report

Charleston Water System

Published by July 1, 2025, per EPA regulation.

Foster Creek leads to the Bushy Park Reservoir, which is our primary raw water source.

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Sedimentation basins at our Hanahan Water Treatment Plant catch tiny particles as they settle, leaving cleaner water behind.

Summary

English

This report provides details on Charleston Water System's drinking water, including where your water comes from, how it's treated, and the results of rigorous testing conducted throughout the year. Our team works 24/7 to provide you with the best possible water quality.

Our only violation of drinking water standards as defined by the U.S. Environmental Protection Agency and the South Carolina Department of Environmental Services is the Maximum Contaminant Level for Per- and Polyfluoroalkyl Substances (PFAS). For more information, please *see **page 8*** and visit **www.epa.gov/pfas**.

Questions / Extra Copies

Communications team: (843) 727-7146

Call our staff for direct assistance in translating this publication at (843) 727-6800.

Get Involved

Our Board of Commissioners meets monthly and meetings are open to the public. Citizen participation is welcomed. Meetings are typically held the fourth Wednesday of every month at 9 a.m. at 103 St. Philip Street. More information: **www.charlestonwater.com.**

Public Water System ID#: 1010001

Español

Este informe proporciona detalles sobre el agua potable del Sistema de Agua de Charleston, incluyendo de dónde proviene su agua, cómo se trata y los resultados de rigurosas pruebas realizadas durante todo el año. Nuestro equipo trabaja las 24 horas del día, los 7 días de la semana, para brindarle la mejor calidad de agua posible.

Nuestra única infracción a las normas de agua potable, según lo definido por la Agencia de Protección Ambiental de EE. UU. y el Departamento de Servicios Ambientales de Carolina del Sur, es el Nivel Máximo de Contaminantes para las sustancias perfluoroalquiladas y polifluoroalquiladas (PFAS). Para más información, *consulte la **página 8*** y visite **www.epa.gov/pfas.**

Preguntas / Copias Adicionales

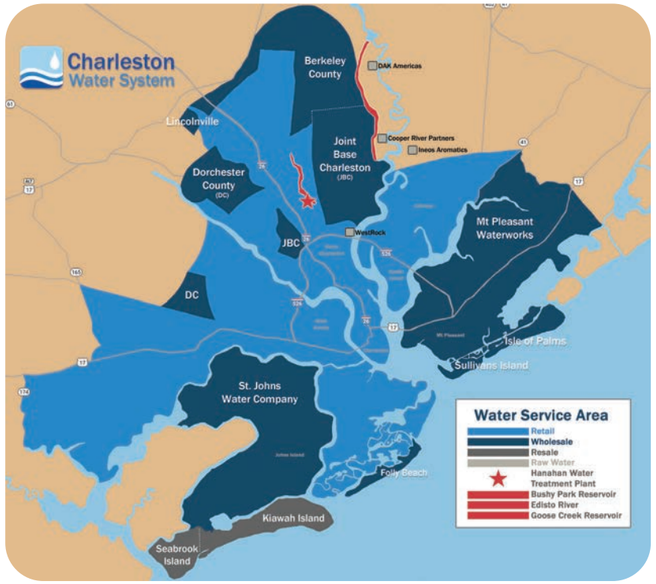
Equipo de comunicaciones: (843) 727-7146

Llame a nuestro personal para obtener asistencia directa para traducir esta publicación al (843) 727-6800.

Involúcrese

Nuestra Junta de Comisionados se reúne mensualmente y las reuniones están abiertas al público. Se anima a la participación ciudadana. Las reuniones normalmente se celebran el cuarto miércoles de cada mes a las 9 a.m. en 103 St. Philip Street. Más información: **www.charlestonwater.com.**

ID del Sistema de Agua Pública: 1010001



Our Mission

Support public health and protect the environment.

Our Vision

Achieve excellence and exceed customer expectations.

Produced by:
Communications Manager
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Information from the EPA

EPA Definitions

Contaminants: The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it can dissolve naturally-occurring minerals and, in some cases, radioactive materials, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

- **Microbial contaminants,** such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- **Inorganic contaminants,** such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharge, oil and gas production, mining or farming.
- **Organic chemical contaminants,** including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.
- **Radioactive contaminants,** which can be naturally occurring or be the result of oil and gas production, and mining activities.
- **Herbicide,** any chemical(s) used to control vegetation that is undesirable.
- **Pesticide,** generally, any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in the water provided by public water systems. The U.S. Food and Drug Administration regulations establish limits for contaminants in bottled water which must provide the same protection for human health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the **Safe Drinking Water Hotline (800-426-4791) or on EPA's website, *www.epa.gov/safewater***.

Cryptosporidium: *Cryptosporidium* is a microbial pathogen found in surface water throughout the U.S. Although filtration removes *Cryptosporidium*, the most commonly used filtration methods cannot guarantee 100% removal. Our monitoring indicates the presence of these organisms in our source water and/or finished water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of *Cryptosporidium* may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people, infants and small children, and the elderly are at greater risk of developing life-threatening illness. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. *Cryptosporidium* must be ingested to cause disease, and it may be spread through means other than drinking water.

Action Level (AL): The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements that a water system must follow.

Hazard Index (HI): An approach that determines the health concerns associated with mixtures of certain PFAS in finished drinking water. Low levels of multiple PFAS that individually would not likely result in adverse health effects may pose health concerns when combined in a mixture. The Hazard Index MCL represents the maximum level for mixtures of PFHxS, PFNA, HFPO-DA, and/or PFBS allowed in water delivered by a public water system. A Hazard Index greater than 1 requires a system to take action.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

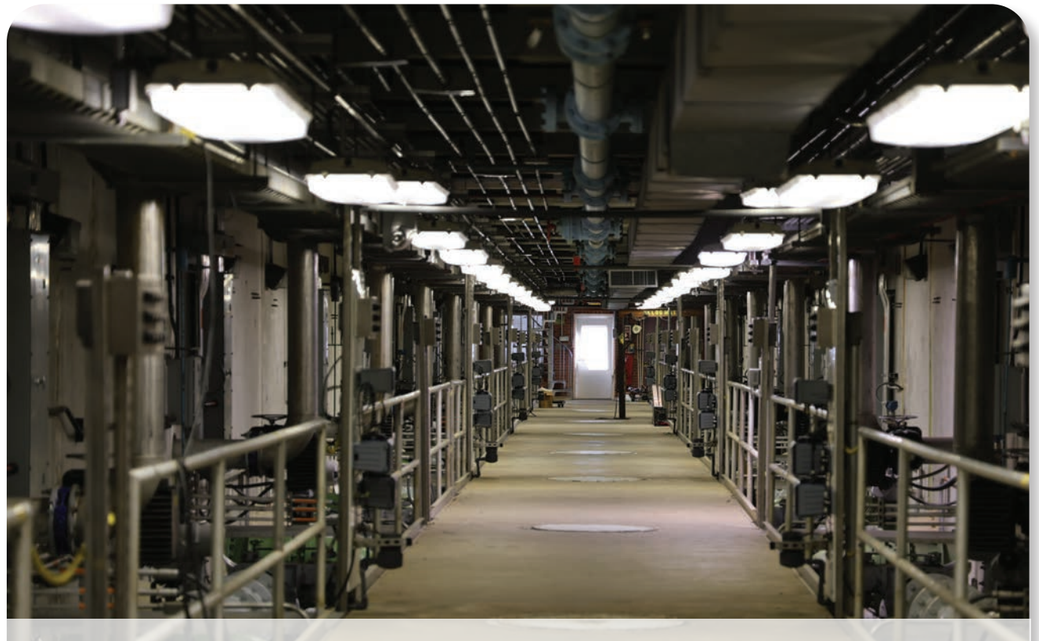
Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

National Award for Water Quality

Since 1995, CWS has received national recognition for the quality of its drinking water!

The honor comes from the Partnership for Safe Water Program, which is made up of seven drinking water organizations, including the EPA. This program recognizes water treatment plants for going above and beyond just meeting federal regulations. The focus is on removing particulates from the source water, which is measured as turbidity, because it can harbor bacteria or viruses. The goal is for turbidity to be less than regulation—**or at least 300% better than it must be**.

CWS has achieved the second-highest level: **Phase IV 8-Year President's Award**. This honor recognizes the Hanahan Water Treatment Plant for implementing practices to continually analyze and compare many separate process performance indicators on each of its 24 individual filters in an effort to keep turbidity even lower (as low as possible), to continuously improve, and to act on indications of water quality changes well before they become an issue.



The filter gallery sends water to different parts of the plant to continue the treatment process.

Regulatory Testing

These are the compounds we are required to test for, and all were below the regulatory limit.

Measurement Abbreviations:

ug/L: Micrograms per Liter
NA: Not Applicable
NTU: Nephelometric Turbidity Units
ppb: Parts per billion (ug/L)
ppm: Parts per million (mg/L)
ppt: Parts per trillion (ng/L)
pCi/l: picocuries per liter

	Required Regulatory Report	Maximum Contaminant Level (MCL) set by EPA	Maximum Contaminant Level Goal (MCLG)	Actual Level in CWS Water for 2024	Year Sampled	Possible Sources in Water
	Turbidity[1] A measure of the amount of suspended particles in the water (cloudiness); an indicator of overall water quality and filtration effectiveness.	Requires a specific treatment technique; 95% of monthly samples must be less than 0.3 NTU	None	0.25 NTU highest level detected 100% of monthly samples met the limit Range: 0.08 – 0.25 NTU	2024	Soil runoff
	***Cryptosporidium* (in source water)** A parasite spread through human and animal waste that causes gastrointestinal illness.	No MCL exists	None	0.0 per liter Range: NA	2024	Human and animal
	***Giardia* (in source water)** A parasite spread through human and animal waste that causes gastrointestinal illness.	No MCL exists	Zero *Giardia* oocysts per 1 liter of water	0.1 per liter Range: 0 to 0.1 per liter	2024	Human and animal
Inorganic Compounds	**Copper** A metal widely used in household plumbing that may corrode into water.	90th percentile of all samples collected must be less than the 1.3 ppm action level	1.3 ppm	90th percentile = 0.089 ppm No samples exceeded the action level. Range: 0 to 0.26 ppm	2024[2]	Corrosion of household plumbing materials
	Lead A metal no longer used in new water pipes, but may be present in plumbing fixtures or old pipes; may corrode into water.	90th percentile of all samples collected must be less than the 15 ppb action level	0 ppb	90th percentile = 3.5 ppb One sample exceeded the action level. Range: 0 to 43 ppb	2024[2]	Corrosion of household plumbing materials
	Nitrate (measured as Nitrogen) Nitrates are nitrogen-oxygen compounds that can become a source of pollution in the form of unwanted nutrients.	Nitrate 10 ppm	Nitrate 10 ppm	0.14 ppm Range: 0.14 to 0.14 ppm	2024	Runoff from fertilizers
	Fluoride A substance that is naturally occurring in some water sources, particularly groundwater. It is also added to drinking water to help prevent tooth decay.	4 ppm	4 ppm	0.16 ppm in source water 0.48 ppm in finished water Range: 0.16 to 0.50 ppm	2024	Naturally occurring in source water and adjusted during treatment to prevent tooth decay
Disinfectants	**Chlorine Dioxide** A disinfection agent added in small amounts to protect against microbes.	800 ppb	800 ppb	400 ppb Range: 0 to 400 ppb	2024	Added for disinfection
	Chloramine Residual A compound of chlorine and ammonia added in small amounts to treated water to protect against microbes.	4 ppm MRDL	4 ppm MRDLG	3.0 ppm Running Annual Average (RAA) Range: 3.0 – 3.0 ppm	2024	Added for disinfection

[1]Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches.

[2] Lead and copper regulatory sampling frequency is every three years, based on our compliance history.

(Data continued on next page.)

Regulatory Testing, continued

	Required Regulatory Report	Maximum Contaminant Level (MCL) set by EPA	Maximum Contaminant Level Goal (MCLG)	Actual Level in CWS Water for 2024	Year Sampled	Possible Sources in Water
Disinfection Byproducts	**Total Trihalomethanes (Stage 2)** Stage 2 of the Disinfectants and Disinfection Byproducts Rule requires the locational running annual average (LRAA) for each sampling location to be below the MCL. CWS has eight sampling locations.	LRAA must be below 80 ppb.	NA	LRAA: 7 ppb Range: 4.7 to 10.3 ppb	2024	Byproduct of disinfection
	Total Haloacetic Acids (Stage 2) Stage 2 of the Disinfectants and Disinfection Byproducts Rule requires the locational running annual average (LRAA) for each sampling location to be below the MCL. CWS has eight sampling locations.	LRAA must be below 60 ppb.	NA	LRAA: 14 ppb Range: 8.3 to 18.10 ppb	2024	Byproduct of disinfection
	Chlorite A byproduct formed when chlorine dioxide is used to disinfect water.	1 ppm	0.8 ppm	Highest level detected: 0.87 ppm Range: 0.43 to 0.87 ppm	2024	Byproduct of disinfection
Organics & Bacteria	**Total Organic Carbon (TOC)** The measure of organic substances in a body of water, mostly from naturally occurring sources such as plant material. TOC provides a measurement for the potential formation of disinfection byproducts.	No MCL; EPA requires a specific treatment technique.	Required % removal depends on source water, 35% - 50%	Removal range: 49% to 67% 56% removed	2024	Naturally present in the environment
	Total Coliform Bacteria A group of bacteria whose presence in water indicates possible contamination with soil or waste from warm-blooded animals.	No more than 5% samples total coliform positive.	0%	3.2% highest level detected in any monthly sample. All repeat samples were satisfactory. Range: 0% to 3.2%	2024	Naturally present in the environment
	PFOA*	4 ppt	0 ppt	Range (2.4 to 5.0 ppt) Average: 3.8 ppt	2024	Widespread throughout the environment and society
	PFOS*	4 ppt	0 ppt	Range (3.7 to 8.8 ppt) Average: 6.0 ppt	2024	Widespread throughout the environment and society
	Perfluorobutanesulfonic acid (PFBS) **Perfluorohexanesulfonic acid (PFHxS)** **Perfluorononanoic acid (PFNA)** **Gen-X (HFPO-DA)****	4 ppt	0 ppt	Hazard Index <1 (unitless) Range (0.27 to 0.48) Average is 0.41	2024	Widespread throughout the environment and society
Radionuclides	**Gross Alpha excluding Radon and Uranium**	15 pCi/L	0 pCi/L	Highest level detected: 0.376 pCi/L Range: 0.376 to 0.376 pCi/L	2022[3]	Runoff from herbicide used on row crops
	Selenium	50 ppb	50 ppb	5.4 ppb Range: 5.4 - 5.4 ppb	2024	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines

[3] Radionuclides regulatory sampling frequency is every six years.

* Before the EPA set MCLs for PFAS in 2024, CWS voluntarily analyzed its drinking water for PFAS. To see the historical data, please *see **page 10***.

** In 2025, the EPA announced it may rescind these regulations. For more information, visit www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas.

Voluntary Testing of Unregulated Compounds

These compounds have EPA Health Advisories.

Unregulated Compound Position Statement and testing schedule: *www.charlestonwater.com/positionstatement*

Compounds with Health Advisories	Units	Aug 2018	Dec 2018	Feb 2019	May 2019	Oct 2020	Nov 2021	Feb 2022	Oct 2023	Jan 2024	EPA Health Advisory	Secondary Drinking Water Standards
2,4-D (2,4-dichlorophenoxyacetic acid)	ppt	NA	NA	NA	8.7	NA	NA	NA	NA	NA	200,000*	NA
Aluminum	ppb	74	58	38	35	70	78	73	NA	94	NA	50 to 200
Atrazine	ppt	22	19	7.2	16	24	NA	NA	NA	NA	700,000*	NA
Barium	ppb	14	12	16	17	14	12	13	19	14	7,000*	NA
Bromodichloromethane	ppb	5.6	3.7	3.3	2.9	5.2	1.6	0.96	2.2	3.1	100*	NA
Bromoform	ppb	NA	NA	NA	NA	NA	0.5	NA	NA	NA	1,000	NA
Chloroform	ppb	7.2	2.7	2.6	3.2	7.1	0.77	NA	1.9	3.6	350*	NA
Dibromochloromethane	ppb	2.6	2.0	1.6	1.5	1.9	1.6	1.0	1.5	1.6	700*	NA
Diuron	ppt	NA	NA	NA	NA	82	NA	NA	NA	NA	100,000*	NA
Formaldehyde	ppb	NA	NA	NA	7.1	7.3	6.3	NA	NA	NA	7000*	NA
Manganese	ppb	13	6.4	3.3	9.6	8.5	4.3	3.9	8.5	5.2	1,600*	NA
Perchlorate	ppb	NA	NA	0.13	0.12	NA	0.09	0.44	0.14	0.17	25*	NA
PFOA**	ppt	5.0	4.1	4.4	5.3	4.3	4.7	4.5	4.2	3.1	0.004	NA
PFOS**	ppt	9.7	6.1	6.3	7.0	7.5	6.0	5.4	5.2	5.3	0.02	NA
PFBS	ppt	3.8	4.0	3.2	3.5	2.9	3.5	3.8	2.8	2.6	2,000	NA
Simazine	ppt	NA	6.9	14	16	NA	NA	NA	NA	NA	700,000*	NA
Strontium	ppb	53	41	43	53	46	39	44	50	42	20,000*	NA
Zinc	ppb	NA	NA	6.3	NA	NA	5.2	NA	NA	NA	10,000*	NA

*EPA Drinking Water Equivalent Level (DWEL)

** The EPA did not set MCLs for PFOA and PFOS until April 2024. Before April 2024, the EPA issued Health Advisories, which are non-regulatory. Public water systems have until 2031 to implement solutions that reduce these PFAS. Visit *page 8* to see more information about PFAS in CWS drinking water.

Voluntary Testing of Unregulated Compounds, continued

Additional unregulated compounds detected during unregulated compound testing.	Units	Aug 2018	Nov 2018	Feb 2019	May 2019	Oct 2020	Nov 2021	Feb 2022	Oct 2023	Jan 2024	EPA Health Advisory	Secondary Drinking Water Standards
1,4 Dioxane	ppb	0.11	0.14	0.32	0.33	0.11	0.31	0.56	0.45	0.10	NA	NA
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	ppt	NA	4.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acesulfame-K	ppt	NA	32	160	88	46	NA	NA	28	33	NA	NA
Atenolol	ppt	NA	NA	NA	5.8	NA	NA	NA	NA	NA	NA	NA
Boron	ppb	37	32	26	22	28	31	28	26	31	NA	NA
Chromium, hexavalent	ppb	0.06	0.06	0.06	0.06	0.33	0.20	0.17	0.20	0.23	NA	NA
DEA (Diethanolamine)	ppt	NA	NA	NA	NA	6.2	NA	NA	NA	NA	NA	NA
DEET	ppt	NA	12	NA	NA	21	NA	NA	NA	NA	NA	NA
Erucylamide	ppt	NA	NA	NA	NA	NA	5.8	5.3	9.5	NA	NA	NA
Iohexal	ppt	NA	19	19	51	21	NA	NA	NA	NA	NA	NA
Lincomycin	ppt	NA	24	NA	NA	NA	NA	NA	NA	NA	NA	NA
NDMA	ppt	7.5	3.4	5.6	5.1	7.7	NA	NA	2.3	2.2	NA	NA
NMEA	ppt	NA	2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
PFBA	ppt	7.0	NA	NA	NA	8	4.8	5.6	NA	NA	NA	NA
PFHpA	ppt	3.2	2.9	2.3	2.8	2.6	3.0	3.0	2.1	2.0	NA	NA
PFHxA	ppt	5.6	5.7	4.3	5.6	4.9	6.3	7.7	4.2	3.6	NA	NA
PFHxS	ppt	3.3	2.8	2.1	2.2	2.7	2.2	2.2	NA	2.2	NA	NA
PFPeA	ppt	7.5	7.5	4.7	5.8	5.5	7.2	8.8	NA	NA	NA	NA
Quinoline	ppt	NA	19	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sucralose	ppt	NA	950	640	580	430	NA	NA	130	89	NA	NA
Tetrahydrofuran	ppb	NA	NA	NA	6.1	20	NA	NA	NA	NA	NA	NA
Theobromine	ppt	NA	NA	16	NA	NA	NA	NA	NA	NA	NA	NA
Hexafluoropropxylene Oxide Dimer Acid (HCPO-DA)	ppt	NA	NA	NA	NA	NA	NA	NA	NA	2.3	NA	NA

(Data continued on the next page.)

Water Characteristics

Parameter	Units	2024 Average	Highest Level Recommended by EPA
Chloride	ppm	14	250
Color	PCU	4	15
Iron	ppm	0.11	0.3
Manganese	ppm	0.06	0.05
Total Dissolved Solids (TDS)	ppm	101	500
Sodium	ppm	8	No Standard
Alkalinity	ppm	30	
Conductivity	µmhos/cm	176	
Hardness	ppm	56 (3.27 gr/gal)	
Orthophosphate	ppm	1.1	
Silica	ppm	8.1	
Temperature	F	71.6° (22°C)	

Water Characteristics Abbreviations

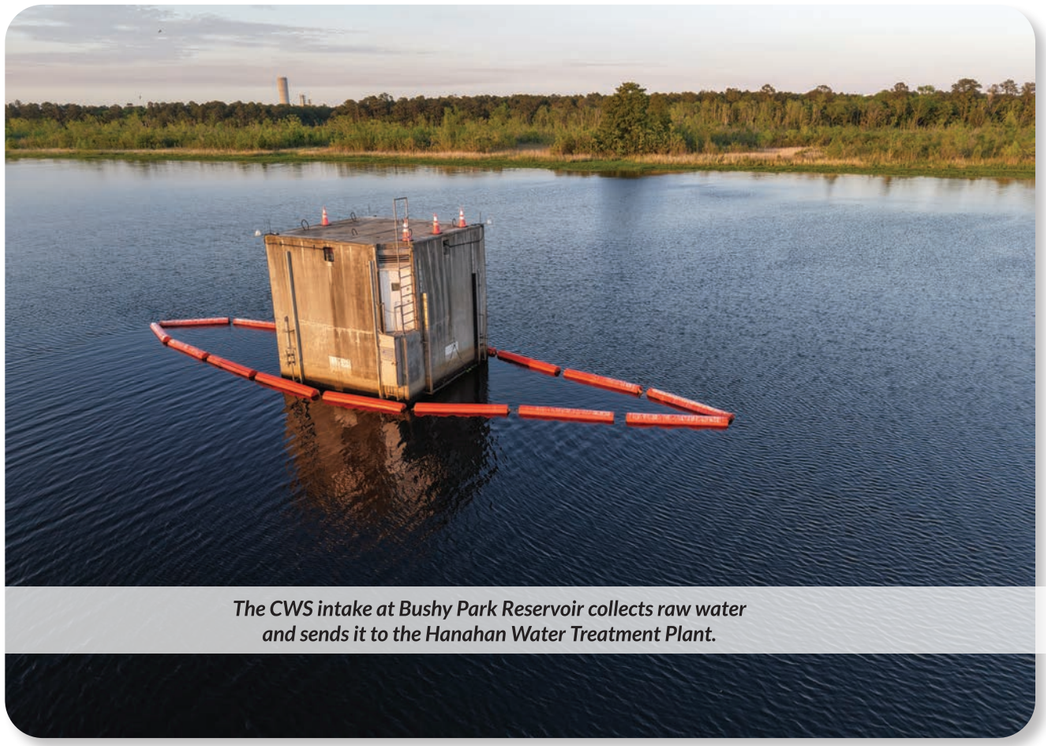
These parameters affect aesthetics such as taste, odor, hardness, etc. The EPA has secondary standards for some of these parameters, which are recommended guidelines.

ppm Parts per million
PCU Platinum Cobalt Units
gr/gal Grains per gallon
µmhos/cm Micromohs/cm

EPA's 2020 Unregulated Contaminant Monitoring Rule (UCMR4)

UCMR participation requires most recent data to be published in the Water Quality Report (this document) until the next round of UCMR testing (2025).

Compound	Units	Raw Water		Finished Water		Distribution Water	
		Average	Range	Average	Range	Average	Range
HAA5	ppb					12.19	8.14 – 18.44
HAA6Br	ppb					5.89	4.34 – 8.42
HAA9	ppb					17.28	12.25 – 25.86
Bromide	ppb	0.04	0.03 – 0.04				
Manganese	ppb			9.38	6.15 – 14.4		
Total Organic Carbon (TOC)	ppm	7.45	6.46 – 7.98				



The CWS intake at Bushy Park Reservoir collects raw water and sends it to the Hanahan Water Treatment Plant.

Lead Service Line Removal:

Getting the Lead Out & Protecting Customers

Timeline of Lead Service Lines

1931: CWS Board votes to stop using lead service lines.

1986: Congress bans lead service lines.

1988: South Carolina bans lead pipes.

1992: CWS detects high levels of lead in drinking water and adjusts its water treatment process.

1994: Lead in CWS water drops below federal limit.

2016: CWS begins using old records to locate lead service lines.

2023: CWS starts to build service line inventory map for customers to check if they have lead service lines. CWS applies for $33 million in state and federal funding to replace lead service lines in the system.

2024: CWS launches lead service line inventory map.

2027: EPA's requirement to remove lead services by 2037 takes effect.

Since ancient Greece and Rome, civilizations chose lead pipes and lead service lines for their water infrastructure due to its malleability, high durability, corrosion resistance, and low cost. Every advanced society was aware of the dangers of lead ingestion and inhalation, but lead pipes weren't a concern until modern science was able to detect that a miniscule amount of lead molecules were leaching into drinking water and impacting human health via repeated exposure.

For water utilities across the United States, the Environmental Protection Agency recently simplified the conundrum with a directive to remove all lead pipes by 2037. In Charleston, this reckoning started nine decades ago.

USING THE PERFECT PIPE (UNTIL IT WASN'T)

In 1931, the Charleston Water System stopped the use of lead service lines. Moving forward, copper would more safely deliver customers' water.

However, since Congress didn't ban new lead service lines until 1986, the complete transition away from lead was gradual among plumbers who installed private service lines and home plumbing. This phased-in approach means there's an unknown number of customer-owned lead service lines in use today, in addition to the 6,000 CWS-owned lead service lines still in use today.

In recent years, CWS anticipated the EPA would intensify its lead regulations. A two-man team would tackle the massive project.

This pipe is lined with orthophosphate, which prevents lead from leaching into water.

DRIVING LEAD REMOVAL

(L-R) Associate Project Manager Britt Meeks and Lead Services Senior Manager John Cruz

Lead Services Senior Manager John Cruz and **Associate Project Manager Britt Meeks** are leading the effort to remove all CWS lead service lines, as well as 1,100 privately owned lead lines via state and federal funding. John, who holds degrees in geology and civil engineering, has been with CWS for nine years, previously working as a GIS (Geographic Information System) operator, closed-circuit television (CCTV) operator, and project manager. Britt has worked at CWS for eight years in roles including hydrant maintenance operator, unidirectional flushing foreman, and distribution system supervisor.

John's responsibilities include developing the lead service line inventory records, ensuring compliance with federal and state regulations, building project lists, and coordinating lead service line removal efforts across departments. Britt handles the replacement list, investigating sites, securing permits, coordinating bids and contractors, ensuring work quality, flushing nearby mains, and helping customers test water.

The Flint, Mich., lead crisis—where utility mismanagement allowed lead from pipes to leach into drinking water—inspired John to take on his role. "I saw that failure and how it impacted customers, especially people in the margins," John said. "I was glad that CWS understood the health risks and was taking on the challenge of finding and replacing its lead lines."

Orthophosphate forms a physical barrier inside pipes, preventing lead and other minerals from leaching into drinking water. Our water is safe to consume, even from lead pipes.

RECOGNIZING THE PROBLEM

The CWS campaign to eliminate lead is a remarkable turnaround story. In June 1992, after the EPA set the maximum lead level in drinking water at 15 parts per billion, lead in CWS water was measured at 211 ppb.

By October 1992, CWS resolved the issue by adding a safe, food-grade additive to the treatment process. Orthophosphate creates a physical barrier inside pipes, preventing lead and other minerals from leaching into water. The barrier continually forms as our water is used. The water remains safe to drink, even from lead pipes. We also maintain the pH of water at an ideal level to reduce the corrosion of pipes and plumbing materials. Success was swift.

Lead levels dropped 22% to 165 ppb by December 1992. By December 1994, it fell to 3 ppb. Lead levels have stayed low since (*see data on **page 24***).

In 2024, the EPA expanded its rules: all lead service lines nationwide must be removed by 2037. Using orthophosphate and keeping pH within an ideal range would no longer be sufficient because eliminating lead is the best way to protect public health.

This water main project near the Charleston Battery, which is a landmark and tourist destination, shows how disruptive excavation via trench can be for pedestrian and vehicle traffic.

DOING THE WORK

Replacing service lines is labor and cost intensive. The crew must uncover the water main, which can be buried deep underground. The service line may need to be excavated via trench from the main to the property line. Thankfully, modern directional boring technology is expected to allow much less excavation when running most of the new copper service lines.

If other utilities are underground nearby, the crew may need to hand dig or hydro excavate using high pressure water and a vacuum. They also might have to dig up sidewalks and streets, which is especially disruptive and costly in historic downtown Charleston, where crews must navigate traffic, tourists, and hardscape like the iconic blue stone. Customers' landscaping, such as brick walls, can also slow the work.

CWS water infrastructure dates back to the 1800s. Aging water mains raise the risk of breaks, so the work is delicate.

A key part of lead service line removal is following standards. Fortunately for John and Britt, if they have any questions, they report to an industry leader who helped set those expectations.

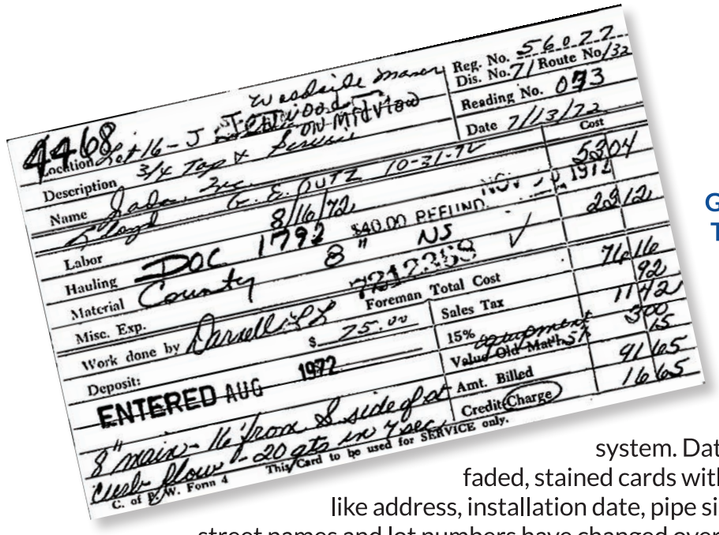
WORKING PROACTIVELY

In 2010, **Director of Water Distribution Kan Oberoi** helped the American Water Works Association form an advisory committee to partner with the EPA. This group helped shape regulations for lead service line replacement. Kan, who has served as director since joining CWS in 1996, holds degrees in civil and environmental engineering.

Director of Water Distribution Kan Oberoi holds a copper service line.

Having a seat at the national table gave CWS a head start. Kan pushed CWS to locate and document its lead service lines, creating a repository known as an inventory. This foresight proved critical years later.

"We knew what was going on," Kan said. "We knew the requirements ahead of time. We were ready."



CWS reviewed 40,000 tap cards, which document properties' connection to the water distribution system. Many of these cards date back to the very early 1900s.

GOING BACK IN TIME TO GET AHEAD

It was a marathon, not a sprint, to become the leader in lead removal in the Palmetto State. The journey began with CWS reviewing about 40,000 tap cards, which document properties' connection to the water distribution system. Dating back to the very early 1900s, these faded, stained cards with cryptic handwriting contain key details like address, installation date, pipe size, and material. Adding to the challenge, street names and lot numbers have changed over the years. Knowing the transition from lead began in 1931, CWS had a starting point to convert records into data. For example, in 1932 fewer than 11% of service lines were lead, and that percentage continues to decline today.

VERIFYING AND PREDICTING DATA

Refining and confirming this data requires two opposing but complementary tactics: digging holes to verify records and using advanced technology to predict more lead service line locations.

"They are two sides of the same coin," John said. "You can't have a model without field verification. You can't do field verification without a model. The model tells us where to dig, we investigate, and feed the results back into the model to improve confidence."

Now, CWS had to make the information easily accessible to the public. The tap card and fieldwork would be transformed into a web application.

CWS Service Lines
(April 2025):

Total Service Lines: 136,000

Non-Lead Lines: 130,000 (96%)

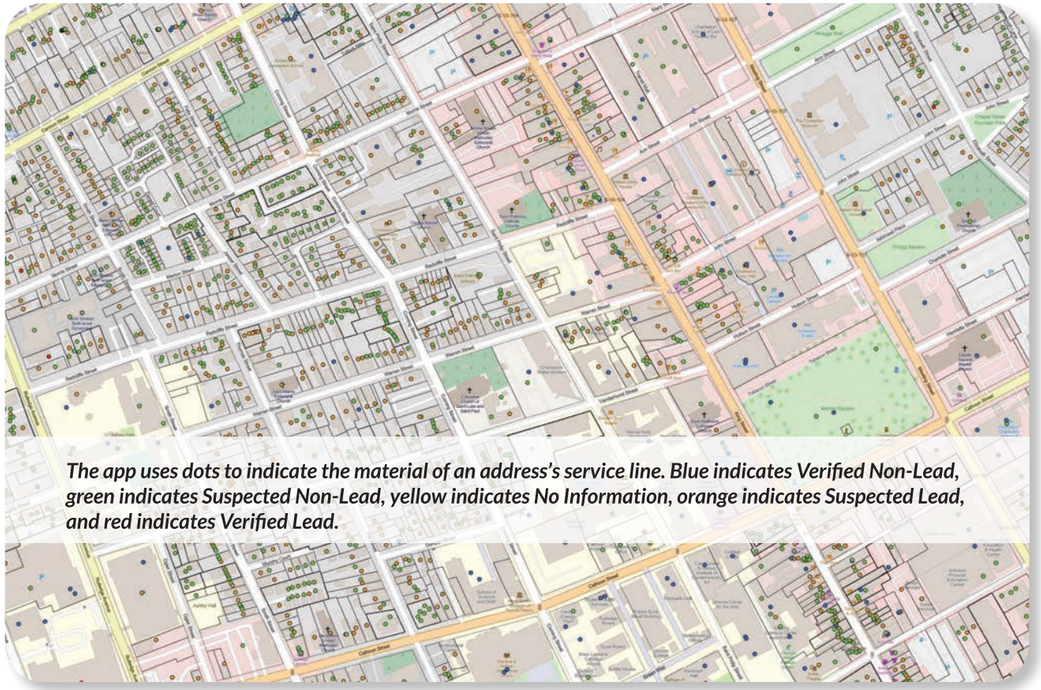
Lead Lines: 6,000 (4%)

LAUNCHING AN INTERACTIVE MAP

It took a year to adapt the data into an intuitive, interactive map (access it at ***www.charlestonwater.com/map)***. Customers can type their address to learn the status of their service line, or simply navigate the map with a mouse or touch screen.

Working with teams across CWS (Water Distribution, Asset Management & GIS, Customer Service, and the Lead Task Force), it was steady work adding data and improving the map's look, feel, and functionality.

Adding data meant asking what pipe material was originally installed, if it was replaced and with what, the pipe's length, data source, and if the material was confirmed. Improving the interface meant reducing clicks, identifying key context information, choosing colors for line material statuses, and making small changes that added up to a major overhaul.



The app uses dots to indicate the material of an address's service line. Blue indicates Verified Non-Lead, green indicates Suspected Non-Lead, yellow indicates No Information, orange indicates Suspected Lead, and red indicates Verified Lead.

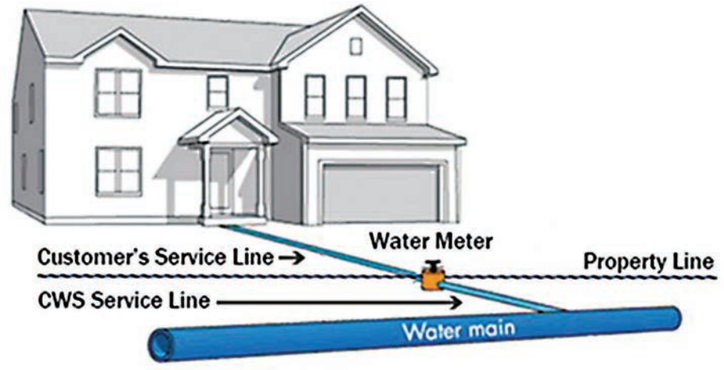
GIS Specialist Kyle Erisman

GIS Specialist Kyle Erisman, who has two years at CWS and degrees in GIS and urban and regional planning, said the project was a valuable opportunity to apply his technical skills while making complex information digestible to a wide audience.

"It took iterations of coming to the table, saying, 'Here is what we have,' getting feedback, changing our methodology, and transforming the data," Kyle said. "We focused on a clean, concise interface and delivering a tool that was informative and intuitive for the public."

The map is drawing attention beyond CWS customers. Esri, a leading GIS software company, featured the map for a global audience in its 2025 Map Book, which published in summer 2025 (check it out at ***www.charlestonwater.com/mapbook***).

With the inventory map in place, CWS was ready for the next chapter in its lead removal journey.

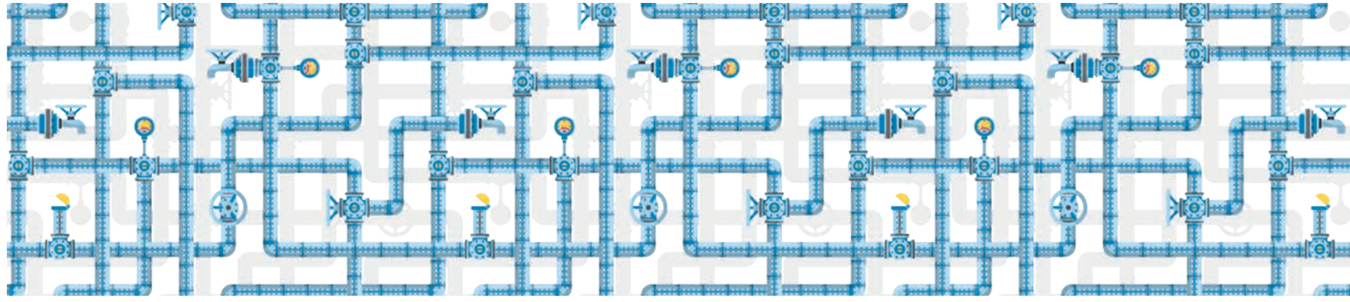


CWS will replace the public lead service line up to the water meter. With property owner permission and grant funds, CWS may cover the cost to replace the private line to the home—a service that normally costs homeowners around $7,500. Without consent, only the public side will be replaced.

QUALIFYING FOR STATE AND FEDERAL FUNDS

The 2021 Bipartisan Infrastructure Law provided funding to states for infrastructure projects. Under this law, the South Carolina Department of Environmental Services will award CWS $33 million to replace 1,100 lines through a loan and principal forgiveness grant. This represents the majority of the $50 million allocated to utilities statewide. At least 67% of the funds must be used in economically disadvantaged communities. CWS chose to use 100% in neighborhoods below the state median household income ($64,115 as of 2023).

On the public side, CWS must hire a contractor to replace the lead service line connecting our water mains to a customer's water meter. On the private side, with property owner permission and if grant funds are available, CWS may also replace lead service lines leading to the home. Without consent, only the public side is replaced. This is a rare opportunity for eligible homeowners. Typically, replacing a private line is their responsibility and can cost about $7,500.



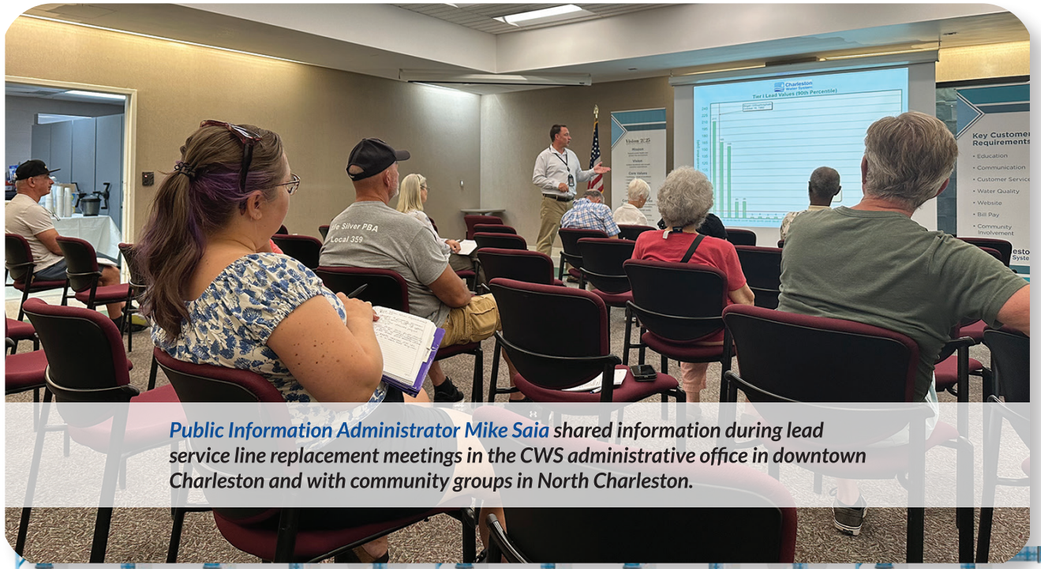
Going door-to-door is an option for engaging and educating property owners about their lead service lines. John Cruz (left) and Britt Meeks (right) walk in Wagener Terrace, which has been a lead hotspot.

ENGAGING CUSTOMERS

CWS is required to make four attempts to get customers' permission to replace private lead service lines. Options include in-person meetings, traditional media, social media, door-to-door visits, and direct mail.

As the public engagement process was underway, the challenge of effectively connecting with customers became clear. Communicating with neighborhood groups to promote meetings only brought out small groups across four meetings in Charleston and North Charleston.

"We're talking about going onto their property and replacing their service line, directly improving their private plumbing," John said



Public Information Administrator Mike Saia shared information during lead service line replacement meetings in the CWS administrative office in downtown Charleston and with community groups in North Charleston.

TESTING WATER QUALITY

In late 2024, when the EPA required utilities to directly inform customers with letters containing alarming regulatory language about lead and other materials used in their service lines, CWS complied via direct mail, which sparked a much different outcome than the optional line replacement program.

Sending more than 71,000 letters to customers with possible lead service lines triggered a surge in interest. Without the benefit of talking in-person about the orthophosphate and pH safety measures that we use to keep people safe, even if they have lead pipes and plumbing, the letter pushed more than 1,000 recipients to ask for tap water testing.

This meant 1,000 test kits containing five one-liter bottles had to be purchased, assembled, and sent to CWS branches for customer pickup or hand-delivered directly to customers' homes. Customers' returned kits had to be transported to the lab.

For comparison, in 2023, CWS processed 15 kits. The 2024 workload was so intense it burned out a testing device!

Fortunately, widespread testing reflected lab data showing that CWS water has been consistently below the EPA's current 15 ppb lead safety standard as well as the stricter 10 ppb standard that takes effect in 2027.

Director of Laboratory Services Becky Thames, who has worked in our lab for 24 years with degrees in biology, environmental resource management, and business, called many customers to reassure them their water surpassed quality requirements. Any abnormal results were due to sampling errors.

Becky said the collaboration highlights the close-knit relationships at CWS. "Teamwork makes a dream work," she said. "We made it happen."

Director of Laboratory Services Becky Thames

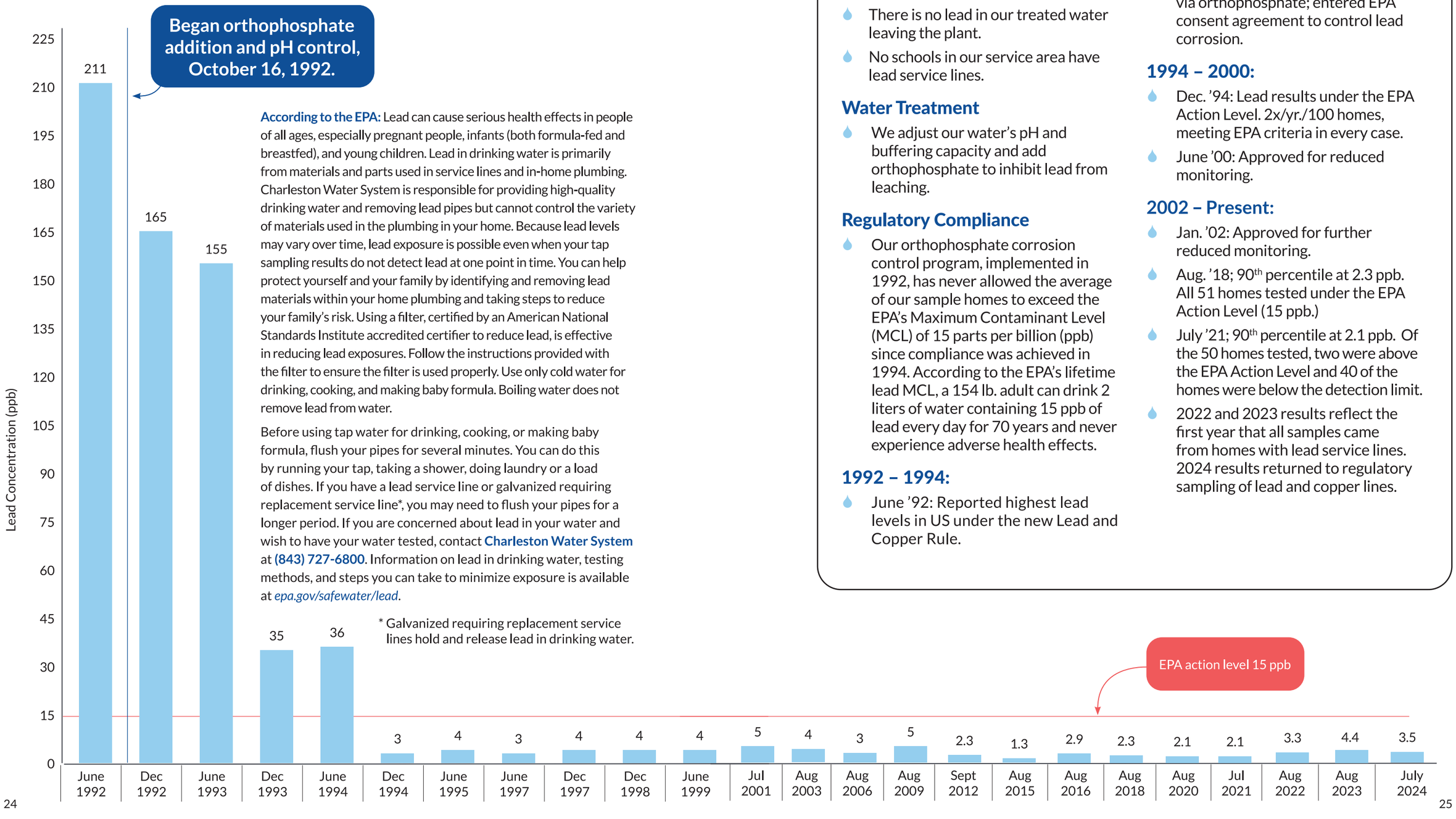
PERSEVERING TOWARD A LEAD-FREE FUTURE

Despite preparation and grant funds, challenges remain. It will cost $125 million to remove all lead service lines. Beyond the replacement of 1,100 lines covered by loan/grant funds, almost 5,000 more will remain. There's a shortage of crew members, and contractors are expensive. Weather in the Lowcountry can delay work. Presidential transitions affect budgets and priorities.

Despite obstacles ahead, John and Britt are optimistic about the 2037 deadline. "I have faith in Charleston Water System," Britt said. "I saw how we came together to make it this far. We'll figure out a way to get all the lead out."

Lead Data

Tier I Lead Values (90th percentile)



According to the EPA: Lead can cause serious health effects in people of all ages, especially pregnant people, infants (both formula-fed and breastfed), and young children. Lead in drinking water is primarily from materials and parts used in service lines and in-home plumbing. Charleston Water System is responsible for providing high-quality drinking water and removing lead pipes but cannot control the variety of materials used in the plumbing in your home. Because lead levels may vary over time, lead exposure is possible even when your tap sampling results do not detect lead at one point in time. You can help protect yourself and your family by identifying and removing lead materials within your home plumbing and taking steps to reduce your family's risk. Using a filter, certified by an American National Standards Institute accredited certifier to reduce lead, is effective in reducing lead exposures. Follow the instructions provided with the filter to ensure the filter is used properly. Use only cold water for drinking, cooking, and making baby formula. Boiling water does not remove lead from water.

Before using tap water for drinking, cooking, or making baby formula, flush your pipes for several minutes. You can do this by running your tap, taking a shower, doing laundry or a load of dishes. If you have a lead service line or galvanized requiring replacement service line*, you may need to flush your pipes for a longer period. If you are concerned about lead in your water and wish to have your water tested, contact **Charleston Water System** at **(843) 727-6800**. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available at *epa.gov/safewater/lead*.

* Galvanized requiring replacement service lines hold and release lead in drinking water.

Our Water

- There is no lead in our treated water leaving the plant.
- No schools in our service area have lead service lines.

Water Treatment

- We adjust our water's pH and buffering capacity and add orthophosphate to inhibit lead from leaching.

Regulatory Compliance

- Our orthophosphate corrosion control program, implemented in 1992, has never allowed the average of our sample homes to exceed the EPA's Maximum Contaminant Level (MCL) of 15 parts per billion (ppb) since compliance was achieved in 1994. According to the EPA's lifetime lead MCL, a 154 lb. adult can drink 2 liters of water containing 15 ppb of lead every day for 70 years and never experience adverse health effects.

1992 – 1994:

- June '92: Reported highest lead levels in US under the new Lead and Copper Rule.
- Oct. '92: Began corrosion control via orthophosphate; entered EPA consent agreement to control lead corrosion.

1994 – 2000:

- Dec. '94: Lead results under the EPA Action Level. 2x/yr./100 homes, meeting EPA criteria in every case.
- June '00: Approved for reduced monitoring.

2002 – Present:

- Jan. '02: Approved for further reduced monitoring.
- Aug. '18; 90th percentile at 2.3 ppb. All 51 homes tested under the EPA Action Level (15 ppb.)
- July '21; 90th percentile at 2.1 ppb. Of the 50 homes tested, two were above the EPA Action Level and 40 of the homes were below the detection limit.
- 2022 and 2023 results reflect the first year that all samples came from homes with lead service lines. 2024 results returned to regulatory sampling of lead and copper lines.

Quick Facts

1
Largest water treatment plant by permitted capacity in S.C.

10,906
Fire hydrants

39,807
Water valves

500,000
People served in the tri-county area

130,000
Retail customer accounts

9
Wholesale customers

64 Million
Gallons per day, average daily volume treated in 2024

86 Million
Gallons per day, largest recorded volume treated in one day since 2020.*

115.4 Million
Gallons per day, SC DES permitted capacity

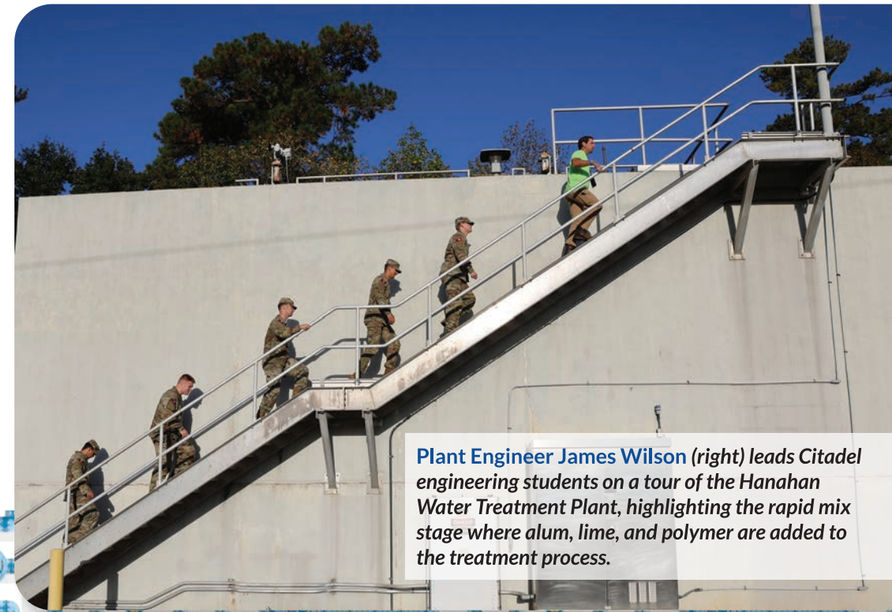
* Large demand is primarily driven by irrigation during the summer and burst pipes during freezing weather. For irrigation, we recommend watering between 5-8 a.m. To avoid burst pipes, we recommend dripping your faucets during freezing temperatures.

1,900
Miles of water mains

33
Miles of raw water tunnels

$90,500
Spent since 2017 on voluntary unregulated compound testing

20,000
Total annual water quality tests



Plant Engineer James Wilson *(right) leads Citadel engineering students on a tour of the Hanahan Water Treatment Plant, highlighting the rapid mix stage where alum, lime, and polymer are added to the treatment process.*

Drinking Water Sources:

Bushy Park Reservoir is Our Primary Water Source

Source Water Protection

To raise awareness about preventing water pollution, South Carolina Department of Environmental Services identifies potential sources of contamination for each drinking water source in the state: *www.des.sc.gov/programs/bureau-water/source-water-protection*.

You Can Help Protect the Water

- **Pick up the poop!** Pet waste adds bacteria and excess nutrients, which contribute to algae growth that chokes out plants and wildlife.
- **Don't over-fertilize your lawn.** It washes into storm drains, streams, rivers, and oceans.
- **No dumping in storm drains.** They empty directly into a waterway.
- **Proper disposal** of oils, paints, and chemicals.

The Bushy Park Reservoir is our primary drinking water source.

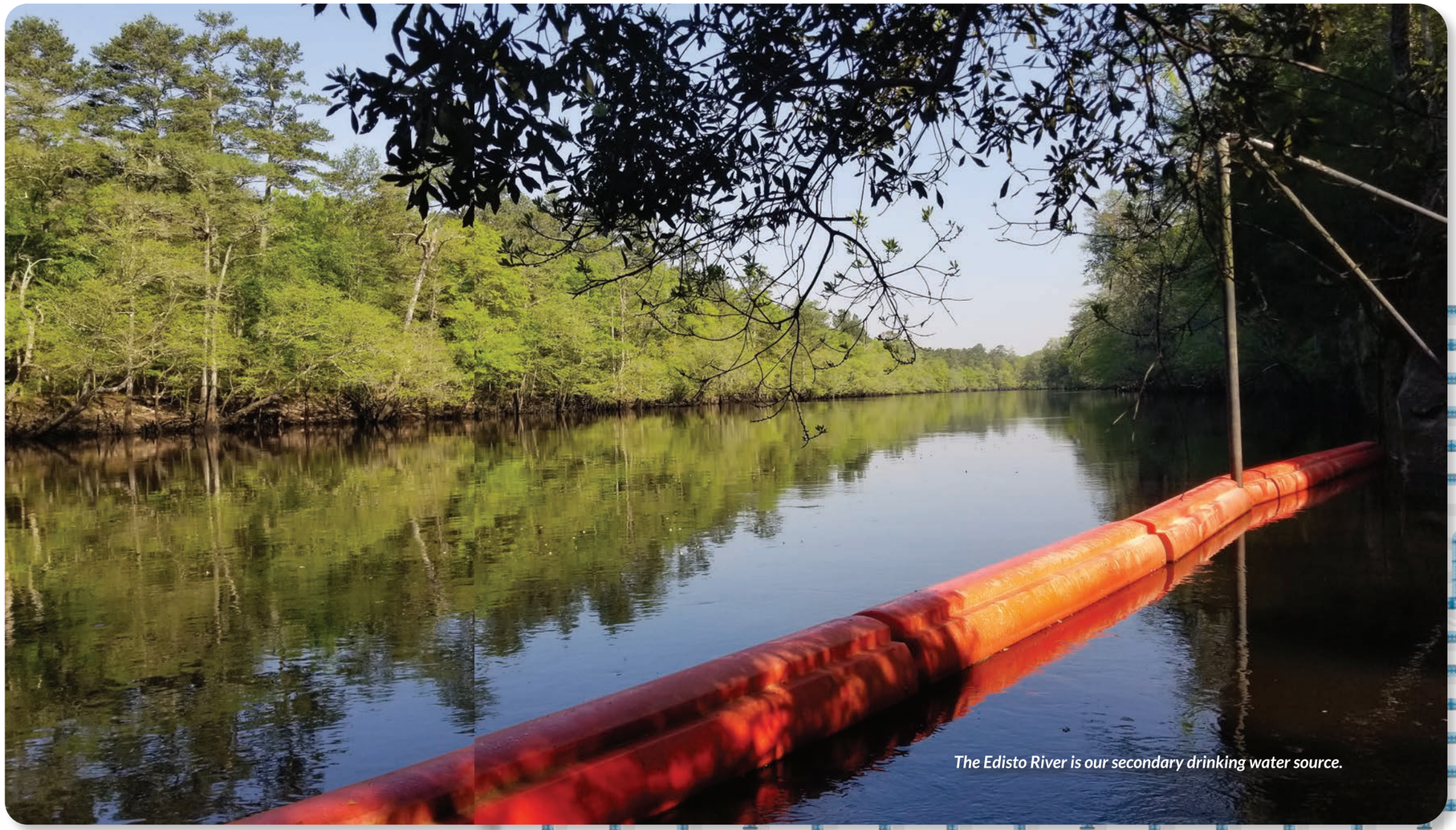
Bushy Park Reservoir Watershed

Drinking Water Sources, continued

Edisto River is Our Secondary Water Source

The Edisto River

- Our intake is located in Givhans Ferry State Park.
- Connected to Hanahan Water Treatment Plant by the historic 23-mile Edisto Tunnel.
- We spent $4.1 million in 2021 to improve our intake structure. These improvements give us better operational control of the raw water supply.



The Edisto River is our secondary drinking water source.

Water Treatment Process

How It Works

Alum (aluminum sulfate): Helps impurities stick together to form bigger particles called floc. Gentle mixing allows the floc particles to grow bigger and heavier.

Chloramine: Long-lasting disinfectant.

Chlorine Dioxide: Disinfectant.

Filtration: A physical process that removes very tiny particles.

Fluoride: Added for dental health. View our fluoride position statement at: *www.charlestonwater.com/positionstatement*

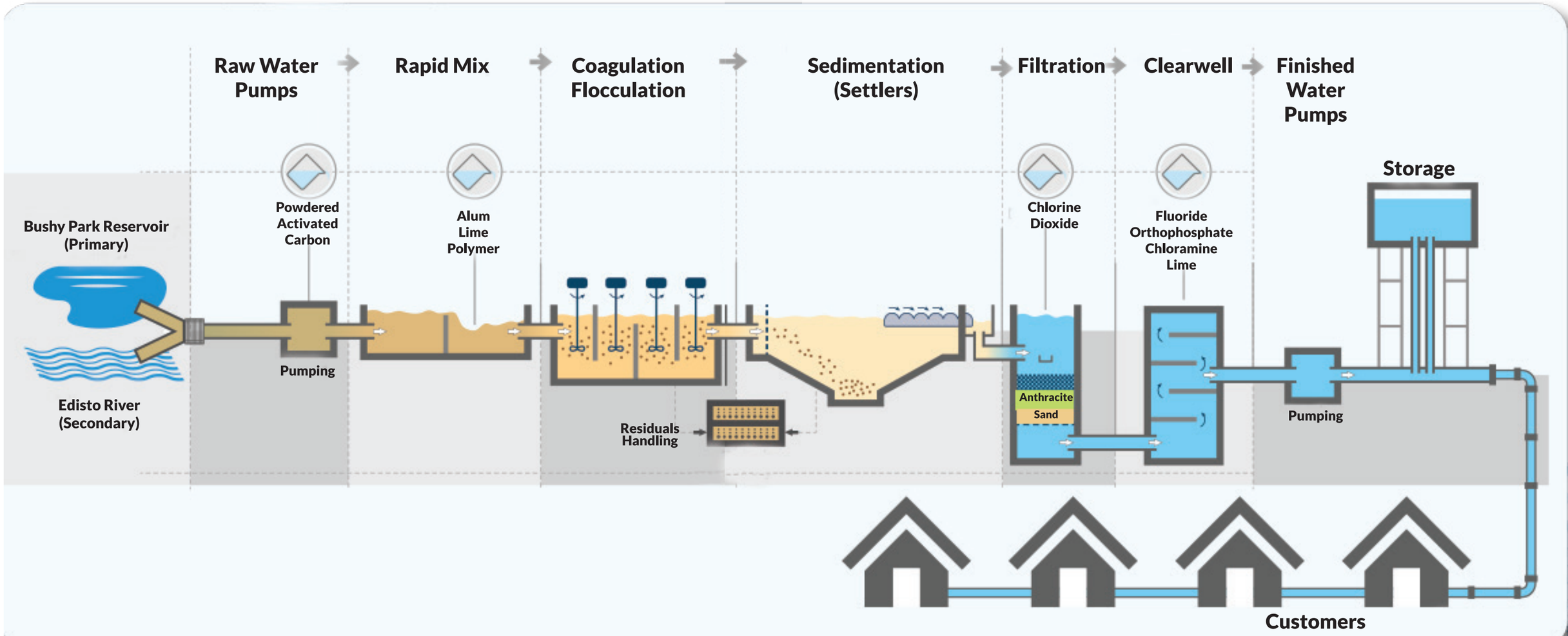
Lime: pH Adjustment for chemical stability.

Orthophosphate: Lead and copper control.

Polymer: Aids with flocculation.

Powdered Activated Carbon: Added for taste and odor control.

Sedimentation (settling): Allows the large, heavy floc particles to settle to the bottom, leaving the clean water on top.



Infrastructure Highlights: At the Hanahan Water Treatment Plant

Adding and maintaining critical infrastructure is an important part of maintaining water quality all the way to customer taps!

Learn more about our capital improvements program: www.charlestonwater.com/CIP

Clearwell 3 Curtain Wall Improvements (Complete)

This project replaced the curtain walls in Clearwell 3, which were nearing the end of their service life. Clearwells provide enough time for water to be disinfected. Within these large, enclosed storage systems, curtain walls ensure even flow distribution and mixing.

Construction photo shows a replacement curtain being raised in Clearwell 3.

$2,800,000

Gibson Raw Water Pump Station Improvements
(In Construction)

The project will upgrade and expand the capacity of the 1940s raw water pump station from 40 million gallons per day to 57 MGD. The work includes replacement of the existing 10 MGD pumps with 14.25 MGD pumps, upgrades to piping and valves, and miscellaneous building and electrical improvements.

$14,732,000

The Gibson pump moves raw water entering the plant toward the first step in the water treatment process, rapid mix.

Future site of Gravity Thickener 4.

$10,000,000

Gravity Thickener 4 (In Design)

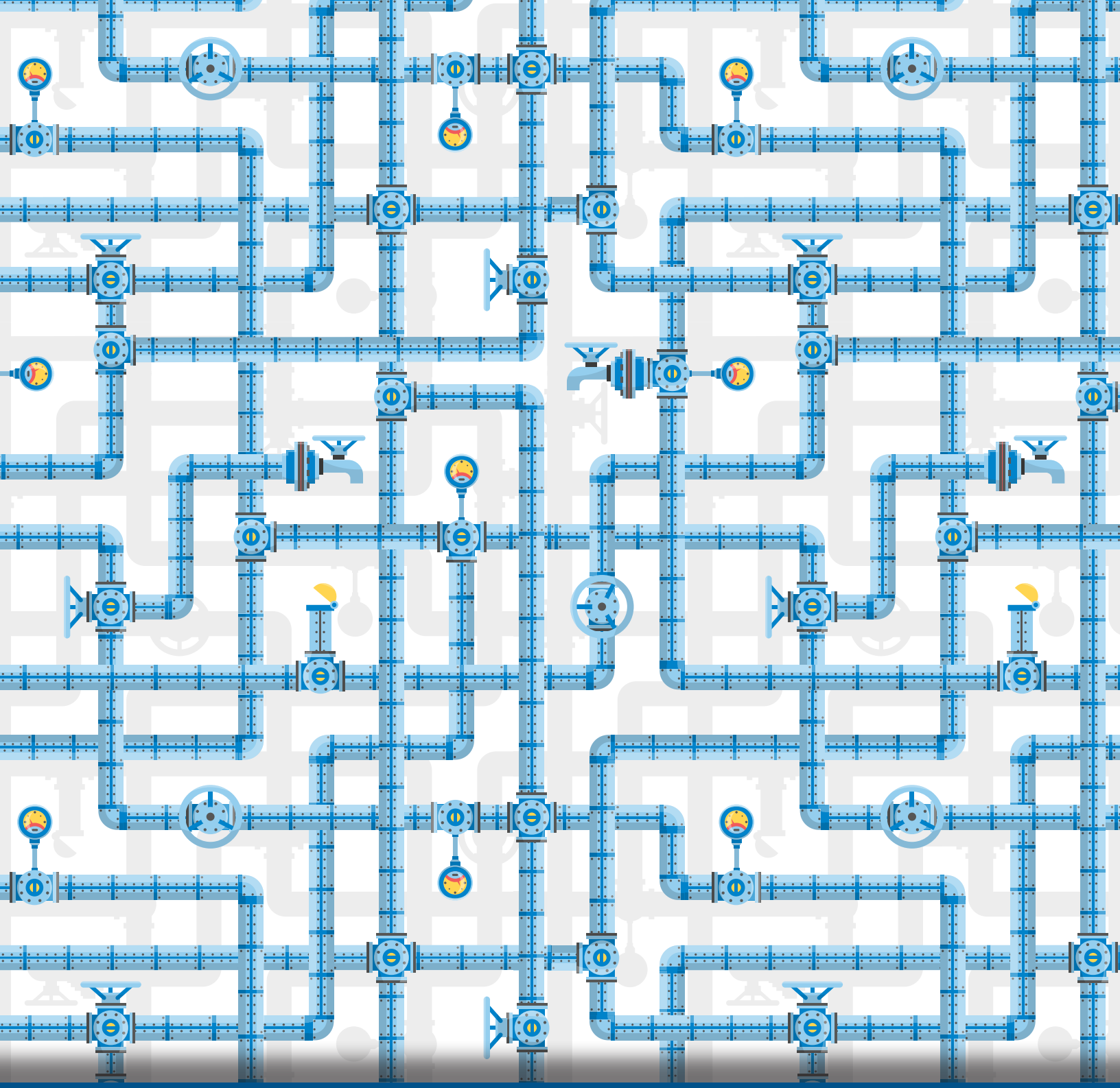
The project will build a new gravity thickener, which helps concentrate the sediment removed at the initial stages of treatment, the sediment basins, and prepares it for dewatering by centrifuge. The new thickener will help prepare CWS for the additional sediment load as water demand increases.

Future site of Plate Settler Basin 13. Sedimentation basins catch tiny particles and make them settle, leaving cleaner water behind.

Plate Settler Basin 13 (In Construction)

The project will install one new inclined plate settler basin with an operational capacity of 25 MGD, replacing Sedimentation Basin 3 and 4. The addition of Plate Settler Basin 13 will help to provide clarification capacity up to 135 MGD.

$29,301,000



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