



WORKSHOP ON WATER QUALITY & REGULATORY COMPLIANCE

OCTOBER 17, 2022



INTRODUCTION

- Water Operations
 - Distribution system
- Safe Drinking Water Act
 - Regulatory requirements
 - Current & future challenges
- Hexavalent Chromium
- Rate Setting
- Consumer Confidence Report (CCR)
- Capital Improvement Planning
- Q&As





WATER OPERATIONS



DISTRIBUTION SYSTEM

- Provide safe drinking water to the residents & businesses of the community
- Water system meets all federal and state water quality requirements
- 6 operators, 1 supervisor
- 1.5 billion gallons of water produced in 2021



DISTRIBUTION SYSTEM

- 7 potable, 3 non-potable wells
- 61.9 miles of potable water mains
- 9 miles of non-potable water mains
- 890 fire hydrants
- 3 water storage facilities
- 617 backflows
- 6,940 water meters



DISTRIBUTION SYSTEM

A Typical Day Includes

- Taking Samples
- Exercising valves
- Meter Readings/Re-reads
- Maintain Wells and Storage Tanks
- Maintain Disinfection Levels in Distribution System
- Customer Service Requests
- High / Low Usage, connects/disconnects

A Non-Typical Day Includes

- Water Main Break
- Service Line Leak
- Water Quality Complaints





SAFE DRINKING WATER ACT (SDWA) & WATER QUALITY





SAFE DRINKING WATER ACT (SDWA)

- The Safe Drinking Water Act was passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply.
- The law was amended in 1986 and 1996 to require specific actions to protect drinking water and its sources.
- SDWA authorizes the US EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water.
- CalEPA can set even more restrictive standards if needed.

Definition of "Safe" is to protect from and not expose to danger or risk.

WATER QUALITY- REGULATORY REQUIREMENTS

- Weekly Bacteriological Monitoring
 - 25 sampling points
- Monthly Source (Well) Monitoring
 - 7 sources (wells)
- Lead & Copper Monitoring
 - Done every three years
 - City subject to revised Federal Lead and Copper Rule
- Unregulated Contaminant Monitoring Requirements (UCMR)
 - What are Unregulated Contaminant Monitoring Rule (UCMR) contaminants? The United States EPA uses the UCMR rule to collect data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the Safe Drinking Water Act (SDWA).
 - U.S. EPA is silent on the issue of reporting federal UCMR contaminants beyond the previous calendar year's detections.



ACRONYMS

- Maximum Contaminant Level (MCL) – The highest level of a contaminant that is allowed in drinking water. Primary MCLS are set as close to the public health goal (PHG) as is economically and technologically feasible.
- Primary Drinking Water Standards (PDWS) - MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements and water treatment requirements.
- Secondary Drinking Water Standards (SDWS) – MCLS for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with secondary drinking water standards do not affect the health at the MCL levels
- ppm: parts per million or milligrams per liter (mg/L)
- ppb: parts per billion or micrograms per liter (ug/L)



WATER QUALITY- CURRENT & FUTURE CHALLENGES

- Nitrates
 - Nitrates can be found in drinking water supplies. Their presence in groundwater is generally associated with septic systems, confined animal feeding operations, or fertilizer use.
 - MCL is 10 mg/L.
- Hardness
 - Water hardness is the amount of dissolved calcium and magnesium in the water. Groundwater is naturally high in mineral content, making it “hard.” Hard water is not a health hazard.
 - There is no primary or secondary standard for water hardness.
- 1,2,3,-Trichloropropane (1,2,3 TCP)
 - 1,2,3- TCP is a chlorinated hydrocarbon with high chemical stability. It is a manmade chemical found at industrial or hazardous waste sites. It has been used as a cleaning and degreasing solvent and is associated with pesticide products.
 - MCL is 0.005 UG/L (micrograms/L)

WATER QUALITY- CURRENT & FUTURE CHALLENGES

- Total Dissolved Solids (TDS)
 - TDS is a measurable dissolved substances in water, including organic and suspended particles that can pass through a very small filter.
 - Salinity sources come from agriculture, municipal, industrial and in some cases natural. Municipal examples include detergents and water softeners.
 - The California State Water Resources Control Board (Water Board) established EC and TDS secondary maximum contaminant level (SMCL) drinking water standards for public water supplies.
 - SMCL is 1,000 mg/L.
- PFAS
 - PFAS stands for per-and polyfluoroalkyl substances.
 - PFAS are widely used, long lasting chemicals, components of which break down very slowly over time.
 - There are thousands of PFAS chemicals, and they are found in many different consumer, commercial, and industrial products. This makes it challenging to study and assess the potential human health and environmental risks.
- Hexavalent Chromium



HEXAVALENT CHROMIUM (CHROME 6)





WATER QUALITY- HEXAVALENT CHROMIUM

- What is chromium? Chromium is naturally found in rocks, plants, humans and animals. The most common forms of chromium found in natural waters are trivalent chromium (chromium 3) and hexavalent chromium (chromium 6).
- Chromium-3 is an essential human dietary element. It is found in many vegetables, fruits, meats, grains, and yeast.
- Chromium-6 occurs naturally in the environment from the erosion of natural chromium deposits. It can also be produced by industrial processes.
- Together, chromium 3 and chromium 6 make up Total Chromium.
- Patterson has always had a small trace amount of chromium 6 that is naturally occurring and not caused by industrial contaminant.

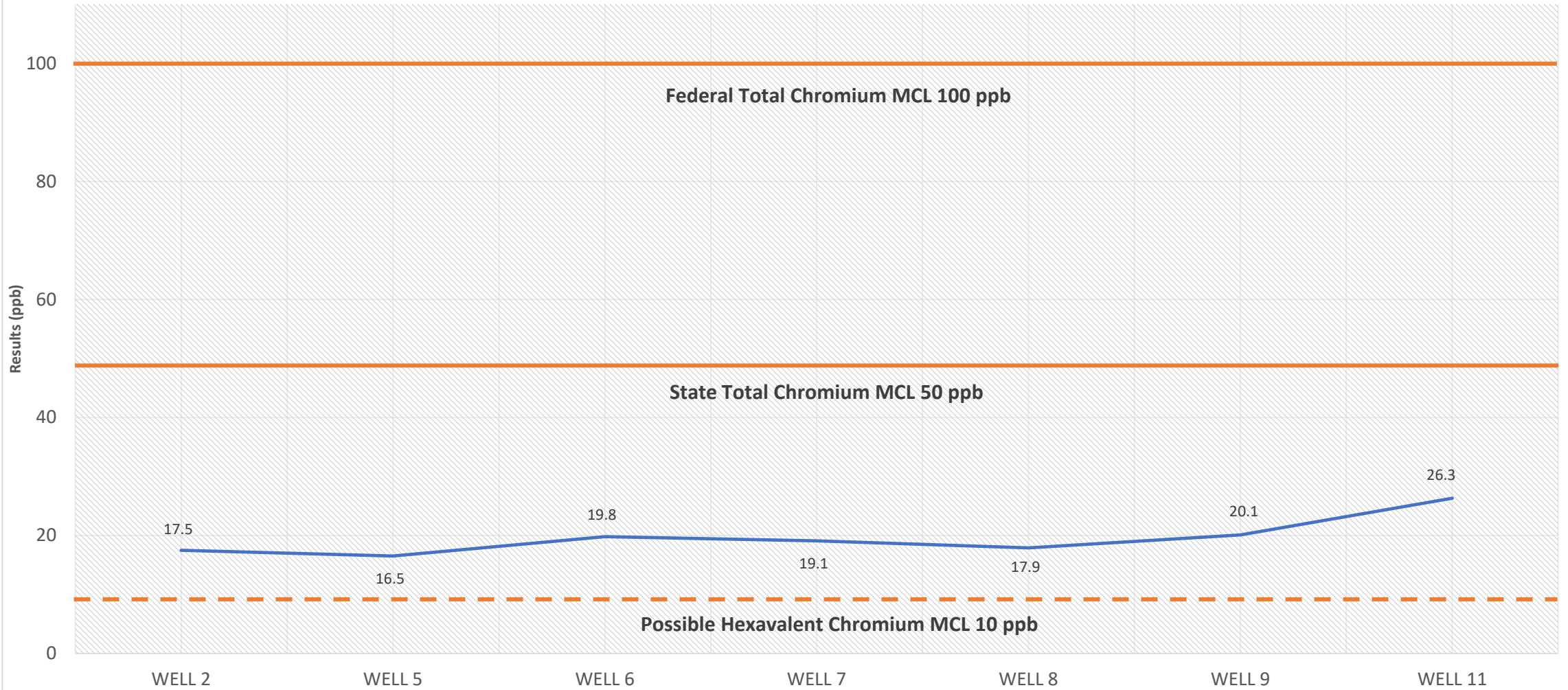
TESTING STANDARDS- CHROMIUM

- Federal UCMR's Assessment Monitoring (List 1 Contaminants)- Chrome 6 is sampled as required by the federal EPA at least once every 5-10 years or as required.
- California EPA-There is no MCL for Chrome 6. Samples for total chromium are taken every three years.
- 100 parts per billion (ppb) is the federal MCL set by the EPA for total chromium. Total chromium includes both trivalent chromium (chromium 3) and hexavalent chromium (chromium 6).
- 50 ppb is the MCL for total chromium for the state of California set by the State Water Resources Control Board, Division of Drinking Water (DDW), and is still in effect.
- The city of Patterson's water supply currently averages between 19-30 ppb for total chromium (2019).

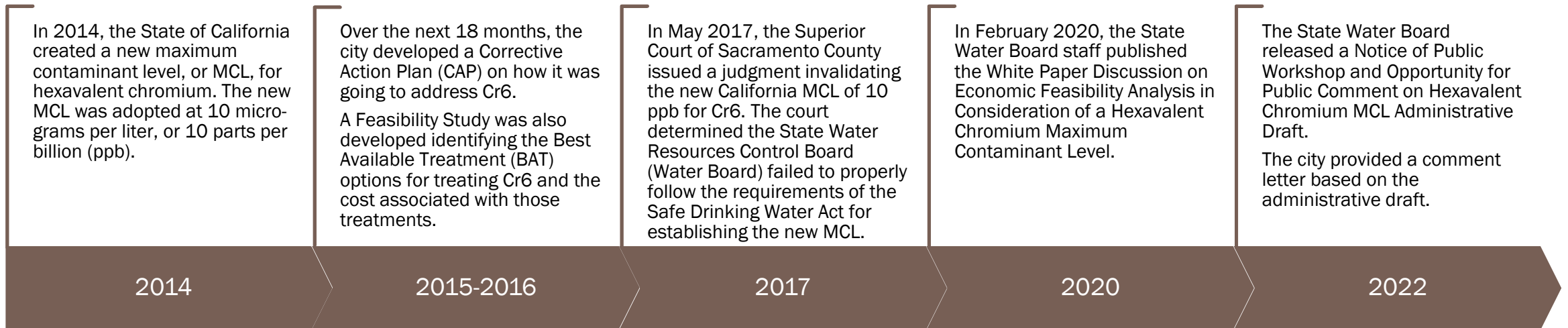
The city of Patterson is currently in compliance with the total chromium standard.

There is no MCL for hexavalent chromium. Alone, it continues to be an unregulated contaminant.

HEXAVALENT CHROMIUM
REPORTING YEARS 2017-2022



BACKGROUND- HEXAVALENT CHROMIUM (CR6) MCL



**The quality of the city's water has not changed.
We are simply subjected to all state and federal drinking water requirements.**

WHAT HAVE WE DONE TO ADDRESS CHROMIUM 6?

- Following the 2014 adoption of the Chrome 6 MCL, the City initiated quarterly monitoring for Chrome 6 in their seven potable wells.
- Submitted a Corrective Action Plan (CAP) outlining the steps and estimated timeframe needed to achieve Chrome 6 compliance.
- Using the mitigation/treatment approach, the city completed the following steps:
 - Field testing of wells to determine the potential for Chrome 6 source control.
 - Feasibility study to evaluate and screen treatment and facility siting alternatives.
 - Pilot testing to develop/confirm site specific design criteria for the selected Chrome 6 treatment process.
 - The pilot project was successful in reducing the concentration levels for Chrome 6.

WHAT ARE WE CURRENTLY DOING?

We continue to monitor our pilot-tested well site on a quarterly basis.

In 2016, a feasibility study was prepared looking at both well head treatment (decentralized) and centralized treatment.

Design and installation of a centralized facility or on-site treatment is placed on hold until a new MCL is established by the State.

The city can then identify which wells will require treatment, if any, and which treatment alternative will be able to meet the new standard.

Once the new MCL is established (possibly by the end of calendar year 2022), the feasibility study will be updated.



BEST AVAILABLE TECHNOLOGIES (BAT)



BEST AVAILABLE TECHNOLOGIES FOR HEXAVALENT CHROMIUM

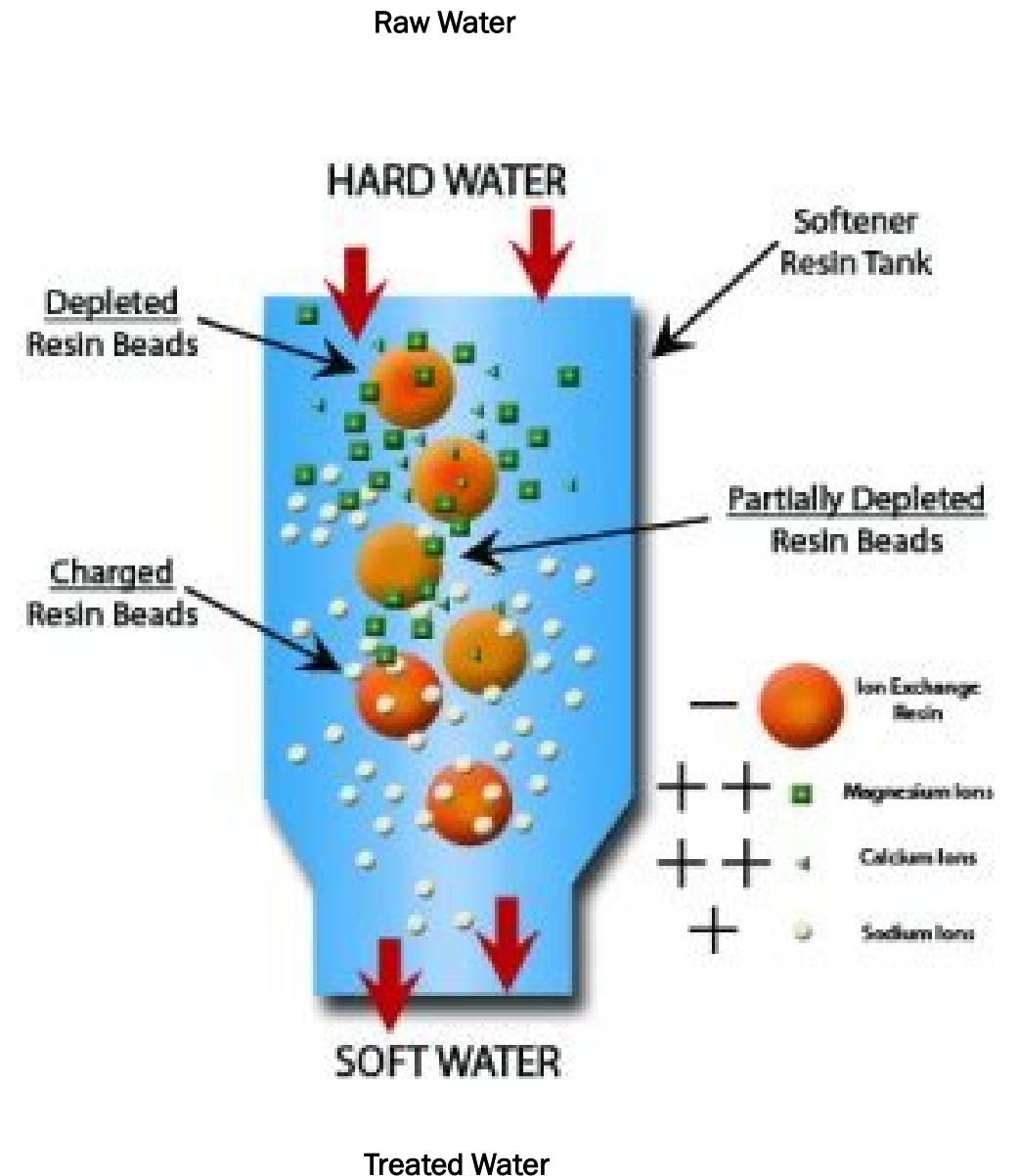
- Water system permitting conducted under federal Safe Drinking Water Act (SDWA) and state California Safe Drinking Water Act (codified in California Health and Safety Code)
- Drinking water system permitting requires the use of Best Available Treatment Technologies (BAT), combined with economic analyses, to determine appropriate level and method of treatment
- BATs identified in regulations used unless special permission is given
- BATs for Hexavalent Chromium include:
 - Reduction-Coagulation-Filtration (RCF)
 - Weak Based Anion Exchange (WBA)
 - Strong Based Anion Exchange (SBA)
 - Reverse Osmosis (RO)

CR6 TREATMENT- REDUCTION, COAGULATION, FILTRATION (RCF)

- Chemical treatment and physical separation process.
- Begins with addition of a reducing agent to the raw water to convert the dissolved Chrome 6 to Chrome 3.
- Reaction results in Chrome 3 precipitating out of solution as solid particles.
- Chrome 3 solids are then coagulated and removed with a filter system to yield the treated water.


WEAK BASE ANION EXCHANGE

- Ion exchange process where raw water is passed through an ion exchange resin bed for treatment
- In the resin bed, the ions targeted for removal from the water exchange with innocuous ones bound to the charged surfaces of the resin
- The targeted ion (hexavalent chromium) remains bound to the resin surfaces while the water exits the resin bed as treated effluent



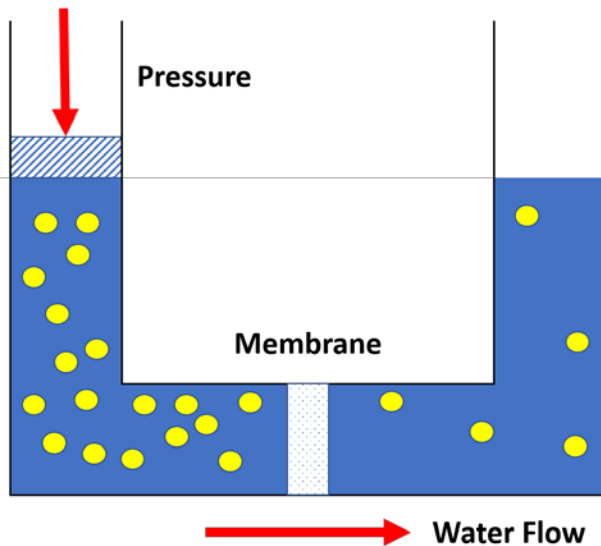
STRONG BASE ANION EXCHANGE

Functions similar to WBA by exchanging the ion targeted for removal for an innocuous ion bound to the resin as the water is passed through the resin bed.



These types of resins have been extensively used in the potable municipal industry for groundwater treatment of constituents such as nitrate and arsenic.

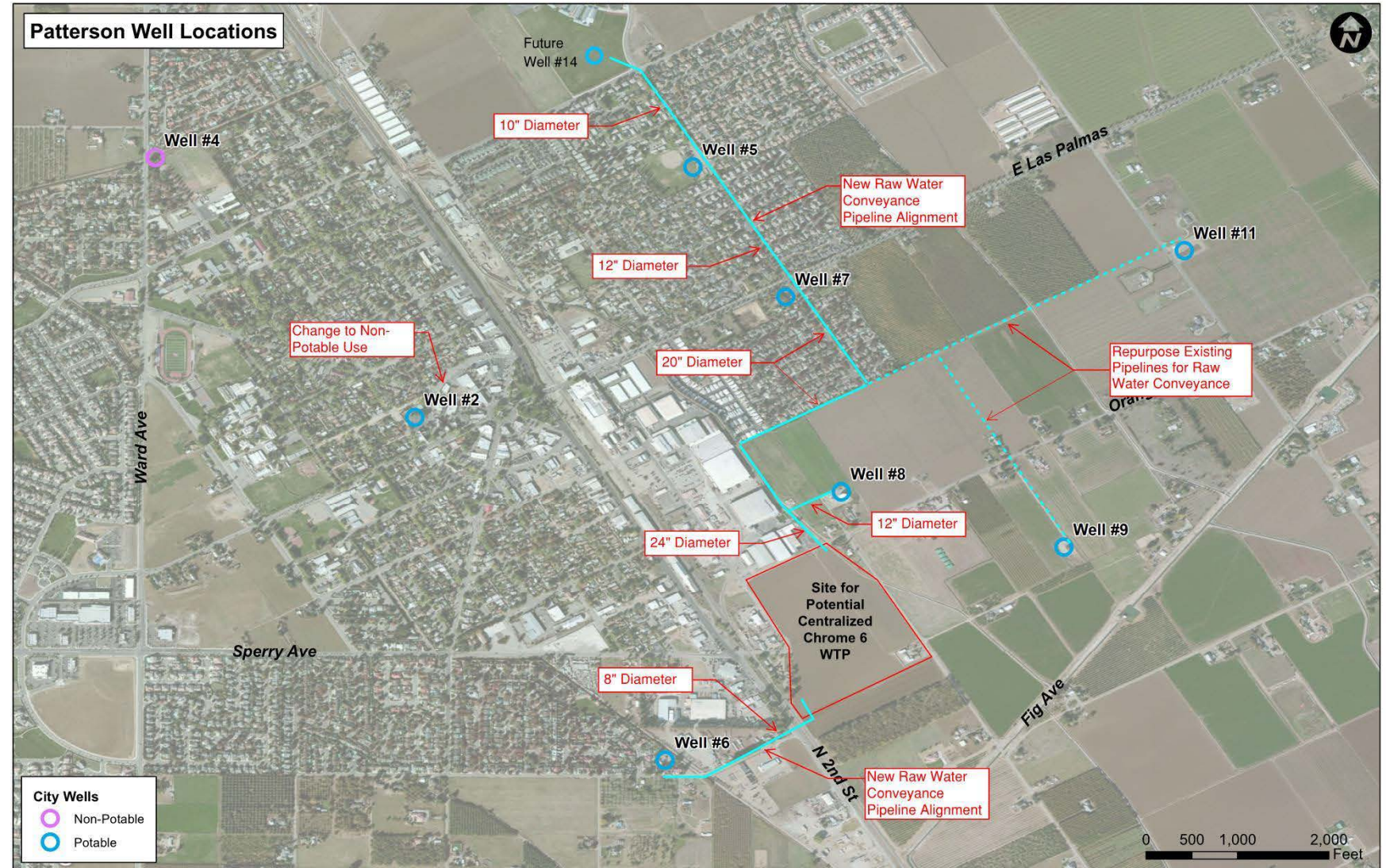
REVERSE OSMOSIS (RO)



- RO is a treatment process that uses a semi-permeable thin film composite (TFC) membrane to separate water from the ions and large molecular weight molecules dissolved in the water (i.e., the raw water TDS).
- RO membranes for large scale municipal water treatment applications are configured in an industry standard 8-inch diameter spiral wound element that is 40-inches in length, and typically have 400 square feet of membrane surface per element.
- Multiple parallel pressure vessels are then used to achieve the treatment capacity needed for the application.

CENTRALIZED TREATMENT VS. DECENTRALIZED TREATMENT

- Decentralized (Wellhead) Treatment
 - Individual treatment systems at each well location
- Centralized Treatment
 - Pipe water from wells to treatment plant
 - Treated water enters distribution system from there



COMPARISON OF CENTRALIZED VS DECENTRALIZED SYSTEMS

Centralized Water Treatment System		Decentralized Water Treatment Systems	
<p>Pros:</p> <ul style="list-style-type: none">• Can treat large volumes at high rates• Well developed approach• Single point (location) of operation• Plant can be modified in future to address other constituents	<p>Cons:</p> <ul style="list-style-type: none">• Capital costs and O&M can be significant• Limited range for operation• May require construction infrastructure (pipelines, tanks)	<p>Pros:</p> <ul style="list-style-type: none">• Greater flexibility as treatment is aligned with well production• May be able to use smaller packaged systems• Reduces costs for new transmission infrastructure	<p>Cons:</p> <ul style="list-style-type: none">• Requires construction of multiple systems• Multiple locations for O&M• Not all well site locations may have space for treatment system• Treatment systems typically limited to design contaminants

POTENTIAL COST FOR CHROMIUM 6 TREATMENT

- Anticipated compliance period will be three years from the date of a compliance order.
- The exceedance of hexavalent chromium is considered an existing deficiency. Therefore, these costs would be passed on to the existing 7,000 ratepayers over a proposed three-year compliance period.
- Costs anticipated to range from \$82M and \$153M

Treatment and Site Alternative	Cost (2022 \$)
Well Head Treatment	Total Initial Project Cost
RCF	\$ 135,000,000
WBA	\$ 91,000,000
SBA	\$ 83,000,000
RO	\$ 105,000,000
Centralized Treatment	
RCF	\$ 153,000,000
WBA	\$ 82,000,000
SBA	\$ 95,000,000
RO	\$ 110,000,000

RATE SETTING-WATER



BARTLE WELLS ASSOCIATES
INDEPENDENT PUBLIC FINANCE ADVISORS

WATER RATE SETTING PROCESS

- Water enterprise is a self-supporting enterprise.
- Revenues must be adequate to fund the costs of providing service.
- Last rate study was in 2017; adopted 5 years of rates increases through January 1, 2022.
- Water Master Plan has identified \$147 MM of capital projects over the next 10 years
 - \$120 MM of projects are projected to be funded privately by developers and developer impact fees.
 - \$27 MM of projects are projected to be funded through water rates through a combination of debt issuances (state revolving fund loans or bonds) and cash
- 2022 Study includes rate increases for the next 5 years. Rate increases will be effective January 1 of each year, beginning in 2023 through 2027.
- Water rates will increase by 2% each year to fund the cost of providing service.

WHY ARE RATE INCREASES NEEDED?



Operations & maintenance expenses is expected to increase 3% per year.



New projected staff for the water enterprise.



Equipment & vehicle replacements.



Capital improvement plan (CIP).



\$27 MM of rate payer funded projects over the next 10 years.



To obtain future financing, City must adopt rates to show ability to repay future debt service and meet current debt rate covenants (125%).



Rates DO NOT pay for development's share of the CIP

CURRENT & ADOPTED WATER RATES

		Current Rate	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027
Monthly Tiers			<i>(Adopted overall rate increases)</i>				
			2.0%	2.0%	2.0%	2.0%	2.0%
<u>Quantity Rates</u>	Use (\$/ccf)						
	Tier 1 (0 to 13)	\$2.70	\$2.80	\$2.86	\$2.92	\$2.97	\$3.03
	Tier 2 (>13)	\$3.86	\$3.89	\$3.97	\$4.05	\$4.13	\$4.21
<u>Service Charges</u>							
Meter Size			<u>Monthly Rate</u>				
5/8"		\$16.79	\$17.12	\$17.46	\$17.81	\$18.17	\$18.53
3/4"		\$16.79	\$17.12	\$17.46	\$17.81	\$18.17	\$18.53
1"		\$21.82	\$22.26	\$22.70	\$23.16	\$23.62	\$24.09
1 1/2"		\$26.86	\$27.39	\$27.94	\$28.50	\$29.07	\$29.65
2"		\$43.64	\$44.51	\$45.40	\$46.31	\$47.24	\$48.18
3"		\$167.85	\$171.21	\$174.63	\$178.13	\$181.69	\$185.32
4"		\$213.17	\$217.44	\$221.78	\$226.22	\$230.74	\$235.36
6"		\$320.60	\$327.01	\$333.55	\$340.22	\$347.03	\$353.97
8"		\$443.13	\$451.99	\$461.03	\$470.25	\$479.66	\$489.25

CHROME 6 TREATMENT OPTIONS*

Treatment Options		Present Value Total	Initial Construction Cost	Soft Costs	Total Initial Project Cost	Lifecycle O&M Cost
Wellhead Options	RCF	\$260 MM	\$82 MM	\$53 MM	\$135 MM	\$125 MM
	RO	\$250 MM	\$64 MM	\$41 MM	\$105 MM	\$145 MM
	SBA	\$305 MM	\$50 MM	\$33 MM	\$83 MM	\$222 MM
	WBA	\$239 MM	\$55 MM	\$36 MM	\$91 MM	\$148 MM
Centralized Options	RCF	\$245 MM	\$93 MM	\$60 MM	\$153 MM	\$92 MM
	RO	\$204 MM	\$67 MM	\$43 MM	\$110 MM	\$94 MM
	SBA	\$267 MM	\$58 MM	\$37 MM	\$95 MM	\$172 MM
	WBA	\$217 MM	\$50 MM	\$32 MM	\$82 MM	\$135 MM

**Costs determined by the City of Patterson Hexavalent Chromium Treatment Feasibility Study*

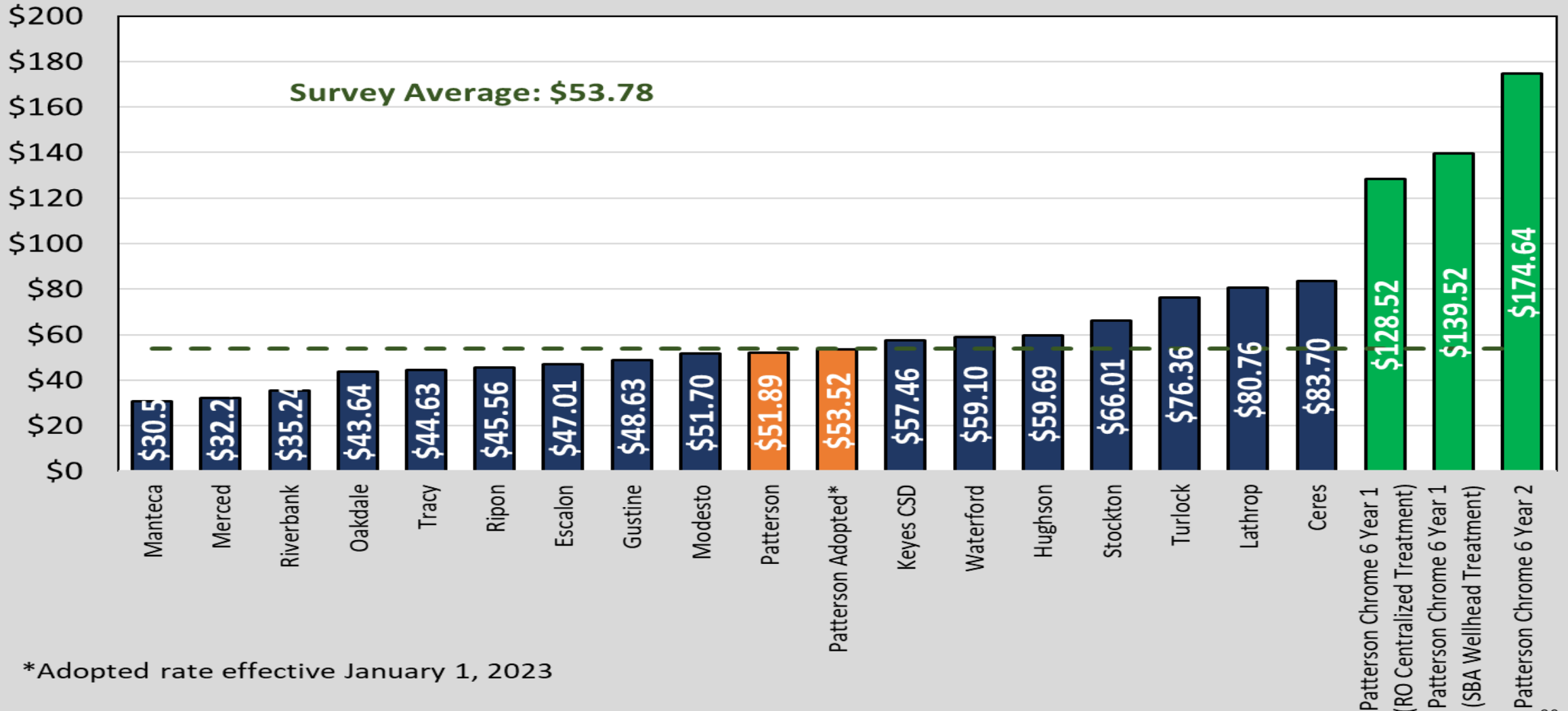
WATER RATE PROJECTIONS (RO CENTRALIZED TREATMENT)

		Current Rate	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027
Monthly Tiers		<i>(Adopted Rates)</i>					
Quantity Rates	Use (\$/ccf)						
	Tier 1 (0 to 13)	\$2.70	\$2.80	\$2.86	\$2.92	\$2.97	\$3.03
	Tier 2 (>13)	\$3.86	\$3.89	\$3.97	\$4.05	\$4.13	\$4.21
Service Charges							
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3"		\$167.85	\$171.21	\$174.63	\$178.13	\$181.69	\$185.32
4"		\$213.17	\$217.44	\$221.78	\$226.22	\$230.74	\$235.36
6"		\$320.60	\$327.01	\$333.55	\$340.22	\$347.03	\$353.97
8"		\$443.13	\$451.99	\$461.03	\$470.25	\$479.66	\$489.25
Service Charges			<i>(Projected Additional Rates)</i>				
Meter Size			Chrome 6 Monthly Service Charge (RO Centralized Treatment)				
5/8"		N/A	\$75.00	\$120.00	\$120.00	\$120.00	\$120.00
3/4"		N/A	\$75.00	\$120.00	\$120.00	\$120.00	\$120.00
1"		N/A	\$97.50	\$156.00	\$156.00	\$156.00	\$156.00
1 1/2"		N/A	\$120.00	\$192.00	\$192.00	\$192.00	\$192.00
2"		N/A	\$195.00	\$312.00	\$312.00	\$312.00	\$312.00
3"		N/A	\$750.00	\$1,200.00	\$1,200.00	\$1,200.00	\$1,200.00
4"		N/A	\$952.50	\$1,524.00	\$1,524.00	\$1,524.00	\$1,524.00
6"		N/A	\$1,432.50	\$2,292.00	\$2,292.00	\$2,292.00	\$2,292.00
8"		N/A	\$1,980.00	\$3,168.00	\$3,168.00	\$3,168.00	\$3,168.00

		Current Rate	CY 2023	CY 2024	CY 2025	CY 2026	CY 2027	
Monthly Tiers		<i>(Adopted Rates)</i>						
Quantity Rates	Use (\$/ccf)							
	Tier 1 (0 to 13)	\$2.70	\$2.80	\$2.86	\$2.92	\$2.97	\$3.03	
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8"		\$443.13	\$451.99	\$461.03	\$470.25	\$479.66	\$489.25	
Service Charges			<i>(Projected Additional Rates)</i>					
Meter Size			Chrome 6 Monthly Service Charge (SBA Wellhead Treatment)					
5/8"	N/A		\$86.00	\$120.00	\$124.00	\$128.00	\$132.00	
3/4"	N/A		\$86.00	\$120.00	\$124.00	\$128.00	\$132.00	
1"	N/A		\$111.80	\$156.00	\$161.20	\$166.40	\$171.60	
1 1/2"	N/A		\$137.60	\$192.00	\$198.40	\$204.80	\$211.20	
2"	N/A		\$223.60	\$312.00	\$322.40	\$332.80	\$343.20	
3"	N/A		\$860.00	\$1,200.00	\$1,240.00	\$1,280.00	\$1,320.00	
4"	N/A		\$1,092.20	\$1,524.00	\$1,574.80	\$1,625.60	\$1,676.40	
6"	N/A		\$1,642.60	\$2,292.00	\$2,368.40	\$2,444.80	\$2,521.20	
8"	N/A		\$2,270.40	\$3,168.00	\$3,273.60	\$3,379.20	\$3,484.80	

WATER RATE PROJECTIONS (SBA WELLHEAD TREATMENT)

Chart B: MONTHLY SINGLE FAMILY RESIDENTIAL WATER BILL SURVEY - 1/2022
 Based on 13 ccf monthly use, 5/8" or 3/4" meter
Chrome 6 Treatment Options



*Adopted rate effective January 1, 2023



CONSUMER CONFIDENCE REPORT (CCR)



CONSUMER CONFIDENCE REPORT (CCR)

- A CCR is a summary of the tests taken to detect contaminants in your drinking water.
- The State Water Resources Control Board, Division of Drinking Water and the United States Environmental Protection Agency (EPA) require all water agencies to provide this information each year.
- The State Water Resources Control Board recommends systems report data for five years from the date of the last sampling. However, they are not required to.
- U.S. EPA is silent on the issue of reporting federal UCMR contaminants beyond the previous calendar year's detections.

CONSUMER CONFIDENCE REPORT (CCR)- CITY OF PATTERSON

- The most recent CCR covers water quality data from January 1, 2021 through December 31, 2021.
- The 2021 CCR was completed and distributed to consumers on June 1, 2022. Due date is July 1 of every year.
- Once the report is generated by the water testing company, the city distributes the report to the public.
- The city does not delete any information from the original report regardless of the minimum reporting requirements.

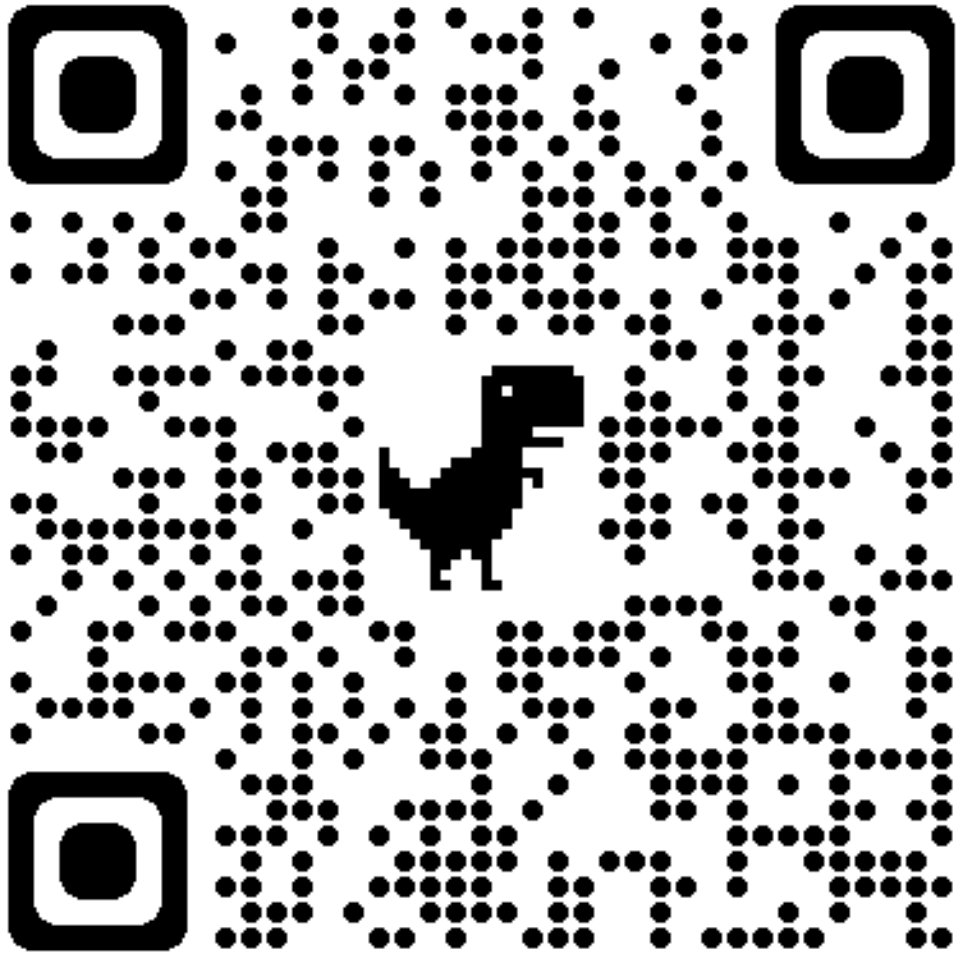


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CONSUMER CONFIDENCE REPORT (CCR)

Table 5 - TREATED DETECTION OF CONTAMINANTS WITH A PRIMARY DRINKING WATER STANDARD						
Constituent (Unit of Measure)	Sample Date	Average	Range	MCL (MRDL)	PHG(MCLG) (MRDLG)	Typical sources of contaminant
Chromium (ug/L)	(2016)	24	19 – 30	50.0	n/a	Discharge from steel and pulp mills and chrome plating; erosion of natural deposits
Hexavalent Chromium (ug/L)	(2016)	17.3	ND – 25.9	10	0.02	Discharge from electroplating factories, leather tanneries, wood preservation, chemical synthesis, refractory production, and textile manufacturing facilities; erosion of natural deposits.

Table 8 - DETECTION OF UNREGULATED CONTAMINANTS					
Constituent (and reporting units)	Sample Date	Average	Range	Notification Level	Typical Sources of Contaminant



CONSUMER CONFIDENCE REPORT (CCR) – DELIVERY METHOD

- The city's primary delivery method is through electronic delivery.
- Electronic delivery is the delivery of information over electronic mediums, such as phone calls, voicemails, text messages, faxes, emails, and postings on the Internet.
- Cities are required to certify their delivery method by October 1 of every year to the State Water Resources Control Board.



CAPITAL IMPROVEMENT PLAN-WATER



WATER CIP- PLANNING PROCESS



The CIP was prepared for the City as a guide for project implementation through buildout, specifically over the next 10 years.



Projects included in the 2015 CIP were developed based on the results of the supply portfolio selection, hydraulic analysis and City staff review of existing facilities.



In addition to addressing future water supply, improvement projects were developed to address the identified deficiencies.



These projects address insufficient fire flow and maximum velocity hydraulic triggers.



Additionally, City staff identified several projects to replace pipes and service connections nearing the end of their useful life.

CIP PROJECTS

Completed Projects

- Re-coating storage tank at Gateway
- WM1A: Kinshire Phase I Pipeline Replacement

Projects in Progress

- WM1B: Kinshire Pipeline Replacement Phase 2
- WM-19B: Retrofit 6,500 water meters. Convert system from AMR to AMI.



CIP PROJECTS

Projects to be Completed

- WT-1: Re-coating and cathodic protection at Well 8
- WT-2: Re-coating storage tank at Pressure Zone II
- WM-2: Replace 4,240 lf of existing pipe at Washburn, Weber, N 1st.
- WM-3: Replace 2,660 lf at Colony Park I & II and Brook Hollow Subdivision.
- WM-6A: Replace approx. 10,180 lf of existing pipe. Bounded by El Circulo. (in design)
- WM-6B: Replace 17,750 lf of existing pipe. Area bounded by W. Las Palmas, S. 9th St, Sperry Ave, Del Puerto, and S. El Circulo Ave. (in design)
- WM-7: Replace approx. 150 service lines along 5,600 lf of existing pipe at California Palms Subdivision.



Questions?