

CHATFIELD WATERSHED AUTHORITY



2022 ANNUAL REPORT

WATER QUALITY CONTROL COMMISSION

AUGUST 2023

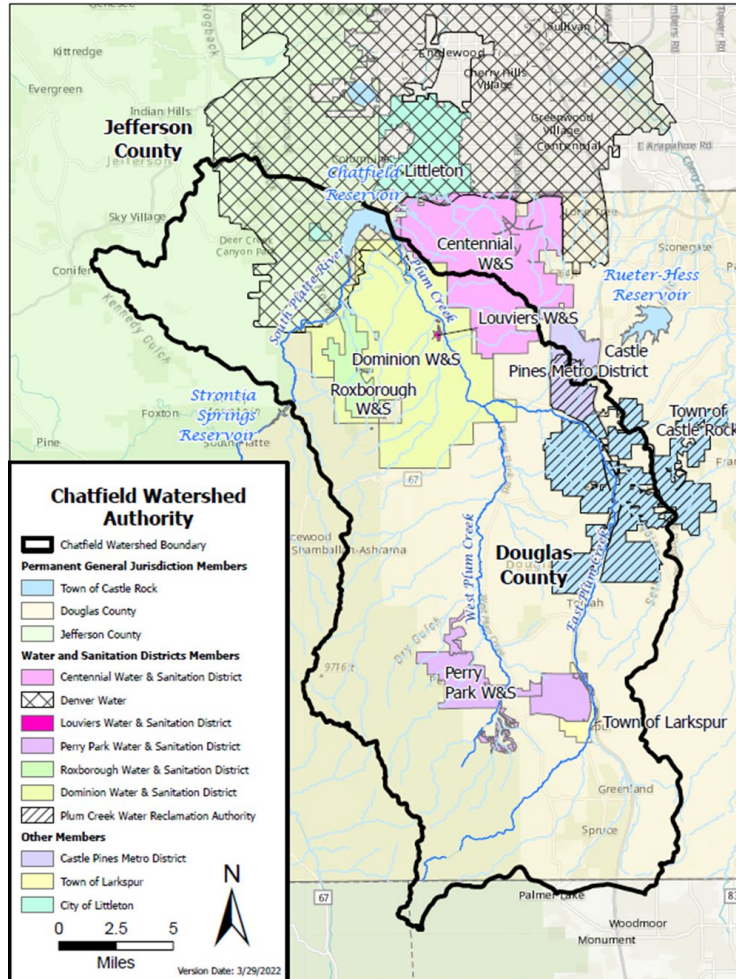
CHATFIELD WATERSHED AUTHORITY

Voluntary organization with self-imposed dues whose mission is to promote protection of water quality in the Chatfield Watershed for recreation, fisheries, drinking water supplies, and other beneficial uses through the promotion of point source and nonpoint source stormwater controls and monitoring.





CWA MEMBERSHIP



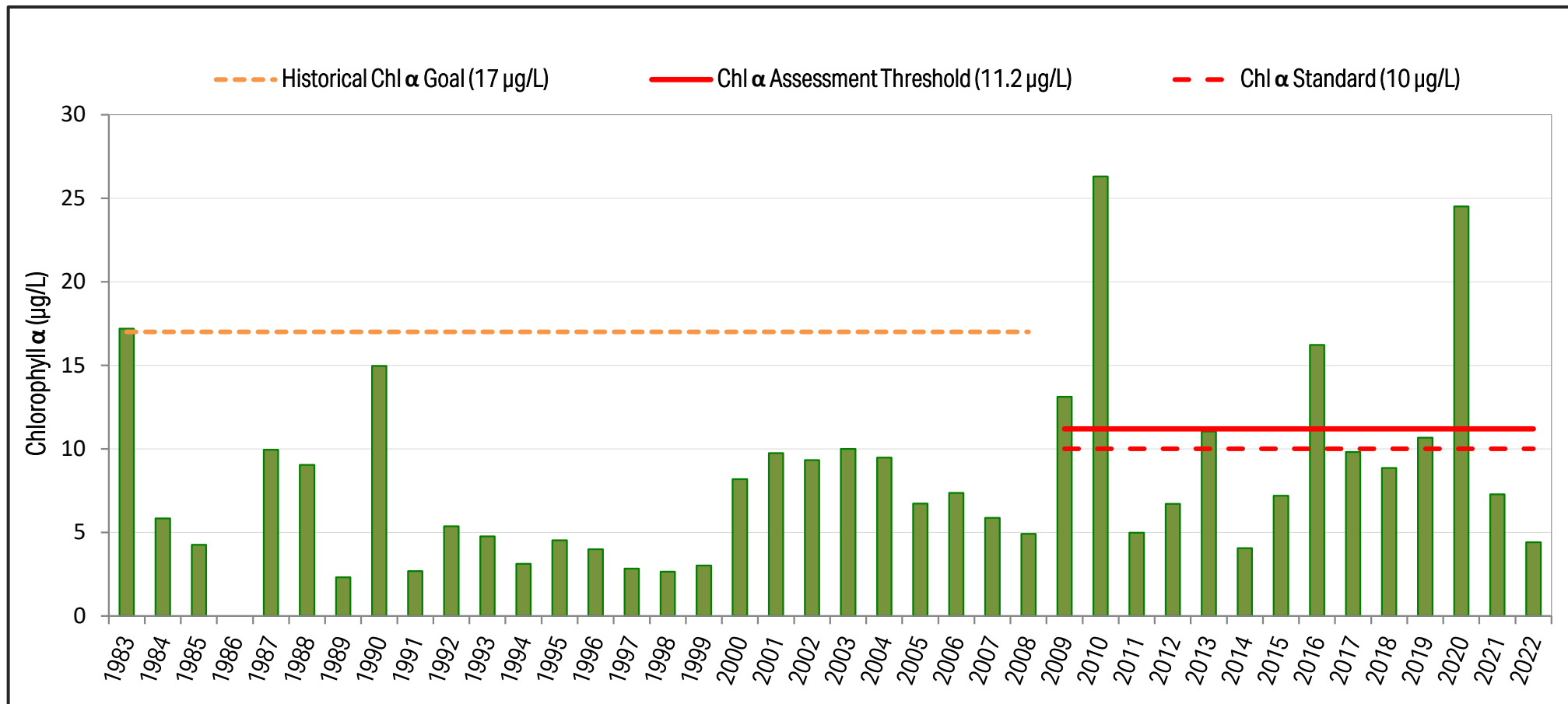
- **Permanent General Jurisdiction Members**
 - Douglas County
 - Jefferson County
 - Town of Castle Rock
- **Water and Sanitation Members**
 - Centennial Water and Sanitation District
 - Denver Water
 - Dominion Water and Sanitation District
 - Louviers Water and Sanitation District
 - Perry Park Water and Sanitation District
 - Plum Creek Water Reclamation Authority
 - Roxborough Water and Sanitation District
- **Other Members**
 - Castle Pines Metropolitan District
 - Town of Larkspur
 - City of Littleton

2022 RESERVOIR REGULATORY COMPLIANCE SUMMARY

- ✓ In compliance with Regulation 38 for chlorophyll α
- ✓ In compliance with Regulation 38 phosphorus standard
- ✗ One WWTF out of 13 WWTF's exceeded its phosphorus concentration limit in Regulation 73



CHLOROPHYLL α



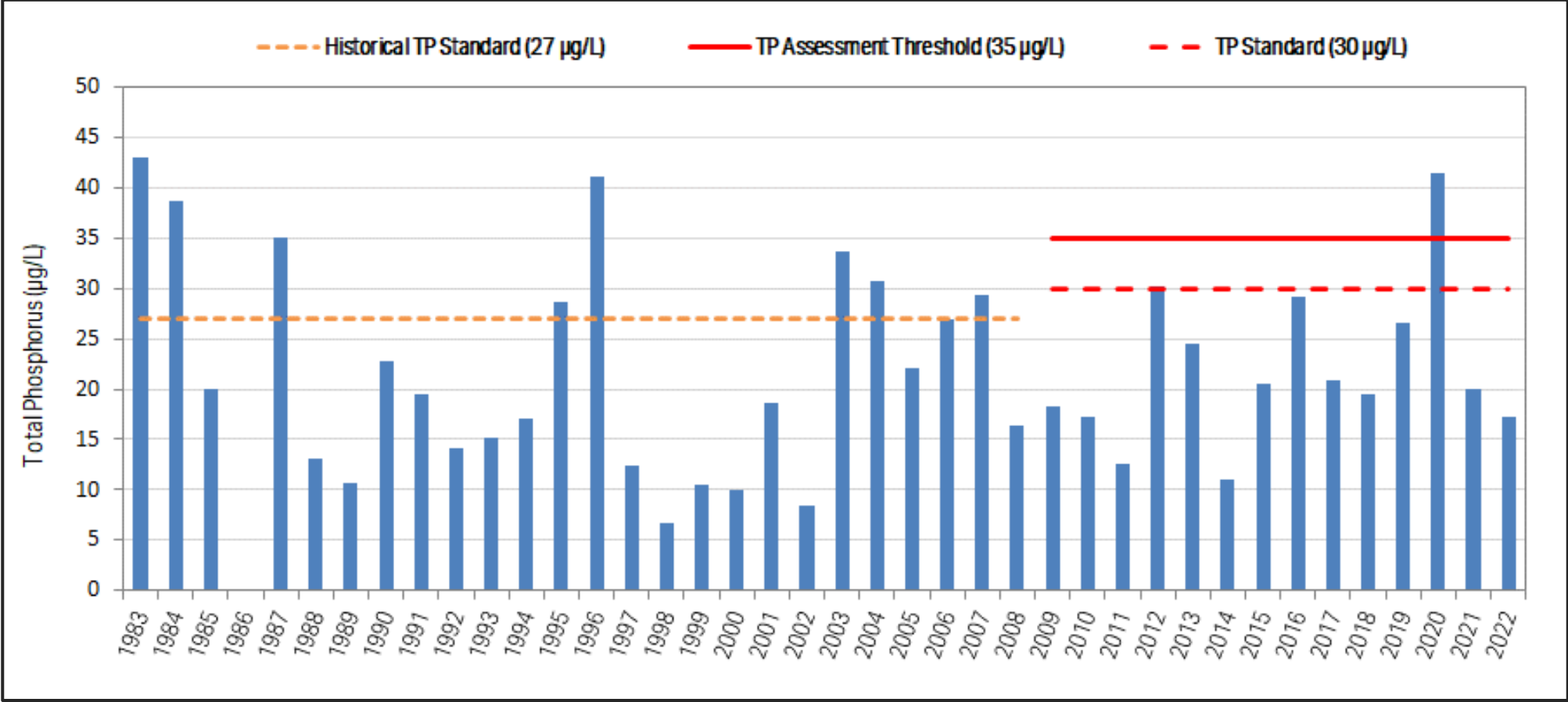
Attainment Assessment Threshold: 11.2 $\mu\text{g/L}$ (Jul. – Sep.)

1 in 5 years allowable exceedance frequency

2022 Summer Average = 4.4 $\mu\text{g/L}$



TOTAL PHOSPHORUS



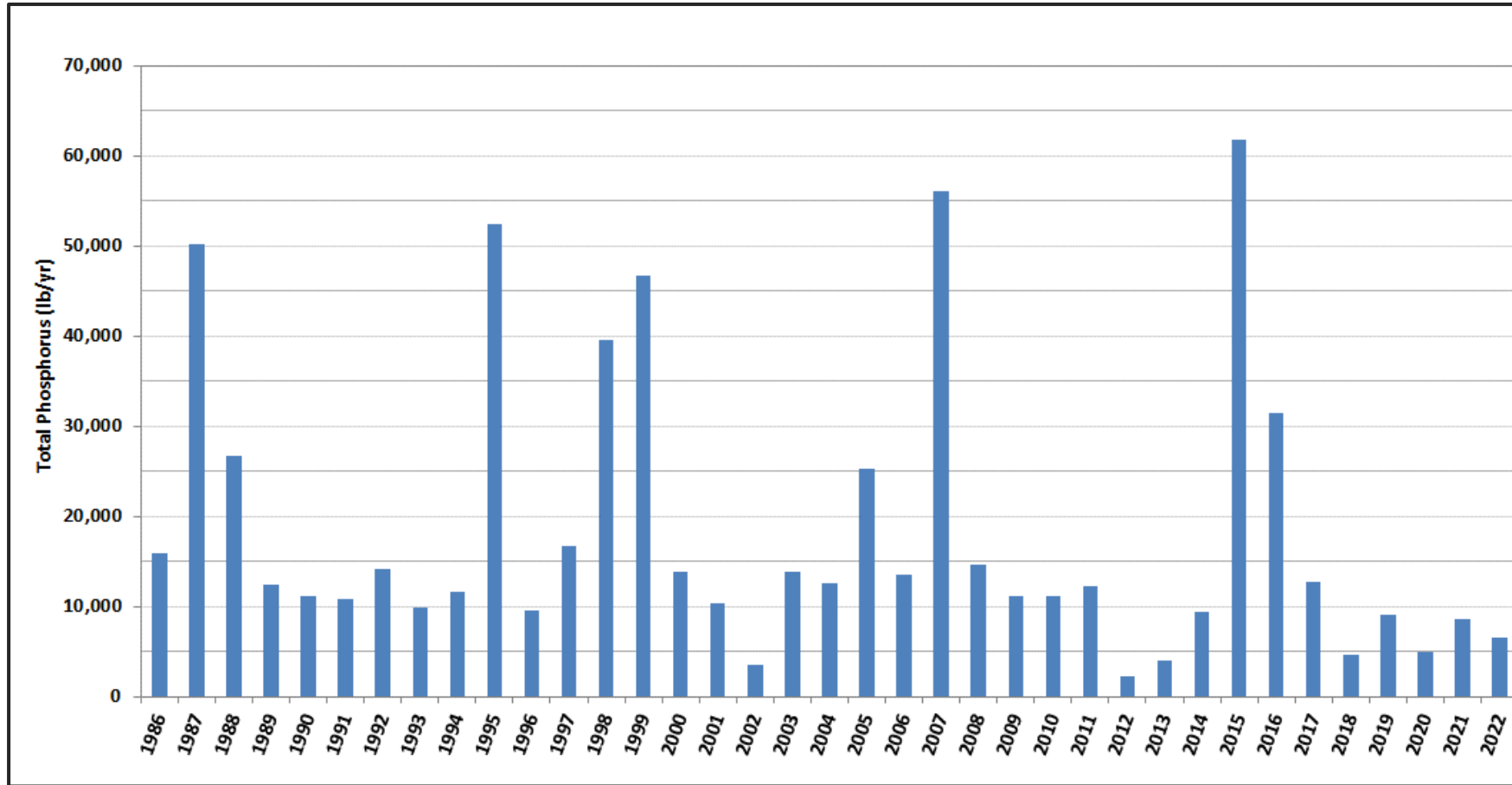
Attainment Assessment Threshold: 35 µg/L (Jul. – Sep.)

1 in 5 years allowable exceedance frequency

2022 Summer Average = 17.2 µg/L



TOTAL PHOSPHORUS LOADING



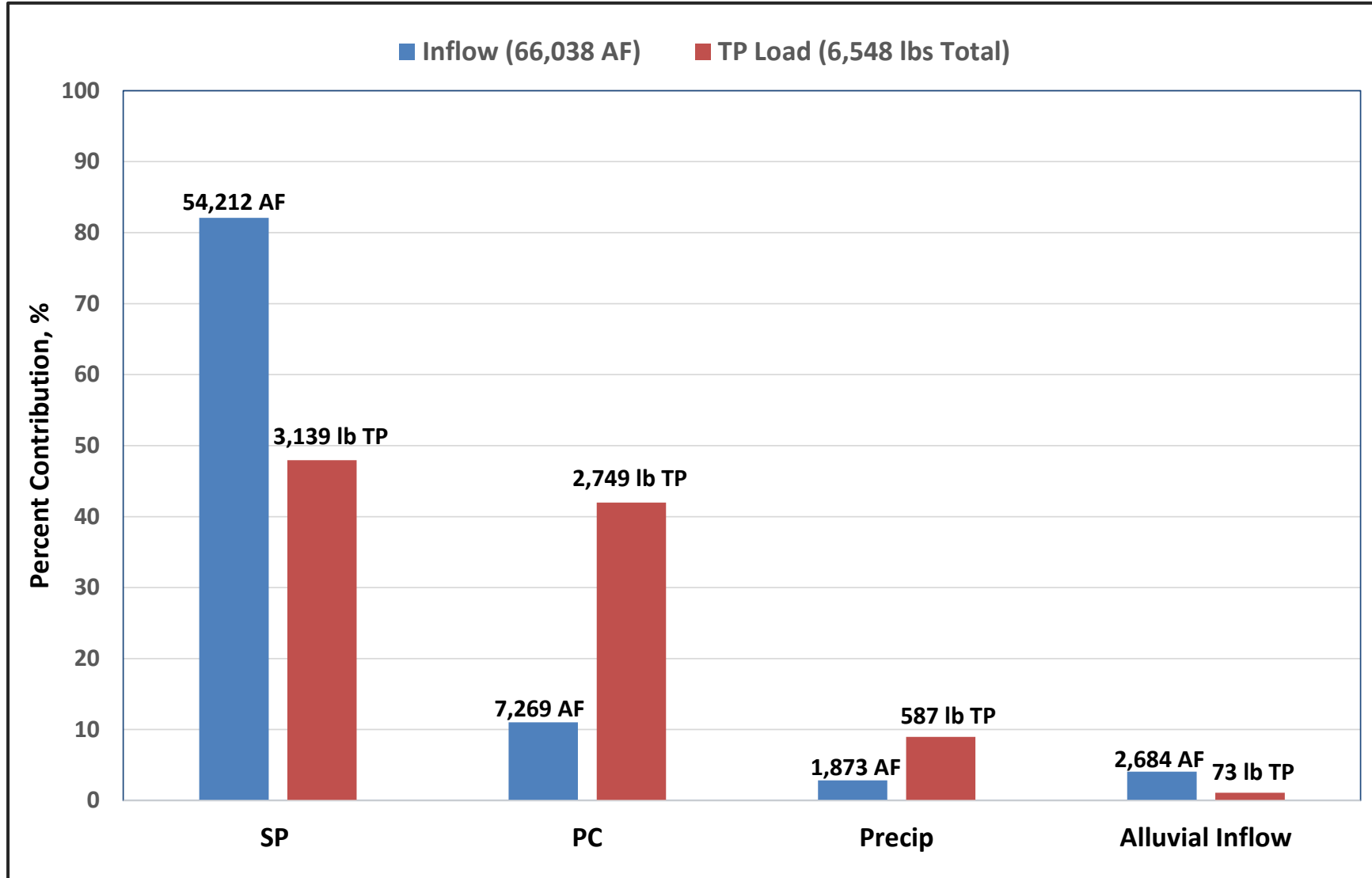
TMAL = 19,600 pounds at an inflow of 100,860 acre-feet

2022 Annual Load to Reservoir

6,548 pounds at an inflow of 66,038 acre-feet



TOTAL PHOSPHORUS LOADING



WHY DID EXCEEDANCE OF THE CHLOROPHYLL α STANDARD OCCUR IN 2020 BUT NOT IN 2021 or 2022?



Very hot and dry summers in all 3 years, 2022 was highest temperature, 2020 precipitation was lowest



No changes in activities at the reservoir



Lowest total phosphorus reaching the reservoir was in 2020



2020 was the 4th lowest annual flow in the last 35 years



2021 and 2022 saw some changes due to reallocation storage



Phosphorus and Chlorophyll- α data do not show a strong correlation



Unclear whether conditions will replicate under similar circumstances



Need more information and analysis – especially looking at other limiting factors



CHATFIELD RESERVOIR STORAGE ELEVATION

(2019-2022)

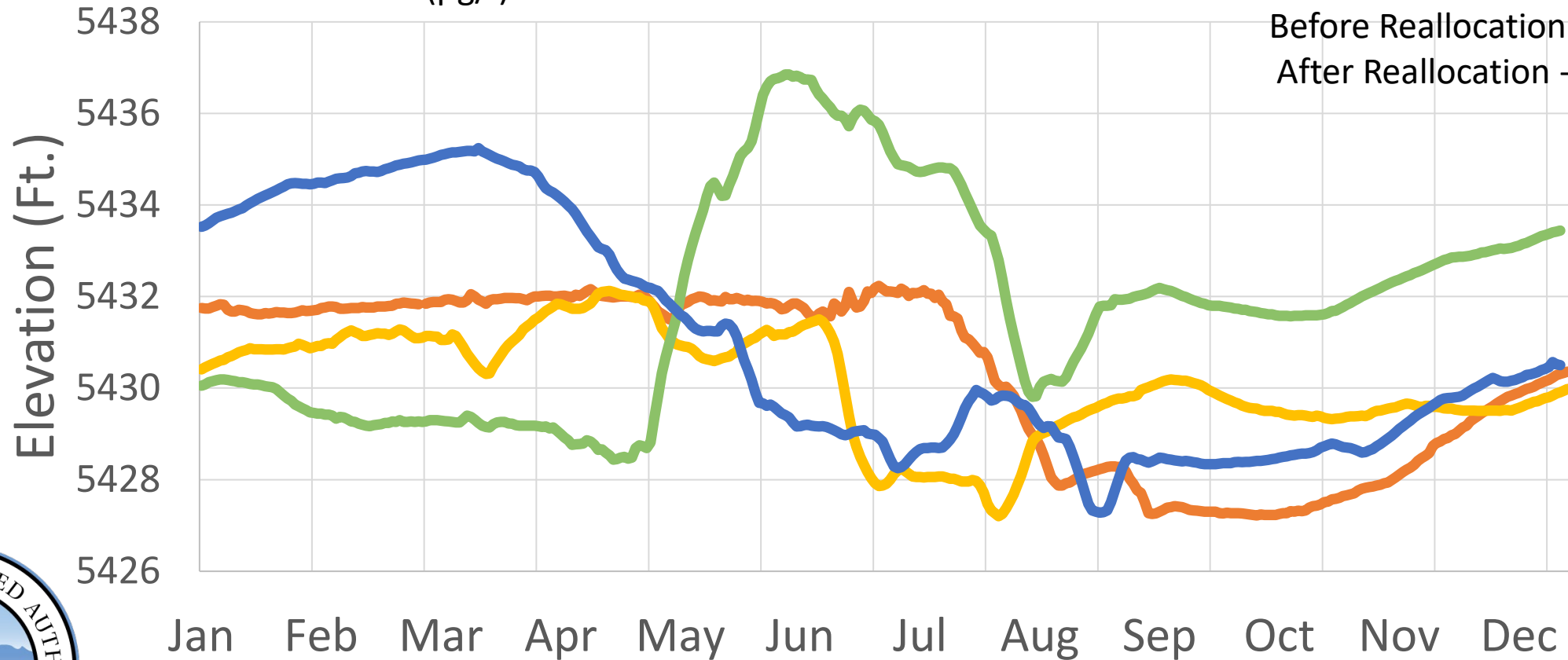
2019 2020 2021 2022

TP ($\mu\text{g/l}$) 26.7 41.5 25.0 17.2

Target NMWS

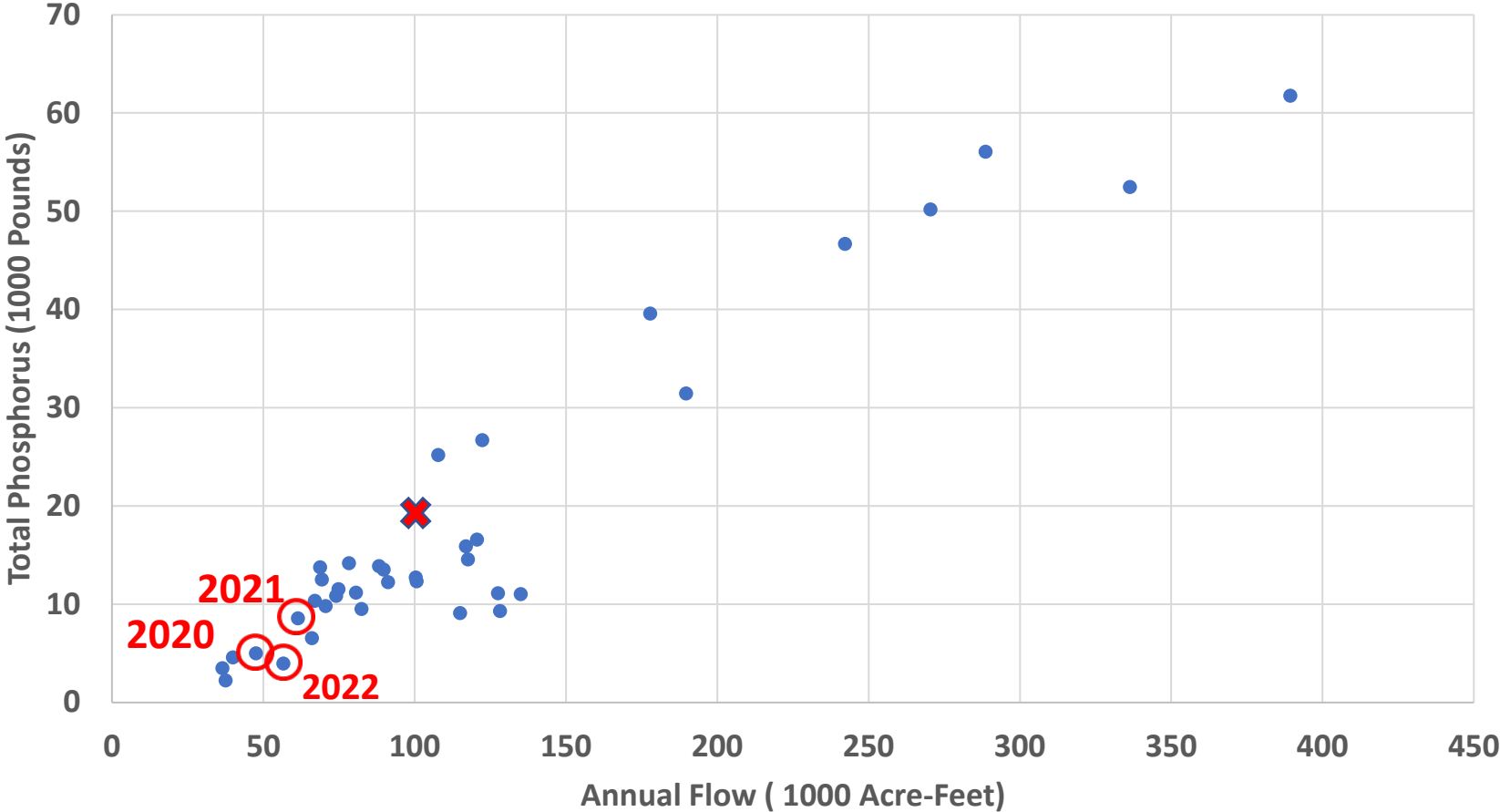
Before Reallocation - 5432

After Reallocation - 5444



FLOW vs TOTAL PHOSPHORUS

Annual (1986-2022)

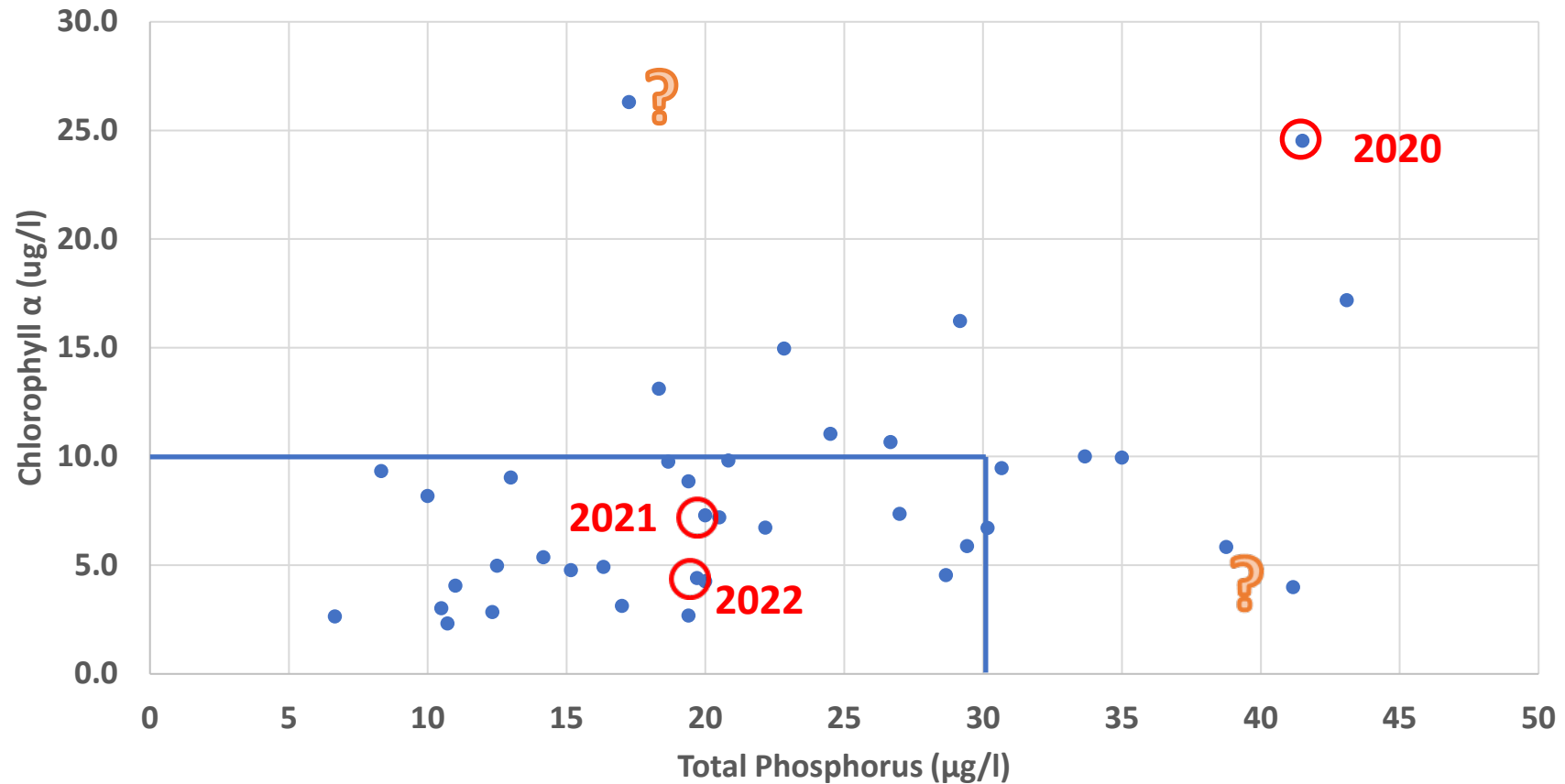


X TMAP = 19,600 pounds at an inflow of 100,860 acre-feet



TOTAL PHOSPHORUS (Concentration) vs CHLOROPHYLL α

Growing Season (1986-2022)

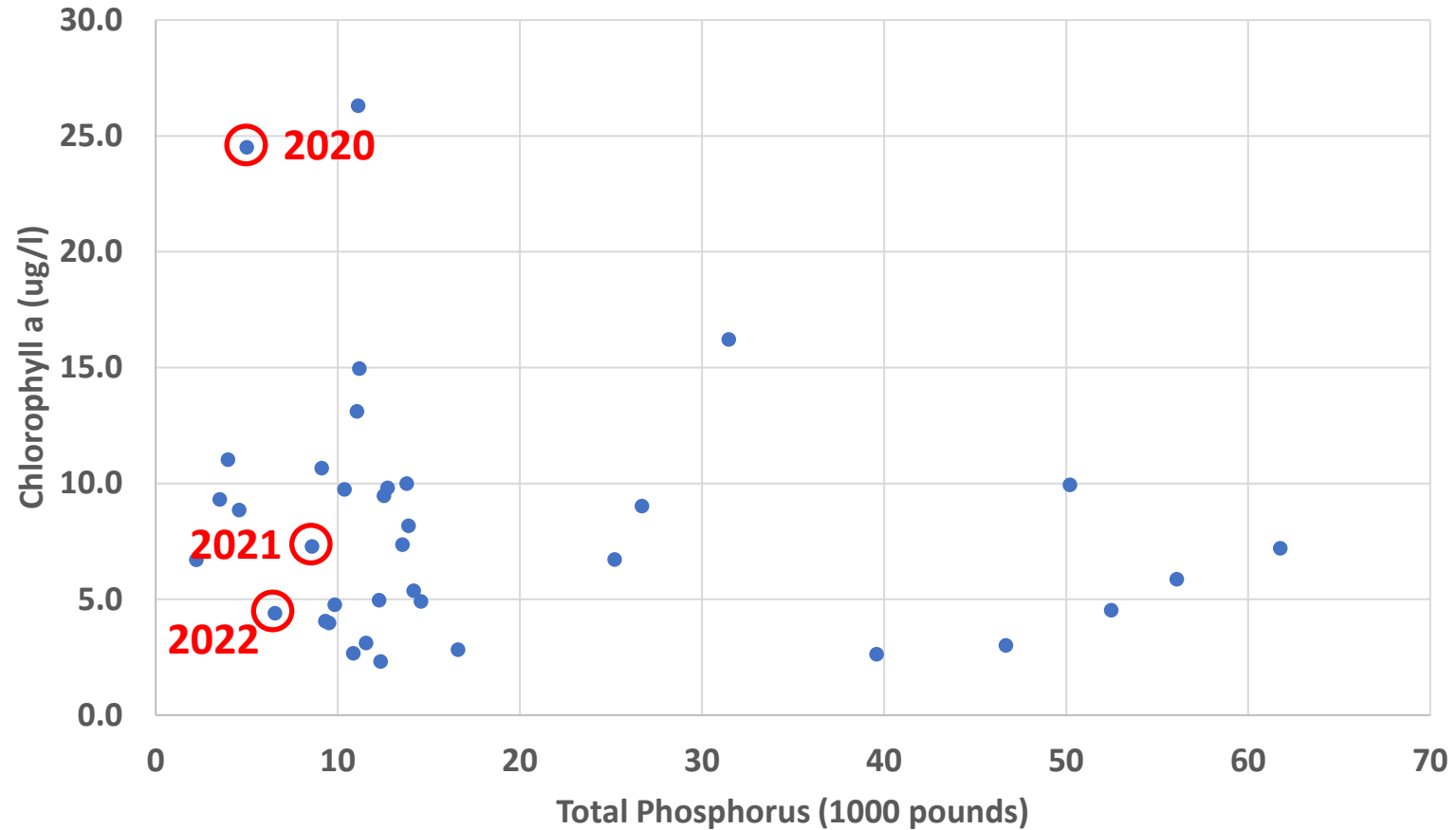


No Reliable Correlation



TOTAL ANNUAL PHOSPHORUS (Load) vs GROWING SEASON CHLOROPHYLL α

Growing Season (1986-2022)



No Reliable Correlation



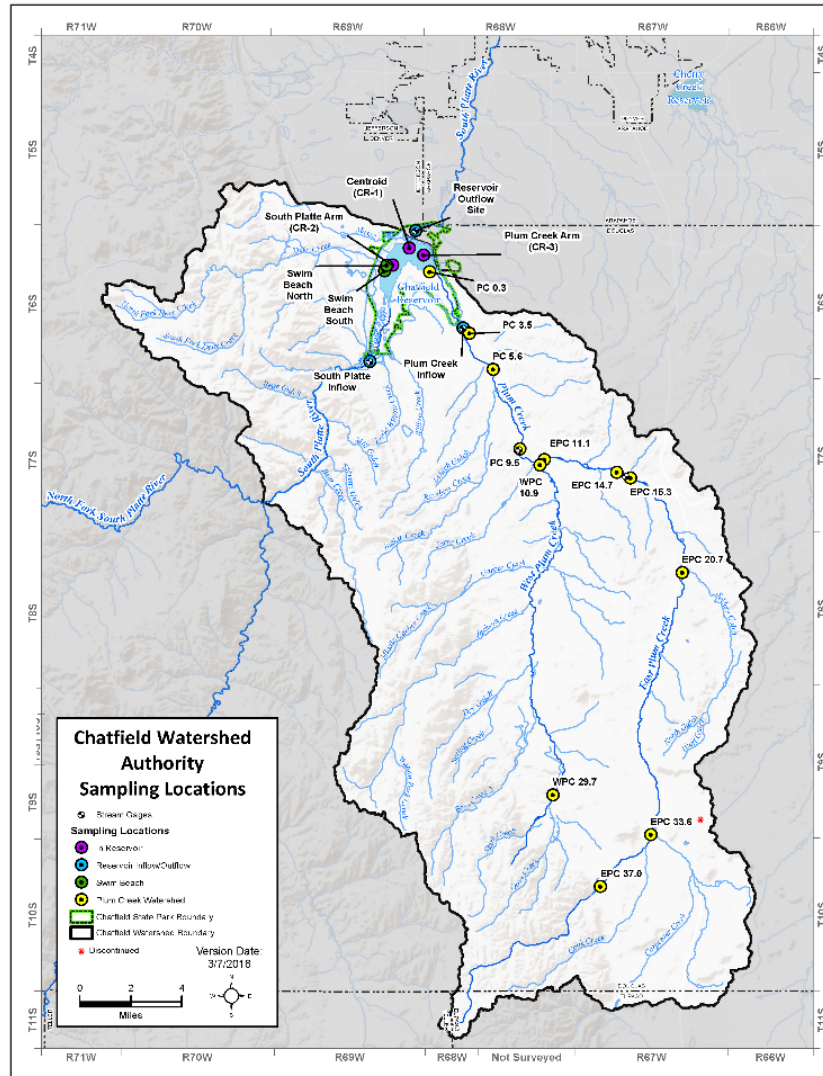
RESERVOIR WATER QUALITY MODELING

- Hydros has been performing reservoir modeling of Chatfield Reservoir to determine the effects of the reallocation project on water quality.
- The adjacent slide is from their “Chatfield Reservoir Water-Quality Model: 2022 Model Update and Extension” presentation at CT-01 (top). Similar results for temperature and dissolved oxygen.
- This information helps inform CWA’s understanding of reservoir dynamics and water quality.

Project Effects – TP and Chlorophyll a

- Similar TP and Chlorophyll a With/Without Project
- Suggests Little Effect of Reallocation Project on Water Quality in 2022





RESERVOIR AND WATERSHED MONITORING PROGRAM

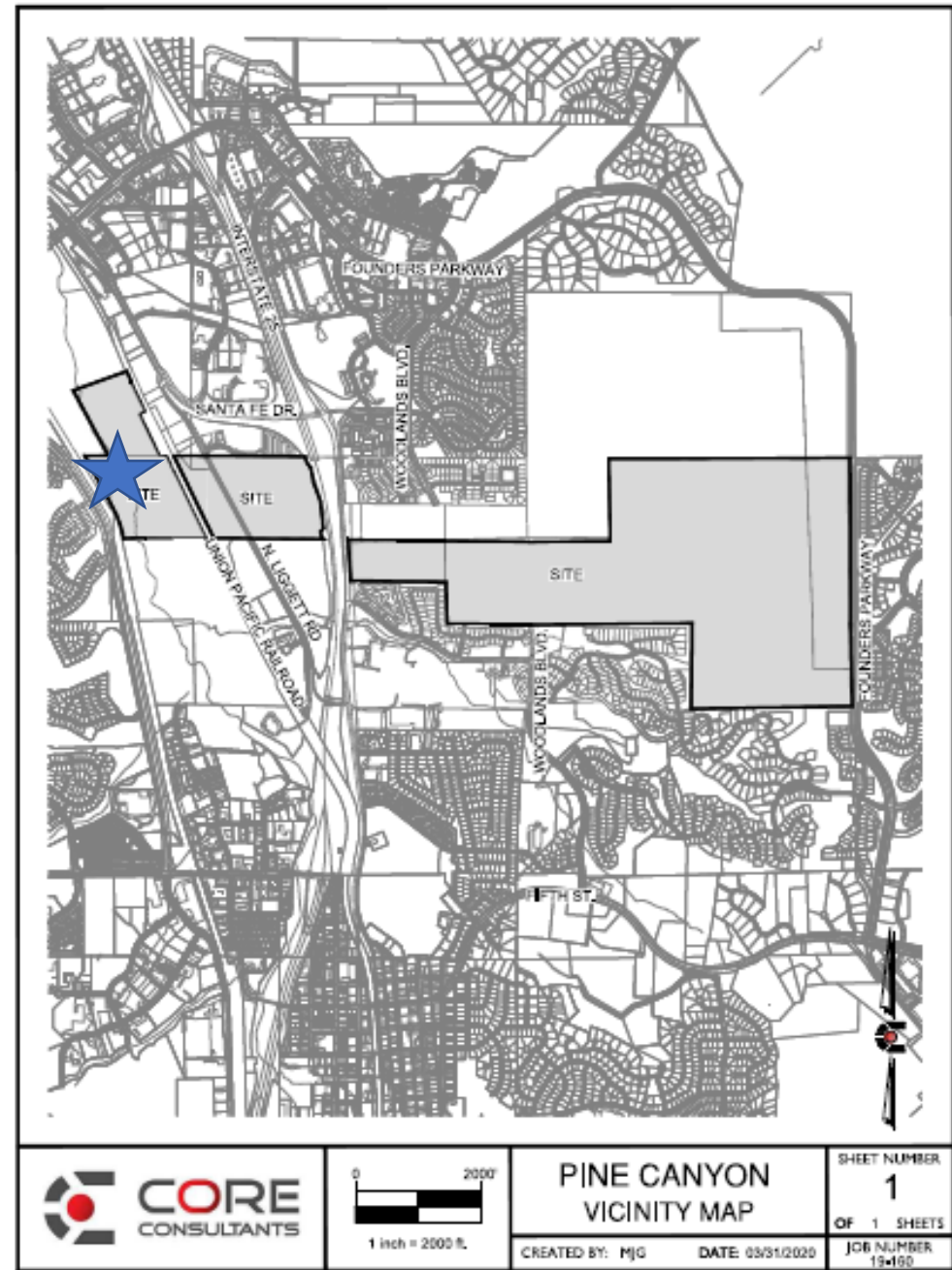
The Authority has been monitoring water quality for over 35 years.

- ✓ Monthly Monitoring at two Reservoir inflow locations, three locations in the Reservoir, and the Reservoir outflow
- ✓ During the growing season (July through September), Reservoir sampling is conducted twice monthly.
- ✓ Monthly Monitoring at 10 Watershed Locations

SITE AND PHOSPHORUS TRADE APPLICATIONS

Pine Canyon Site Application and Phosphorus Trade Application (Initial application submitted in 2020)

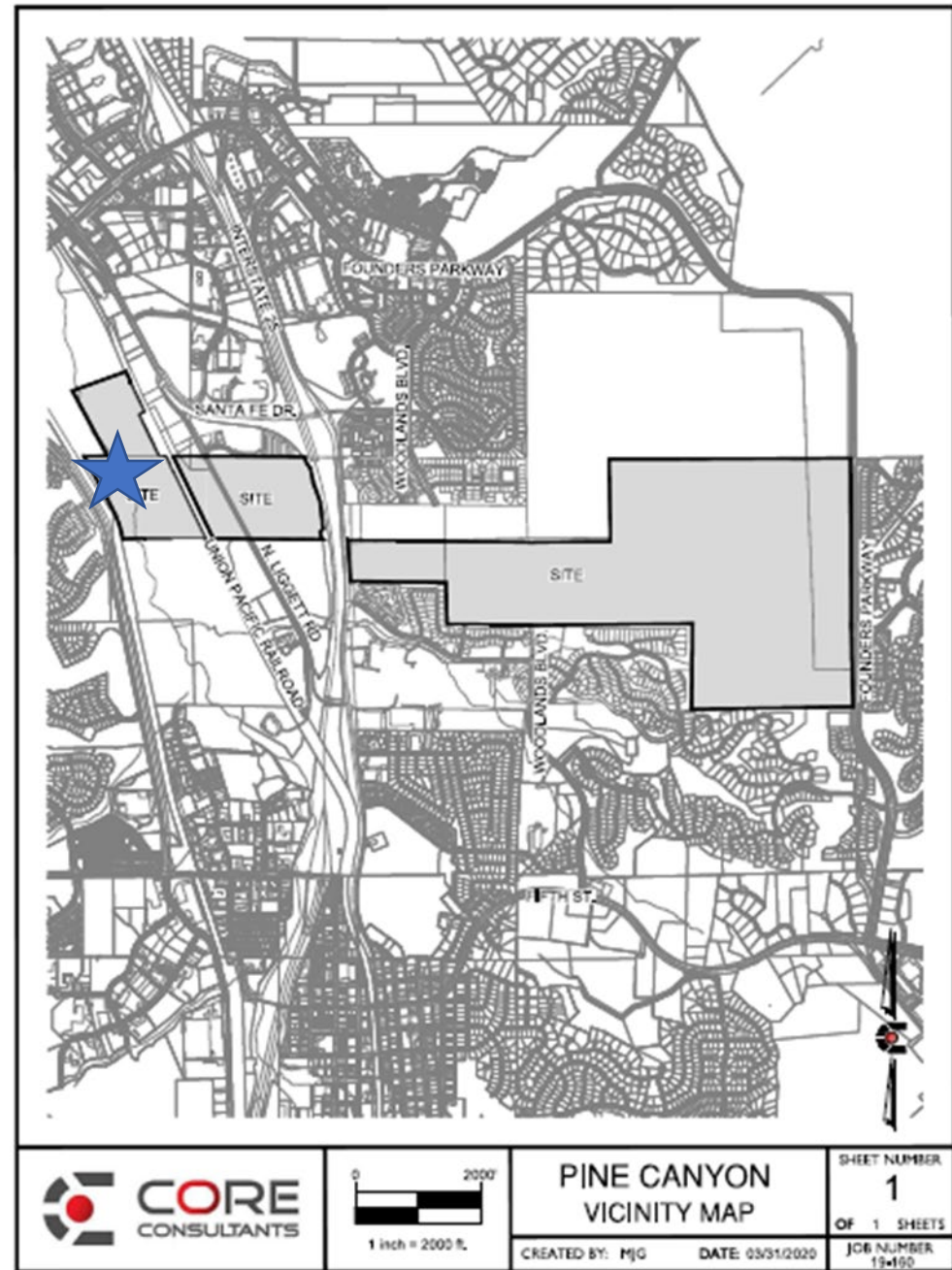
- Located in the Middle of Castle Rock
- Site Application for WWTF (0.405 mgd design capacity)
- Initial Phosphorus Non-Point Source to Point Source Trade Application (1528 lbs/yr on-site cattle operations elimination to 763 lbs/yr WWTF discharging to East Plum Creek)



SITE AND PHOSPHORUS TRADE APPLICATIONS

Pine Canyon Site Application and Phosphorus Trade Application

- On January 26, 2021, the Division issued a letter to the Applicant stating that “because the Applicant’s property is subject to Douglas County MS4 permit that trading under an MS4 permit also is not a feasible option at this time”.
- On January 28, 2021, the Division put their review of the Site Application on hold until the phosphorus allocation issue was resolved.
- On February 2, 2021, the CWA Technical Advisory Committee (TAC) formally denied the proposed phosphorus trade and on May 4, 2021, formally denied the Pine Canyon Site Application.



PINE CANYON
VICINITY MAP

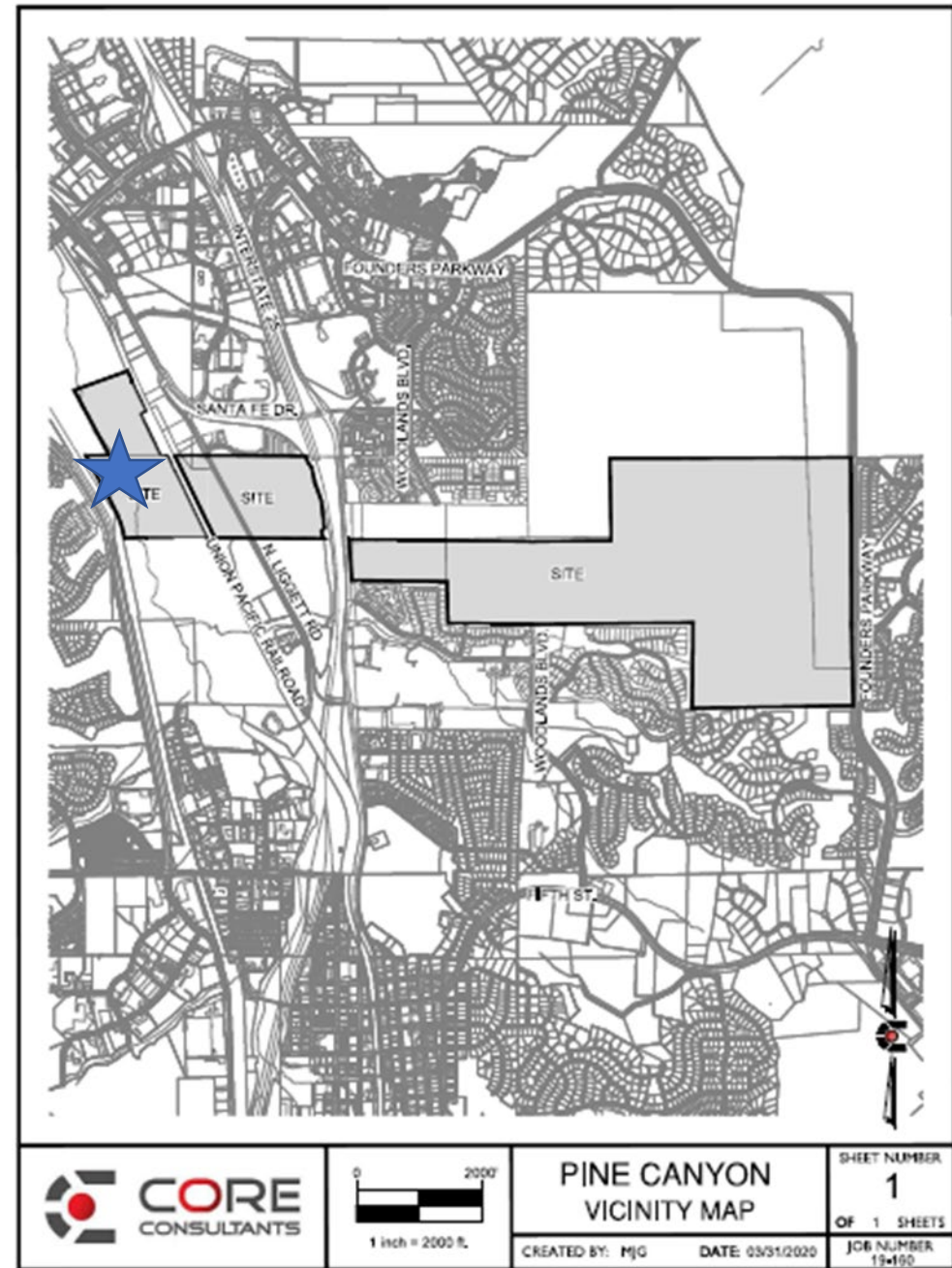
CREATED BY: MJC DATE: 05/31/2020

SHEET NUMBER
1
OF 1 SHEETS
JOB NUMBER
19-190

SITE AND PHOSPHORUS TRADE APPLICATIONS

Pine Canyon Site Application and Phosphorus Trade Application

- On April 6, 2022, the applicant submitted an amended site application to CWA based on meeting a no-phosphorus discharge using a LAMP.
- On June 7, 2022, the Authority's TAC recommended to the Division that the site application be denied due to concerns with the LAMP.
- The CWA does not believe that outside irrigation from reclaimed water can be controlled such that there is no surface runoff and no deep percolation from lawn irrigation.



PINE CANYON
VICINITY MAP

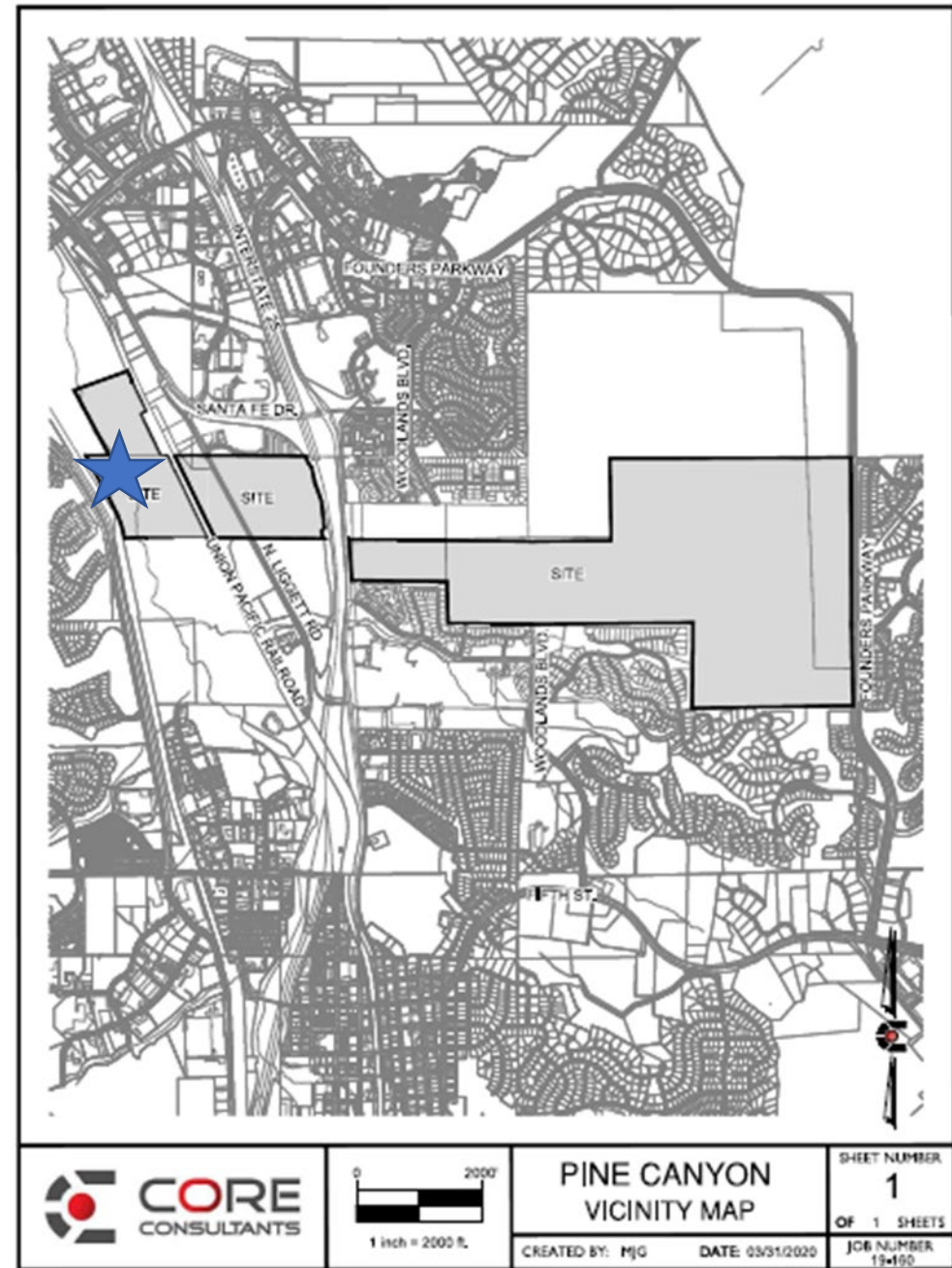
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SITE AND PHOSPHORUS TRADE APPLICATIONS

Pine Canyon Site Application and Phosphorus Trade Application

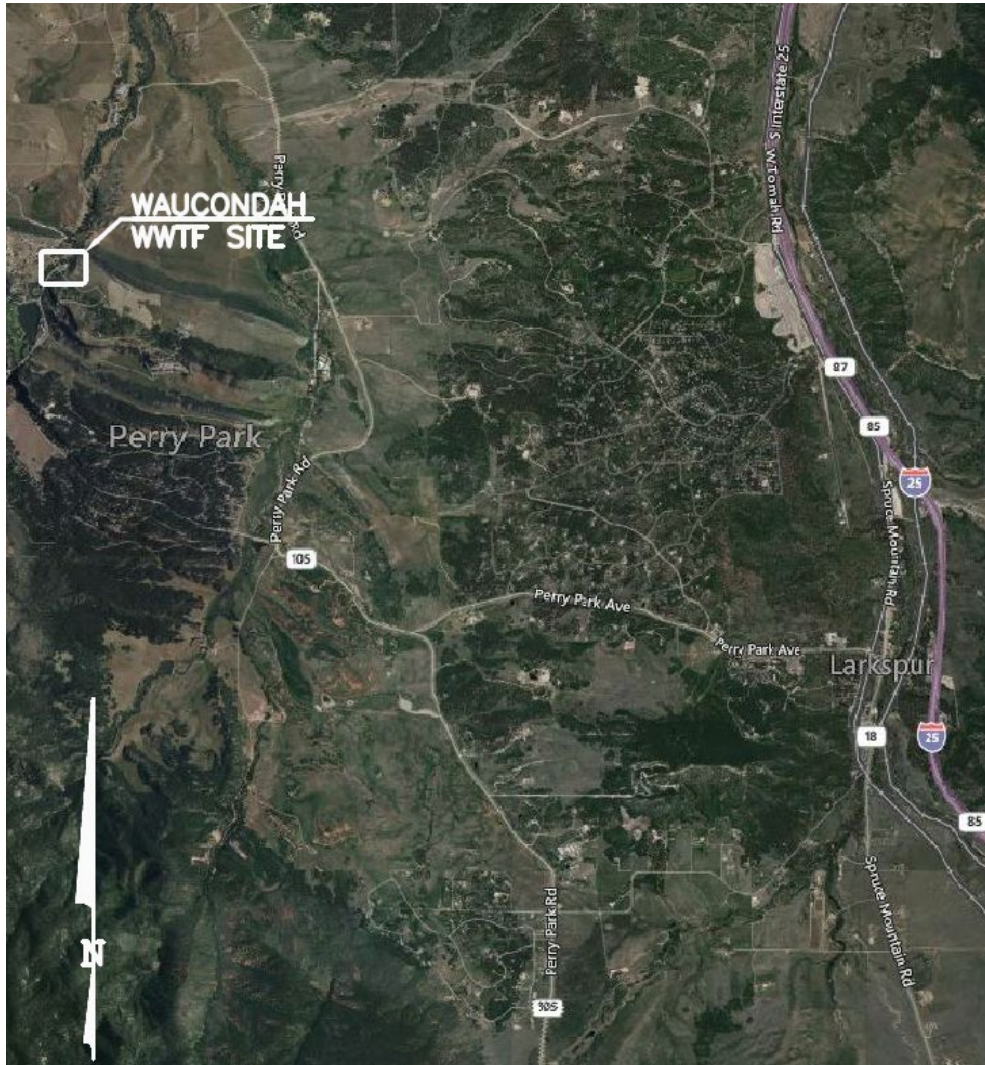
- On December 1, 2022, the site location application was found by the Division to be in conformance with the site application regulations and was approved.
- The CWA will review and provide comments on the discharge permit conditions once a draft permit is issued for comment.



PINE CANYON
VICINITY MAP

CREATED BY: MJC DATE: 05/31/2020

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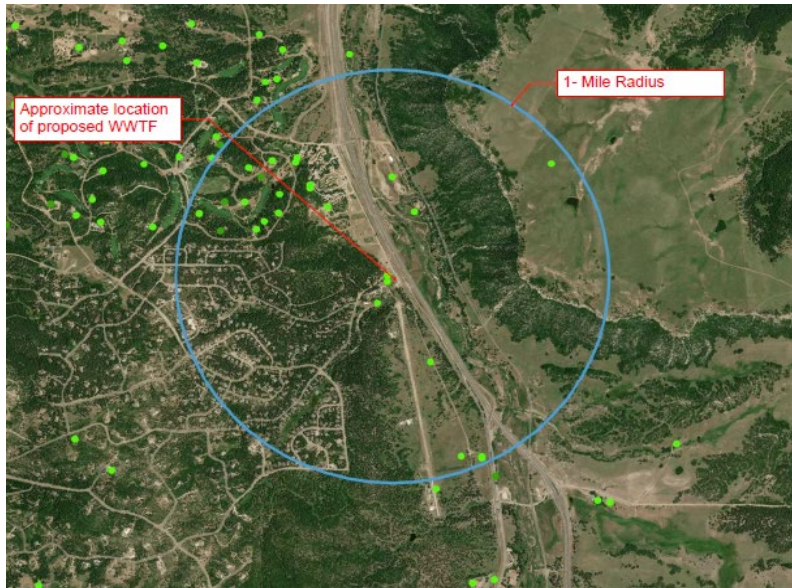
SITE APPLICATION

Perry Park Water and Sanitation District – Waucondah Wastewater Treatment Facility Site Application Review

- ✓ The site application related to significant changes to the WWTF to replace digestors that are over 40 years old.
- ✓ The Phosphorus Wasteload Allocation revision was not needed.
- ✓ The WWTF phosphorus concentration limits had not been exceeded.
- ✓ CWA recommended approval of this application.



TOTAL PHOSPHORUS WASTELOAD AND CONCENTRATION ALLOCATION VIOLATION

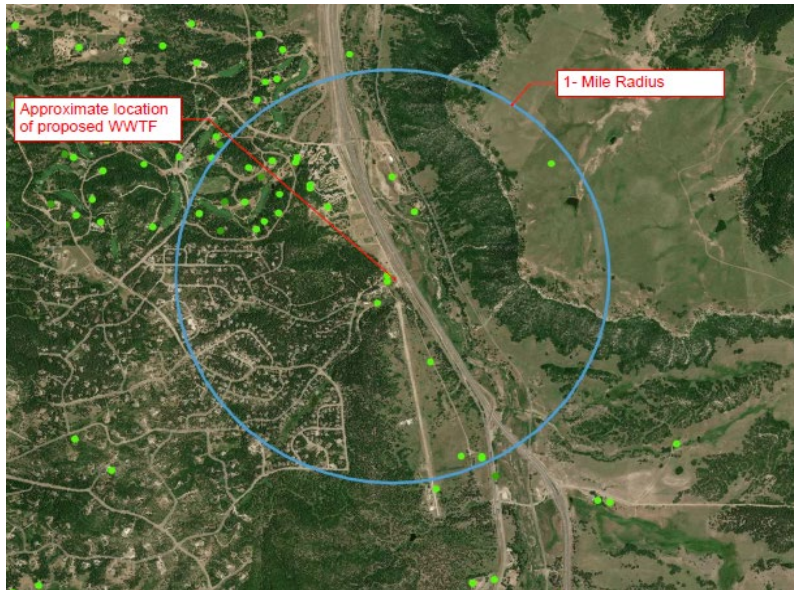


Jellystone RV Park – Jellystone Park at Larkspur WWTF

- / On May 13, 2020, the Division, with CWA concurrence, approved a Phosphorus Trade of 145.2 lbs. from decommissioned OWTS's to 72.6 lbs. of WWTF discharge to groundwater.
- / The Division ultimately approved the associated site application and WWTF design report and construction plans and on May 14, 2020, issued CDPS Certification COX631080.



TOTAL PHOSPHORUS WASTELOAD AND CONCENTRATION ALLOCATION VIOLATION



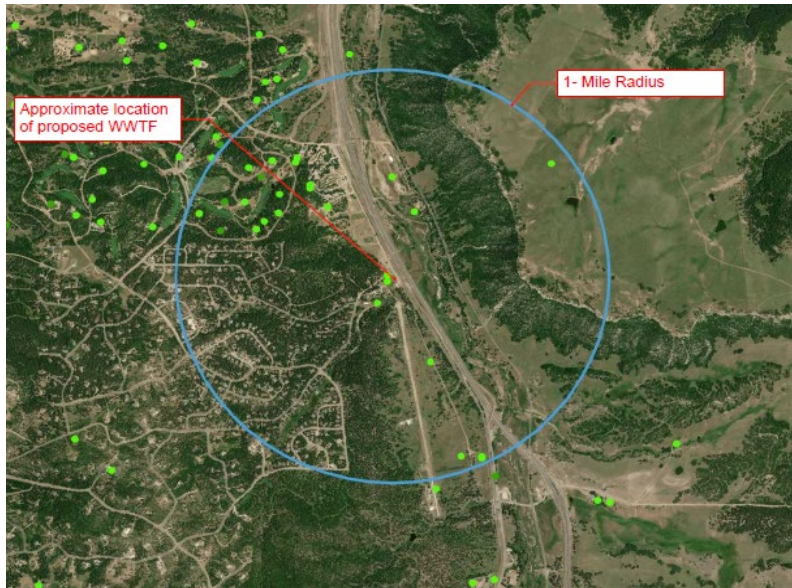
Jellystone RV Park – Jellystone Park at Larkspur WWTf

- / After beginning operations in June of 2020, the WWTf encountered problems with meeting effluent permit limits.
- / Exceedances included: monthly average total phosphorus concentration limit, monthly total inorganic nitrogen concentration limit, and annual phosphorus wasteload allocation.
- / In 2022, the facility exceeded its average total phosphorus concentration limit in January and April.



TOTAL PHOSPHORUS WASTELOAD AND CONCENTRATION ALLOCATION VIOLATION

Jellystone RV Park – Jellystone Park at Larkspur WWTF



- / On July 14, 2021, the Division issued a revised CDPS Certification which, among other conditions, requires the WWTF to achieve final compliance with discharge limits by 8/1/2024.
- / The CWA is monitoring the Division's actions regarding enforcement of the CDPS permit and, as of the end of 2022, had not taken any formal action against the facility owner.
- / If a SEP is ultimately required to mitigate the violations, the CWA would appreciate consideration of locating the SEP project in the Chatfield watershed.



EFFORTS IN 2022 TO BETTER UNDERSTAND AND REDUCE POLLUTANT LOADS IN THE WATERSHED AND RESERVOIR

- / Member Activities
- / Watershed Model Update Efforts
- / Colorado School of Mines Project
- / Funding of Non-point Source Projects
- / Securing Additional Revenue for NPS projects
- / Lake Nutrients Rulemaking participation
- / Plans for 2023/2024



MEMBER ACTIVITIES

Many of the member entities' typical outreach programs continued to be impacted by COVID-19 precautions. However, additional in-person events were able to resume in 2022, such as:

- / The City of Littleton conducted stream clean-ups and manned four stormwater booths.
- / Jefferson County hosted a public cleanup of the Clear Creek corridor on National Public Lands Day (690 volunteers).
- / DC Clear ran 12 informational newspaper ads.
- / The Town of Castle Rock held its annual Spring Up the Creek clean-up event (178 volunteers).
- / DC initiated a new curbside household chemical disposal service.



PROGRESS TO PROMOTE WATER QUALITY PROTECTION –TOWN OF CASTLE ROCK

- / Craig and Gould North Infrastructure Improvement Project (\$7.6 million): Persistent flooding in an historic neighborhood is being addressed. The Town implemented water quality improvements above and beyond MS4 requirements
- / Omni Tributary - Prairie Hawk Dr. to Red Hawk Dr. (\$1,345,275): The Town completed these Stormwater Masterplan Improvements to Omni Tributary and Unnamed Tributary in October 2022. The work included repairing extensive damage to both channels which will reduce sediment loading to East Plum Creek and reduce phosphorus transport.





PROGRESS TO PROMOTE WATER QUALITY PROTECTION – DOUGLAS COUNTY EXAMPLE



Willow Creek Stream Improvements at Sterling Ranch

- / Realigning and stabilizing 8,600 linear feet of streambank
- / Constructing 33 riffle-pool stream features
- / Planting 55 acres of native plant seed
- / Planting 50 trees and nearly 2,000 shrubs
- / Establishing 2 new acres of wetland habitat
- / Creating 18 acres of high-quality riparian habitat
- / Establishing a high functioning and more resilient stream corridor



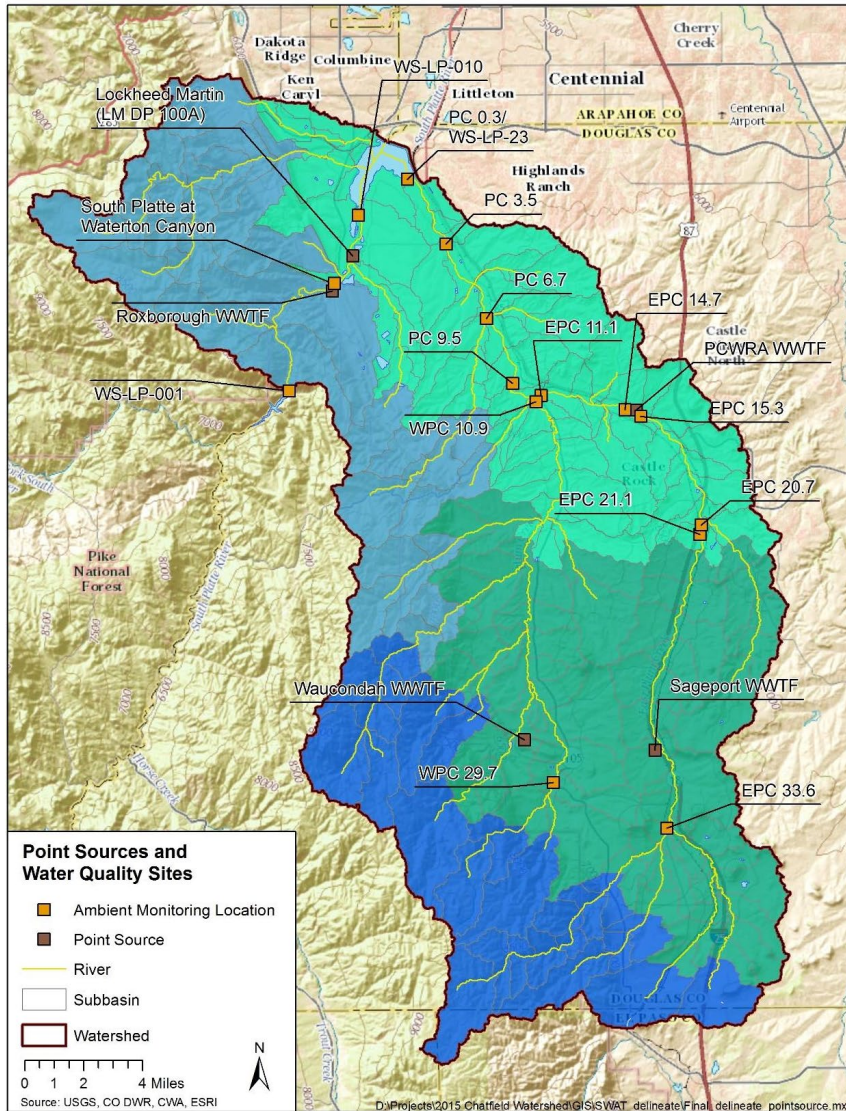
WATERSHED MODELING

Reach ID	Description	Total Phosphorus Load (% / lbs)	Total Nitrogen Load (% / lbs)	Total Sediment Load (% / tons)	Total Flow (% / af)
Percent Increase (%)					
Reach 105	East Plum Creek	5.2	1.6	5.7	1.7
Reach 56	East Plum Creek (upstream of PCWRA)	2.1	0.8	2.4	1.1
Reach 52	East Plum Creek (downstream of PCWRA)	1.1	0.4	2.4	0.7
Reach 45	Plum Creek at Sedalia	0.8	0.2	1.3	0.4
Reach 28	Plum Creek at Titan Rd	0.8	0.2	1.1	0.4
Absolute Increase (lbs, tons, af)					
Reach 105	East Plum Creek	59.1	449.2	21.3	80.4
Reach 56	East Plum Creek (upstream of PCWRA)	55.6	390.4	22.2	80.5
Reach 52	East Plum Creek (downstream of PCWRA)	55.5	388.7	22.2	80.5
Reach 45	Plum Creek at Sedalia	55.6	378.1	22.7	80.6
Reach 28	Plum Creek at Titan Rd	54.4	358.0	22.5	80.7

The Authority contracted with Lynker to use the watershed model to further explore model assumptions and inputs on the model results. In addition, Denver Water funded updating the watershed model by adding additional years of analysis to the original period of analysis. The purposes of the modeling efforts started in 2021 were to:

- ✓ Prepare a more robust model by expanding the model simulation period
- ✓ Simulate the watershed response to removal of modeled point source discharges
- ✓ Simulate the watershed response to wastewater facilities operating in the future at their full wasteload allocations

WATERSHED MODELING



- **Analysis 1: Watershed Simulated without Point Source Discharges.** The Chatfield watershed model was used to run scenarios with the point sources turned off. On average, the total phosphorus contribution from the South Platte River **decreased by 360 pounds per year** and the total phosphorus contribution from Plum Creek **decreased by 1,740 pounds per year.**
- **Analysis 2: Full Wasteload Allocation Simulation.** The Chatfield watershed model ran a scenario where 4 of the 5 modeled point sources discharge their full wasteload allocation to simulate an increase of approximately 3,458 pounds of TP per year. On average, the total phosphorus contribution from the South Platte River **increased by 950 pounds per year** and the total phosphorus contribution from Plum Creek **increased by about 2,500 pounds per year.**

COLORADO SCHOOL OF MINES FIELD STUDY

6 groups of ~5 students visited over 30 sites in the watershed in 2022

Locations CRC2, EPC17, and CRC1:

Arsenic and thallium were measured above drinking water standards, and selenium reported below detection limits.

Locations EPC13, EPC14, EPC15, and EPC16:

E. coli and selenium were detected in low concentrations in all samples.

Locations EPC9, EPC10, EPC11, and EPC12:

High levels of E. coli were measured in EPC9, EPC10, and EPC11.

Locations EPC5, SG1, EPC6, EPC7, and EPC8:

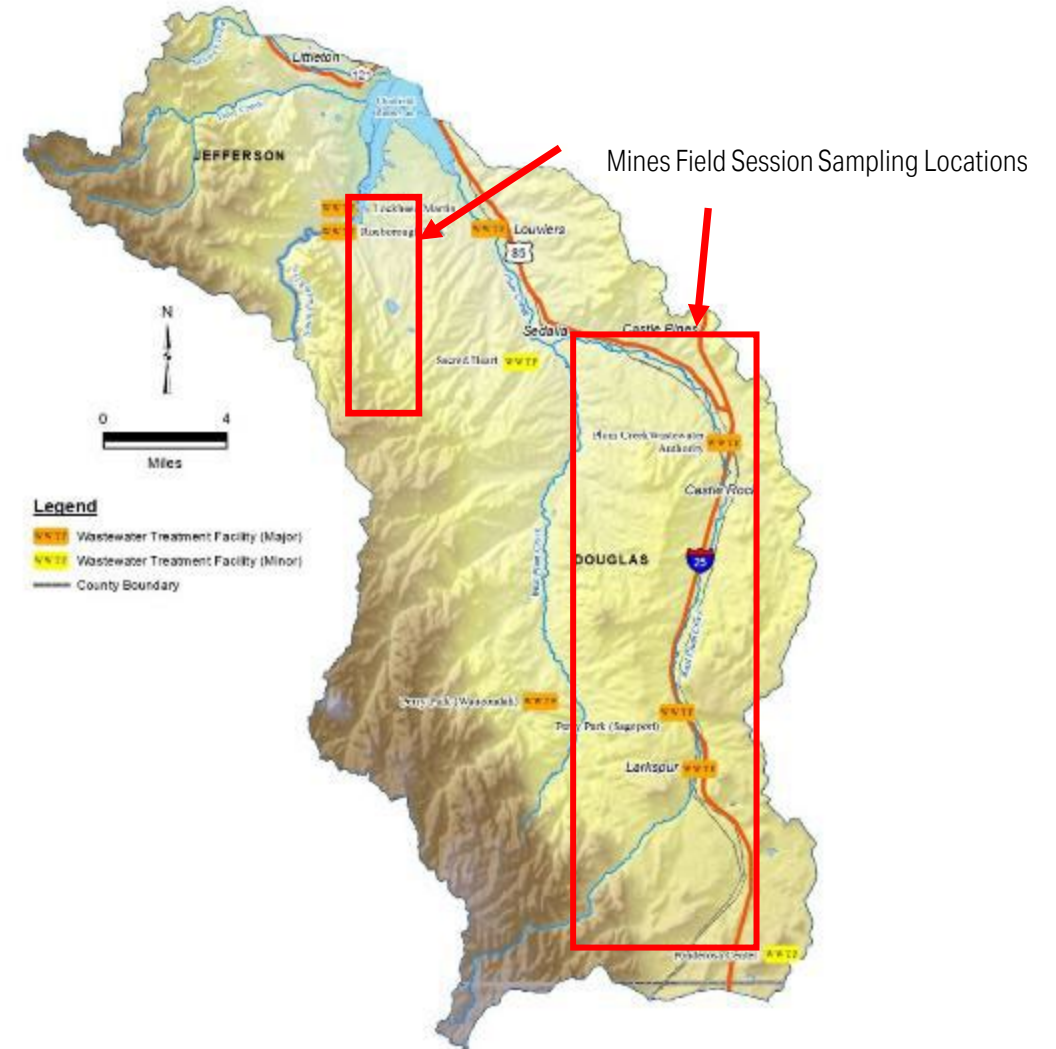
Arsenic was measured above drinking water standards and E. coli was detected at EPC5, SG1, and EPC6.

Locations EPC1, EPC2, EPC3, and EPC4:

Selenium exceeded the EPA aquatic life standard at EPC3. E. coli did not exceed any standards at any site.

Locations WC1, WC2, WC3A, and WC3:

Selenium exceeded CDPHE chronic and acute exposure levels at WC2.



COLORADO SCHOOL OF MINES FIELD STUDY

Example Results

				Analyte (mg/L)								Anion (mg/L)	Pathogens (cfu/100mL)														
				As	Se	P	Tl	Al	Fe	Zn	Pb	F-	Total Coliform	<i>E. coli</i>													
E Plum Creek above Larkspur Analysis 2021 Group 1: Torre Brown, Abby Bullard, Ashley Dunivan, Camila Garcia-Ferreira, Perla Lyon, Linh Vo				Standard																							
				EPA Aquatic Life Chronic [1]													0.15	0.0031	0.01	N/A	N/A	1	0.12	0.0025	N/A	N/A	N/A
				EPA Aquatic Life Acute [1]													0.34	N/A	0.01	N/A	N/A	N/A	0.12	0.065	N/A	N/A	N/A
				EPA Recreation [2]													1.8E-05	0.17	N/A	0.0002	N/A	N/A	7.4	N/A	N/A	N/A	N/A
				EPA Drinking [3]													0.01	0.05	N/A	0.002	N/A	N/A	N/A	0.015	4	N/A	N/A
				CDPHE Chronic [4]													2E-05	0.0046	0.17	N/A	N/A	WS	0.0082	N/A	N/A	200	126
				CDPHE Acute [4]													0.34	0.0184	N/A	N/A	N/A	N/A	0.11	0.05	N/A	200	N/A
				USDA Livestock [5]													0.01	0.05	N/A	N/A	5	0.3	25	0.015	2	200	N/A
Detection Limit				0.008	0.008	0.002	0.0006	0.0042	0.0003	0.0031	0.0057		0.1		1	1											
Site	Sample ID/Type	Date	Description	Location	BDL: below detection limit																						
CRC2	G1.1 / water	5/18/2021	Creek by I-25	39.132494 -104.51613	2.1E-02	2.0E-02	BDL	6.6E-03	5.1E-02	4.5E-01	3.4E-03	BDL	0.27	1550	17.3												
CRC2	G1.2 / water	5/18/2021	Holding pond by I-25 (south entry ramp)	39.132494 -104.51613	3.3E-02	BDL	1.7E-01	2.3E-02	1.97	1.42	2.5E-02	1.1E-02	0.28	>2420	155												
COC2	G1.3 / water	5/18/2021	Creek with culvert going under road	39.93631 -104.545603	1.2E-02	BDL	4.8E-02	9.1E-03	5.8E-01	3.0E-01	BDL	BDL	1.52	238.2	10.1												
EPC17	G1.4 / water	5/18/2021	Creek running under bridge	39.111605 -104.552934	1.3E-02	BDL	2.6E-02	1.1E-02	6.8E-01	3.6E-01	1.3E-02	BDL	1.53	167	21.2												
EPC14a	G1.5 / water	5/18/2021	Creek by railroad	39.234081 -104.880302	1.6E-02	BDL	9.8E-03	6.0E-04	3.6E-01	3.6E-01	BDL	BDL	1.42	1986.3	6												
EPC14a	G1.6 / water	5/18/2021	Storm runoff under railroad	39.234081 -104.880302	2.3E-02	BDL	2.3E-01	2.2E-02	2.46	1.38	2.2E-01	6.0E-02	0.34	>2420	214												
EPC14a	G1 / soil	5/18/2021	Erosion bank by creek	39.234081 -104.880302	BDL	BDL	2.0E-01	6.6E-03	1.4E-01	1.1E-01	3.2E-02	BDL	X	X	X												
CRC2	G1.7 / water	5/21/2021	Holding pond by I-25 (south entry ramp)	39.132494 -104.51613	3.6E-02	2.3E-02	1.3E-01	1.4E-02	BDL	5.7E-01	1.6E-02	BDL	X	X	X												
CRC2	G1.8 / water	5/21/2021	Holding pond by I-25 (south exit ramp)	39.132494 -104.51613	2.6E-02	BDL	2.5E-01	8.3E-03	1.06	1.23	4.8E-02	1.2E-02	X	X	X												
COC2	G1.9 / water	5/21/2021	Creek with culvert going under road	39.93631 -104.545603	1.1E-02	BDL	1.5E-02	3.2E-03	3.6E-01	2.2E-01	6.5E-03	BDL	X	X	X												
EPC17	G1.10 / water	5/21/2021	Creek running under bridge	39.111605 -104.552934	BDL	BDL	2.6E-02	4.2E-03	4.1E-01	2.5E-01	9.7E-03	BDL	X	X	X												
EPC14a	G1.11 / water	5/21/2021	Creek by railroad	39.234081 -104.880302	BDL	BDL	4.7E-02	5.4E-03	2.4E-01	3.4E-01	7.3E-03	BDL	X	23.4	2												

31

[1] US EPA, O. (2015). "National Recommended Water Quality Criteria - Aquatic Life Criteria Table." US EPA, Data and Tools, < <https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table> >
 [2] US EPA, O. (2015). "National Recommended Water Quality Criteria - Human Health Criteria Table." US EPA, Data and Tools, < <https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table> >
 [3] US EPA, O. (2015). "National Primary Drinking Water Regulations." US EPA, Overviews and Fact sheets, < <https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations> >
 [4] "Water Quality Control Commission regulations | Department of Public Health & Environment." (n.d.). < <https://dohpe.colorado.gov/water-quality-control-commission-regulations> >
 [5] Coppenhever, G. (n.d.). "United States Department of Agriculture." 31.





FUNDING OF NON-POINT SOURCE PROJECTS

- Continued funding of West Plum Creek Stream Management Plan (Total Cost \$265,786 with \$31,000 in-kind match funding, of which \$5,000 cash and \$5,000 in-kind services contributed by CWA).
- Colorado School of Mines Field Session (\$5,000 in-kind services contributed by CWA).
- CWA would fund additional NPS projects if additional sources of revenue could be secured.



SECURING ADDITIONAL REVENUE FOR NPS PROJECTS

- CWA's ability to fund more NPS projects is primarily limited based on matching funding requirement for grants.
- CWA investigated potential sources of additional revenue that would balance the CWA member's voluntary funding with the users of Chatfield Reservoir.
- This effort resulted in the CWA lobbying the 2023 Colorado Legislature to allow the collection of a water quality fee at the park entrances (like the fee the CCBWQA currently collects at Cherry Creek Reservoir)
- CWA was successful with the 2023 Colorado Legislature passing HB-267. In 2023 and 2024, CWA will work with the CPW commission to finalize the details of the water quality fee with an anticipated start date in January 2025.



PARTICIPATION IN THE LAKES NUTRIENTS RULEMAKING PROCESS

- CWA was a party to the Division's Lakes Nutrients rulemaking process. CWA coordinated and cooperated with the Division and other stakeholders to determine the need for and the appropriate standard for Lakes Nutrients, specifically for Chatfield Reservoir.
- As presented at the rulemaking hearing in April 2023, CWA supported the final recommendation of the Division as subsequently approved by the WQCC.
- CWA staff appreciated the cooperation and assistance we had with the Division staff throughout the process.

PLANS FOR 2023/2024

- Explore the effort and funding requirements needed to establish a site-specific standard for Total Nitrogen in Chatfield Reservoir. Because of limited funds, CWA proposes to prioritize this effort in front of the continued effort to establish revised point source wasteload allocations as required in Regulation #73. CWA request's the Commission confirm that this revised approach is acceptable to the Commission.
- Continue to partner with the Colorado School of Mines for the single point in time watershed sampling and analysis field session.
- Perform additional watershed modeling and explore potential for linkage with the existing Chatfield Reservoir model.
- Implement the NRCS NWQI grant



QUESTIONS?

