



**Cherry Creek Basin Water Quality Authority  
Technical Advisory Committee Meeting Agenda  
Thursday, February 1, 2024, 9:00 a.m.**

**In-person attendance is encouraged due to audio limitations in the meeting room.**

**In-Person: SEMSWA**

**7437 S. Fairplay St.**

**Centennial, CO 80112**

**Virtual: Zoom**

**<https://us06web.zoom.us/j/87425775963> Passcode: CCBWQA**

**Phone (646)931-3860 Mtg ID: 874 2577 5963# Passcode: 815374**

**TAC Meeting Documents can be found online at the link below.**

**<https://drive.google.com/drive/folders/12BoEhmFbnnMCxivnpjY2l7T5TzP8Azlq?usp=sharing>**

1. Call to Order (9:00) (5 minutes)
  - a. Introduction of Elysa Loewen, Pollution Abatement Project Manager
2. Meeting Minutes from January 4, 2024 (enclosed)
3. Highlights from the January 18, 2024 Board Meeting (Clary) (9:05) (5 minutes)
4. Action Items (9:10) (25 minutes)
  - a. Acceptance of RDS 2023 Annual Operations and Maintenance Report (Goncalves, enclosed)
  - b. Acceptance of RESPEC's Watershed Modeling Scenario Report (Clary/Leak, enclosed)
  - c. Recommend Approval of Reservoir Modeling Scope and Budget for Hydros Consulting (Clary, enclosed)
5. Discussion Items (9:35) (25 minutes)
  - a. WY 2023 Water Quality Monitoring Report Feedback and Questions (Stewart, [link to Draft Report](#))
  - b. Watershed Planning Update/Discussion (Clary/Stewart)
    - i. April 18, 2024 8:30-11:30 am.
  - c. CIP Subcommittee Next Steps (Knerr/Clary)
6. Presentations (none)
7. TAC Member Updates (10:00) (As Needed)
8. Updates (20 minutes)
  - a. Manager (Clary)
    - i. Reminder on Annual Report Content
    - ii. Cherry Creek Reach 1 Funding Update
    - iii. Lake Loop Shoreline Stabilization Status Update
    - iv. Lone Tree Creek Master Plan Update
    - v. Regulation 72 Hearing: February 12, 2024  
([https://drive.google.com/drive/u/1/folders/1CH5cOj9ym7Qr\\_cXi6n4uylyUZtfKs6gl](https://drive.google.com/drive/u/1/folders/1CH5cOj9ym7Qr_cXi6n4uylyUZtfKs6gl))
    - vi. July TAC Meeting (Currently on July 4th; suggest canceling)
    - vii. TAC Agenda
  - b. Cherry Creek Stewardship Partners (Davenhill)
  - c. [TAC Subcommittees](#) (As Needed)
    - i. Modeling Subcommittee
    - ii. Watershed Plan Subcommittee
    - iii. Cherry Creek Reach 1 Reservoir to Lakeview Drive Alternatives Analysis Subcommittee
    - iv. Lone Tree, Windmill, and Cottonwood Creek Subcommittee (Clary)
      - a. Draft Report for Overall Basin Report and Cherry Creek State Park Appendix:  
([https://wrightwater1-my.sharepoint.com/:f/g/personal/mlewis\\_wrightwater\\_c om/Eo6pCLbioQZKthk2zQjbMgABLPJhkUqiHKpQ5WsPZ\\_dNWg?e=zC3unP](https://wrightwater1-my.sharepoint.com/:f/g/personal/mlewis_wrightwater_c om/Eo6pCLbioQZKthk2zQjbMgABLPJhkUqiHKpQ5WsPZ_dNWg?e=zC3unP))
      - b. Comments Due Cherry Creek State Park Appendix: February 27, 2024

- d. Contractors (As Needed)
  - i. [Water Quality Update](#) (Stewart)
  - ii. Pollution Abatement Projects - CIP Status Report (Loewen, enclosed)
  - iii. In-Park PRF and RDS Maintenance and Operations (Goncalves)
  - iv. Regulatory (DiToro, enclosed)
  - v. [Land Use Referral Tracking](#) (Endyk)
- 9. Adjournment

[Board Binder](#) and [2024 Timeline](#)



**Cherry Creek Basin Water Quality Authority  
Technical Advisory Committee Meeting Agenda  
Thursday, January 4, 2024, 9:00 a.m.**

**TAC Members Present**

Alex Mestdagh, Town of Parker (zoom)  
Ashley Byerley, TAC Vice Chair, SEMSWA (representing the City of Centennial)  
Casey Davenport, Board Appointee, Cherry Creek Stewardship Partners  
Cayla Cappello, City of Greenwood Village  
Diana Rashash, Board Appointee, Arapahoe County Public Health  
Gene Seagle, US Army Corps of Engineers  
Jacob James, City of Lone Tree  
James Linden, SEMSWA - Alternate (zoom)  
Jessica La Pierre, City of Aurora (zoom)  
Jim Watt, Board Appointee, Mile High Flood District  
Joseph Marencik, City of Castle Pines (zoom)  
Jon Erickson, Board Appointee, Colorado Parks and Wildlife (zoom)  
Lisa Knerr, TAC Chair, Arapahoe County  
Michelle Seubert, Board Appointee, Cherry Creek State Park (zoom)  
Rick Goncalves, Board Appointee  
Ryan Adrian, Douglas County (zoom)  
Wanda DeVargas, Board Appointee, E-470 (zoom)

**Board Members Present**

Bill Ruzzo, Assistant Secretary, Governor's Appointee  
Tom Downing, Governor's Appointee (zoom)

**Others Present**

Alan Leak, RESPEC  
Erin Stewart, LRE Water  
Jane Clary, Wright Water Engineers, CCBWQA Technical Manager  
Jessica DiToro, LRE Water  
Joni Nuttle, CDPHE (zoom)  
Val Endyk, CCBWQA

**1. Call to Order**

Lisa Knerr called the meeting to order at 9:00 am.

**2. Meeting Minutes from December 7, 2023**

Casey Davenport moved to approve the December 7, 2023 meeting minutes. Seconded by Rick Goncalves.

**3. Action Items**

None

**4. Discussion Items**

a. TAC Vision for 2024

- i. TAC Overview and Role**
- ii. Subcommittees**
- iii. Open Discussion and Input**

Lisa Knerr led the TAC in a discussion regarding the TAC's vision for 2024.

She reviewed the TAC responsibilities as outlined in the Authority's bylaws and highlighted key documents found in the Board Binder.

The TAC discussed current subcommittees and the potential addition of a Capital Improvement Program Subcommittee. CIP Subcommittee topics may include: current and future CIP projects, support for the new PAPM on larger-scale projects, overall planning, etc. Bill Ruzzo noted that if a subcommittee is formed that a charter describing the purpose, role, etc., should be prepared. There was also some discussion about a future :

- RDS Subcommittee, which can be revisited after the Reservoir Model update has been completed.
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#### **b. Draft Timeline and Activities for 2024**

Jane Clary provided the TAC with an overview of the Authority's plan and timeline for 2024. A draft of the 2024 overview timeline can be accessed [here](#).

The project team has been working on an integrated spatial inventory to support the Watershed Plan, which can be accessed in draft form here: [Cherry Creek Basin Spatial Inventory](#).

#### **c. [WY 2023 Monitoring Report Presentation](#) (Provisional Draft)**

Erin Stewart presented the Provisional Annual Water Quality Monitoring Report to the TAC. The [memo](#) provided outlines the the provisional report content and what will be included with the amended report.

The [WY 2023 Monitoring Report Provisional draft](#) was provided to the TAC for review before the meeting.

Time will be provided to go over questions/comments at the February TAC meeting and the TAC was encouraged to reach out directly to Erin with specific questions.

#### **d. Watershed Modeling Update**

Alan Leak [presented](#) an update on the watershed modeling based on subcommittee direction in 2022 with the details outlined in the [memo](#) provided. Alan identified some corrections that are needed, so a revised version will be provided in the February TAC packet.

A small consultant team meeting is planned for January with RESPEC and Hydros to help define Hydros' scope for the Reservoir Model in early 2024.

Jane and Alan will continue to provide updates at future TAC meetings.

### **5. Presentations**

None (Water Quality Monitoring Presentation included under Discussion 4c)

### **6. Updates**

#### **a. Manager (Clary)**

##### **i. Support Letter for USACE Project**

The Authority provided a [letter of support](#) for the USACE's Cherry Creek Low-Level Release Sustainable Rivers Program Proposal and we are willing to assist with providing ongoing input and monitoring data during the evaluation.

##### **ii. Regulation 72 Update ([Responsive Prehearing Statements - Google Drive](#))**

The Authority submitted a Responsive Prehearing Statement with a "do not oppose" position regarding PWSD and Castle Rock's proposed revisions to dewatering requirements in Regulation 72. Rebuttals are due January 16, 2024; at this time, CCBWQA does not plan to file a Rebuttal. The Executive Committee has recommended involvement in discussions regarding "extent feasible" discussion.

##### **iii. Lake Loop Shoreline Stabilization**

At a future TAC meeting, the Lake Loop Shoreline Stabilization project will be discussed. The originally envisioned maintenance project cost has increased substantially due to "foot-by-foot" cut and fill

requirements identified by USACE under the 408 permit. CCBWQA will need to decide whether it wants to continue to support the project.

**iv. Lakeview Drive Road Repairs**

The repairs on Lakeview Drive are projected to be completed by January 26, 2024.

**v. Peoria Pond O&M Plan**

CCBWQA, SEMSWA, Greenwood Village and the Mile High Flood District have been working together to develop a clear inspection and maintenance plan for Peoria Pond, which has been circulated among the technical representatives of each organization. The Authority's legal counsel will be sharing a draft IGA accompanying the plan in draft form soon.

**vi. PAPM Recommendation**

Three qualified candidates responded to the PAPM RFP and the Executive Committee will make a recommendation to the Board at the January Board meeting.

**vii. Governor Appointees to the Board**

The Board will swear in new and re-appointed members at the January Board meeting. The Governor's appointees include Dr. Aditi Bhaskar, Dr. John Woodling and Tom Downing.

**viii. July TAC Meeting (Currently on July 4th)**

TAC will discuss at a future meeting.

**b. Cherry Creek Stewardship Partners (Davenhill)**

Casey Davenhill provided the TAC with an [update](#) and noted that the Water Quality Brochure updates will be coming early 2024.

Casey noted that the Eco Park seems to have more sand deposition than normal following the flood events in 2023.

The Stewardship Partners are coordinating with the USACE on the Dam Safety event in May and Casey will provide updates at future TAC meetings.

[Upcoming events](#).

**c. TAC Members (As Needed)**

**d. TAC Subcommittees (As Needed)**

**i. Modeling Subcommittee**

**ii. Watershed Plan Subcommittee**

**iii. Cherry Creek Reservoir to Lakeview Drive Alternatives Analysis Subcommittee**

**iv. Lone Tree, Windmill, and Cottonwood Creek Subcommittee**

Internal draft will be completed by the end of the month.

**e. Contractors (As Needed)**

**i. [Water Quality Update](#) (Stewart)**

**ii. Pollution Abatement Projects (see Manager update)**

[CIP Status Report](#) and [Spreadsheet for 2024 Timeline](#).

**iii. In-Park PRF and RDS Maintenance and Operations (Goncalves)**

**iv. Regulatory (DiToro) No additional updates.**

**v. [Land Use Referral Tracking](#) (Endyk)**

**7. Adjournment**

Lisa Knerr adjourned the meeting at 11:07 am.

[Board Binder](#) and [2024 Timeline](#)



## ACTION ITEM MEMORANDUM

To: CCBWQA Technical Advisory Committee  
From: Rick Goncalves, RDS & PRF Maintenance Manager  
Date: February 1, 2023  
Subject: 2023 RDS Annual Operations and Maintenance Report

**Request:** That the TAC accept the 2023 RDS Annual Report and recommend that the Board implement the RDS maintenance and evaluation tasks described in the report, as summarized in the memorandum.

The following activities are recommended for the RDS operation:

1. **Additional maintenance:** To prevent the compressor oil coolers from clogging with dust, overheating, and shutting down as occurred on August 21, 2023, recommend that Ingersoll Rand (IR) add two maintenance stops to their current maintenance schedule to clean the compressor oil coolers in April and in August, in between their three current contracted maintenance dates, to minimize the chances of another high temperature shutdown for an additional cost of \$1,750.
2. **Continue monitoring annual energy consumption:** It is recommended to continue monitoring the annual energy consumption and look for any trends that may point to developing issues or concerns with the compressor.
3. **Analyze existing aerator replacement:** It is recommended that the Authority evaluate whether replacement parts for the current aerator assemblies will continue to be available, and if not available, what other heads might be available as replacements.
4. **Analyze aeration system for expansion:** Once the 2024 reservoir modeling is completed, evaluate findings to assess whether the aeration system output should be increased, and if so, by how much. Additionally, analyze how much the existing system output could be increased by either changing the flow control orifices or changing out the heads with new, higher output heads, and determine how much the existing compressor's output can be increased. Based on this information, determine if the existing system can be modified or augmented to meet future needs or whether it would need to be completely replaced to better manage in-reservoir conditions.

**Budget:**

The additional recommended maintenance cost and operational activities are within the 2024 budget.

**Reports:** 2023 RDS Annual Report and [RDS Operations Policy](#)

**Suggested****Motion:**

Move that the TAC accept the 2023 RDS Annual Report and recommend that the Board accept the report and implement these recommendations during 2024:

- Authorize additional maintenance of the compressor oil coolers.
- Continue monitoring annual energy consumption.
- Analyze existing aerator equipment replacement by first developing a scope and budget subject to review and approval of the Executive Committee

**Next Steps:** Implement the Board's directive.



**CHERRY CREEK RESERVOIR  
DESTRATIFICATION SYSTEM**

**OPERATION AND MAINTENANCE  
ANNUAL REPORT  
2023**

Prepared by:

Ricardo Goncalves, PE

January 2024



**RG AND ASSOCIATES, LLC**

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**CHERRY CREEK BASIN WATER QUALITY AUTHORITY  
RESERVOIR DESTRATIFICATION SYSTEM  
OPERATION AND MAINTENANCE  
ANNUAL REPORT  
2023**

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**INTRODUCTION**

RG and Associates, LLC (RGA) has been retained to manage the operation and maintenance of the compressor and aeration system commonly referred to as the Cherry Creek Reservoir Destratification System (RDS). The RDS began operation in April 2008.

**RDS OPERATIONS POLICY**

At its January 20, 2022, meeting, the CCBWQA Board of Directors (Board) adopted a restated amended Policy for the Operation of the RDS (Policy) by resolution 2022-1-2 which recognized that the RDS historically has shown to reduce the summer Chlorophyll *a* average by 0.8 to 4.7 ug/l. As such, the board established a new operating season of approximately mid-April through approximately the end of September.

In accordance with this policy, then, RGA started the RDS on April 17, 2023, and shut it down at 11:28 am on October 5, 2023.

**SYSTEM OPERATION**

The RDS operated almost trouble-free in 2023, with only 21 hours of down-time, less than one day, as compared to 9 days in 2022. Part of this was due to the fact that there were no calls during the operating season for heads inadvertently broken by boat anchors, causing a system upset, and part was due to implementation of the RMS, the remote monitoring system, whereby we and the IR team were able to get almost immediate notification that the system was not operating and allowing repair teams to get out repairs immediately make repairs or adjustments. The operating log of the system is contained in the Appendix for more information.

**REPAIRS TO THE SYSTEM**

Repairs to the system were minimal in 2023. At the beginning of April, it was discovered that the lower pressure regulator and some of its piping had frozen and broken during the winter due to water that had accumulated during the past year of operation. IR repaired the broken pipe, installed drip-legs to allow accumulated water to be blown off, and installed a new pressure reducer.

The second repair was done in the second week of April, when at start-up testing of the system, it was found that two of the aerators were not operating correctly, by allowing too much air to pass through them. B&RW repaired these aerators by replacing parts and had them operational on April 17, for official seasonal start-up.

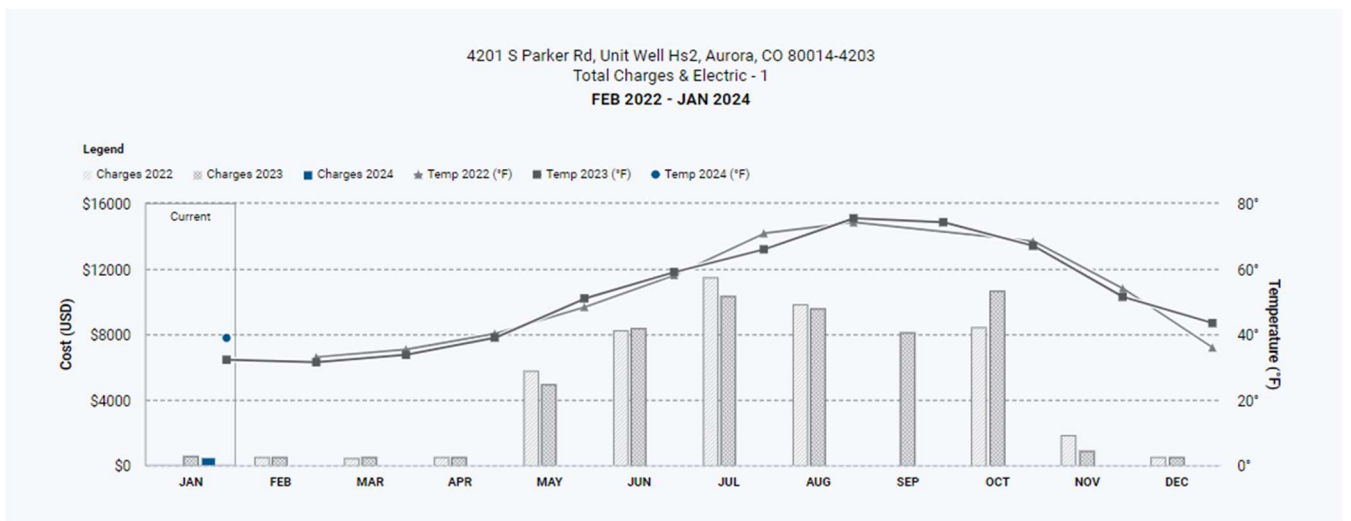
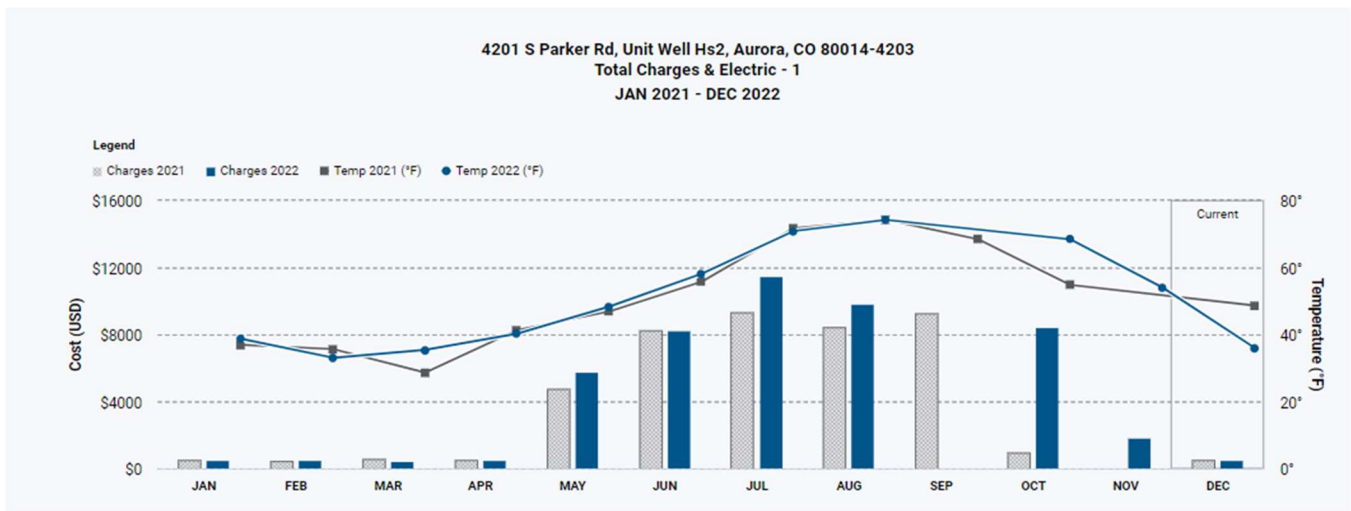
No other repairs were necessary throughout the operating season.

## MAINTENANCE ON THE SYSTEM

Routine maintenance was performed three times on the system on-schedule by Ingersoll Rand, in February, June and October, under their PerformanceCare maintenance contract with the Authority. One unscheduled maintenance event was done by the IR team on August 21, when we were alerted by the RMS that the compressor had shut down due to overheating. That maintenance included blowing accumulated dust off of the oil coolers to allow them to provide adequate cooling.

The final scheduled maintenance event was performed between October 3<sup>rd</sup> and 5<sup>th</sup> by Foster Dirt and Construction Co. Foster Dirt replaced B&RW during the year due to Blair Wacha's desire to retire and transition the business to Justin Foster of Foster Dirt and Construction Co. Blair stayed on the team during the year to assist and lend his expertise to the Foster Dirt Team. During this final maintenance, a few cam levers, cam pins and flow regulators were replaced due to corrosion on the old parts and the flow regulators were cleaned, but nothing of great consequence was noted. A complete log of the maintenance performed can be found in the Appendix of this report, for more detailed information regarding this maintenance event.

## 2023 ELECTRICAL USAGE AND CHARGES



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Xcel Energy provided two graphs shown above, graphing monthly data for the electrical charges and ambient temperatures for a two-year period of time, one superimposed on the other for comparison's sake. One graph is for the 2021-2022 period and the other is for the 2022-2023 period. Note that there is information missing September 2022, which may be a result of the meter not having been read. When the corresponding data is summarized, the total electrical usage for 2023 was 202,240 kWh at a cost of \$55,592.31 compared with 2022 that used 181,720 kWh at a cost of \$48,088.50.

The energy use of the RDS increased in 2023 as compared to 2022 as shown on the charts below. While the 2023 season was shorter than 2022 by 3 days, when comparing startup and stop dates for each year, April 17 to October 5, 2023 (171 days) versus April 15 to October 6, 2022 (174 days), 2023 only had less than one day of shutdown (21 hours) due to mechanical issues, versus 9 days in 2022, yielding 170 net operating days in 2023 versus 163 net operating days in 2022. The increase in operating time in 2023 equates to a 4.3 % increase in operating time, yet the actual power usage in 2023 increased by 11.8%. While there is no readily apparent reason for this difference, it may be a result of different weather patterns, or, more likely, the greater amount of average water depth in the reservoir due to the spring storms. It is recommended, as was last year, that the energy use be monitored going forward to determine whether there are any developing performance issues with the RDS.

#### System power Costs 2022-2023

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Charges 2022		\$481.62	\$473.83	\$486.83	\$5,802.56	\$8,276.05	\$11,497.55	\$9,826.91		\$8,420.90	\$1,820.20	\$504.77	\$47,591.22
Charges 2023	\$546.82	\$520.39	\$511.15	\$483.99	\$4,977.13	\$8,403.07	\$10,340.82	\$9,578.53	\$8,136.47	\$10,666.11	\$896.45	\$531.38	\$55,592.31
Charges 2024	\$532.55												
Temp 2022 (°F)		33.06667	35.39655	40.25806	48.39655	58.13334	70.913795	74.25		68.46774	54.06452	36	
Temp 2023 (°F)	32.25714	31.5	33.76667	39.03571	51.01724	59.07576	66.01667	75.5	74.29311	67.09091	51.48276	43.46875	
Temp 2024 (°F)	38.90625												

#### System Power Usage 2022-2023

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total KW-HR	
Energy Usage 2022 (kWh)			800	760	800	26,200	38,240	41,600	35,160		29,760	6,640	880	180,840
Energy Usage 2023 (kWh)	1,080	960	920	800	21,440	37,080	36,680	34,240	28,600	37,680	1,920	840	202,240	
Energy Usage 2024 (kWh)	840													
Temp 2022 (°F)		33.06667	35.39655	40.25806	48.39655	58.13334	70.9138	74.25		68.46774	54.06452	36		
Temp 2023 (°F)	32.25714	31.5	33.76667	39.03571	51.01724	59.07576	66.01667	75.5	74.29311	67.09091	51.48276	43.46875		

#### RDS EFFECT ON WATER QUALITY

Given that one of the original goals of the RDS was to reduce the upward mobility and subsequent proliferation of cyanobacteria during the growing season, July-September, to further reduce the number and severity of those blooms, the water quality information compiled by LRE WATER shown below indicates that the RDS system appears to have continued to be moderately successful in accomplishing that goal and was again in 2023.

## RESERVOIR WATER QUALITY

- Cyanobacteria blooms are variable
- Species responsible for closures due to toxin production occur but not every year
- 2023 - Cyano bloom in late July tested positive for toxin and affected areas were closed to contact for few days - within 2 weeks the bloom had dissipated and no toxin was detected (Microcystis - non N-fixer)

Year	Bloom	Toxin/ Closure
2014	Yes - Severe	Yes/ Yes
2015	Yes - Moderate	Not Detected/ No
2016	Yes - Severe	Yes/ Yes
2017	Yes	- / No
2018	Yes - Mild	Not Detected/ No
2019	Yes - Moderate	Not Detected/ Caution
2020	Yes - Severe	Yes/ extended
2021	No	
2022	Yes - multiple	Yes/ Yes
2023	Yes - multiple	Yes/ Yes



Cyanobacteria Activity-Courtesy of LRE Water

## **OVERALL HEALTH OF THE SYSTEM**

Generally, the RDS is in sound condition, especially since the compressor was replaced in January of 2020, four years ago. The life of a system like that should be upwards of 20-30 years, with the compressor being the most sensitive to wear and tear. The compressor is the only active part of the system and is only three years into its life span. The aerators and piping are passive parts, meaning they have no moving parts, and in the opinion of Foster Dirt and Construction Co., the aeration system is a “Cadillac” system, and should have at least five to ten years of life left. The only problems that we have had with the aeration system is from corrosion of the stainless-steel parts.

## **RECOMMENDATIONS**

The following recommendations are provided for consideration to improve system operation.

- To prevent the compressor oil coolers from clogging with dust and overheating, as occurred on August 21, to have Ingersoll Rand (IR) clean compressor coolers in April and in August, in between their three current contracted maintenance dates to minimize the chances of another high temperature shutdown. Jeff Handley has already quoted that to add this maintenance to their current contract would cost an additional \$1,750 and they are ready to implement this at any time.
- It is recommended to continue monitoring the annual energy consumption and look for any trends that may point to developing issues or concerns with the compressor.
- It is recommended that the authority begin an analysis to determine whether the current aerator assemblies will be able to be replaced in the coming years, if necessary, due to availability, and if not available, what other heads might be available as replacements.
- After completion of the reservoir/watershed modeling efforts, slated to be completed this year, it is recommended that data be analyzed from the results of that modeling work as to whether it is warranted to increase the aeration system output, and if so, how much to increase it, analyze how much the existing system output can be increased by either changing the flow control orifices or changing out the heads with new, higher output heads, how much the existing compressor’s output can be increased, all to determine if the existing system can be modified at all to meet future needs, augmented or whether it would need to be completely replaced.

## **Appendices**

**SUMMARY of 2023 OPERATIONS DETAILS, REPAIRS and MAINTENANCE**

## SUMMARY of 2023 OPERATIONS DETAILS, REPAIRS and MAINTENANCE

April 7-

- Rich Borchardt, Erin Stewart and Rick Goncalves met at the compressor building to begin season startup procedures.
- Found the compressor building open, doors ajar, and the lower pressure regulator and its piping disassembled.
- With no entries on the Maintenance log explaining what had happened, we decided to cancel the test until we could find out what the situation was.
- After contacting Ingersoll Rand, I found out, from Jeff Handley of IR that the maintenance personnel who were working at the facility had been let go for doing poor work, at our compressor as well as elsewhere and he said he would go out to check out and start the compressor.
- I related to CPW that vandalism was not the problem with the doors.
- Later in the day, Jeff called to say that the compressor was “good to go” and that the aerators were pumping air into the reservoir.
- He also said that he would arrange to get the piping and pressure regulator reinstalled, and leave the compressor shut off. He also said that the problem with the piping and lower regulator was caused by poor piping design that allowed water that is naturally produced by compressing air to accumulate at the low spots in the pipe then freeze and break the pipe and regulator.

April 14-

- Started the compressor at 12:30 pm then proceeded with Erin Stewart to inspect the aerator plumes by boat.
- Found two aerators out of order and established their locations by GPS to forward to B&RW for repair.
- Blair Wacha of B&RW was contacted and related to me that he would be out early morning on April 17 to repair the faulty aerators.
- Finished our inspection of the system and shut the compressor off at 1:45pm.



Broken aerator



Broken aerator



Marking broken aerator by GPS

April 17-

- B&RW finished its repair of the two identified aerators and a third that he had found.
- Blair called me to give details of the repairs, all of which were situations where the plastic flow regulators had been blown out of place by back-pressure, probably caused by too rapid a shutdown during shutdown last year.
- We will be revising our shutdown procedures for the end of the operating season.



- With notice that the system was operating in good condition, I directed Blair to leave the compressor on at 40 psi.
- I then notified CCBWQA staff, Parks personnel and managers that the RDS was on and operating for the season.

April 19-

- Went out to the reservoir twice to perform the final two pressure step increases to 50 psi and 55 psi which were performed at least 4 hours apart, as per Authority Operations Policy.

April 20-

- Received a quote from Ingersoll Rand for \$2,992.45 to repair the compressor piping to and from the lower pressure regulator that was damaged by water that is normal in air compression that accumulated, froze, and broke the pipe and regulator, replace the broken pressure regulator, and revise the piping to provide drop-legs with purge valves to prevent accumulated water from freezing and breaking the pipes again.
- This repair is not covered under warranty, as the warranty only covers the compressor itself.
- The entire system was designed to meet Authority directed operating parameters of “between April and November” and the building heater was designed to produce enough heat within those parameters to allow the compressor to work with at a minimum of 38 degrees. No one anticipated needing the building to be heated during the off season, as there would have been no need to. Except for accumulated water in the pipes? No one anticipated that either. Heating the building to prevent accumulated water from freezing would not have been the prudent solution. Providing drop legs and purging the water at the end of the operating season is.

April 24-

- The repair cost was approved by the Executive Committee and a work order prepared and issued to Ingersoll Rand.

May 8-

- Ingersoll Rand repaired the broken compressor piping and pressure reducing valve.

May 18-

- At the May 18th board meeting, the question was raised as to whether the broken piping and pressure reducing valve repairs should be paid for by Ingersoll Rand under warranty or not. Based on the analysis of the contract documents and maintenance agreement report that all warranties had expired, and, principally, that the damage to the compressor piping and pressure reducing valve had been due to the compressor piping not being sufficiently protected from freezing, through no fault of Ingersoll Rand, Ingersoll Rand was paid for the repairs.

June 14-

- Made a spot inspection of the compressor and visual inspection of the aeration pattern in the reservoir. Found the aeration pattern in the reservoir satisfactory, the compressor running at its 100 psi satisfactorily, but the pressure reducer gauge was showing only 45psi. Figuring that it had been adjusted during the piping repair, I adjusted it back up to 55 psi. Everything was good.



Initial pressure at 45 psi



Compressor pressure at 100 psi



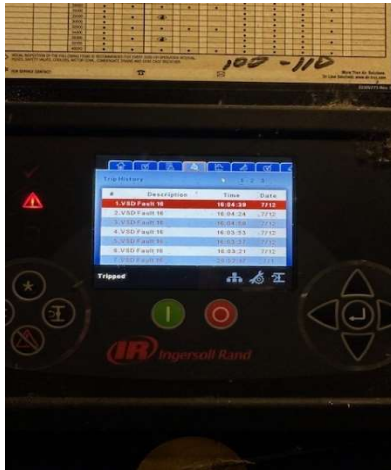
Reset pressure to 55 psi

July 5-

- Made another spot RDS inspection. Lake aerator pattern still showed no aerator issues. The compressor pressures were still good, but outlet pressure was down to 50 psi. Re-adjusted the pressure to 55 psi. Suspect that the changing reservoir levels due to the floods are affecting the pressures. Will continue to watch for any problems.

July 13-

- On 7/13/23 at 8:15 I performed a random visual inspection of the diffuser pattern on the reservoir and found that was no pattern, meaning that no air was getting to the aerators in the reservoir.
- Upon an inspection of the compressor, I found that it was off, with a fault indication reading "VSD Fault 16" at 4:18 pm, the day before, 7/12/23. This meant that the compressor had been off for about a day and a half.
- I called Jeff Handley at Ingersoll Rand, who indicated that IR had just received a fault notice, and that it was safe to restart the compressor, which was done.
- The compressor started immediately with no issue. Jeff said the fault had been caused by a voltage drop, probably from local area heavy air conditioning usage, or possibly caused by an electrical contractor known to have been working nearby.



July 19-

- I made another spot inspection. Reservoir aeration pattern was satisfactory, but discharge pressure was down to 50 psi. Pressure was adjusted to 55 psi. All else looked good. I checked aeration manholes for flood damage. Except for a piece of driftwood that floated into one of the manholes, there was little evidence that reservoir high flood levels had affected the manholes or the aeration piping at all, and there was definitely no damage.



July 26-

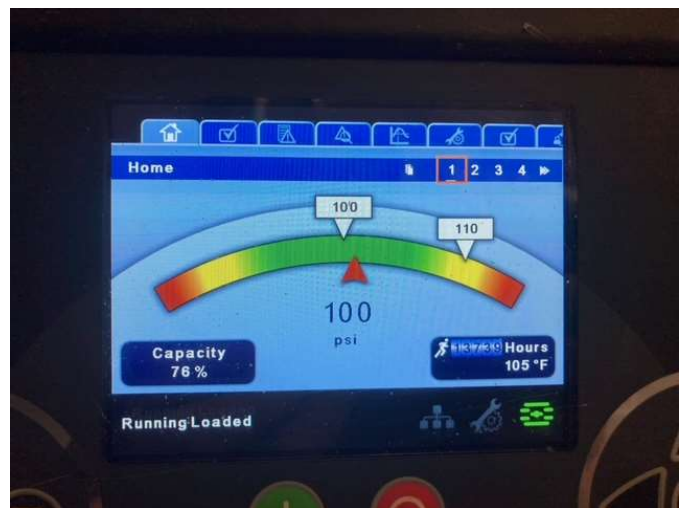
- I had Ingersoll Rand put the Authority on the IR Remote Monitoring System (RMS) so as to get notifications on compressor failure relatively quickly to minimize RDS down time.

August 21-

- Even though out of the country, I received an alarm by text message from the newly implemented RMS indicating that the compressor had shut down due to excessive bearing temperature. When I immediately called Ingersoll Rand, they said that they had received the same alarm and had someone already on it.
- The compressor had shut down because of excessive oil temperature caused by excessive dust build-up on the oil cooler. IR cleaned the oil cooler, and had the compressor back on line in 3 hours and 15 minutes from the time of the shutdown, substantiating the value of setting up the RMS process.



Trip notification



Compressor back in operation



**Dust buildup on the oil cooler**



**Oil cooler after cleaning**

#### October 4

- The yearly inspection and maintenance of the aeration system was done and completed on October 4, 2023, by Foster, Dirt and Construction. Its inspection report is contained in the Appendix of this report.
- Foster Dirt has taken over the duties that Blair Wacha with B&RW had previously done for the last number of years.
- No major issues were encountered. A few of the cam lock levers and pins were replaced due to corrosion.
- It appears that more pins and cams have been replaced in the area of the reservoir where Cottonwood Creek drains into it than any other place in the reservoir.
- This could be caused by wastewater effluent presence in Cottonwood Creek drainage from the upstream wastewater treatment plants.



**Corroded flow regulator**



**Corroded cam lever**



**Corroded pin**

#### October 5

- On October 5th, 2023, the process for compressor was shut down in accordance with Authority Policies and Procedures was begun.
- The newly installed drip legs were released of accumulated water to prevent water freezing in the pressure reducers.
- Water was blown off from the compressor and the regulator tank.
- A new procedure whereby the air discharge valves downstream of the pressure reducers were shut down very slowly while the compressor was still running to shut off the air to the aeration system gradually to prevent a sudden back pressure on the aeration system heads that has caused some of the O-rings to blow out in the past.
- After the valves were shut, the compressor was shut down for the winter at 8:15 am.



**Foster Dirt Report from 2023 Annual Maintenance**

## Foster Dirt Report from 2023 Annual Maintenance

### September 2023 repairs to Cherry Creek aeration system

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness (new .025") / End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
101	x	clean	0	0	0	0	0	38.507	51.912		
102	x	clean	0	0	0	0	0	38.477	51.894		
103	x	clean	0	0	0	0	0	38.446	51.879		
104	x	clean	1	0	0	0	0	38.413	51.870		
105	x	clean	0	0	0	0	0	38.373	51.875		
106	x	clean	0	0	0	0	0	38.357	51.899		
107	x	clean	0	0	0	0	0	38.338	51.931		
108		x	clean	0	0	0	0	38.327	51.956		
109	x	clean	0	0	0	0	0	38.361	51.823		
110	x	clean	0	0	0	0	0	38.338	51.830		
111	x	clean	0	0	0	0	0	38.322	51.842		
112	x	clean	0	0	0	0	0	38.298	51.870		
113	x	clean	0	1	0	0	0	38.277	51.891		
114	x	clean	0	0	0	0	0	38.349	51.786		
115	x	clean	0	2	0	0	0	38.337	51.740		Apparently moved by boater 50 ft. We moved back
116	x	clean	0	0	0	0	0	38.332	51.710		Apparently moved by boater 100 ft. We moved back
117	x	clean	1	2	0	0	0	38.327	51.669		Apparently moved by boater 50 ft. We moved back
118	x	replace	1	0	0	0	0	38.320	51.626		Heavy filter build up, filter taken for cleaning/repair
119	x	clean	0	1	0	0	0	38.314	51.584		Apparently moved by boater 50 ft. We moved back
120	x	clean	0	0	0	0	0	38.307	51.549		Apparently moved by boater 100 ft. We moved back
121	x	clean	0	0	0	0	0	38.477	51.998		
122	x	clean	0	0	0	0	0	38.452	52.043		
123	x	clean	0	0	0	0	0	38.431	52.077		
124											out of service since 2018
Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
201	x	clean	0	0	0	0	0	38.543	51.840		
202	x	clean	0	0	0	0	0	38.514	51.817		
203	x	clean	0	0	0	0	0	38.489	51.793		
204	x	clean	0	1	0	0	0	38.467	51.769		
205	x	clean	0	0	0	0	0	38.444	51.741		
206	x	clean	0	0	0	0	0	38.418	51.715		
207	x	clean	0	0	0	0	0	38.389	51.673		
208	x	clean	1	0	0	0	0	38.364	51.607		
209	x	clean	0	0	0	0	0	38.351	51.553		
210	x	replace	0	0	0	0	0	38.332	51.488		Heavy filter build up, filter taken for cleaning/repair
211	x	clean	0	0	0	0	0	38.339	51.428		Apparently moved by boater 50 ft. We moved back
212	x	clean	0	0	0	0	0	38.357	51.296		Apparently moved by boater 200 ft. We moved back
213	x	clean	0	0	0	0	0	38.384	51.254		Apparently moved by boater 50 ft. We moved back
214	x	clean	0	0	0	0	0	38.432	51.192		
215	x	clean	0	0	0	0	0	38.474	51.142		Mineral build up on fittings
216	x	clean	0	0	0	0	0	38.513	51.097		Mineral build up on fittings
217	x	clean	0	0	0	0	0	38.551	51.062		Mineral build up on fittings
218	x	clean	0	0	0	0	0	38.601	51.029		Blow off at end

Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg. xx.xxx min	Actual longitude W 104 deg. xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
301	x	clean	0	0	0	0	0	38.427	51.578		
302	x	clean	0	0	0	0	0	38.448	51.526		Mineral build up on fittings
303	x	clean	0	0	0	0	0	38.473	51.603		Mineral build up on fittings
304	x	clean	0	0	0	0	0	38.447	51.438		Mineral build up on fittings
305	x	clean	0	1	0	0	0	38.420	51.416		Blow off at end
306	x	clean	0	0	0	0	0	38.493	51.427		
307	x	clean	0	0	0	0	0	38.475	51.390		
308	x	clean	0	0	0	0	0	38.433	51.362		Blow off at end
309	x	clean	0	0	0	0	0	38.401	51.323		
310	x	replace	0	0	0	0	0	38.507	51.358		Heavy filter build up, filter taken for cleaning/repair
311	x	clean	0	0	0	0	0	38.485	51.342		
312	x	clean	0	0	0	0	0	38.456	51.293		Blow off at end
313	x	clean	0	0	0	0	0	38.542	51.323		
314	x	clean	0	0	0	0	0	38.571	51.276		Leaking fitting tightened
315	x	clean	0	0	0	0	0	38.601	51.220		Leaking fitting tightened
316	x	clean	0	0	0	0	0	38.627	51.170		Blow off at end
Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg. xx.xxx min	Actual longitude W 104 deg. xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 15 psi)	Notes
401	x	clean	0	0	0	0	0	38.525	51.633		
402	x	clean	0	0	0	0	0	38.536	51.604		
403	x	clean	0	0	0	0	0	38.556	51.559		
404	x	clean	0	0	0	0	0	38.580	51.512		
405	x	clean	0	0	0	0	0	38.606	51.462		
406	x	clean	0	0	0	0	0	38.634	51.408		
407	x	clean	0	0	0	0	0	38.660	51.347		
408	x	clean	0	0	0	0	0	38.689	51.300		
409	x	clean	0	0	0	0	0	38.709	51.250		
410	x	clean	0	2	1	0	0	38.740	51.192		
411	x	clean	0	1	0	0	0	38.761	51.152		Blow off at end
412	x	clean	0	0	0	0	0	38.492	51.570		
413	x	replace	0	0	0	0	0	38.502	51.543		Heavy filter build up, filter taken for cleaning/repair
414	x	clean	0	0	0	0	0	38.528	51.491		
415	x	clean	0	0	0	0	0	38.547	51.455		
416	x	clean	0	0	0	0	0	38.575	51.390		
417	x	clean	0	0	0	0	0	38.604	51.338		
418	x	clean	0	0	0	0	0	38.630	51.289		
419	x	clean	0	0	0	0	0	38.661	51.237		
420	x	clean	0	0	0	0	0	38.689	51.178		Mineral build up on fittings
421	x	clean	0	0	0	0	0	38.711	51.134		Blow off at end
422	x	clean	0	0	0	0	0	38.540	51.679		
423	x	clean	0	1	0	0	0	38.559	51.625		
424	x	clean	0	0	0	0	0	38.585	51.575		
425	x	clean	0	1	0	0	0	38.612	51.521		
426	x	clean	0	0	0	0	0	38.640	51.466		
427	x	clean	0	0	0	0	0	38.667	51.415		
428	x	clean	0	1	0	0	0	38.692	51.361		
429	x	clean	1	0	0	0	0	38.718	51.305		
430	x	clean	0	0	0	0	0	38.745	51.250		
431	x	clean	0	0	0	0	0	38.771	51.201		Blow off at end




Head location	Clean head & adjust position, check fitting tightness	Clean or replace filter	Upper cam pins replaced	Lower cam pins replaced	Replace cam levers	Replace O Ring	Replace other broken parts	Actual latitude N 39 deg, xx.xxx min	Actual longitude W 104 deg, xx.xxx min	Stainless Steel Band Clamp Thickness/ End of Line Blow Off Valve Pressure (distribution vault pressure 47 psi)	Notes
501	x	clean	0	0	0	0	0	38.608	51.716		
502	x	clean	0	0	0	0	0	38.646	61.759		Replace corroded SS fitting
503	x	clean	0	0	0	0	0	38.684	51.581		
504	x	clean	0	0	0	0	0	38.710	51.534		
505	x	clean	0	0	0	0	0	38.733	51.488		
506	x	clean	0	0	0	0	0	38.756	51.440		
507	x	clean	0	0	0	0	0	38.779	51.393		
508	x	clean	0	0	0	0	0	38.811	51.321		
509	x	clean	1	0	0	0	0	38.831	51.271		
510	x	clean	0	0	0	0	0	38.850	51.226		
511	x	clean	0	0	0	0	0	38.638	51.108		
512	x	clean	0	0	0	0	0	38.615	51.110		
513	x	clean	0	1	0	0	0	38.574	51.145		
514	x	clean	0	0	0	0	0	38.549	51.183		
515	x	clean	0	0	1 upper	0	0	38.526	51.232		
516	x	clean	0	0	0	0	0	38.507	51.276		
517	x	clean	0	1	0	0	0	38.573	51.678		
518	x	clean	0	0	0	0	0	38.591	51.633		
519	x	clean	0	0	0	0	0	38.614	51.587		
520	x	clean	0	0	0	0	0	38.641	51.530		
521	x	clean	0	0	0	0	0	38.661	51.484		
522	x	clean	0	0	0	0	0	38.693	51.427		
523	x	clean	0	0	0	0	0	38.723	51.368		Abnormally dirty filter
524	x	clean	0	0	0	0	0	38.747	51.325		Plugged filter
525	x	clean	0	0	0	0	0	38.774	51.267		
526	x	clean	0	0	0	0	0	38.802	51.213		
527	x	clean	0	0	0	0	0	38.821	51.162		Blow off at end



## EXTERNAL MEMORANDUM

**To:** Cherry Creek Basin Water Quality Authority  
Modeling Sub-committee

**From:** Alan J. Leak, P.E.   
Principal  
RESPEC  
720 South Colorado Blvd., Suite 410 S  
Denver, CO 80246

**Date:** January 22, 2024

**Subject:** Additional Watershed Model Scenarios and Scenario Approaches

Two additional watershed scenarios were completed using the Cherry Creek 2030 Future Development HSPF model:

1. Reduced WWTF TN concentration (Scenario 12).
2. Scenario 12 plus improved water quality treatment for all developed areas (Scenario 13).

Scenarios 8 through 13 were also rerun using an alternative approach where water quality efficiencies were adjusted using the flow efficiency. For the scenarios represented, flow, sediment, and nutrients were being adjusted. With small flow adjustments, changes in concentrations of parameters that are not intentionally being adjusted with each scenario (such as BOD and dissolved oxygen) are not obvious. However, the larger the flow adjustments become, the more the scenario concentrations of those parameters that are not intentionally being adjusted show up. Therefore, in the most recent run of scenarios, where flow adjustments were as large as 40%, the increases in concentrations of parameters such as BOD and dissolved oxygen were becoming apparent, and an alternative methodology was incorporated to also adjust the loads of all parameters based on the changes in flow. Details regarding the additional scenarios and the alternative efficiency factor methodology are provided in the following sections. Results are briefly described in this memo with the full results provided in Appendix A.

### ADDITIONAL SCENARIOS

Scenario 12 was developed using Scenario 11 (full 2030 buildout) as the base model. The WWTF TN concentrations were capped at 6 mg/l during the summer (April – September) and 8 mg/l during the winter (October – March). The Pinery, Parker, and Stonegate facilities exceed the seasonal limits 100%, 58%, and 23% of the simulation time-period, respectively. During these periods, the total nitrate-nitrite concentrations were reduced until there were no more

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exceedances. The Arapaho County Water and Wastewater Authority (ACWWA) facility never exceeded the seasonal TN limits, so those associated time series remained unchanged.

Relative to Scenario 11, the inflow TN loads and concentrations to Cherry Creek Reservoir for Scenario 12 were reduced by 5% and 3%, respectively. The TN load is still 51% higher than the base model, but the concentration is 1% lower. Inflow volume, TSS, and TP remained the same as Scenario 11.

Scenario 13 was developed using Scenario 12 as the base model. Efficiency factors for flow (0.4), TSS (0.5), TN (0.1), and TP (0.25) that were applied to new development in Scenarios 10 – 12 were applied to all developed model landuse categories.

As expected, Scenario 13 resulted in a reduction in inflow volume and water quality loads to the reservoir relative to Scenarios 11 and 12. However, there was a 10% and 15% increase in inflow TP and TN concentrations, respectively, relative to Scenario 11. These modeled increases are likely due to the modeled enrichment that occurs in the model when the flow efficiency change is larger than water quality efficiencies change (e.g., when more volume than load is removed at the edge of the stream, an increase in inflow concentration is expected). The results generated using the original methodology show the effects of changes in loads but do not maintain the original concentrations of the modeled constituents. Although applying the efficiencies directly to loads is an acceptable method to model load changes, our goal with this additional modeling is to use concentrations as the basis for projections related to the effects of improved water quality treatment for all developed areas. Thus, the alternative efficiency factor approach is provided for this purpose.

### ALTERNATIVE EFFICIENCY FACTOR APPROACH

The equation below was used to adjust the water quality efficiency factors as a function of the flow efficiency factor for Scenarios 8 – 13.

$$NewEff_{WQ} = (1 - Eff_{Flow}) \times OriEff_{WQ} + Eff_{Flow}$$

where:

$$\begin{aligned} NewEff_{WQ} &= \text{adjusted water quality efficiency factor} \\ Eff_{Flow} &= \text{efficiency factor for flow} \\ OriEff_{WQ} &= \text{original water quality efficiency factor} \end{aligned}$$

This methodology prevents enrichment in water quality pollutants when the flow efficiency is higher than a water quality efficiency. It also preserves runoff concentrations for parameters that have zero efficiency by setting the efficiency to that of flow. For example, the efficiency for BOD was zero, so the concentrations in runoff actually increased using original method even though the load remained the same. The original and new efficiency factors are summarized in Table 1.



Table 1. Summary of Original and New Efficiency Factors.

Parameter	Original Efficiency Scen 8 – 9	New Efficiency Scen 8 – 9	Original Efficiency Scen 10 – 13	New Efficiency Scen 10 – 13
Flow	0.20	0.20	0.40	0.40
TSS	0.50	0.60	0.50	0.70
TP	0.25	0.40	0.25	0.55
TN	0.10	0.28	0.10	0.46
Temperature	0.00	0.20	0.00	0.40
DO	0.00	0.20	0.00	0.40
BOD	0.00	0.20	0.00	0.40
Carbon	0.00	0.20	0.00	0.40

The new methodology resulted in more accurate estimates of future loads and concentrations. Overall, the narrative remains the same regarding inflow to the reservoir where TSS, TP, and TN loads are still substantially larger than the base condition for Scenarios 8-12. Scenario 13 resulted in no change in TP load and slight increase in TSS and TN load relative to the base condition. Furthermore, all inflow concentrations for Scenario 13 were lower than the base results. A legend for the various scenarios is presented in Table 2. Presented in Figures 1-7 are graphic representations of the results of the alternative model runs.

Table 2 – Scenarios Legend

Scenario	Description	Representative Icons	Color
Base	Baseline Model	None	
4	2030 Level of Development Only		
5	2030 WWTF Flows Only		
6	2030 Level of Development and WWTF Flows Only		
7	2030 Level of Development, WWTF Flows, and PRFs		
8	2030 Level of Development, WWTF Flows, PRFs, and LID		
9	2030 Level of Development and LID only		
10	2030 Level of Development, WWTF Flows, PRFs, and LID at 40% Volume Reduction	 + 20% Added Volume Reduction	
11	Scenario 10 with Parker Wastewater Flows from Future Development diverted to Rueter-Hess Reservoir	plus future additional Parker WW to Rueter Hess Reservoir	
12	Scenario 11 with WWTF TN in Discharges Limited to 6 mg/l Summer, 8 mg/l Winter	plus future additional Parker WW to Rueter Hess Reservoir and reduced TN from WWTF	
13	Scenario 12 with Improved Water Quality Treatment for all Developed Areas	plus future additional Parker WW to Rueter Hess Reservoir, reduced TN, and improved WQ for all development	

Figure 1 - Modeled Flow

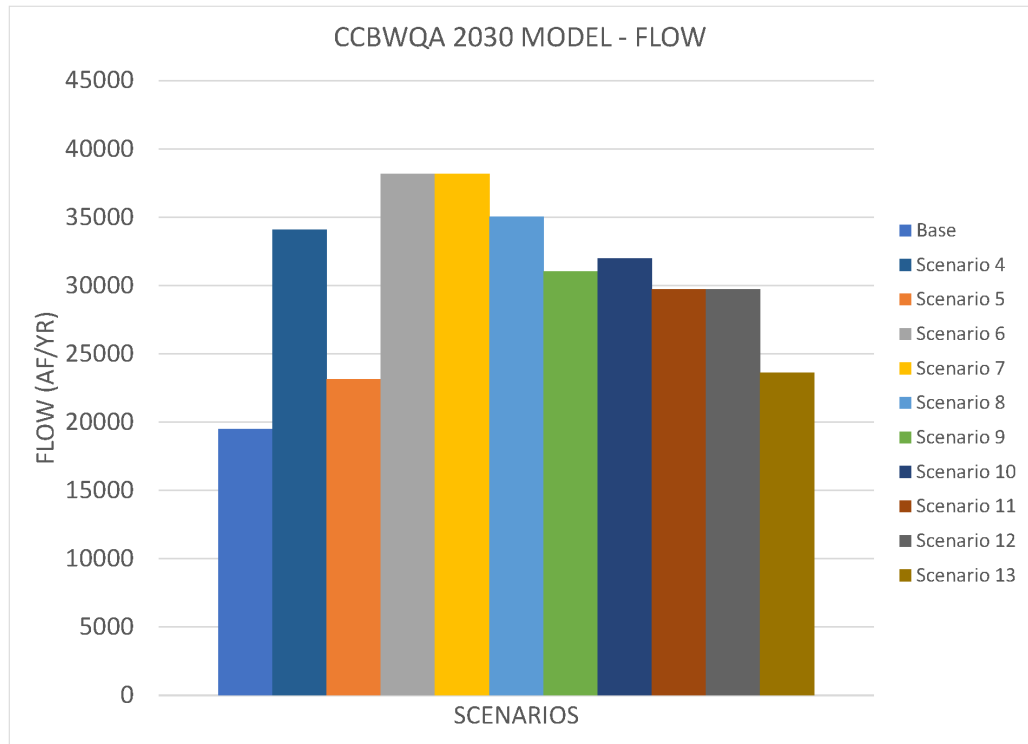


Figure 2 - Modeled TP Load

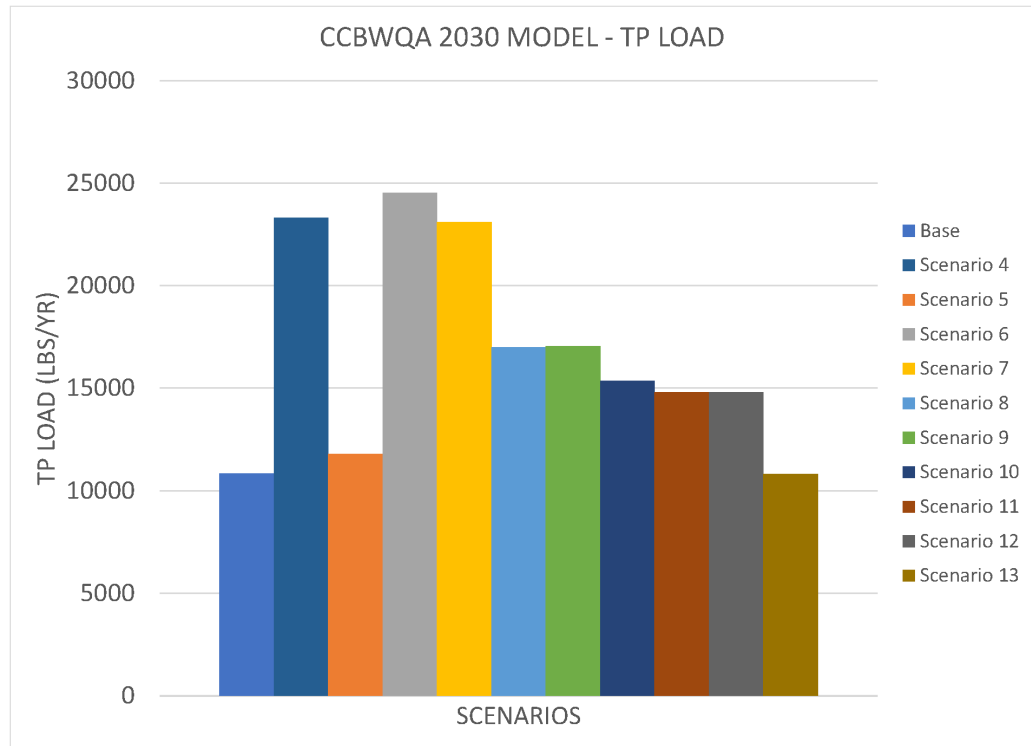


Figure 3 - Modeled TP Concentration

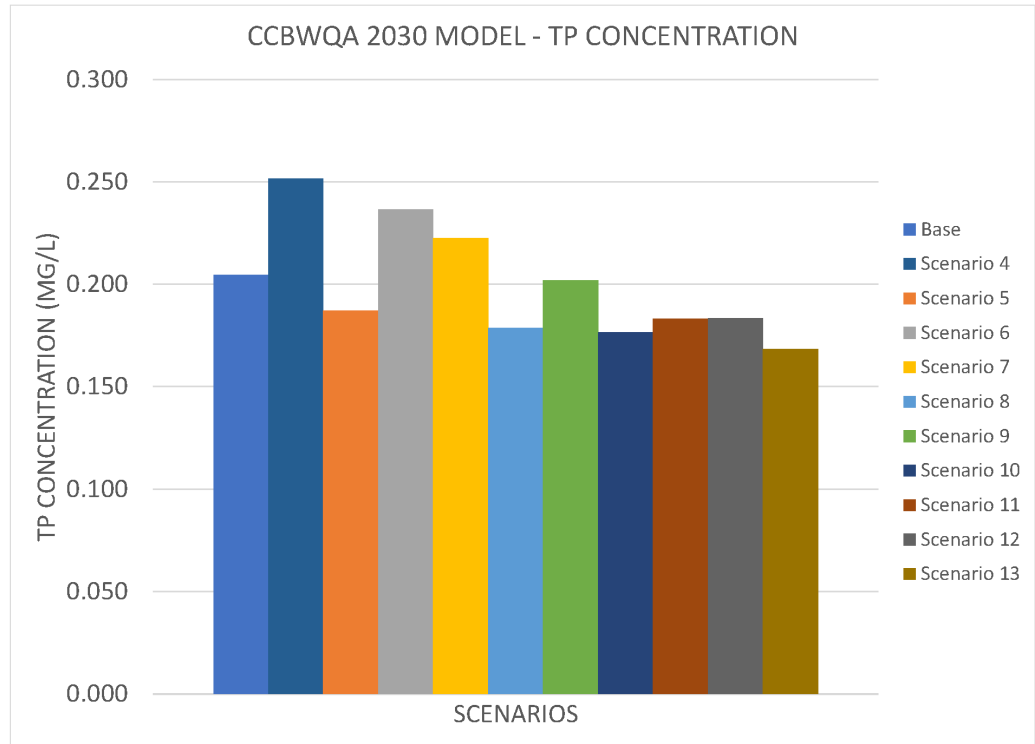




Figure 4 - Modeled TN Load

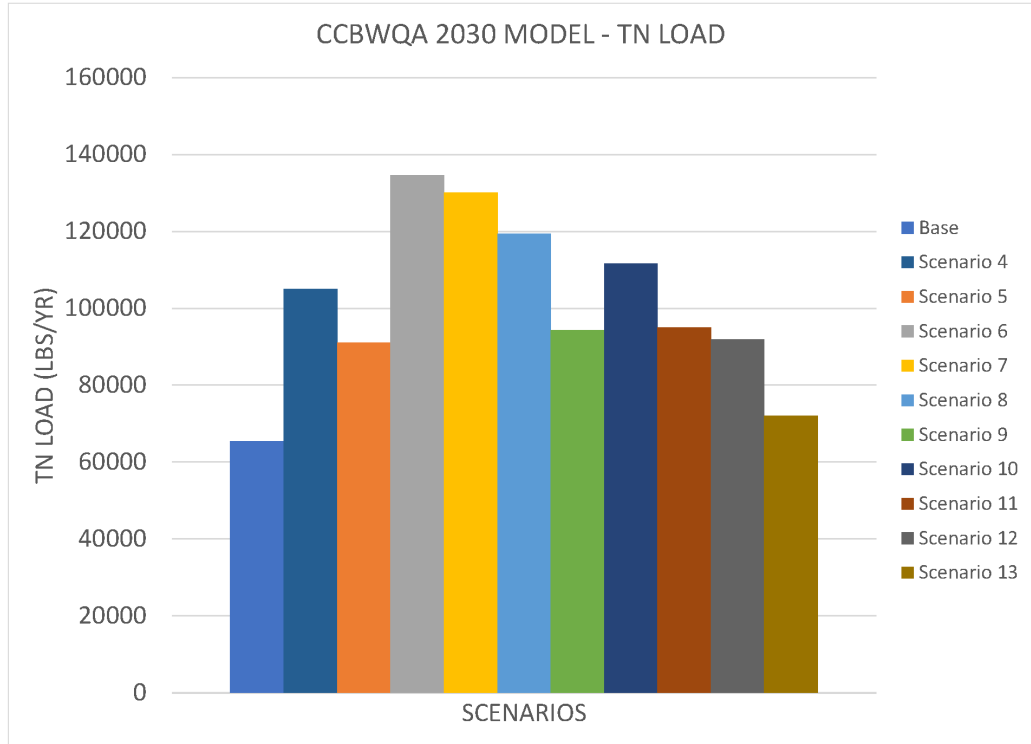


Figure 5 - Modeled TN Concentration

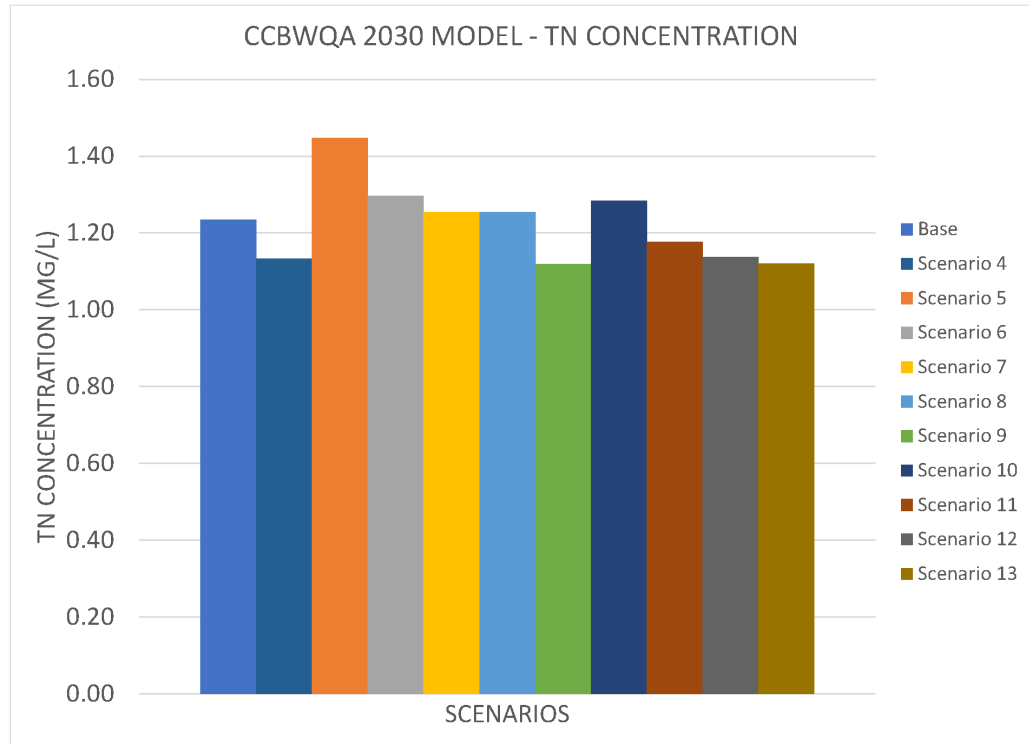


Figure 6 - Modeled TSS Load

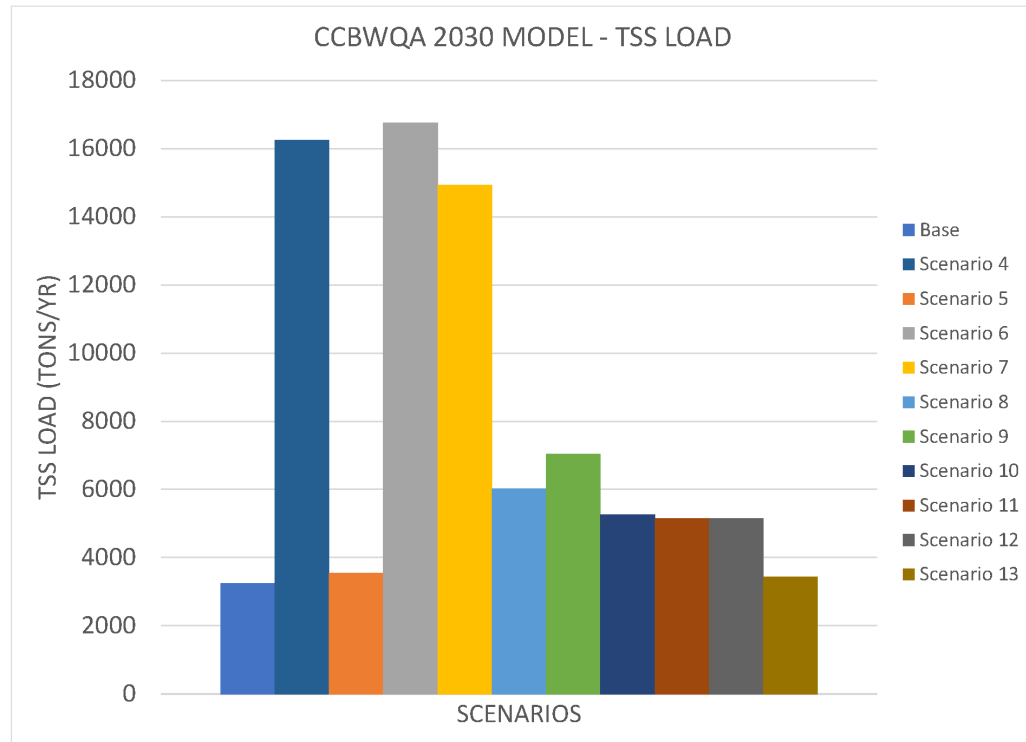
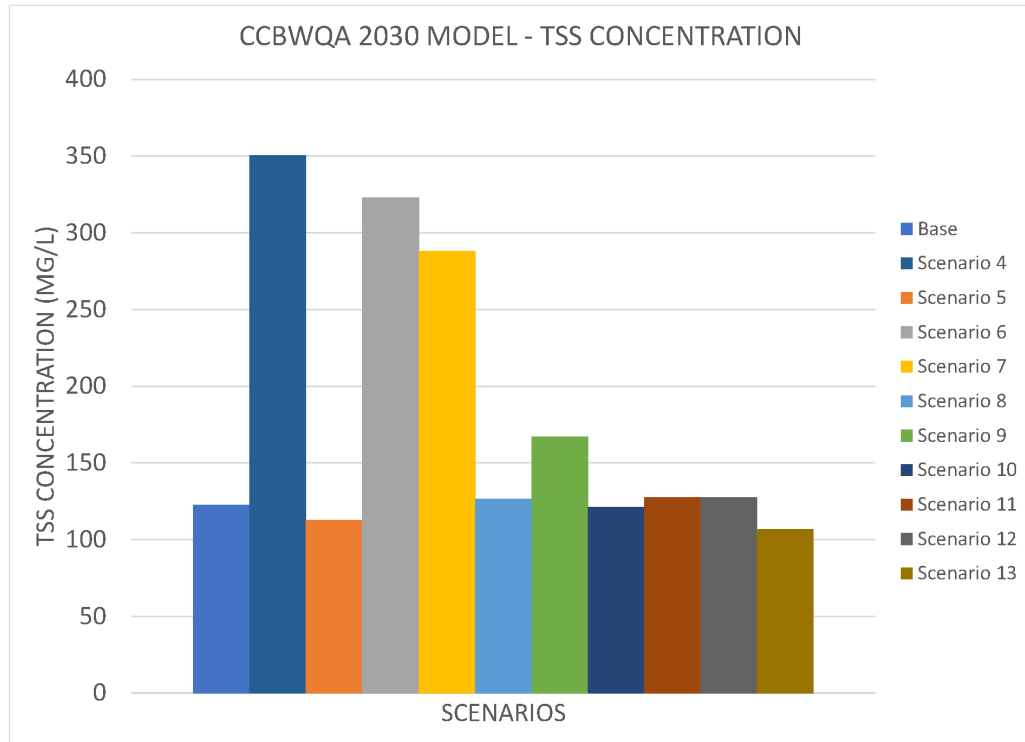


Figure 7 - Modeled TSS Concentration





## APPENDIX A

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Load and Concentration Results	Base_v2 Model				Scen004 Model				Scen005 Model				Scen006 Model				Scen007 Model				Scen008 Model				Scen009 Model				Scen010 Model				Scen011 Model				Scen012 Model				Scen013 Model											
	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN								
Source	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR	AF/YR	TON/YR	LB/YR	LB/YR
Cherry Creek Surface Flow	14473	2845	9447	43356	27991	15730	21495	80410	17815	3146	10367	65972	31706	16238	22682	106792	31706	14413	21252	102499	28756	5552	15261	92211	25101	6570	15323	70119	25929	4805	13694	84859	23680	4697	13141	68397	23680	4697	13141	68397	19173	3278	9967	49777								
Cottonwood Creek Surface Flow	4340	280	839	18568	5195	395	1132	20374	4647	281	853	21561	5503	396	1147	23377	5503	396	1136	23280	5353	346	1053	22956	5046	345	1049	20050	5203	334	1007	22651	5203	334	1007	22651	4034	112	537	20224												
Other Surface Inflow	679	122	560	3520	903	123	685	4260	679	122	561	3525	935	123	703	4367	935	123	703	4367	906	123	687	4273	873	123	668	4159	852	123	657	4094	830	123	645	4020	830	123	645	4020	422	42	310	2000								
Total Inflow	19491	3247	10846	65444	34090	16249	23312	105043	23141	3549	11781	91058	38144	16757	24532	134535	38144	14932	23092	130146	35015	6022	17001	119440	31019	7039	17040	94328	31984	5262	15358	111604	29713	5155	14793	95068	29713	5155	14793	95068	23629	3432	10815	72001								
FWMC	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L	cfs	mg/L	mg/L	mg/L								
Cherry Creek Surface Flow	20.0	145	0.240	1.10	38.7	413	0.282	1.06	24.6	130	0.214	1.36	43.80	377	0.263	1.24	43.80	334	0.246	1.19	39.72	142	0.195	1.18	34.67	193	0.224	1.03	35.81	136	0.194	1.20	32.71	146	0.204	1.06	32.71	146	0.204	1.06	26.48	126	0.191	0.95								
Cottonwood Creek Surface Flow	5.99	47.4	0.071	1.57	7.18	55.9	0.080	1.44	6.42	44.4	0.068	1.71	7.60	53	0.077	1.56	7.60	53	0.076	1.56	7.39	48	0.072	1.58	6.97	50	0.076	1.46	7.19	47	0.071	1.60	7.19	47	0.071	1.60	5.57	20	0.049	1.84												
Other Surface Inflow	0.937	133	0.303	1.91	1.248	100	0.279	1.73	0.937	133	0.304	1.91	1.29	97	0.277	1.72	1.29	97	0.277	1.72	1.25	100	0.279	1.73	1.21	104	0.281	1.75	1.18	106	0.284	1.77	1.15	109	0.286	1.78	1.15	109	0.286	1.78	0.58	73	0.271	1.74								
Total Inflow	26.9	123	0.205	1.23	47.1	351	0.251	1.13	32.0	113	0.187	1.45	53	323.1	0.237	1.30	53	287.9	0.223	1.25	48	126.5	0.179	1.25	43	166.9	0.202	1.12	44	121.0	0.177	1.28	41	127.6	0.183	1.18	41	127.6	0.183	1.14	33	106.8	0.168	1.12								

Change Relative to Base_v2	Scen004 - SCH only				Scen005 - WWTF only				Scen006 - SCH & WWTF				Scen007 - SCH, WWTF, & PRF				Scen008 - SCH, WWTF, PRF, & LID				Scen009 - SCH & LID				Scen010 - 008 with Flow eff X 2				Scen011 - 010 w/ Base Parker WWTF				Scen012 - 011 w/ WWTF TN Capped				Scen013 - 012 w/ Eff Fac on all Dev			
	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN	Flow	TSS	TP	TN
Source	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ
Cherry Creek Surface Flow	93	453	128	85	23	11	10	52	119	471	140	146	119	407	125	136	99	95	62	113	73	131	62	8	79	69	45	96	64	65	39	58	64	65	39	58	32	15	6	15
Cottonwood Creek Surface Flow	20	41	35	10	7	0	2	16	27	42	37	26	27	42	35	25	23	24	25	24	16	23	25	8	20	19	20	22	20	19	20	22	20	19	20	22	-7	-60	-36	9
Other Surface Inflow	33	1	22	21	0	0	0	0	38	1	26	24	38	1	26	24	34	1	23	21	29	1	19	18	26	1	17	16	22	1	15	14	22	1	15	14	-38	-66	-45	-43
Total Inflow	75	400	115	61	19	9	39	96	416	126	106	96	360	113	99	80	85	57	83	59	117	57	44	64	62	42	71	52	59	36	45	52	59	36	45	21	6	0	10	10
FWMC	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ	% Δ
Cherry Creek Surface Flow	93	186	18	-4	23	-10	-11	24	119	161	10	12	119	131	3	8	99	-2	-19	7	73	33	-6	-7	79	-6	-19	9	64	1	-15	-4	64	1	-15	-8	32	-13	-20	-13
Cottonwood Creek Surface Flow	20	18	13	-8	7	-6	-5	8	27	12	8	-1	27	12	7	-1	23	0	2	0	16	6	7	-7	20	0	0	2	20	0	2	20	0	2	-7	-57	-31	17	17	17
Other Surface Inflow	33	-24	-8	-9	0	0	0	0	38	-27	-9	-10	38	-27	-9	-10	34	-25	-8	-9	29	-22	-7	-8	26	-20	-6	-7	22	-18	-6	-7	22	-18	-6	-7	-38	-45	-11	-9
Total Inflow	75	186	23	-8	19	-8	-9	17	96	164	16	5	96	135	9	2	80	3	-13	2	59	36	-1	-9	64	-1	-14	4	52	4	-11	-5	52	4	-10	-8	21	-13	-18	-9



**TO:** Jane Clary, Cherry Creek Basin Water Quality Authority (CCBWQA) Technical Manager  
**FROM:** Christine Hawley, Hydros Consulting Inc.  
**SUBJECT:** Scope of Work for Linked Reservoir Model Runs in 2024  
**DATE:** January 25, 2024

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Hydros currently has a contract with Cherry Creek Basin Water Quality Authority (CCBWQA) for 2024 that includes \$50,000 to run simulations with the Cherry Creek Reservoir Model using watershed model results as the basis for inputs (i.e., linked model runs). At the time of development of the Hydros contract for 2024, there was uncertainty as to which model runs should be conducted and how the effort should be coordinated with CCBWQA, so a detailed scope of work was not included in the contract. At a recent meeting (1/24/24) between representatives of CCBWQA, Hydros, and the watershed modeling contractor (RESPEC), an approach was developed. This memorandum presents the scope of work reflecting that approach and the anticipated schedule and budget for consideration by CCBWQA.

## 1 Phased Approach

Recognizing that this effort comprises the first full test of linkage of the watershed and reservoir models for the Cherry Creek basin, a phased approach is specified to allow for flexibility to support issue resolution, as needed. Phase I consists of conducting the initial set of linked model runs. The first task of Phase II will be to share the draft model run results with CCBWQA (or the appropriate subcommittee) in an informal presentation. The remaining tasks in Phase II will be determined by CCBWQA in response to Phase I findings and the remaining budget.

Model runs to be considered in this scope of work are:

- **Baseline Run** (simulating observed conditions from 2003-2016);
- **Watershed Model Run 6** (2030 development and WWTF flows; RESPEC, 2024); and
- **Watershed Model Run 13** (2030 development and WWTF flows, PRFs, LID, and 40% volume reduction, diversion of Parker wastewater flows from future development to Rueter-Hess Reservoir, and WWTF TN discharges limited to 8 mg/L in winter and 6 mg/L in summer; RESPEC, 2024).

These scenarios were selected to be the initial model linkage simulations because they are expected to produce notable differences in reservoir response relative to baseline, thereby supporting evaluation of model linkage, providing useful insights to CCBWQA, and informing next steps.

## 1.1 Phase I – Conduct Initial Linkage Runs

### Task 1. Coordinate with RESPEC to Receive Data

Hydros will coordinate with RESPEC to receive the required daily flow and water-quality output from the watershed model for the selected model runs. The data request will include specifications for format and content for each run. Watershed model output will be needed for the following locations:

- Cherry Creek inflow to Cherry Creek Reservoir;
- Cottonwood Creek inflow to Cherry Creek Reservoir; and
- Direct watershed inflow to Cherry Creek Reservoir.

In addition to daily flow rates, daily watershed model output will be needed at each location for the following water-quality constituents:

- Temperature (°C);
- Dissolved oxygen (mg/L);
- Total organic carbon (mg/L as C);
- Dissolved organic carbon (mg/L as C);
- Total ammonia (mg/L as N);
- Nitrate plus nitrite (mg/L as N);
- Total nitrogen (mg/L as N);
- Orthophosphate (mg/L as P);
- Total phosphorus (mg/L as P); and
- Total suspended solids (mg/L).

### Task 2. Develop Data Translation Tools

Tools will be developed and tested to translate watershed model outputs into reservoir model inputs in accordance with the detailed linkage methodology previously developed by the CCBWQA Model Linkage subcommittee (Hydros et al., 2020). While only a small number of model runs are planned for this scope of work, tool development is considered an important step to streamline future linked model runs.

### Task 3. Conduct Data Translation and Model Simulations

Watershed model output received from RESPEC will be processed and used to calculate reservoir model input values using the translation tools. The reservoir water balance will also be modified for each run, updating daily outflow rates to maintain daily storage values from the baseline run. Flow and water-quality input files will then be created for the reservoir model. Finally, the reservoir model scenario runs will be conducted.

### Task 4. Process and Review Model Results

Reservoir model run results will be processed and reviewed, focusing on the following output:



- Total Nitrogen (July-Sept Avg. – 1 m, CCR-2);
- Total Phosphorus (July-Sept Avg. – 1 m, CCR-2);
- Chlorophyll *a* (July-Sept Avg. – 1 m, CCR-2);
- Cyanobacteria (timeseries, 1 m, CCR-2); and
- Dissolved oxygen (timeseries, bottom cell, CCR-2).

Graphics will be generated to support visual comparison of results from the three simulations.

## 1.2 Phase II – Coordinate with CCBWQA and Conduct Next Steps

### Task 1. Present Summary of Results to CCBWQA

Hydros will prepare and deliver an informal presentation of the findings from Phase I to CCBWQA (or the appropriate sub-committee). The presentation will include recommendations for next steps.

### Task 2. Conduct Next Steps Determined by CCBWQA

The remaining tasks in Phase II will be determined by CCBWQA in response to Phase I findings and the available remaining budget. It is anticipated that Phase II tasks may include documenting Phase I results, conducting additional runs, and/or revisiting the linkage approach, as needed.

## 2 Schedule and Budget

The proposed schedule is summarized in Table 1, including key anticipated meetings, CCBWQA decision-points, and deliverables. Dates are approximate, recognizing that meetings have yet to be scheduled and will likely need some adjustment to accommodate CCBWQA schedules. The entire SOW is scheduled to be complete in 2024.

**Table 1. Summary of Anticipated Project Timeline**

Project Milestone	Target
Watershed Model Output Received	On or before February 9, 2024
Presentation of Phase I Results	On or before May 15, 2024
CCBWQA Decision-Point for Next Steps	On or before June 15, 2024
Completion of Next Steps (TBD; Phase II, Task 2)	End of October 2024

The total anticipated budget for this project is \$50,000, corresponding with the contract amount for 2024 with Hydros for Reservoir Model Runs. Cost estimates for Phase I and Phase II are summarized in Table 2.

**Table 2. Summary of Estimated Cost by Project Task**

Project Phase	Anticipated Cost
Phase I – Conduct Initial Linkage Runs	\$38,915
Phase II – Coordinate with CCBWQA and Conduct Next Steps	\$11,085
<b>Total Cost:</b>	<b>\$50,000</b>

### 3 References

Hydros Consulting, RESPEC, Kilgore, R. 2020. Technical Memorandum to CCBWQA Re: Proposed Approach to Link the Cherry Creek Watershed and Reservoir Models. April 30, 2020.

RESPEC. 2024. Memorandum from A. Leak (RESPEC) to CCBWQA Modeling Sub-committee. Subject: Additional Watershed Model Scenarios and Scenario Approaches. January 22, 2024.

**CHERRY CREEK BASIN WATER QUALITY AUTHORITY**  
**2023 Capital Project Status Report**  
January 26, 2024

**RESERVOIR PROJECTS**

1. East Shade Shelters Phase III and Tower Loop Phase II Shoreline Stabilization (CCB-17.5.1 and CCB-17.7)
  - a. Description: These projects were identified in 2014 through the annual inspection. The Tower Loop Phase II connects to the Phase I project and extends shoreline protection 570 feet to the southeast towards Dixon Grove. The East Shade Shelters Phase III starts on the north end of the Shade Structure and goes 400-feet to the south.
  - b. Status: Consultant selection is scheduled for the 1<sup>st</sup> quarter. A consultant selection committee will be set in February (1/29/21). At the February TAC meeting Jason Trujillo, Jon Erickson, Lanae Raymond, Bill Ruzzo were interested in serving on the consultant selection committee (2/11/21). This selection committee was discussed at the 3/18/21 Board Meeting, and no further members were added. The Request for Proposals (RFP) has been posted on BidNet and Proposals are due 04/21/21 (3/25/21). The pre-proposal meeting was held on 4/7/21. 5 proposals were received on 4/28/21; the selection committee is reviewing them. Interviews were held and a selection is being brought to the May Board meeting (5/14/21). Board authorized negotiations with RESPEC (5/27/21). Agreement has been executed with RESPEC (10/15/21). Field Survey of project areas and topographic mapping is underway (12/30/21). A design kickoff meeting was held on 4/22/22. A design sprint workshop was held on 7/12/22 which included a site visit and evaluation of alternatives. RESPEC is developing a recommended alternative (9/8/22). RESPEC provided updated project costs for budgeting (10/13/22). The 30% submittal was received on 11/16/22 and is under review. CCBWQA provided comments on 30% review on 1/17/23; a value engineering effort is recommended as the project costs exceed the budget. The value engineering meeting was held on 2/24/23. RESPEC's request for additional services was approved by TAC and Board in May (5/25/23). The reservoir water level has come down since the May and June storms and additional erosion was observed on 7/14/23; a site visit was made with RESPEC on 8/1/23 and the erosion areas at East Shade Shelters were measured. It has been estimated that roughly 14 cubic yards of soil was eroded from the 2023 storms (9/15/23). A progress meeting was held on 9/15/23, RESPEC will refine the breakout of components between recreational (CPW responsibility), water quality (CCBWQA responsibility), and shared (both CPW and CCBWQA responsibilities) costs and work on 408 review submittal to US Army Corps of Engineers. RESPEC was provided by the US Army Corps of Engineers' guidance on cut and fill and asked to prioritize the 408 application and review; they are coordinating with Gene Seagle in preparation for this submittal. *RESPEC has provided a draft plan of action for the 408 permit submittal to be discussed with Gene (1/15).*

Tower Loop Phase II –

1. In 1<sup>st</sup> and 2<sup>nd</sup> quarters, PAMP receives design submittal that includes revisions from value engineering effort. Final design and construction are currently scheduled for 2032 and 2033 (see row 12 of 10-year CIP).

## STREAM RECLAMATION PROJECTS

1. Cherry Creek Stream Reclamation at Arapahoe Rd. - Valley Country Club to Soccer Fields, Reaches 3 to 4 (CCB-5.14C)
  - a. Description: This project continues the work on Cherry Creek by CCBWQA, MHFD, and local partners. It ties into the previous stream reclamation projects of Cherry Creek Eco Park to Soccer Fields (CCB-5.14A) and Cherry Creek at Valley Country Club (CCB-5.14B). The 5,167 Linear Feet of stream reclamation reduces bed and bank erosion immobilizing approximately 88 pounds of phosphorus annually. The project is anticipated to be funded over several years and likely be broken into phases.
  - b. Status: In 2021, an IGA was executed between CCBWQA, MHFD, City of Aurora, and SEMSWA to begin this work. IGA Amendment that brings in 2022 funding is under review (5/13/22). Board authorized IGA Amendment for 2022 funding on 7/21/22 (8/12/22). IGA Amendment has been revised to show Aurora's lower participation; CCBWQA's participation was lowered accordingly to meet 25% partner project level; revised IGA Amendment received TAC recommendation and is being taken to Board for their consideration in October (10/13/22). Board authorized the IGA Amendment for 2022 funding at their 10/22/22 meeting. It appears that CCBWQA's 2023 participation will be reduced as a result of less partner funding available for this project (2/24/23). The IGA Amendment that brings in 2023 funding was recommended by the TAC and authorized by the Board at their June meetings (6/29/23). MHFD is starting consultant selection process (10/13/23). Jacobs, Olsson, and Muller were shortlisted for interviews which are scheduled for mid-December (11/10/23). Muller was selected as the consultant (12/28/23). *A scoping meeting for the project has been scheduled for (01/30/2024)*
2. Cherry Creek - Reservoir to Lake View Drive Alternatives Analysis and Development of Preferred Alternative (CCB-5.16A)
  - a. Description: This project is in follow up to CCBWQA's study of Cherry and Piney Creeks in Cherry Creek State Park (CCSP). Muller completed two reports on Cherry Creek from Reservoir to State Park Boundary, Stream and Water Quality Assessment and Baseline Channel Monitoring Report, in 2022. These reports highlight the need for this project.
  - b. Status: A workshop is scheduled for the 3/16/23, to seek CCBWQA Board and TAC input on this project and Cherry and Piney Creeks in CCSP (3/10/23). *The follow up from workshop is underway – project overview and funding flyer has been created*, Muller is scoping the next step of design for Reach 1 and providing a fee, and multi-pronged approach is in development for workshop priority reaches that prioritizes Reach 1 and reduces risk from upstream reaches; these items will be brought to TAC and Board for discussion, direction, and/or action at upcoming meetings (3/30/23). A site visit for partner outreach and funding was held on 5/25/23 at 1-4 pm (6/8/23). A coordination meeting was held with Aurora on 6/23/23 and they showed interest in partnering on the project to protect their water lines. The Mile High Flood District has provided their budget/CIP schedule and Arapahoe County Open Space has been contacted to investigate potential partnering opportunities (7/13/23). The TAC created a subcommittee for this project on 8/3/23; which will attend progress meetings, provide timely feedback to Muller, and to coordinate with TAC as needed. The alternatives analysis kickoff meeting was held on 8/29/23. A site visit was held on 9/22/23 to look at multiple flow paths and potential risks for consideration in alternatives analysis. It was verbally reported at

the 11/16/23 Board meeting that Colorado Parks and Wildlife's repair of Lake View Drive is underway which includes the alternatives of concrete pipe and trash racks, cleaning out of culverts 1-9 and the beaver debris, and it is scheduled for completion by mid-December. Muller was provided US Army Corps of Engineers' guidance on cut and fill for consideration in their alternatives analysis (12/1/23).

3. Cherry Creek Stream Reclamation – Upstream of Scott Road (CCB-5.17)
  - a. Description: Design and construction of stream reclamation is in partnership with Douglas County and MHFD. It improves 4,100 feet of Cherry Creek and is located upstream of Scott Road.
  - b. Status: IGA was approved by the Board at their April 2020 meeting. Muller had been selected as consultant, and design scope of work is being prepared. Kickoff meeting was held on 12/11/20; a follow-up field visit will be scheduled for early 2021. Site visit was held on 1/29/21. Conceptual design is complete, negotiations are underway to contract for 60% design (4/8/21). Muller is working on alternatives (4/30/21). Muller is working on preliminary design and an IGA Amendment to bring in additional 2021 funding from Douglas County is being brought to the Board in October (10/15/21); IGA Amendment has been executed (11/11/21). Muller is preparing 60% Design Submittal (1/28/22). Muller submitted 60% Design on 2/2/22; comments have been provided on 60% Design Submittal (3/10/22). IGA Amendment bringing in 2022 funding is scheduled for TAC and Board consideration in June (5/27/22). IGA Amendment was authorized at the June 16<sup>th</sup> Board Meeting (6/30/22). Muller is working on Final Design and held a progress meeting on 4/14/23, a site visit is being scheduled to support the 90% design submittal. The 90% site visit was held on 5/22/23. Muller submitted their 90% design submission on 9/14/23; the engineer's estimate confirms that additional funding is needed for construction. IGA Amendment for additional funding is scheduled for TAC and Board consideration at October meetings and 90% review meeting was held on 10/13/23. Comments were provided for 90% submittal and discussed at the review meeting (11/10/23).
4. Cherry Creek Stream Reclamation at Dransfeldt (CCB-5.17.1B)
  - a. Description: Design and construction of stream reclamation is in partnership with Town of Parker and MHFD. It improves 2,400 feet of Cherry Creek near the future location of Dransfeldt bridge which is just downstream of the Cherry Creek at KOA project.
  - b. Status: Initial scoping has begun, and a partners meeting was held on 1/30/21. IGA is scheduled for CCBWQA's May TAC and Board meetings (4/30/21). IGA was approved by all parties and has been executed (6/25/21). Muller Engineering has submitted their Draft Scope of Work for Design Services, and the project sponsors have reviewed it (7/8/21). Design kickoff meeting was held on 10/14/21. Alternatives are being evaluated (12/9/21). Pre-submittal meeting for the 404 permit is being scheduled (12/30/21). CLOMR is being prepared for project (3/10/22) and was submitted to FEMA on 3/31/22. CEI was selected for as project partner to provide contractor input during the design (5/27/22). CLOMR is under review by FEMA (8/12/22). Muller has received comments on CLOMR and is preparing responses; 90% Submittal is scheduled for early February (1/27/23). Comments on 90% Submittal were provided on 2/22/23; project is experiencing substantive cost increases due to current market conditions (2/24/23). TAC at their 3/2/23 meeting recommended that the Board authorized the IGA Amendment to bring in 2023 funding along with an increase in CCBWQA's 2023 funding from \$170,000 to

\$570,000. The Board authorized the IGA Amendment with the increased 2023 funding of \$570,000 at their 3/16/23 meeting. The Conditional Letter of Map Revision (CLOMR) was issued by the Federal Emergency Management Agency (FEMA) on April 28, 2023 (5/12/23). The sanitary sewer relocation will be contracted to start with, in order to avoid a pipe material cost increase, and to get it out of the way for the forthcoming stream reclamation (7/13/23). The sanitary sewer relocation has been contracted for with Concrete Express Inc. or CEI (8/11/23). Construction of stream reclamation will start once 404 permit has been received (11/10/23).

5. Piney Creek - Cherry Creek to Parker Road, Reaches 1 to 2 (SE/MSWA) (CCB-6.5)
  - a. Description: This project includes 2900 liner feet of stream reclamation on Piney Creek. The project partners are SEMSWA and CCBWQA.
  - b. Status: Project coordination meeting was held with SEMSWA on 6/29/22. IGA drafted and is being reviewed by SEMSWA (8/12/22). IGA was approved by CCBWQA at the 9/15/22 Board meeting. IGA Amendment to bring in 2023 funding was recommended by the TAC and authorized by the Board in May (5/25/23). CCBWQA sent the Draft IGA Amendment to SEMSWA for review on 6/29/23. SEMSWA has no comments on the IGA Amendment and plans to take it to their Board in October (8/11/23). The project site was walked w/ith SEMSWA and Olsson and Associates on 8/30/23, Olsson is preparing their scope of work and fee for design. Comments on Olsson's scope of work and fee were provided to and coordinated with SEMSWA (11/10/23). Olsson's scope of work and fee have been finalized and SEMSWA is planning on contracting for the initial design phase in early 2024 (12/1/23). *The design contract with Olsson was completed on (01/19/2024)*
6. Piney Creek south of Orchard Rd., Reaches 4 to 5 (SEMSWA) (CCB-6.6)
  - a. Description: *New Project 2024 – Description TBD*
  - b. Status:
7. McMurdo Gulch Priority 3 Stream Reclamation (CCB-7.4)
  - a. Description: The design and construction of stream reclamation is in partnership with Castle Rock. Castle Rock is the lead agency. This phase continues the work from the previous phase. Muller Engineering is the design consultant.
  - b. Status: Board authorized IGA for Priority 3 at their May 19,2022 meeting. Muller submitted their 30% deliverable on 10/31/22, review comments were returned on 11/8/22. Easements needed for projects have been identified (1/23/22). The 60% Submittal was received on 1/30/23 and comments have been provided on 2/7/23. Muller is working on updating their construction cost estimate (2/8/23). On 2/23/23, Castle Rock requested that CCBWQA's 2023 funding be deferred to 2024 to match their schedule. *A meeting was held on 01/24/2024 to help determine the approach for obtaining 404 permitting (including Muller, ERO, Castle Rock and CCBWQA). Wetland mitigation under a nationwide permit was recommended by ERO and potential cost impacts for this approach were discussed. Muller's is working on updating estimated construction costs but anticipates being able to move forward with one complete project instead of phasing into two (separating the work on the upstream reach).*
8. Lone Tree Creek in CCSP downstream of Pond (CCBWQA Only) (CCB-21.1)
  - a. Description: *New Project 2024 – Description TBD*
  - b. Status:

9. Lone Tree Creek in Cherry Creek State Park (CCB-21.3)
  - a. Description: This project includes a trail connection to Cherry Creek State Park and includes 570 linear feet of stream reclamation on Lone Tree Creek from the State Park Boundary to the Windmill Creek Loop Trail. The City of Centennial is the project lead. CCBWQA participation is for stream reclamation only.
  - b. Status: 95% submittal is under review (5/13/22); review comments have been returned (5/27/22). Project funding was brought to TAC at their 7/7/22 meeting, during drafting of IGA it was discovered that future maintenance of stream reclamation should be considered, project will be brought back to TAC at an upcoming meeting for maintenance discussion and recommendation (8/12/22). A stakeholder meeting was held on 9/29/22 to discuss maintenance. A stakeholder meeting was held on 11/2/22 to discuss findings from CCBWQA's site visit and findings included in Wright Water Engineers report. The Board supports CCBWQA's partnering with Centennial at their 11/17/22 meeting. A Memo of Understanding is under review by Colorado Parks and Wildlife (CPW) affirming maintenance responsibilities for the stream reclamation fit under the current agreement between CCBWQA and CPW (3/30/23). CCBWQA sent the Draft IGA to Centennial for review on 5/23/23. The project is included in CCBWQA's 2024 Budget and 10-year CIP (11/10/23).
  
10. Happy Canyon Creek at Jordan Road (SEMSWA) (CCB-22.1)
  - a. Description: The design and construction are in partnership with Southeast Metro Stormwater Authority and MHFD and includes 2,500 feet of stream reclamation. The Authority's water quality component share for design and construction is estimated to be \$325,000. The total project cost is estimated at \$1,300,000.
  - b. Status: IGA is scheduled for June TAC and Board meetings (5/27/21). IGA has been approved and executed by all parties (7/29/21). Jacobs has been selected as design consultant and project scoping is underway; limits have been extended upstream to the County Line and sediment capture area and transport will be included with the project (10/15/21). Jacobs has submitted their scope of work and fee for design which is under review by project sponsors (11/11/21). Project sponsors have completed a review of Jacobs' fee and scope of work and the agreement is being routed for signatures (1/28/22). IGA Amendment to bring in 2022 funding is in process (3/10/22). A project kickoff meeting was held on 3/28/2022. A site visit was performed on 4/12/22 to document existing conditions and identify sediment source/transport/deposition areas. Project Team is preparing a sampling plan for bank and bed materials to determine phosphorus content (5/13/22). The project team met on 5/24/22 to discuss project goals and Jacobs is progressing through the study. Jacobs and ERC are working on sediment transport analysis and model (6/30/22). The results from the sediment transport model were presented at the 8/23/22 progress meeting and an upstream sediment capture area just south of the JWPP was included in the alternatives analysis (8/26/22). The alternative analysis report is expected to be completed before the end of 2022 (10/13/22). Lab results from stream soil samples were sent to Jacobs so that they include phosphorus reduction in the alternatives analysis report; a groundwater investigation is needed to inform sediment capture facility and stream reclamation alternatives, scoping and negotiations are in progress (11/11/22). Groundwater scope of work has been reviewed and approved by project sponsors (1/13/23). The IGA Amendment bringing in the 2023 funding was recommended by TAC and authorized by the Board in April (5/12/23). A progress meeting was held on 10/30/23 where the groundwater information was reviewed and the impacts from the 2023 storms were discussed;

MHFD is planning additional sediment removals accordingly. *A project site walk with the project team is scheduled for 1/31/2024.*

11. Happy Canyon Creek - Upstream of I-25 (CCB-22.2)
  - a. Description: The design and construction are in partnership with Douglas County, City of Lone Tree, and MHFD and includes 2,500 feet of stream reclamation. The Authority's water quality component share for design and construction is estimated to be \$500,000. The total project cost is estimated at \$2,000,000.
  - b. Status: Douglas County, City of Lone Tree, and MHFD have initially funded and selected Muller Engineering as the design engineer. Design has started and a progress meeting was held on 1/27/21. Design is progressing (2/11/21). Muller has submitted 60% Design Deliverables (5/27/21). IGA for 2021 Funding is being brought to Board in September (9/9/21). 2021 IGA Amendment has been executed (11/11/21). Coordination with CDOT and Amendment at their June 16<sup>th</sup> meeting (6/30/22). The project received environmental clearance from CDOT (8/12/22). The 90% design submittal is scheduled for delivery by end of September (8/26/22). The 90% design submittal is being reviewed (10/13/22). Comments were provided on 90% submittal (11/11/22). Muller completed the 100% design submittal on 11/22/22. CDOT permit was issued, and pre-construction meeting was held on 1/10/23; construction start is scheduled for 1/30/23 pending execution of easement documents from Surrey Ridge which has agreed to terms and easement language. Notice to Proceed on construction is pending execution of easement documents (1/27/23). Easements have been signed by property owners and Notice to Proceed has been issued to Naranjo Civil Constructors (2/8/23). Construction is underway with initial construction BMPs/stormwater controls in place; water diversion and control is being set up for the downstream section of the project (3/10/23). Water control is in place and construction of stream reclamation is underway for downstream sections of the project (3/30/23). Riffle and Boulder Cascade drop structures on downstream third of project are nearing completion (4/13/23). Construction is underway in the middle third of the project; efforts consist of stream grading and installation of Riffle and Boulder Cascade drop structures (5/12/23). The storm damage from May 11 to 13, 2023 event is being identified and repaired (5/25/23). Construction on the middle third is substantially complete and work has begun on the upstream third (7/27/23). The construction is nearly complete with the punch list walk on 9/13/23; contractor is working on completing plantings and resolving punch list items. Asphalt repairs on the frontage road are being scheduled and some of the plantings will need to be done during the 2024 spring planting window to improve their chance for success (11/10/23). Asphalt repairs have been made and the project summary has been prepared (12/1/23).
12. Dove Creek - Otero to Chambers Rd. (CCB-23.1)
  - a. Description: The design and construction are in partnership with Southeast Metro Stormwater Authority (SEMSWA) and with Mile High Flood District (MHFD) being a key stakeholder; it includes 1,300 feet of stream reclamation. The Authority's water quality component share for design and construction is estimated to be \$175,000. The total project cost is estimated at \$700,000.
  - b. Status: SEMSWA is drafting the Intergovernmental Agreement to bring in the 2021 funding for the project (3/12/21). RESPEC is the design consultant; two conceptual design alternatives have been prepared and reviewed during meeting on 3/15/21. IGA is scheduled for CCBWQA's May TAC and Board meetings (4/30/21). IGA has been approved and executed by all parties (7/29/21). 30% Design Review Meeting



was held on 8/23/21. A Progress meeting is scheduled for 2/26/22 with 60% Plan submittal expected to follow (1/28/22). The 60% Design was submitted on 2/16/2022, comments were provided, and a design review meeting was held on 2/23/2022. IGA Amendment to bring in 2022 funding is in process (3/10/22). Construction costs were prepared by CEI based on 60% submittal (5/13/22). A design progress meeting was held 6/14/22 and 90% design submittal is being prepared (6/30/22). 90% design submittal is expected by the end of July (7/15/22). The 90% design submittal was reviewed, and comments were submitted on 8/22/22. Construction is anticipated in 2023 (10/13/22). A progress meeting was held on 11/8/22, project will likely be done in 2 phases, IGA Amendment will be needed early in 2023 so that construction can start ahead of storm season. Dove Creek IGA for construction of Phase 1 is scheduled for TAC and Board in January 2023, construction is expected to start shortly afterwards (12/30/22). Construction is scheduled to start mid-February; construction agreement and engineering construction services amendment are currently being reviewed (1/27/23). Construction and engineering construction services have been finalized and a preconstruction meeting was held on 2/2/23. Notice to Proceed has been issued to Concrete Express; construction is underway with initial construction BMPs/stormwater controls in place (3/10/23). Water control is in place and construction of stream reclamation is on-going (3/30/23). Step pool drop structures have been constructed and work on soil wraps is underway (4/13/23). Low-flow or bank full channel work (soil wraps and erosion control blanket) and step-pool structures are complete, water diversion has been removed, and is active to storm flows; work continues in upland areas and higher elevations of stream reclamation (5/12/23). Storm damage from May 11 to 13, 2023 event is being repaired (5/25/23). Construction punch list is being completed (6/29/23). Construction of Phase 1 is complete (7/27/23). Project summary has been prepared (12/1/23).

13. Dove Creek - Chambers Rd. to Pond D-1 (CCB-23.1)

- a. Description: The design and construction are in partnership with Southeast Metro Stormwater Authority (SEMSWA) and with Mile High Flood District (MHFD) being a key stakeholder; it includes 1,300 feet of stream reclamation. Construction was broken into 2 phases with Phase 2 scheduled for 2024.
- b. Status: CCBWQA acted at their October meeting to advance their funding for Phase 2 Construction to 2023 with SEMSWA's funding scheduled for 2024, IGA has been prepared and scheduled for signatures after SEMSWA's November Board meeting, phosphorus estimates for sediment capture areas for the project were provided to Technical Manager (11/10/23). *A progress meeting was held on 01/23/204 and construction is expected to start on 02/05/2024 completing 07/2024.*

14. Mountain and Lake Loop Shoreline Stabilization Phase II (OM-)

- a. Description: This project was identified through the 2020 annual inspection and design and permitting started in 2021. It adds about 40 feet of shoreline protection where it has eroded leaving a 1-2 foot tall vertical bank.
- b. Status: Construction Plans have been prepared and the GESC was submitted to Arapahoe County for review (1/13/22). Plans are being reviewed by US Army Corps of Engineers for 408 clearance (5/13/22). *Comments were received from the US Army Corps of Engineers on 8/29/23.* A meeting has been scheduled for 11/16/23 with USACOE's local staff and CPW staff to discuss the cut and fill balance requirements on this project and other planned projects in Cherry Creek State Park (11/10/23). A site meeting with CPW is being scheduled to determine the feasibility

of the project after the 2023 storm damage (12/1/23). The 12/20/23 site meeting with Michelle Seubert identified 2 possible alternatives to address 2023 storm damage and meet USACOE cut and fill requirements while maintaining access to the swim beach. An updated project cost is about \$90,000 which is over the \$65,000 budgeted in 2024 (12/28/23).

## Memorandum

**To:** CCBWQA TAC  
**From:** Jessica DiToro, PE, LRE Water  
Jane Clary, CCBWQA Technical Manager, Wright Water Engineers  
**Date:** February 1, 2024  
**Subject:** Colorado Water Quality Rulemaking Hearing Information

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In the Colorado water quality world there are four types of hearings<sup>1</sup>:

1. Water Quality Control Commission (WQCC) Rulemaking Hearing (RMH) Proceedings:
  - RMH proceedings are where formal WQCC rules (e.g., Regulations 31-38<sup>2</sup>) are approved<sup>3</sup>.
  - Currently upcoming/ongoing WQCC RMHs can be found at the following webpage: <https://cdphe.colorado.gov/wqcc-rulemaking-proceedings>
  - Recently completed WQCC RMHs can be found at the following webpage: <https://cdphe.colorado.gov/completed-wqcc-hearings>
  - If you would like older RMHs that are no longer available on the Recently Completed Webpage, call me. These take some effort to dig up.
2. Administrative Action Hearings (AAH):
  - AAHs are where documents that are not formal rules (i.e., WQCC policies<sup>4</sup>, 208 water quality management plans, nonpoint source management programs, etc.) are approved.
  - Ongoing and recently completed AAHs can be found at the following webpage: <https://cdphe.colorado.gov/wqcc-administrative-action-hearings>
3. Public Informational Hearings (IH):
  - Public IHs are informal WQCC hearings that do not result in any formal action by the WQCC. Some examples of public IHs include issues scoping hearings<sup>5</sup> (ISH) and issues formulation hearings<sup>5</sup> (IFH).

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<sup>1</sup> WQCC Hearings: <https://cdphe.colorado.gov/wqcc-hearings>

<sup>2</sup> WQCC Regulations: <https://cdphe.colorado.gov/water-quality-control-commission-regulations>

<sup>3</sup> From Regulation 21, p. 3, a RMH may be conducted through written comments only: “The Commission may determine that receipt of only written comments on a published proposal, and any substantive written response(s) to such comments or issues raised in such comments, is sufficient public participation to establish an adequate record for Commission deliberation and decision-making. If the proponent of a proposal disagrees with any written comments submitted, the proponent shall submit a written response in accordance with the deadline established in the rulemaking proceeding notice. An opportunity shall be provided to other interested persons to submit written responses to comments in accordance with a deadline established in the rulemaking proceeding notice.”

<sup>4</sup> WQCC Policies: <https://cdphe.colorado.gov/wqcc-policies>

<sup>5</sup> “For surface water quality classifications and standards which are organized by river basin and for the Basic Standards and Methodologies for Surface Water, the Commission has established a three-step triennial review process. The Issues Scoping Hearing is the first step in the process. In short, the Issues Scoping Hearing provides an opportunity for early identification of potential issues

- With respect to Control Regulations (i.e., Regulations 71-74 and 81-86<sup>2</sup>), the WQCC will first hold an IH to receive staff input and public comment. Depending on the outcome of the IH, the WQCC will decide if a formal RMH is needed.
- Upcoming and recently completed IHs can be found at the following webpages: <https://cdphe.colorado.gov/wqcc-public-informational-hearings>  
[https://drive.google.com/drive/folders/1vWZlpzixW4Y0\\_CJ2adoFY2ldcoZ7Wwh3](https://drive.google.com/drive/folders/1vWZlpzixW4Y0_CJ2adoFY2ldcoZ7Wwh3)

#### 4. Adjudicatory Hearings:

- Adjudicatory hearings are quasi-judicial proceedings by the WQCC or the Water Quality Control Division (WQCD) to review specific types of decisions by the WQCD with respect to individual regulated entities<sup>6</sup>. The procedures for these hearings are spelled out in WQCC Regulation 21<sup>7</sup> (Procedural Rules).
- Ongoing and recently completed WQCC adjudicatory hearings can be found at the following webpage: <https://cdphe.colorado.gov/wqcc-adjudicatory-hearings>

**Anyone can sign up to receive notice of any of the described upcoming hearings at the following WQCC webpage. The link below will send you to a google form where you can “pick your own adventure” and choose exactly what regulations, policies, etc. you would like to be notified about:**

**[https://docs.google.com/forms/d/e/1FAIpQLSeKpmSyDnGrMZFPGBqHxMmWvKEzp-xktDqpoAD\\_q0jX4Qrtnw/viewform](https://docs.google.com/forms/d/e/1FAIpQLSeKpmSyDnGrMZFPGBqHxMmWvKEzp-xktDqpoAD_q0jX4Qrtnw/viewform)**

**For additional information on the above hearings, please reference the WQCC’s Public Participation Website and Public Participation Handbook (February 2017):**

**Website: <https://cdphe.colorado.gov/wqcc-public-participation>**

**Handbook: [https://drive.google.com/file/d/166i2sWZ8c-59MLp7kDhQOWTDbCo\\_TQGS/view](https://drive.google.com/file/d/166i2sWZ8c-59MLp7kDhQOWTDbCo_TQGS/view)**

The following table lists the scheduled upcoming hearings through 2027, with hearings of interest to the Cherry Creek Basin Water Quality Authority (CCBWQA) highlighted in red and bolded. This information can also be found online in two places:

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*that may need to be addressed in the next major rulemaking hearing for particular regulations, and for identification of any issues that may need to be addressed in rulemaking prior to that time. The second step in the triennial review process – the Issues Formulation Hearing – results in the identification of the specific issues to be addressed in the next major rulemaking hearing. The third step is the Rulemaking Hearing, where any revisions to the water quality classifications and standards are formally adopted. The timing of the three steps is as follows: (1) the Issues Scoping Hearing is held in October of Year 1; (2) the Issues Formulation Hearing is held in November of Year 2; and (3) the Rulemaking Hearing is held in June of Year 3. More complete descriptions of these three steps in the triennial review process for surface water quality classifications and standards are posted on the Commission’s web site, under the section entitled ‘Water Quality Standards’.” Public Participation Handbook, p. 4-5.*

<sup>6</sup> This is not to be confused with a permit adjudication which is an administrative hearing requested by a Colorado Discharge Permit Systems (CDPS) permittee or other stakeholder, to challenge the terms and conditions of an issued permit, challenge permit denials, or challenge other permitting actions. These hearings are held by the Office of Administrative Courts, not the WQCC.

<sup>7</sup> Regulation 21: <https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=7100&fileName=5%20CCR%201002-21>

1. The WQCC Long-Range Schedule – Usually covers the upcoming two to three years of hearings in detail, and is updated regulatory. The Long-Range Schedule can be found at the following link<sup>8</sup>:

<https://drive.google.com/file/d/15GqG9bnNoJW-ChysL86oA8KaN59qiXsl/view><sup>9</sup>

2. The Index of WQCC Regulations and Policies – Usually covers the upcoming two to three years of Regulatory and Policy hearings. Also includes the date of last WQCC action. The Index of WQCC Regulations and Policies can be found at the following link<sup>10</sup>:

[https://drive.google.com/file/d/11cxHB5ce76Dp34UYaIWefvgqg9xq\\_wL1/view](https://drive.google.com/file/d/11cxHB5ce76Dp34UYaIWefvgqg9xq_wL1/view)<sup>9</sup>

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<sup>8</sup> Please note that as of the date of this memorandum, the WQCC Long-Range Schedule was last updated in January 2024.

<sup>9</sup> Main website for access: <https://cdphe.colorado.gov/wqcc-meetings>

<sup>10</sup> Please note that as of the date of this memorandum, the Index of WQCC Regulations and Policies was last updated January 2024.

Table 1. Water Quality Control Commission Regulation Hearing Timeline

Hearing Date	Rule	Event <sup>11</sup>	Potential Relevance to CCBWQA
February 2024	Regulation 72 – Cherry Creek Reservoir Control Regulation	RMH	Relevance high, PWSD + CR’s proposal re short-term construction dewatering discharge TP limit – CCBWQA is party to this RMH and monitoring the written testimony
March 2024	Regulation 73 – Chatfield Reservoir Control Regulation	TRIH	Relevance low, but of interest if CCBWQA wants to learn more about its sister-entity
August 2024	Regulation 64 – Biosolids Regulation	RMH	Relevance low, but applicable to Basin WWTFs
November 2024	Regulation 31 – Basic Standards for Surface Water	ISH	Relevance potentially high, CCBWQA should attend ISH to see what potential issues are planned for RMH in 2026, particularly changes to Lakes Nutrient Criteria (if any)
	Regulation 38 – South Platte Water Quality Standards	IFH	Relevance high, CCBWQA will participate as next step in the lake nutrients site specific standards process for the 2025 RMH
December 2024	Regulations 32-38 - Temporary Modifications	RMH	Relevance low, unless temporary modifications applied to Cherry Creek Reservoir
March 2025	Regulation 22 – Site Location and Design Approval Regulation for Domestic Wastewater Treatment Works	RMH	Relevance potentially high, likely to address outstanding issues from March 2020 RMH such as historical lift stations. (Designated Mgmt. Agency roles revisited?)

<sup>11</sup> “Event” Definitions:

TRIH – Triennial Review Informational Hearing; ISH – Issues Scoping Hearing; IFH – Issues Formulation Hearing; RMH – Rulemaking Hearing; AAH – Administrative Action Hearing; RRIH – Routine Review Informational Hearing

Hearing Date	Rule	Event <sup>11</sup>	Potential Relevance to CCBWQA
	Regulation 43 – Onsite Wastewater Treatment System Regulations	RRIH	Relevance low, but should track to understand changes being proposed and if any changes are relevant to Regulation 72
May 2025	<b>Regulation 93 – Colorado's Section 303(d) List and M&amp;E List Focus: South Platte River Basin Segments</b>	RMH	<b>Relevance likely low, Cherry Creek Reservoir is currently on the 303(d) List for DO and Chlorophyll-a, Windmill Creek for selenium, and the Mainstem of Cherry Creek is on the M&amp;E List for manganese</b>
	Regulation 84 – Reclaimed Water Control Regulation	TRIH	Relevance low, but should track to understand changes being proposed and if any changes are relevant to Regulation 72
June 2025	<b>Regulation 38 – South Platte Water Quality Standards</b>	RMH	<b>Relevance high, CCBWQA will file party status and propose site specific TP and TN standards for Cherry Creek Reservoir</b>
April 2026	<b>Regulation 85 – Nutrients Management Control Regulation</b>	TRIH	<b>Relevance high, could revisit nonpoint source progress, and assess whether additional regulatory requirements are needed to replace current voluntary approach, focusing on agriculture (upper basin may be affected)</b>
November 2025	<b>Regulation 31 – Basic Standards for Surface Water</b>	IFH	<b>Relevance high, CCBWQA should attend IFH to see what will likely be proposed for RMH in 2026</b>
	<b>Regulations 85 – Nutrients Management Control Regulation</b>	RMH	<b>Relevance potentially high</b>
June 2026	<b>Regulation 31 – Basic Standards for Surface Water</b>	RMH	<b>Relevance high, CCBWQA should monitor and determine if party status is</b>

Hearing Date	Rule	Event <sup>11</sup>	Potential Relevance to CCBWQA
			needed based on issues identified at 2025 IFH
TBD 2027	Regulations 31-38 – Lakes & Reservoirs Nutrients	RMH	Relevance high, TN and TP standards for Cherry Creek and Reuter-Hess Reservoirs to be set – Developing site-specific standards for this RMH
	Regulations 31-38 – Stream Nutrients	RMH	Relevance potentially high, TP and TN water quality standards applied to all streams and rivers in Colorado

For more information on the Water Quality 10-Year Roadmap follow the links below:

[Roadmap Information](#)

[Roadmap Workgroup Meeting Materials](#)