ACTION ITEM MEMORANDUM

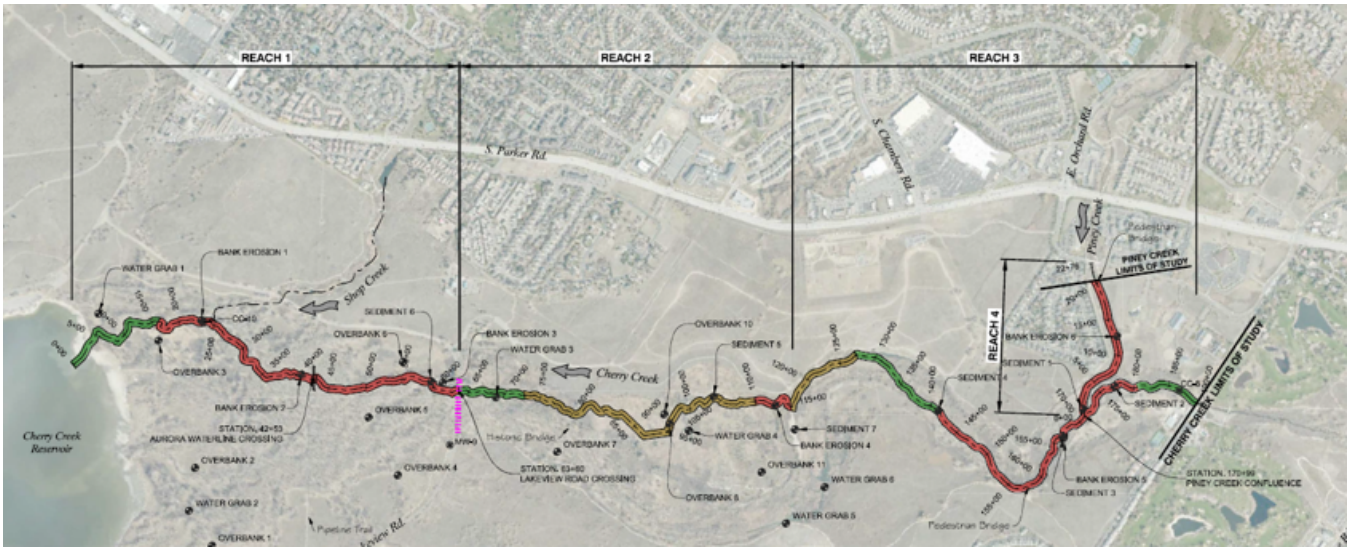
To: CCBWQA Technical Advisory Committee (TAC)
From: Richard Borchardt, Pollution Abatement Project Manager
Date: April 6, 2023
Subject: Alternatives Analysis and Selection of Preferred Alternative on Cherry Creek from the Reservoir to Lake View Drive (aka Reach 1)

Request: Recommend that the Board:

1. Contract directly with Muller Engineering for the Alternatives Analysis on Cherry Creek from the Reservoir to Lake View Drive (aka Reach 1),
2. Authorize the preparation and execution of necessary consulting agreement,
3. and an expenditure of $256,715.

Project: The Stream and Water Quality Assessment and Baseline Channel Monitoring Reports (Reports) include Cherry and Piney Creeks within CCSP (See **Figure 1**). CCBWQA sole-sourced the Reports to Muller Engineering (Muller) in 2020 and 2021 respectively. Muller presented their initial findings to CCBWQA at the July 15, 2021 Board Meeting and the Board accepted the Reports on December 15, 2022.

Figure 1. Cherry and Piney Creeks within CCSP



CCBWQA had a workshop on March 16, 2023 which included Cherry Creek from the Reservoir to the Aurora Soccer fields (south of Arapahoe Road) and Piney Creek from the confluence to Parker Road. In the workshop, Reach 1 was presented as the top priority as it has an average sediment loss of 2,143 tons per year and 1684 pounds of phosphorus per year directly to the Reservoir.

Muller Engineering prepared the attached scope of work and fee for Alternatives Analysis for a cost of $256,715 and Concept Design of Selected Alternative for a cost of $180,847. Muller anticipates 7 months for the Alternatives Analysis, which is achievable in 2023. CCBWQA could contract for the Alternatives Analysis in 2023 and defer the Concept Design of Selected Alternative to 2024; this approach fits best within CCBWQA's 10-year CIP.

I recommend contracting directly with Muller Engineering, based on their successful completion of the Reports, their work on the Cherry Creek Major Drainageway Planning Study which

continued upstream to Scott Road, their effective engagement in the March 16, 2023 workshop, and their previous experience and success on Plum Creek in Chatfield State Park.

Budget: CCBWQA's Capital Improvement Program includes $200,000 for an Alternatives Analysis on Cherry Creek from Reservoir to Lake View Drive. CCBWQA's 2023 CIP budget also includes $2,111,000 for East Shade Shelters, Cherry Creek at Arapahoe (R 3-4), and McMurdo Gulch projects. It is likely that these projects will be delayed past 2023 due to partner funding constraints and/or revised schedules; therefore, this 2023 funding could be reallocated to cover the additional $56,715 in CCBWQA funding needed.

Motion: **I move to recommend that the Board:**

1. **Contract directly with Muller Engineering for the Alternatives Analysis on Cherry Creek from the Reservoir to Lake View Drive (aka Reach 1),**
2. **Authorize the preparation and execution of necessary consulting agreement,**
3. **and an expenditure of $256,715.**

April 5, 2023

Manager
Cherry Creek Basin Water Quality Authority
PO Box 3166
Centennial, CO 80111

RE: Scope of Services for Cherry Creek Reach 1 Alternatives Analysis and Conceptual Design

Dear Manager:

Muller Engineering Company, Inc. (Muller) would like to thank you for the opportunity to work with the Cherry Creek Basin Water Quality Authority (CCBWQA) to perform the alternatives analysis for Reach 1 of Cherry Creek which extends from the Cherry Creek Reservoir south, approximately 6,500 feet, to Lakeview Drive within the Cherry Creek State Park boundary. The purpose of the analysis is to develop alternatives for the restoration of Cherry Creek that reduce sediment and phosphorus loading to the reservoir, preserve and enhance natural resources, and protect existing infrastructure. Construction cost estimates will also be produced along with pros and cons for each alternative. The analysis also includes development of a conceptual design for a selected alternative to further refine the layout developed during the alternatives analysis and to refine the estimated construction costs for the Reach 1 improvements.

It is anticipated that the work will be contracted in phases with the alternatives analysis occurring in 2023 as Phase 1 and the conceptual design of the selected alternative will occur in 2024 as Phase 2. The following sections outline the scope and fee and have been broken out by phases.

I. Phase 1: Alternatives Analysis

A. Scope of Work

The scope of work will include the following items summarized below:

1. Project management, Meetings, and Coordination

The following tasks are included in the scope of work:

- ***Project Management:*** Muller will complete project setup, preparation of sub consultant agreements, and monthly invoicing for 7 months.
- **Coordination:** Muller will complete as needed e-mail and phone coordination with CCBWQA for 7 months.
- **Progress Meetings:** Assume 3 virtual progress meetings with CCBWQA staff.
- **TAC Meetings:** Muller will attend 2 in-person meetings with the CCBWQA TAC.

2. Alternatives evaluation

The following tasks are included in the scope of work:

- ***Site Visits and Geomorphic Evaluation:*** Muller will perform two site visits, one to visit Reach 1 with the internal consulting team and a second site visit to a reference reach site and collect bankfull channel measurements. Muller will review existing hydrology and bankfull discharge estimates based on the collected field measurements and perform a geomorphic evaluation of the reference reach, existing reach, and apply this analysis to the proposed design. A conceptual hydraulic evaluation will also be performed including a two section HEC-RAS model of a representative reach to size a preliminary bankfull channel and perform approximate rock sizing calculations. Secondary channels will be assessed using the existing SRH2D model.
- ***Alternative 1 – Stabilize Existing Main Channel:*** Muller will develop an alternative to stabilize the existing main channel in the current horizontal location, minimal improvements to Lakeview Drive culverts, and minimal secondary channel improvements. The alternative development will include a sketch layout of the channel improvements and the Lakeview Drive improvements, culvert hydraulics at Lakeview Drive using the Lakeview Drive HEC-RAS model developed by RESPEC to model minimal upgrades to the existing culverts, and the preparation of 5 to 7 plan, profile, and typical channel section sheets.
- ***Alternative 2 – Shift Main Channel East to Historic Valley Low-Point with Overflow Channel:*** Muller will develop an alternative to shift the main channel east to the valley low-point, develop up to two secondary channels, and moderate improvements to the Lakeview Drive culverts required to support this alternative. The alternative development will include a sketch layout of the channel improvements and the Lakeview Drive improvements, culvert hydraulics at Lakeview Drive using the Lakeview Drive HEC-RAS model developed by RESPEC to model upgrades to several of the existing culverts, and the preparation of 5 to 7 plan, profile, and typical channel section sheets.
- ***Alternative 3 – Shift Main Channel East to Historic Valley Low-Point with Multiple Overflow Channels:*** Muller will develop an alternative to shift the main channel east to the valley low-point, develop multiple secondary channels, and extensive improvements to the Lakeview Drive culverts required to support this alternative. The alternative development will include a sketch layout of the channel improvements and the Lakeview Drive improvements, culvert hydraulics at Lakeview Drive using the Lakeview Drive HEC-RAS model developed by RESPEC to model upgrades to most of the existing culverts, and the preparation of 5 to 7 plan, profile, and typical channel section sheets.
- ***Water Quality Analysis:*** Muller will provide qualitative and approximate quantitative assessment of water quality benefits for three alternatives. This task includes coordination with CCBWQA consultants and TAC, research on treatment effectiveness associated with stream rehabilitation and overbank infiltration and wetland processes, and consideration of follow-up bench-scale or field testing to prove-out treatment concepts.
- ***Conceptual Construction Costs and Design Report:*** Muller will estimate construction quantities and prepare conceptual level engineer's opinion of probable construction costs for three alternatives. Muller will document the three alternatives, water quality analysis, and construction cost estimates in an alternatives analysis design report.

3. Special Services

The following tasks are included in the scope of work:

Ecological Services: ERO will identify existing conditions and restoration opportunities in Reach 1 including mapping of vegetation communities and a high-level quality assessment with a memo to document the results. ERO will consult with project team to provide ecological and USACOE 404 permitting input on three alternatives for the restoration of Cherry Creek and the adjacent floodplain. The scope includes one site visit, three internal virtual team meetings, and one in person TAC meeting. A more detailed scope of work for services provided by ERO is attached to this scope and fee.

Geomorphology and Sediment Transport Services: Alden will provide geomorphic and sediment transport qualitative input on three alternatives. Includes a virtual internal project kickoff meeting, 1 site visit, 3 internal virtual meetings for alternatives analysis, a review of available information and assessment of processes impacting the park, and review and input of three alternatives. A more detailed scope of work for services provided by Alden is attached to this scope and fee.

As Needed Services: Muller and ERO will reserve this time for partner outreach and check in with CCBWQA consulting staff, executive committee, TAC, and Board for coordination of project to be billed at a time and materials basis and will be as directed by CCBWQA.

4. Deliverables

The following deliverables are included in the scope of work:

- ***Plan, Profile, and Typical Channel Cross Section Sheets:*** Muller will prepare 5 to 7 plan, profile, and typical channel section sheets for each of the three alternatives using available LiDAR and aerial photography to document the layout and improvements assumed for each alternative.
- ***Conceptual Level Construction Cost Estimates:*** Muller will provide conceptual level construction cost estimates for each of the three alternatives.
- ***Alternatives Analysis Design Report:*** Muller will prepare an alternatives analysis design report to document each of the three alternatives, the water quality analysis, and the construction cost estimates.

B. Assumptions and Exclusions

The following is a list of assumptions and exclusions used in preparation of this scope and fee:

- A 7-month project duration is assumed for Phase 1: Alternatives Analysis.
- A landscape architect has not been contracted as part of this phase of work. Landscape plans will be limited to planting zones (wetland/riparian/upland) as directed by the ecologist.
- Preparation of a 404 Permit, CSQT, or any other required permits are not included in this scope and fee.
- Calculations of Environmental Functional Units (EFU's) or SACWET are not included in this scope and fee.

- Sediment transport will be limited to a qualitative assessment, no sediment transport capacity calculations are included in this scope.
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C. Fee

We estimate that the fee associated with this scope of work will not exceed **$256,715**. Below is a breakdown of the fee:

Task	**Muller**	**ERO**	**Alden**	**Total**
Project Management and Meetings	$31,622	-	-	$31,622
Alternatives Evaluation	$162,777	-	-	$162,777
Special Services	$9,940	$35,421	$16,955	$62,316
Sub Total	***$204,339***	***$35,421***	**$16,955**	
Total Fee				**$256,715**

A project fee estimating sheet from Muller and from the sub-consultants are attached which provides a breakdown of our anticipated staff time by task and a schedule of our 2023 hourly rates.

D. SCHEDULE

We anticipate completing the Phase 1: Alternatives Analysis and providing the deliverables within approximately seven months of receiving the notice to proceed.

II. PHASE 2: CONCEPTUAL DESIGN OF SELECTED ALTERNATIVE

A. Scope of Work

The scope of work will include the following items summarized below:

1. Project management, Meetings, and Coordination

The following tasks are included in the scope of work:

- ***Project Management:*** Muller will complete project setup, preparation of sub consultant agreements, and monthly invoicing for 4 months.
- **Coordination:** Muller will complete as needed e-mail and phone coordination with CCBWQA for 4 months.
- **Progress Meetings:** Assume 2 virtual progress meetings with CCBWQA staff.
- **Board Meeting:** Muller will attend 1 in-person meetings with the CCBWQA Board.

2. Conceptual Design of Selected Alternative

The following tasks are included in the scope of work:

- ***Selected Alternative Development:*** Muller will perform a site visit to assist in the refinement of the main channel, secondary channels, and Lakeview Drive culverts. Muller will develop a conceptual design by refining the layouts for the selected alternatives based on feedback from the CCBWQA TAC. Muller will prepare a conceptual level SRH2D model of Reach 1 including rough grading using AutoCAD corridors with minimal cleanup to allow the model to run. Muller will also refine the WQ evaluation to reflect the refinements of the selected alternative.
- ***Conceptual Channel Plans:*** Muller will prepare conceptual level plans for the selected alternative including a title sheet, a site plan, up to three plan and profile sheets, typical channel sections for the main and secondary channels, and will include conceptual and typical grade control and bank protection details. A plan and profile will also be included for the culvert improvements at Lakeview Drive.
- ***Conceptual Construction Costs and Design Report:*** Muller will refine the construction quantities and prepare conceptual level engineer's opinion of probable construction costs for the conceptual design of the selected alternative. Muller will document the conceptual design, water quality analysis, and construction cost estimates in a conceptual design report.

3. Special Services

The following tasks are included in the scope of work:

Ecological Services: ERO will consult with the project team to provide ecological and USACOE 404 permitting input on the selected alternative and conceptual design for the restoration of Cherry

Creek and the adjacent floodplain. A more detailed scope of work for services provided by ERO is attached to this scope and fee.

Groundwater Monitoring Wells: ERO will coordinate and install up to six groundwater monitoring wells outfitted with a pressure transducer and a barometric logger and provide 1-year of quarterly data collection. A more detailed scope of work for services provided by ERO is attached to this scope and fee.

Geomorphology and Sediment Transport Services: Alden will provide geomorphic and sediment transport qualitative input on the selected alternative and conceptual design. The scope includes 1 internal virtual meeting and time to review and provide input on concept design. A more detailed scope of work for services provided by Alden is attached to this scope and fee.

As Needed Services: Muller and ERO will reserve this time for partner outreach and check in with CCBWQA consulting staff, executive committee, TAC, and Board for coordination of project to be billed at a time and materials basis and will be as directed by CCBWQA.

4. Deliverables

The following deliverables are included in the scope of work:

- ***Plan, Profile, Typical Channel Cross Sections, and Typical Detail Sheets:*** Muller will prepare a conceptual level plan set including plan, profile, typical channel section, and typical detail sheets for the selected alternative.
- ***Conceptual Level Construction Cost Estimates:*** Muller will provide a refined conceptual level construction cost estimate for the selected alternative.
- ***Conceptual Design Report:*** Muller will prepare a conceptual design report to document the selected alternative improvements, the refined water quality analysis, and the refined construction cost estimates.

B. Assumptions and Exclusions

The following is a list of assumptions and exclusions used in preparation of this scope and fee:

- A 4-month project duration is assumed for Phase 2: Concept Design of Selected Alternative.
- A landscape architect has not been contracted as part of this phase of work. Landscape plans will be limited to planting zones (wetland/riparian/upland) as directed by the ecologist.
- Preparation of a 404 Permit, CSQT, or any other required permits are not included in this scope and fee.
- Calculations of Environmental Functional Units (EFU's) or SACWET are not included in this scope and fee.
- It is assumed that the Phase 2 work will occur in 2024 and that this fee will be revised to use 2024 billing rates prior to executing the final agreement.
- The number of groundwater monitoring wells is assumed and is anticipated to be refined during the Phase 1 work. The fee should be considered a placeholder and will need to be adjusted to meet the project needs prior to executing the agreement for Phase 2.

- Sediment transport will be limited to a qualitative assessment, no sediment transport capacity calculations are included in this scope.

C. Fee

We estimate that the fee associated with this scope of work will not exceed **$180,847**. Below is a breakdown of the fee:

Task	Muller	ERO	Alden	Total
Project Management and Meetings	$19,774	-	-	$19,774
Conceptual Design of Selected Alternative	$108,706	-	-	$108,706
Special Services	$5,080	$18,330	$3,957	$27,367
Groundwater Monitoring Wells	-	$25,000	-	$25,000
Sub Total	***$133,560***	***$43,330***	**$3,957**	
Total Fee				**$180,847**

A project fee estimating sheet from Muller and from the sub-consultants are attached which provides a breakdown of our anticipated staff time by task and a schedule of our 2023 hourly rates.

D. SCHEDULE

We anticipate completing the Phase 2: Conceptual Design of Selected Alternative and providing the deliverables within approximately four months of receiving the notice to proceed.

We look forward to working with you and assisting the Cherry Creek Basin Water Quality Authority with this analysis. If you have any questions or concerns related to the scope and fee, please don't hesitate to call.

Sincerely,

MULLER ENGINEERING COMPANY, INC.

John Yager
Water Resources Project Manager

Derek Johns
Principal

Enclosures (Muller, ERO, and Alden Fee Estimates)

CC: CCBWQA Manager (Jane Clary and Val Endyk), R2R (Rich Borchardt)

MULLER ENGINEERING COMPANY
PROJECT FEE ESTIMATE

CLIENT:
Cherry Creek Basin Water Quality Authority

PROJECT:
Cherry Creek Reach 1: Phase 1 Alternatives Analysis

PROPOSAL NO.: 923.22 | PREPARED BY: JAY | CHECKED BY: DDJ/JTW
PROJECT NO.: 20-023.04 | DATE: 4/5/2023
PROPOSED TOTAL FEE: $ 256,715

TASK NO.	ITEM DESCRIPTION	LABOR (HOURS)								EXPENSES					TOTALS			
		Senior Project Manager 9	Senior Project Manager 9	Project Manager 7L	Project Engineer 5L	Design Engineer 3	GIS Analyst	Technician/CADD Operator 4	Administrative Support	OUTSIDE SERVICES	TRAVEL	REPRODUCTION	DELIVERY	MISCELLANEOUS	TIME (HOURS)	LABOR COST	EXPENSES	SUBTOTAL
	2023 Billing Rate>>>	$242	$242	$208	$166	$140	$132	$123	$93									
100	**PROJECT MANAGEMENT AND MEETINGS**																	
	Project management including sub-consultant agreements and preparation of monthly invoices and progress reports. (Assume 7 months)			10	16										26	$ 4,736		$ 4,736
	Phone and e-mail coordination with the CCBWQA. (7-months)			14	14										28	$ 5,236		$ 5,236
	Progress Meetings: assume 3 virtual progress meetings w/CCBWQA	5	5	8	8	8									34	$ 6,532		$ 6,532
	TAC Meetings: Assume 2 in person meetings, one for alternatives and one for development of selected alternative.	12	12	20	20	12					$ 150				76	$ 14,968	$ 150	$ 15,118
	SUBTOTAL														164	$ 31,472	$ 150	$ 31,622
110	**ALTERNATIVES EVALUATION**																	
	Site Visits and Geomorphic Evaluation																	
	Site visit and bankfull measurements.	10	10	10	12	12					$ 150			$ 350	54	$ 10,592	$ 500	$ 11,092
	Reference reach site visit and bankfull measurements			4	6	6					$ 75			$ 350	16	$ 2,668	$ 425	$ 3,093
	Review existing hydrology and bankfull discharge estimates based on field measurements			4	6	8									18	$ 2,948		$ 2,948
	Geomorphic Evaluation of existing conditions, reference reach, and proposed design (bankfull dimensions, sinuosity, meander wavelength, pool-to-pool spacing, etc.)	0	2	4	8	16									30	$ 4,884		$ 4,884
	Hydraulics evaluation (quick 2 section HEC-RAS modeling of representative reach to size primary bankfull channel and to perform approximate rock sizing calculations, assess existing secondary channel hydraulics using existing 2D model)	2	4	12	16	24									58	$ 9,964		$ 9,964
	Alternative 1 - Stabilize Existing Main Channel																	
	Sketch Layout restoration of main channel improvements (6500 LF)	4	4	8	8	16									40	$ 7,168		$ 7,168
	Sketch Layout improvements at existing Lakeview Road Culverts (u/s control weir, d/s erosion protection)	2	4	6	8	16									36	$ 6,268		$ 6,268
	Culvert hydraulics evaluation (HEC-RAS modeling of minimal upgrades to the existing culverts under Lakeview Drive using the RESPEC model as a starting point)		2	4	4	8									18	$ 3,100		$ 3,100
	Prepare channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	12	24		20							64	$ 9,476		$ 9,476
	Alternative 2 - Shift Main Channel East to Historic Valley Low Point with Overflow Channel																	
	Sketch Layout restoration of main channel improvements (6500 LF)	4	4	8	8	16									40	$ 7,168		$ 7,168
	Sketch Layout restoration of two secondary channel improvements	4	4	8	8	12									36	$ 6,608		$ 6,608
	Sketch Layout improvements at existing Lakeview Road Culverts with new main channel box culvert (u/s control weir, new box culvert, d/s erosion protection)	4	6	8	8	12									38	$ 7,092		$ 7,092
	Hydraulics evaluation (HEC-RAS modeling of a representative reach for a system with two secondary channels)		1	4	6	8									19	$ 3,190		$ 3,190
	Culvert hydraulics evaluation (HEC-RAS modeling of upgrades to several of the existing culverts under Lakeview Drive using the RESPEC model as a starting point)		2	4	6	12									24	$ 3,992		$ 3,992
	Prepare channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	12	24		12							56	$ 8,492		$ 8,492
	Alternative 3 - Shift Main Channel East to Historic Valley Low Point with Multiple Overflow Channels																	
	Sketch Layout restoration of main channel improvements (6500 LF)	2	2	4	4	8									20	$ 3,584		$ 3,584
	Sketch Layout restoration of multiple secondary channel improvements	4	4	8	8	12									36	$ 6,608		$ 6,608
	Sketch Layout improvements at existing Lakeview Road Culverts with new main channel box culvert and new overflow culverts (u/s control weir, new box	4	6	8	12	20									50	$ 8,876		$ 8,876
	Hydraulics evaluation (HEC-RAS modeling of a representative reach for a system with multiple secondary channels)		1	4	6	8									19	$ 3,190		$ 3,190
	Culvert hydraulics evaluation (HEC-RAS modeling of full replacement of the existing culverts under Lakeview Drive using the RESPEC model as a starting point)		2	4	6	12									24	$ 3,992		$ 3,992
	Prepare channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	12	24		12							56	$ 8,492		$ 8,492
	Water Quality Analysis																	
	Provide qualitative and approximate quantitative assessment of water quality benefits for three alternatives. Task includes coordination with CCBWQA consultants and TAC, research on treatment effectiveness associated with stream rehabilitation and overbank infiltration and wetland processes, and consideration of follow-up bench-scale or field testing to prove-out treatment concepts.	18		24		18									60	$ 11,868		$ 11,868
	Conceptual Construction Costs and Design Report																	
	Construction cost estimate for 3 alternatives		6	12	18	24									60	$ 10,296		$ 10,296
	Alternatives Analysis Design Report	8	4	16	24	8									60	$ 11,336		$ 11,336
	SUBTOTAL														932	$ 161,852	$ 925	$ 162,777
120	**SPECIAL SERVICES**																	
	Ecology and 404 Permitting (ERO): Identify existing conditions and restoration opportunities including mapping of vegetation communities and a high level quality assessment with a memo to document the results. Consult with project team to provide ecological and USACOE 404 permitting input on three alternatives for the restoration of Cherry Creek and the adjacent floodplain. Including one site visit, three internal virtual team meetings, and in person TAC meetings.									$ 31,421							$ 31,421	$ 31,421
	Geomorphology and Sediment Transport (Alden): Provide geomorphic and sediment transport qualitative input on three alternatives. Includes a virtual internal project kickoff meeting, 1 site visit, 3 internal virtual meetings for alternatives analysis, a review of available information and assessment of processes impacting the park, and review and input of three alternatives.									$ 16,955							$ 16,955	$ 16,955
	Muller and ERO time for partner outreach and check in with CCBWQA consulting staff, executive committee, TAC, and Board for coordination of project to be billed at a time and materials basis and will be as directed by CCBWQA.	6	10	18	14					$ 4,000					48	$ 9,940	$ 4,000	$ 13,940
	SUBTOTAL														48	$ 9,940	$ 52,376	$ 62,316
	TOTAL HOURS	89	95	258	290	368	0	44	0						1144			
	TOTAL LABOR	$ 21,538	$ 22,990	$ 53,664	$ 48,140	$ 51,520	$ -	$ 5,412	$ -							$ 203,264		
	TOTAL EXPENSES									$ 52,376	$ 375	$ -	$ -	$ 700			$ 53,451	
	TOTAL FEE																	$ 256,715

Exclusions and Assumptions:
1. A 7 month project duration is assumed for Phase 1: Alternatives Analysis.
2. A landscape architect has not been contracted as part of this phase of work. Landscape plans will be limited to plantine zones (wetland/riparian/upland) as directed by the ecologist.
3. Preparation of a 404 Permit. CSOT. or any other required permits are not included in this scope and fee.
4. Calculations of Environmental Functional Units (EFU's) or SACWET are not included in this scope and fee.
5. Sediment transport will be limited to a qualitative assessment. no sediment transport capacity calculations are included in this scope.

MULLER ENGINEERING COMPANY
PROJECT FEE ESTIMATE

CLIENT:
Cherry Creek Basin Water Quality Authority

PROPOSAL NO.: 923.22 | PROJECT NO.: 20-023.04

PROJECT:
Cherry Creek Reach 1: Phase 2 Concept Design of Selected Alternative (Work Beginning in January of 2024)

PREPARED BY: JAY | DATE: 4/5/2023

CHECKED BY: DDJ/JTW | **PROPOSED TOTAL FEE: $ 180,847**

TASK NO.	ITEM DESCRIPTION	LABOR (HOURS)								EXPENSES					TOTALS			
	2023 Billing Rate>>>	Senior Project Manager 9 $242	Senior Project Manager 9 $242	Project Manager 7L $208	Project Engineer 5L $166	Design Engineer 3 $140	GIS Analyst $132	Technician/CADD Operator 4 $123	Administrative Support $93	OUTSIDE SERVICES	TRAVEL	REPRODUCTION	DELIVERY	MISCELLANEOUS	TIME (HOURS)	LABOR COST	EXPENSES	SUBTOTAL
200	**PROJECT MANAGEMENT AND MEETINGS**																	
	Project management including sub-consultant agreements and preparation of monthly invoices and progress reports. (Assume 4 months)			8	12										20	$ 3,656		$ 3,656
	Phone and e-mail coordination with the CCBWQA. (4-months)			8	8										16	$ 2,992		$ 2,992
	Progress Meetings: assume 2 virtual progress meetings w/CCBWQA	4	4	6	8	8									30	$ 5,632		$ 5,632
	Board Meetings: Assume 1 in person meeting to present the selected alternative.	8	4	10	10	5					$ 150				37	$ 7,344	$ 150	$ 7,494
	SUBTOTAL														103	$ 19,624	$ 150	$ 19,774
210	**CONCEPTUAL DESIGN OF SELECTED ALTERNATIVE**																	
	Selected Alternative Development																	
	Site Visit	10	10	10	12	12					$ 150			$ 350	54	$ 10,592	$ 500	$ 11,092
	Refine layout of main channel restoration improvements	4	4	12	16	16									52	$ 9,328		$ 9,328
	Refine Layout of secondary channel improvements	2	4	8	12	16									42	$ 7,348		$ 7,348
	Refine Layout improvements at existing Lakeview Road Culverts	1	2	6	6	12									27	$ 4,650		$ 4,650
	2D Model hydraulics evaluation of selected alternative including rough grading using AutoCAD corridors with minimal cleanup to allow the model to run.	6	12	24	44	60									146	$ 25,052		$ 25,052
	Refine WQ evaluation (estimate reduction in sediment/phosphorous loading)	12		16		8									36	$ 7,352		$ 7,352
	Conceptual Channel Plans																	
	Refine channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	10	16		14							48	$ 7,286		$ 7,286
	Add title sheet, site plan sheet			2	4	4		8							18	$ 2,624		$ 2,624
	Add typical sections for main channel and secondary channels			4	4	8		6							22	$ 3,354		$ 3,354
	Add typical riffle details			4	6	8		12							30	$ 4,424		$ 4,424
	Add typical bank protection details			4	2	4		6							16	$ 2,462		$ 2,462
	Add profile of Lakeview Drive Culvert improvements			2	4	6		6							18	$ 2,658		$ 2,658
	Conceptual Construction Costs and Design Report																	
	Construction cost estimate for conceptual design		2	6	8	12									28	$ 4,740		$ 4,740
	Conceptual Design Report	12	8	24	24	18									86	$ 16,336		$ 16,336
	SUBTOTAL														623	$ 108,206	$ 500	$ 108,706
220	**SPECIAL SERVICES**																	
	Ecology and 404 Permitting (ERO): Consult with project team to provide ecological and USACOE 404 permitting input on the selected alternative and conceptual design for the restoration of Cherry Creek and the adjacent floodplain.									$ 17,330							$ 17,330	$ 17,330
	Groundwater Monitoring Wells (ERO): Coordinate and install groundwater monitoring wells outfitted with a pressure transducer and a barometric logger and provide 1-year of quarterly data collection (Assume up to 6 wells in Reach 1 only).									$ 25,000							$ 25,000	$ 25,000
	Geomorphology and Sediment Transport (Tetra Tech): Provide geomorphic and sediment transport qualitative input on the selected alternative and conceptual design. Includes 1 internal virtual meeting and time to review and provide input on concept design.									$ 3,957							$ 3,957	$ 3,957
	Muller and ERO time for partner outreach and check in with CCBWQA consulting staff, executive committee, TAC, and Board for coordination of project to be billed at a time and materials basis and will be as directed by CCBWQA.	4	6	8	6					$ 1,000					24	$ 5,080	$ 1,000	$ 6,080
	SUBTOTAL														24	$ 5,080	$ 47,287	$ 52,367
	TOTAL HOURS	63	56	170	196	213	0	52	0						750			
	TOTAL LABOR	$ 15,246	$ 13,552	$ 35,360	$ 32,536	$ 29,820	$ -	$ 6,396	$ -							$ 132,910		
	TOTAL EXPENSES									$ 47,287	$ 300	$ -	$ -	$ 350			$ 47,937	
	TOTAL FEE																	$ 180,847

Exclusions and Assumptions:

1. An 4 month project duration is assumed for Phase 2: Concept Design of Selected Alternative.
2. A landscape architect has not been contracted as part of this phase of work. Landscape plans will be limited to planting zones (wetland/riparian/upland) as directed by the ecologist.
3. Preparation of a 404 Permit, CSQT, or any other required permits are not included in this scope and fee.
4. Calculations of Environmental Functional Units (EFU's) or SACWET are not included in this scope and fee.
5. It is assumed that the Phase 2 work will occur in 2024 and that this fee will be revised to use 2024 billing rates prior to executing the final agreement.
6. The number of groundwater monitoring wells is assumed and is anticipated to be refined during the Phase 1 work. The fee should be considered a placeholder and will need to be adjusted to meet the project needs prior to executing the agreement for Phase 2.
7. Sediment transport will be limited to a qualitative assessment. no sediment trasport capacity calculations are included in this scope.

ERO Resources Corporation
Scope of Work for Environmental Services for
Cherry Creek Basin Water Quality Authority
Cherry Creek Reach 1
Arapahoe County, Colorado

April 4, 2023

Background

Muller Engineering, Inc. (Client), on behalf of Cherry Creek Basin Water Quality Authority (CCBWQA), has requested ERO Resources Corporation (ERO) prepare this Scope of Work (SOW) to perform the environmental services discussed below for the proposed Cherry Creek Reach 1 at Cherry Creek Reservoir State Park (Park) Study project. The project would evaluate restoration alternatives for Reach 1 through the Park in Arapahoe County, Colorado (study limits). ERO proposes the following tasks to assist with evaluating current conditions, restoration alternatives, and permitting approaches.

Task 1. Identify Existing Conditions and Restoration Opportunities

ERO will identify existing ecological conditions and any areas within the study area for wetland and riparian habitat restoration. This task would include mapping vegetation communities within the project area, completing a high-level quality assessment of the vegetation in the project area, and potential areas for enhancement or restoration. ERO will provide a memo to be included as part of an overall project documentation that summarizes the existing ecological conditions and restoration potential within the study limits.

Products

- Map identifying vegetation communities, quality assessment, and restoration or enhancement areas
- Draft and final memo discussing existing ecological conditions and restoration opportunities

Task 2. Develop Restoration Alternatives

ERO will coordinate with Muller during the study and project implementation. ERO will assist the project team with identifying potential restoration of three enhancement alternatives within the project area. ERO would also work with the project team early in the designing process to identify concept alternatives that reduce impacts to high quality wetland or riparian habitat or other sensitive natural resources. This includes meeting with Muller to review the wetland and riparian mapping, potential restoration and enhancement areas, and provide comments for the three alternatives. ERO assumes that up to six conference call meetings with Muller/project team to discuss the project will be required.

ERO will provide recommendations, and review and refine alternatives based on team meetings and a meeting with the TAC.

As part of this task, ERO will investigate the quantity of plant materials and develop cost estimates for each of the three alternatives. Following collaboration with the project team, ERO will also refine estimates and planting costs based on design changes and input from the project team. ERO will coordinate with Muller to deliver a final report with a summary of each alternative and projected restoration costs in terms of planting and revegetation.

Based on the design of the three alternatives, ERO will provide permitting constraints or approaches for each of the alternatives, including type of Clean Water Act Section 404 permit may be required, consultation on impacts to Preble's meadow jumping mouse habitat (a federally listed species), and 408 clearance.

Products

- Recommendations for areas to protect, enhance, or restore
- Provide input and collaboration on design alternatives
- Provide written documentation on permitting constraints or challenges for each alternative
- Provide quantity and cost estimate of revegetation planting materials for each alternative

Assumptions

- This task does not include any formal consultation with the Corps or other agencies or any 404 permitting or consultation with U.S. Fish and Wildlife Services.
- This includes up to 6 meetings with the project team to discuss alternatives.

Task 3. Project Management, Coordination, and Meetings

This task includes items specifically associated with contract and project management services through the duration of the contract, such as project start-up documentation, health and safety plan compliance, monthly invoicing, and project close-out documentation. This task also includes attending a one day site-meeting with the project team, a kick-off meeting, and a meeting with the TAC to present alternative designs. This task also includes ensuring that all documents and figures are reviewed for technical and editorial accuracy.

Products

- Attendance at a 1 day site meeting with the project team
- Attendance at a kickoff meeting
- Attendance at a TAC meeting to present alternative designs

Task 4. Groundwater wells

ERO will install nine shallow groundwater wells in the project area to determine how patterns in groundwater relate to existing vegetation communities and conditions. Each well will be outfitted with a pressure transducer and a barometric logger will be installed to correct water-level measurements. ERO will also collect groundwater data for the first year, collected quarterly.

Products

- Installation of 9 monitoring wells and monitoring quarterly

Assumptions

- This task assumes the wells can be installed by hand and no drill rig will be required. If the wells need to be installed deeper than can be reached by hand, then a new scope of work will be prepared.
- Groundwater monitoring will be collected up to 4 times.

Task 5. Additional Support

ERO will conduct any additional tasks necessary for the project, at the direction of the Client and CCBWA.

Estimated Costs

The above Tasks 1 and 5 will be completed on a time-and-materials basis for a cost not to exceed $71,289 (see below and attached spreadsheet for breakout), including expenses billed at cost plus 8%.

Task 1.	Identify Existing Conditions and Restoration Opportunities	$13,411
Task 2.	Develop Restoration Alternatives	$24,128
Task 3.	Project Coordination and Meetings	$9,811
Task 4.	Groundwater wells	$21,538
Task 5.	Additional Items	$5,000
	Total	**$71,289**

Estimated Costs for 2023	**$31,421**
Estimated Costs for 2024	**$39,868**
Total Costs	**$71,289**

Total Costs

ERO Cost Proposal - Cherry Creek Reach 1 at Cherry Creek Reservoir State Park

Labor Category	**2023/ Unit Rate**	**Task 1. Identify existing conditions and restoration opportunities**	**Task 2. Develop restoration alteratives**	**Task 3. Project Management, Coordination, and Meetings**	**Task 4. Groundwater wells**	**Task 5. Additional Support**	**Labor Hours Total**	**Totals**
Project Principal	$197.00	4	52	20		13	*89*	*$17,533*
Biologist II	$128.00	48	100	20	60	14	*242*	*$30,976*
Staff Biologist	$109.00	40			60		*100*	*$10,900*
GIS	$78.00	16	8		6	8	*38*	*$2,964*
Word Processing/Editor	$109.00	2	4				*6*	*$654*
Administrative Staff	$92.00			6			*6*	*$552*
Bulk Additional Costs/Items								
Total Labor Hours		110	164	46	126	35	481	
Total Labor		**$12,758**	**$24,104**	**$7,052**	**$14,688**	**$4,977**		***$63,579***
Expenses	Unit Rate	Task 1. Identify existing conditions and restoration opportunities	Task 2. Develop restoration alteratives	Task 3. Project Management, Coordination, and Meetings	Task 4. Groundwater wells	Task 5. Additional Support	Totals Quantities	Totals
Field Equipment Charges	$10.000	2			2		*4*	*$40*
Mileage	$0.625	500		200	400	34	*1,134*	*$709*
Photocopy (color/8.5x11)	$0.300	50	50	50	50		*200*	*$60*
Photocopy (b&w/8.5x11)	$0.150	50	50	50	50		*200*	*$30*
RTK rental	$275.000				2		*2*	*$550*
Well materials	$500.000				11		*11*	*$5,500*
GPS Rental (per day)	$125.000	2					*2*	*$250*
Total Expenses		$605	$23	$148	$6,343	$21		*$7,139*
8% markup		$48	$2	$12	$507	$2		***$571***
Total estimated costs		**$13,411**	**$24,128**	**$7,211**	**$21,538**	**$5,000**		***$71,289***

2023 Costs

ERO Cost Proposal - Cherry Creek Reach 1 at Cherry Creek Reservoir State Park

Labor Category	2023/ Unit Rate	Task 1. Identify existing conditions and restoration opportunities	Task 2. Develop restoration alteratives	Task 3. Project Management, Coordination, and Meetings	Task 5. Additional Support	Labor Hours Total	Totals
Project Principal	$197.00	4	26	10	6	*46*	*$9,062*
Biologist II	$128.00	48	50	10	7	*115*	*$14,720*
Staff Biologist	$109.00	40				*40*	*$4,360*
GIS	$78.00	16	6		4	*26*	*$2,028*
Word Processing/Editor	$109.00	2				*2*	*$218*
Administrative Staff	$92.00			3		*3*	*$276*
Bulk Additional Costs/Items							
Total Labor Hours		110	82	23	17	232	
Total Labor		**$12,758**	**$11,990**	**$3,526**	**$2,390**		***$30,664***
Expenses	Unit Rate	Task 1. Identify existing conditions and restoration opportunities	Task 2. Develop restoration alteratives	Task 3. Project Management, Coordination, and Meetings	Task 5. Additional Support	Totals Quantities	Totals
Field Equipment Charges	$10.000	2				*2*	*$20*
Mileage	$0.625	500		100	17	*617*	*$386*
Photocopy (color/8.5x11)	$0.300	50	25	25		*100*	*$30*
Photocopy (b&w/8.5x11)	$0.150	50	25	25		*100*	*$15*
RTK rental	$275.000					*0*	*$0*
Well materials	$500.000					*0*	*$0*
GPS Rental (per day)	$125.000	2				*2*	*$250*
Total Expenses		$605	$11	$74	$11		*$701*
8% markup		$48	$1	$6	$1		***$56***
Total estimated costs		**$13,411**	**$12,002**	**$3,606**	**$2,401**		***$31,421***

2024 Costs

ERO Cost Proposal - Cherry Creek Reach 1 at Cherry Creek Reservoir State Park

Labor Category	**2023/ Unit Rate**	**Task 2. Develop restoration alteratives**	**Task 3. Project Management, Coordination, and Meetings**	**Task 4. Groundwater wells**	**Task 5. Additional Support**	**Labor Hours Total**	**Totals**
Project Principal	$197.00	26	10		7	*43*	*$8,471*
Biologist II	$128.00	50	10	60	7	*127*	*$16,256*
Staff Biologist	$109.00			60		*60*	*$6,540*
GIS	$78.00	2		6	4	*12*	*$936*
Word Processing/Editor	$109.00	4				*4*	*$436*
Administrative Staff	$92.00		3			*3*	*$276*
Bulk Additional Costs/Items							
Total Labor Hours		82	23	126	18	249	
Total Labor		**$12,114**	**$3,526**	**$14,688**	**$2,587**		***$32,915***
Expenses	Unit Rate	Task 2. Develop restoration alteratives	Task 3. Project Management, Coordination, and Meetings	Task 4. Groundwater wells	Task 5. Additional Support	Totals Quantities	Totals
Field Equipment Charges	$10.000			2		*2*	*$20*
Mileage	$0.625		100	400	17	*517*	*$323*
Photocopy (color/8.5x11)	$0.300	25	25	50		*100*	*$30*
Photocopy (b&w/8.5x11)	$0.150	25	25	50		*100*	*$15*
RTK rental	$275.000			2		*2*	*$550*
Well materials	$500.000			11		*11*	*$5,500*
GPS Rental (per day)	$125.000					*0*	*$0*
Total Expenses		$11	$74	$6,343	$11		*$6,438*
8% markup		$1	$6	$507	$1		***$515***
Total estimated costs		**$12,126**	**$3,606**	**$21,538**	**$2,598**		***$39,868***

April 5, 2023

Re: Scope of Work and Cost Estimate to support development of 30% level channel improvement designs for Reach 1 in Cherry Creek State Park.

Dear Mr. Yager

Alden is pleased to provide the following Scope of Work and cost estimate to provide technical support to Muller Engineering in the development of 30% level designs for channel improvements along Reach 1 of Cherry Creek within Cherry Creek State Park.

Scope of Work

The cost estimate is based on the following tasks:

Task 1: Project Kickoff:

a. Project setup
b. Participate in one 2-hr virtual kickoff meeting.

Task 2: Review of Information:

a. Review of available information
b. Review of previous studies

Task 3: Reach 1 Design Alternative 1 Support:

a. Prepare for and participate in one 2-hr virtual workshop with Muller to develop initial concepts for Alternative 1 design.
b. Review and comment on channel geometry recommendations developed by Muller

Task 4: Reach 1 Design Alternatives 2 & 3 Support:

a. Prepare for and participate in one 3-hr virtual workshop with Muller to develop initial concepts for Alternatives 2 and 3 design.
b. Review and comment on channel geometry recommendations developed by Muller

Task 5: Site Visit:

a. Prepare for and participate in one 1-day site visit of the project reach with Muller team.

Task 6: Selected Alternative Refinement Support (to be contracted in 2024):

a. Prepare for and participate in one 2-hr virtual workshop with Muller to review design alternatives and identify recommended Selected Alternative and propose potential refinements to Selected Alternative.
b. Review and comment on channel geometry refinements developed by Muller

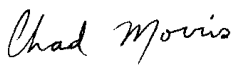
Cost Estimate

Alden proposes to complete the identified scope of work above on a time-and-material-basis, not to exceed $20,912 without written authorization from Muller Engineering Of the $20,912, $16,955 is expected to be contracted in 2023, and the remainder in 2024. A breakdown by task is provided in **Attachment A**.

Thank you for the opportunity to provide this proposal. If you have any questions, please do not hesitate to contact me at 970-852-6036 or cmorris@aldenlab.com.

Sincerely,

Alden Research Lab



Chad Morris, PE
Project Manager

a verdantas company

ALDEN

Attachment A
Cost Estimate to Support 30% Level Design of Cherry Creek Reach 1

Task	Description	Principal Engineer/ Geomorphologist $250 Hours	Principal Engineer/ Geomorphologist $250 Fee	Sr. Engineer $232 Hours	Sr. Engineer $232 Fee	GIS/CAD Specialist $137 Hours	GIS/CAD Specialist $137 Fee	Subtotal Hours	Labor Subtotal	ODCs (Ordinary Direct Costs)*	Subtotal
	Support of Reach 1 Alternatives Analysis										
1	Project Kickoff	2	$500	4	$928		$0	6	$1,428		$1,428
2	Review of available information	6	$1,500	8	$1,856		$0	14	$3,356		$3,356
3	Reach 1 Design Alternative 1 Support	4	$1,000	8	$1,856	1	$137	13	$2,993		$2,993
4	Reach 1 Design Alternatives 2 & 3 Support	6	$1,500	10	$2,320	1	$137	17	$3,957		$3,957
5	Site Visit (1 day)	10	$2,500	10	$2,320	1	$137	21	$4,957	$264	$5,221
	2023 Subtotal (to be contracted in 2023)	28	$7,000	40	$9,280	3	$411	71	$16,691	$264	$16,955
6	Selected Alternative Refinement Support	6	$1,500	10	$2,320	1	$137	17	$3,957		$3,957
	2024 Subtotal Estimate (to be contracted in 2024)	6	$1,500	10	$2,320	1	$137	0	$3,957	$0	$3,957
	Total	**34**	**$8,500**	**50**	**$11,600**	**4**	**$548**	**71**	**$20,648**	**$264**	**$20,912**

*Includes cost plus G&A of 15%.

MULLER ENGINEERING COMPANY

MULLER ENGINEERING COMPANY
PROJECT FEE ESTIMATE

CLIENT:
Cherry Creek Basin Water Quality Authority

PROJECT:
Cherry Creek Reach 1: Phase 1 Alternatives Analysis

PROPOSAL NO.: 923.22
PREPARED BY: JAY
CHECKED BY: DDJ//JTW

PROJECT NO.: 20-023.04
DATE: 4/5/2023
PROPOSED TOTAL FEE: $ 256,715

TASK NO.	ITEM DESCRIPTION	JTW Senior Project Manager 9 $242	DDJ Senior Project Manager 9 $242	JAY Project Manager 7L $208	NAY Project Engineer 5L $166	CRV Design Engineer 3 $140	SR2 GIS Analyst $132	PBS Technician/CAD/Operator 4 $123	ALG Administrative Support $93	OUTSIDE SERVICES	TRAVEL	REPRODUCTION	DELIVERY	MISCELLANEOUS	TIME (HOURS)	LABOR COST	EXPENSES	SUBTOTAL
100	**PROJECT MANAGEMENT AND MEETINGS**																	
	Project management including sub-consultant agreements and preparation of monthly invoices and progress reports. (Assume 7 months)			10	16										26	$ 4,736		$ 4,736
	Phone and e-mail coordination with the CCBWQA. (7-months)			14	14										28	$ 5,236		$ 5,236
	Progress Meetings: assume 3 virtual progress meetings w/CCBWQA	5	5	8	8	8									34	$ 6,532		$ 6,532
	TAC Meetings: Assume 2 in person meetings, one for alternatives and one for development of selected alternative.	12	12	20	20	12					$ 150				76	$ 14,968	$ 150	$ 15,118
	SUBTOTAL														164	$ 31,472	$ 150	$ 31,622
110	**ALTERNATIVES EVALUATION**																	
	Site Visits and Geomorphic Evaluation																	
	Site visit and bankfull measurements.	10	10	10	12	12					$ 150			$ 350	54	$ 10,592	$ 500	$ 11,092
	Reference reach site visit and bankfull measurements			4	6	6					$ 75			$ 350	16	$ 2,668	$ 425	$ 3,093
	Review existing hydrology and bankfull discharge estimates based on field measurements			4	6	8									18	$ 2,948		$ 2,948
	Geomorphic Evaluation of existing conditions, reference reach, and proposed design (bankfull dimensions, sinuosity, meander wavelength, pool-to-pool spacing, etc.)	0	2	4	8	16									30	$ 4,884		$ 4,884
	Hydraulics evaluation (quick 2 section HEC-RAS modeling of representative reach to size primary bankfull channel and to perform approximate rock sizing calculations, assess existing secondary channel hydraulics using existing 2D model)	2	4	12	16	24									58	$ 9,964		$ 9,964
	Alternative 1 - Stabilize Existing Main Channel																	
	Sketch Layout restoration of main channel improvements (6500 LF)	4	4	8	8	16									40	$ 7,168		$ 7,168
	Sketch Layout improvements at existing Lakeview Road Culverts (u/s control weir, d/s erosion protection)	2	4	6	8	16									36	$ 6,268		$ 6,268
	Culvert hydraulics evaluation (HEC-RAS modeling of minimal upgrades to the existing culverts under Lakeview Drive using the RESPEC model as a starting point)		2	4	4	8									18	$ 3,100		$ 3,100
	Prepare channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	12	24		20							64	$ 9,476		$ 9,476
	Alternative 2 - Shift Main Channel East to Historic Valley Low Point with Overflow Channel																	
	Sketch Layout restoration of main channel improvements (6500 LF)	4	4	8	8	16									40	$ 7,168		$ 7,168
	Sketch Layout restoration of two secondary channel improvements	4	4	8	8	12									36	$ 6,608		$ 6,608
	Sketch Layout improvements at existing Lakeview Road Culverts with new main channel box culvert (u/s control weir, new box culvert, d/s erosion protection)	4	6	8	8	12									38	$ 7,092		$ 7,092
	Hydraulics evaluation (HEC-RAS modeling of a representative reach for a system with two secondary channels)		1	4	6	8									19	$ 3,190		$ 3,190
	Culvert hydraulics evaluation (HEC-RAS modeling of upgrades to several of the existing culverts under Lakeview Drive using the RESPEC model as a starting point)		2	4	6	12									24	$ 3,992		$ 3,992
	Prepare channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	12	24		12							56	$ 8,492		$ 8,492
	Alternative 3 - Shift Main Channel East to Historic Valley Low Point with Multiple Overflow Channels																	
	Sketch Layout restoration of main channel improvements (6500 LF)	2	2	4	4	8									20	$ 3,584		$ 3,584
	Sketch Layout restoration of multiple secondary channel improvements	4	4	8	8	12									36	$ 6,608		$ 6,608
	Sketch Layout improvements at existing Lakeview Road Culverts with new main channel box culvert and new overflow culverts (u/s control weir, new box	4	6	8	12	20									50	$ 8,876		$ 8,876
	Hydraulics evaluation (HEC-RAS modeling of a representative reach for a system with multiple secondary channels)		1	4	6	8									19	$ 3,190		$ 3,190
	Culvert hydraulics evaluation (HEC-RAS modeling of full replacement of the existing culverts under Lakeview Drive using the RESPEC model as a starting point)		2	4	6	12									24	$ 3,992		$ 3,992
	Prepare channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	12	24		12							56	$ 8,492		$ 8,492
	Water Quality Analysis																	
	Provide qualitative and approximate quantitative assessment of water quality benefits fore three alternatives. Task includes coordination with CCBWQA consultants and TAC, research on treatment effectiveness associated with stream rehabilitation and overbank infiltration and wetland processes, and consideration of follow-up bench-scale or field testing to prove-out treatment concepts.	18		24		18									60	$ 11,868		$ 11,868
	Conceptual Construction Costs and Design Report																	
	Construction cost estimate for 3 alternatives		6	12	18	24									60	$ 10,296		$ 10,296
	Alternatives Analysis Design Report	8	4	16	24	8									60	$ 11,336		$ 11,336
	SUBTOTAL														932	$ 161,852	$ 925	$ 162,777
120	**SPECIAL SERVICES**																	
	Ecology and 404 Permitting (ERO): Identify existing conditions and restoration opportunities including mapping of vegetation communities and a high level quality assessment with a memo to document the results. Consult with project team to provide ecological and USACOE 404 permitting input on three alternatives for the restoration of Cherry Creek and the adjacent floodplain. Including one site visit, three internal virtual team meetings, and in person TAC meetings.									$ 31,421							$ 31,421	$ 31,421
	Geomorphology and Sediment Transport (Alden): Provide geomorphic and sediment transport qualitative input on three alternatives. Includes a virtual internal project kickoff meeting, 1 site visit, 3 internal virtual meetings for alternatives analysis, a review of available information and assessment of processes impacting the park, and review and input of three alternatives.									$ 16,955							$ 16,955	$ 16,955
	Muller and ERO time for partner outreach and check in with CCBWQA consulting staff, executive committee, TAC, and Board for coordination of project to be billed at a time and materials basis and will be as directed by CCBWQA.	6	10	18	14					$ 4,000					48	$ 9,940	$ 4,000	$ 13,940
	SUBTOTAL														48	$ 9,940	$ 52,376	$ 62,316
	TOTAL HOURS	89	95	258	290	368	0	44	0						1144			
	TOTAL LABOR	$ 21,538	$ 22,990	$ 53,664	$ 48,140	$ 51,520	$ -	$ 5,412	$ -							$ 203,264		
	TOTAL EXPENSES									$ 52,376	$ 375	$ -	$ -	$ 700			$ 53,451	
	TOTAL FEE																	$ 256,715
	Hours/Month	11	12	32	36	46	0	6										

Exclusions and Assumptions:
1. A 7 month project duration is assumed for Phase 1: Alternatives Analysis.
2. A landscape architect has not been contracted as part of this phase of work. Landscape plans will be limited to planting zones (wetland/riparian/upland) as directed by the ecologist.
3. Preparation of a 404 Permit, CSQT, or any other required permits are not included in this scope and fee.
4. Calculations of Environmental Functional Units (EFU's) or SACWET are not included in this scope and fee.
5. Sediment transport will be limited to a qualitative assessment. no sediment trasport capacity calculations are included in this scope.

MULLER ENGINEERING COMPANY
PROJECT FEE ESTIMATE

CLIENT:
Cherry Creek Basin Water Quality Authority

PROPOSAL NO.: 923.22 | PROJECT NO.: 20-023.04
PREPARED BY: JAY | DATE: 4/5/2023
CHECKED BY: DDJ//JTW | **PROPOSED TOTAL FEE: $ 180,847**

PROJECT:
Cherry Creek Reach 1: Phase 2 Concept Design of Selected Alternative (Work Beginning in January of 2024)

TASK NO.	ITEM DESCRIPTION	LABOR (HOURS)								EXPENSES					TOTALS			
	Staff Member Initials >>>	JTW	DDJ	JAY	NAY	CRV	SR2	PBS	ALG									
	2023 Billing Rate>>>	Senior Project Manager 9 $242	Senior Project Manager 9 $242	Project Manager 7L $208	Project Engineer 5L $166	Design Engineer 3 $140	GIS Analyst $132	Technician/CADD Operator 4 $123	Administrative Support $93	OUTSIDE SERVICES	TRAVEL	REPRODUCTION	DELIVERY	MISCELLANEOUS	TIME (HOURS)	LABOR COST	EXPENSES	SUBTOTAL
200	**PROJECT MANAGEMENT AND MEETINGS**																	
	Project management including sub-consultant agreements and preparation of monthly invoices and progress reports. (Assume 4 months)			8	12										20	$ 3,656		$ 3,656
	Phone and e-mail coordination with the CCBWQA. (4-months)			8	8										16	$ 2,992		$ 2,992
	Progress Meetings: assume 2 virtual progress meetings w/CCBWQA	4	4	6	8	8									30	$ 5,632		$ 5,632
	Board Meetings: Assume 1 in person meeting to present the selected alternative.	8	4	10	10	5					$ 150				37	$ 7,344	$ 150	$ 7,494
	SUBTOTAL														103	$ 19,624	$ 150	$ 19,774
210	**CONCEPTUAL DESIGN OF SELECTED ALTERNATIVE**																	
	Selected Alternative Development																	
	Site Visit	10	10	10	12	12					$ 150			$ 350	54	$ 10,592	$ 500	$ 11,092
	Refine layout of main channel restoration improvements	4	4	12	16	16									52	$ 9,328		$ 9,328
	Refine Layout of secondary channel improvements	2	4	8	12	16									42	$ 7,348		$ 7,348
	Refine Layout improvements at existing Lakeview Road Culverts	1	2	6	6	12									27	$ 4,650		$ 4,650
	2D Model hydraulics evaluation of selected alternative including rough grading using AutoCAD corridors with minimal cleanup to allow the model to run.	6	12	24	44	60									146	$ 25,052		$ 25,052
	Refine WQ evaluation (estimate reduction in sediment/phosphorous loading)	12		16		8									36	$ 7,352		$ 7,352
	Conceptual Channel Plans																	
	Refine channel plan (3 sheets at 1"=200'), profile main channel, channel cross sections, and plan view of Lakeview Drive Culvert improvements (7 sheets total)			8	10	16		14							48	$ 7,286		$ 7,286
	Add title sheet, site plan sheet			2	4	4		8							18	$ 2,624		$ 2,624
	Add typical sections for main channel and secondary channels			4	4	8		6							22	$ 3,354		$ 3,354
	Add typical riffle details			4	6	8		12							30	$ 4,424		$ 4,424
	Add typical bank protection details			4	2	4		6							16	$ 2,462		$ 2,462
	Add profile of Lakeview Drive Culvert improvements			2	4	6		6							18	$ 2,658		$ 2,658
	Conceptual Construction Costs and Design Report																	
	Construction cost estimate for conceptual design		2	6	8	12									28	$ 4,740		$ 4,740
	Conceptual Design Report	12	8	24	24	18									86	$ 16,336		$ 16,336
	SUBTOTAL														623	$ 108,206	$ 500	$ 108,706
220	**SPECIAL SERVICES**																	
	Ecology and 404 Permitting (ERO): Consult with project team to provide ecological and USACOE 404 permitting input on the selected alternative and conceptual design for the restoration of Cherry Creek and the adjacent floodplain.									$ 17,330							$ 17,330	$ 17,330
	Groundwater Monitoring Wells (ERO): Coordinate and install groundwater monitoring wells outfitted with a pressure transducer and a barometric logger and provide 1-year of quarterly data collection (Assume up to 6 wells in Reach 1 only).									$ 25,000							$ 25,000	$ 25,000
	Geomorphology and Sediment Transport (Tetra Tech): Provide geomorphic and sediment transport qualitative input on the selected alternative and conceptual design. Includes 1 internal virtual meeting and time to review and provide input on concept design.									$ 3,957							$ 3,957	$ 3,957
	Muller and ERO time for partner outreach and check in with CCBWQA consulting staff, executive committee, TAC, and Board for coordination of project to be billed at a time and materials basis and will be as directed by CCBWQA.	4	6	8	6					$ 1,000					24	$ 5,080	$ 1,000	$ 6,080
	SUBTOTAL														24	$ 5,080	$ 47,287	$ 52,367
	TOTAL HOURS	63	56	170	196	213	0	52	0						750			
	TOTAL LABOR	$ 15,246	$ 13,552	$ 35,360	$ 32,536	$ 29,820	$ -	$ 6,396	$ -							$ 132,910		
	TOTAL EXPENSES									$ 47,287	$ 300	$ -	$ -	$ 350			$ 47,937	
	TOTAL FEE																	$ 180,847

Exclusions and Assumptions:
1. An 4 month project duration is assumed for Phase 2: Development of Selected Alternative.
2. A landscape architect has not been contracted as part of this phase of work. Landscape plans will be limited to planting zones (wetland/riparian/upland) as directed by the ecologist.
3. Preparation of a 404 Permit, CSQT, or any other required permits are not included in this scope and fee.
4. Calculations of Environmental Functional Units (EFU's) or SACWET are not included in this scope and fee.
5. It is assumed that the Phase 2 work will occur in 2024 and that this fee will be revised to use 2024 billing rates prior to executing the final agreement.
6. The number of groundwater monitoring wells is assumed and is anticipated to be refined during the Phase 1 work. The fee should be considered a placeholder and will need to be adjusted to meet the project needs prior to executing the agreement for Phase 2.
7. Sediment transport will be limited to a qualitative assessment, no sediment trasport capacity calculations are included in this scope.

CCBWQA 3/16/23 Workshop – Follow up

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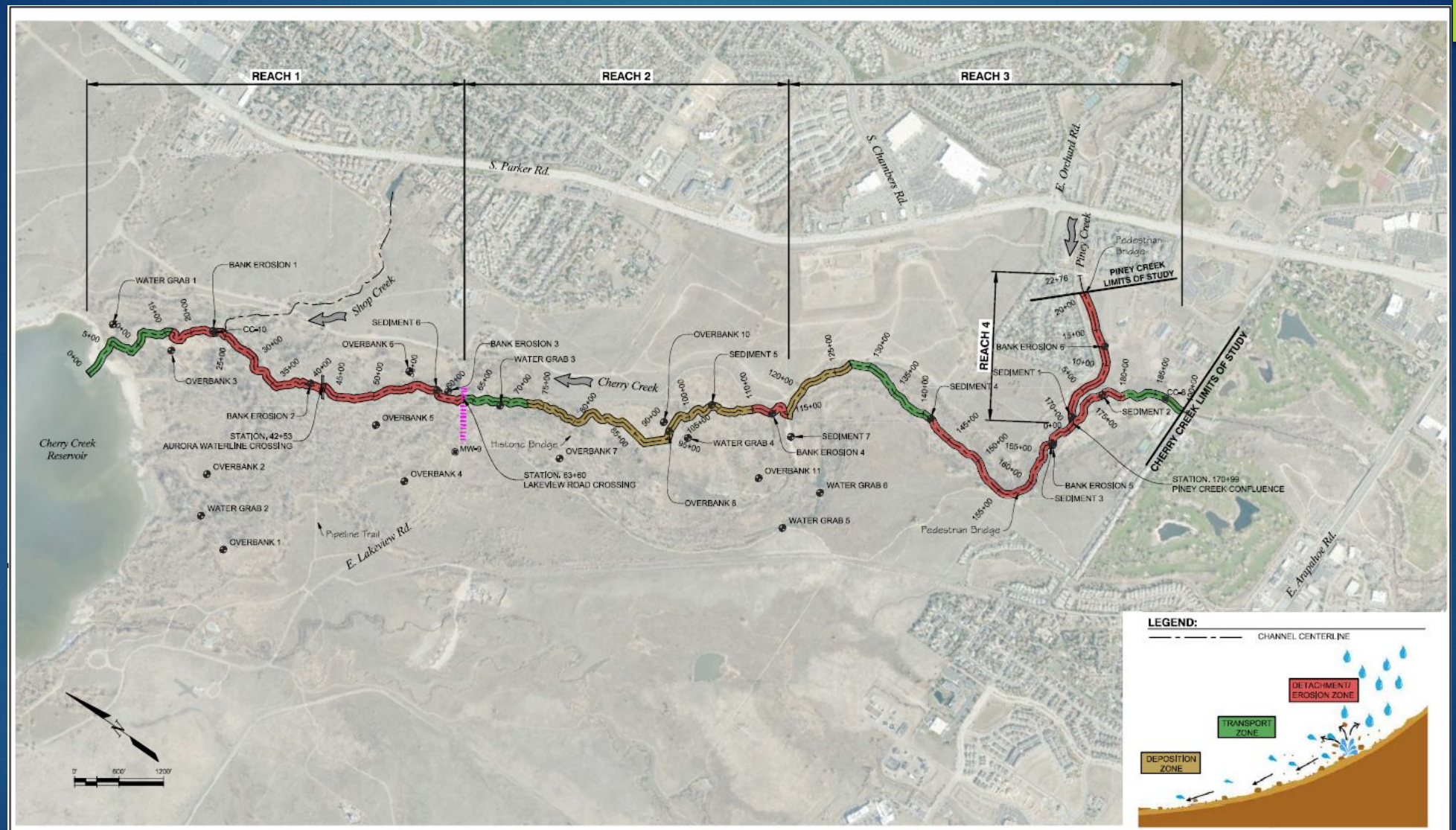

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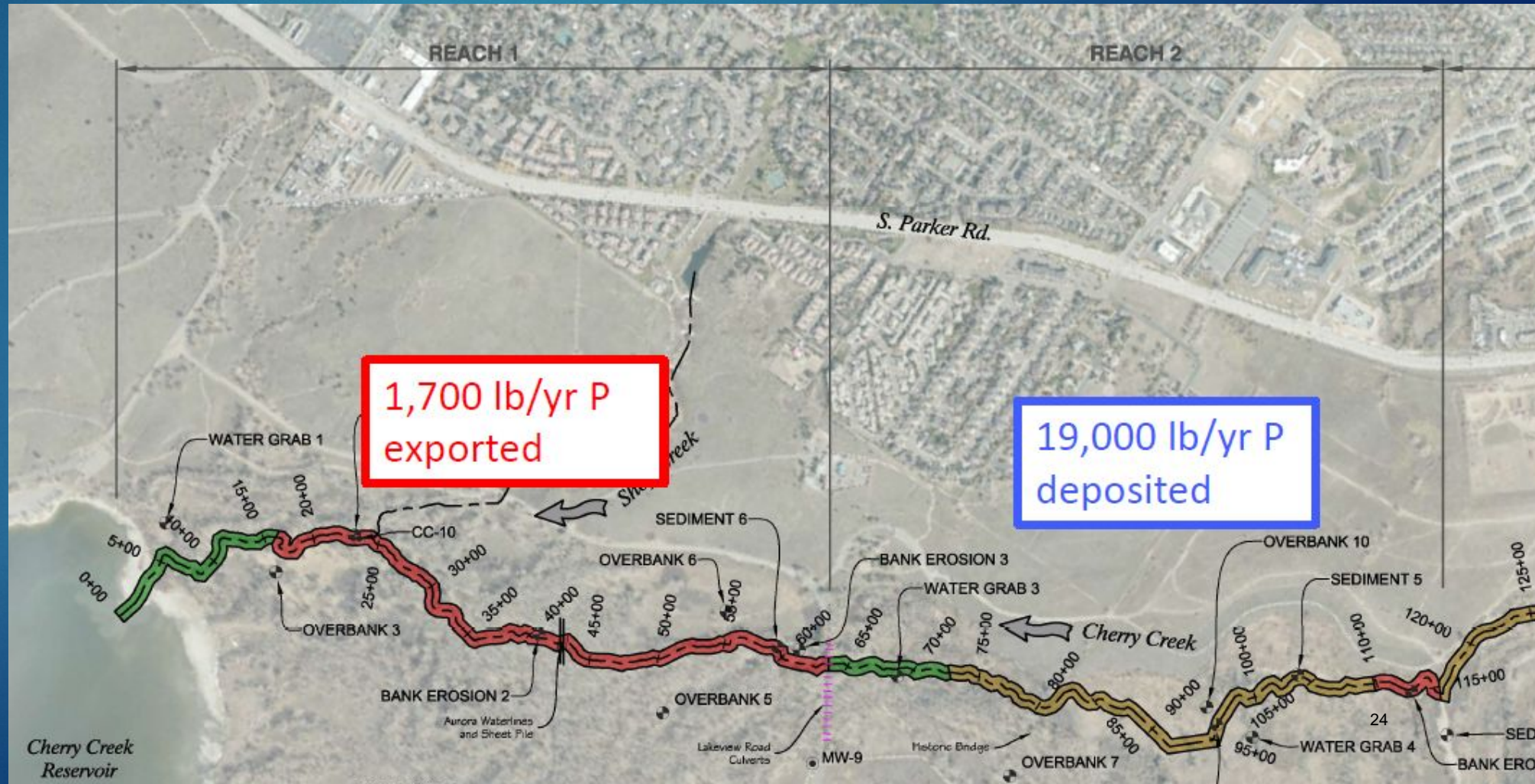
Cherry Creek Reach 1, Workshop Notes

- Reach 1 is the top priority and it is severely degraded and eroding.
  - From 2013 to 2021, the average sediment loss of 2,143 tons per year and 1684 pounds of phosphorus per year directly to the Reservoir.



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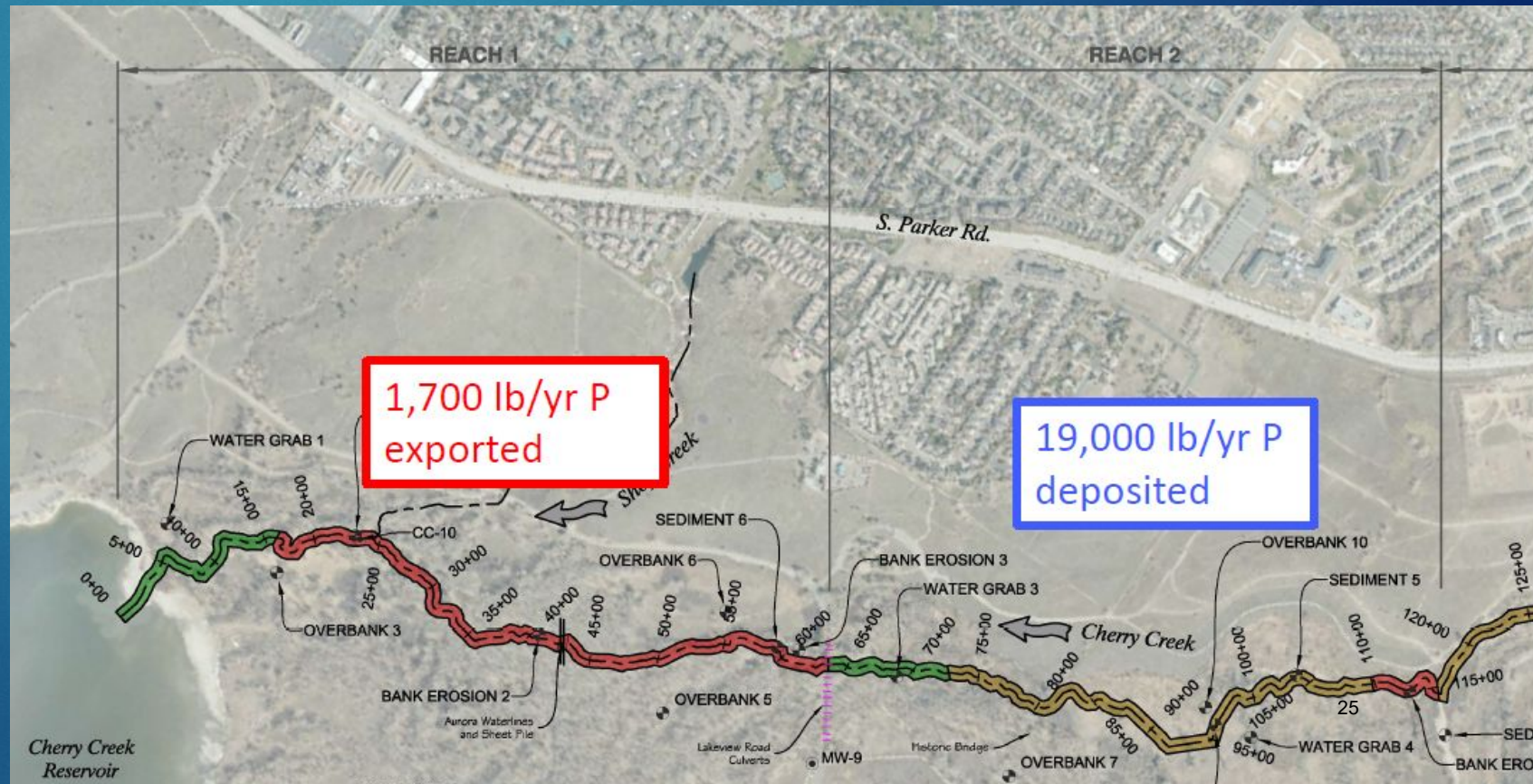
Cherry Creek Reach 2, Workshop Notes

- Reach 2 benefits the system.
  - It captures 19,000 pounds of phosphorus per year.
  - It acts as a temporary buffer by trapping sediment and reduces the near-term risk of moving forward with the downstream stream reclamation on Reach 1.
  - The sediment deposition on Reach 2 is likely not sustainable; since, more work needed on Cherry and Piney Creeks upstream for long-term success.
  - Ultimately Reaches 1, 2, and 3 work together in the system, allowing for sediment transport and exchange that achieves dynamic equilibrium.



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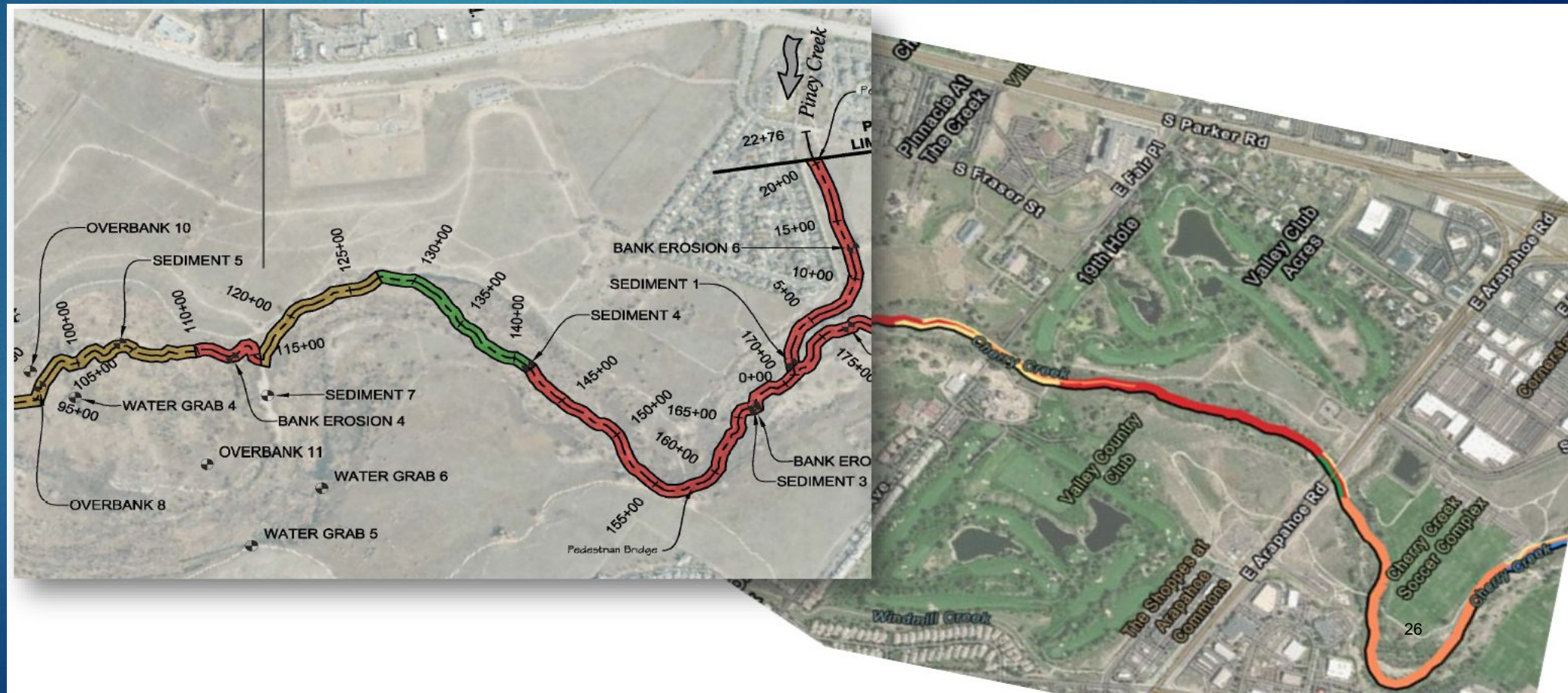
Cherry Creek Reach 3, Workshop Notes

- Cherry Creek Reach 3 is severely degraded and eroding.
- The erosion on Cherry Creek continues upstream past the Cherry Creek State Park Boundary to the Aurora Soccer fields as show in the Cherry Creek Major Drainageway Planning.
- This erosion presents a risk to the sediment trapping feature that naturally captures phosphorus in Reach 2.
- Completed stream reclamation projects upstream of the Aurora Soccer fields serve to protect the stream and minimize potential impacts from the upstream system.



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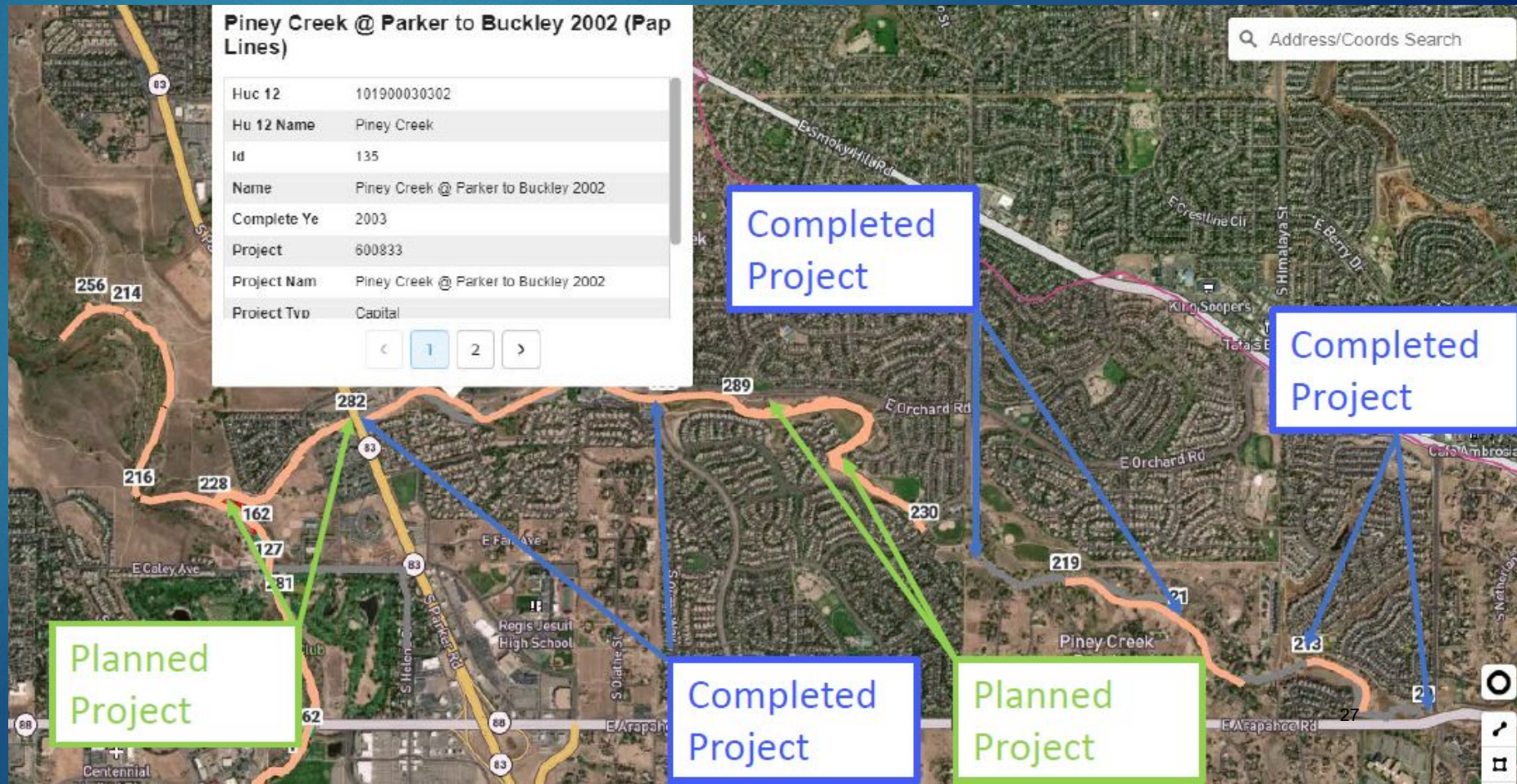
Piney Creek Reach 4, Workshop Notes

- Piney Creek Reach 4 is severely degraded and eroding.
- The erosion on Piney Creek continues upstream past the Cherry Creek State Park Boundary to Parker Road.
- This erosion presents a risk to the sediment trapping feature that naturally captures phosphorus in Reach 2.
- CCBWQA and SEMSWA have a project currently underway for Piney Creek Reach 4 and the including the section upstream to Parker Road.
- Completed stream reclamation projects upstream of the Parker Road serve to protect the stream and minimize potential impacts from the upstream system.



CCBWQA 3/16/23 Workshop – Follow up

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How does this summary look? Any other items that should be included?

Workshop Input	Follow-up	Action Item(s)
Consensus with Reach 1 being the top priority	❑ Muller prepared scope of work and fee for alternatives analysis and selection of preferred alternative (which includes cost estimate)	❑ Take consultant agreement to TAC and Board for their action in April
Develop an approach for the entire system that reduces the risk of upstream reaches on the Reach 1 project	❑ R2R reviewed 10-year CIP and prepared approach that: ○ Prioritizes Reach 1 (near term) ○ Provides funding for monitoring and adaptive management approach for upstream reaches (longer term)	❑ Discuss and review approach with TAC and Board in April ❑ Revise approach and include it in 10-year CIP for TAC and Board and action with CCBWQA's budget in October and November
Partner outreach and funding is critical to meeting the needs	❑ Bill, Jane, and Rich developed and coordinated with CPW the project overview and outreach handout ❑ Met with CPW on their backlog projects and how to best approach CPW on these projects ❑ Reach out to Aurora about support/partnership in projects to protect their waterlines ❑ Reach out to CWCB for grants for these projects ❑ Reach out to USACOE for support/partnership ❑ Identify other stakeholders and partners	❑ Prepare for TAC and Board discussion and review in April, incorporate any comments ❑ Encourage CCBWQA champions to use project overview to engage their communities, stakeholders, and partners for support and funding
Current project on Piney Creek from confluence with Cherry Creek upstream to Parker Road benefits from completed projects which serve to protect the stream and minimize potential impacts from the upstream system	❑ Continue with project on the planned schedule	❑ Bring IGA Amendment to TAC and Board for 2023 funding
??? – Any other items?		

CCBWQA 3/16/23 Workshop – Follow up

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Project Overview and Outreach

We Need Your Help to Protect Cherry Creek and the Reservoir!

Where:
Cherry Creek State Park (CCSP, see Figure 1) and Cherry Creek Reservoir serve as an oasis for the Denver metro area and Colorado Front Range. CCSP is in Arapahoe County, surrounded by Denver, Greenwood Village, Aurora, and Centennial. CCSP sees over 2 million park visitors annually that enjoy the natural resources and recreation provided by Cherry Creek and the Reservoir.

Who:
The Cherry Creek Basin Water Quality Authority (CCBWQA) and Colorado Parks and Wildlife (CPW) are working to protect the water quality in Cherry Creek and the Reservoir. For more, see https://www.cherrycreekbasin.org/.

Issue:
Severe erosion (see photos 1 and 2) is occurring in Cherry Creek in CCSP and in Piney Creek immediately upstream. The erosion is threatening the surrounding environment, wildlife corridors, critical infrastructure, and water quality. Additionally, downed trees could become debris in a large flood event potentially impacting the flood control purpose of the Reservoir.

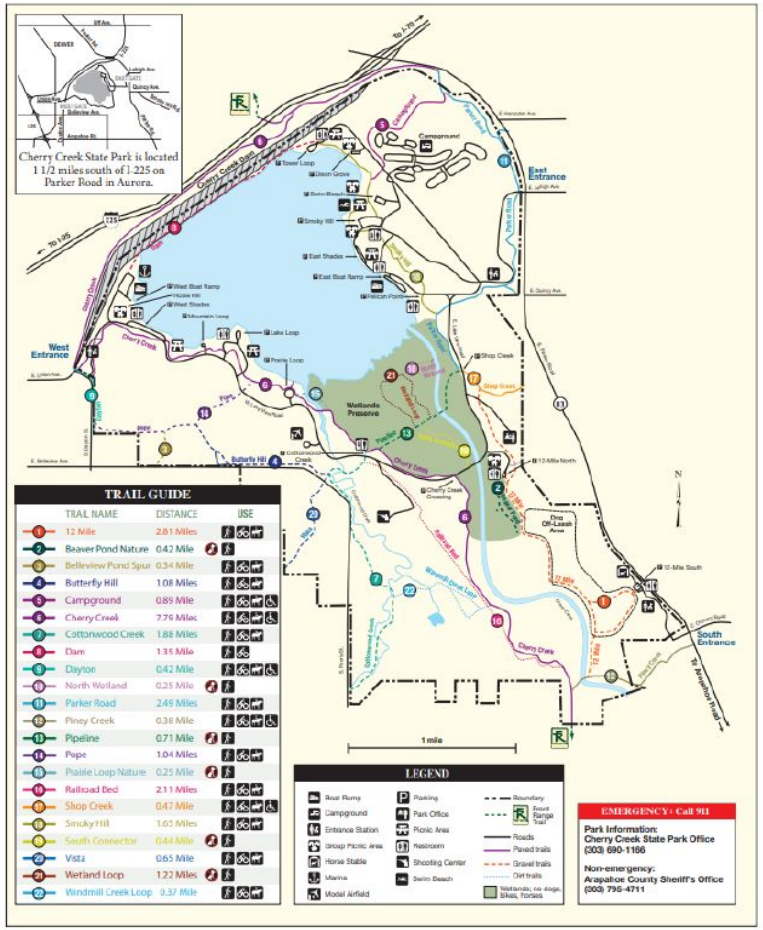

Figure 1 - Cherry Creek State Park

CCBWQA 3/16/23 Workshop – Follow up

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Multi-pronged approach

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

TABLE 2 - SUMMARY OF RECOMMENDED POLLUTANT REDUCTION FACILITIES

2023 - 2032 BUDGET PROJECTIONS (1000$)

Multi-pronged Approach on Workshop Priority Reaches (Piney Creek downstream of Parker Rd. and Cherry Creek downstream of drop structure at Aurora Soccer Complex which is south of Arapahoe Road)

	March 29, 2023	Current Project Budget			Proposed 2023 Budget				Proposed 2024 Budget	Proposed 2025 Budget	Proposed 2026 Budget	Proposed 2027 Budget	Proposed 2028 Budget	Proposed 2029 Budget	Proposed 2030 Budget	Proposed 2031 Budget	Proposed 2032 Budget	2023-2032 Total
Project No.	Project Title	Total	Authority Portion	Authority Portion	Design	Capital	Water	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
CCB-5.14C	Cherry Creek Stream Reclamation - Reach 3	$ 2,567	$ 640	25%	$ 130	$ -	$ -	$ 130	$ 510	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 640
CCB-5.14C	Cherry Creek Stream Reclamation - Reach 4	$ 2,720	$ 680	25%	$ -	$ 475	$ -	$ 475	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 475
CCB-5.16A	Cherry Creek - Reservoir to Lake View Drive Alternatives Analysis	$ 200	$ 200	100%	$ 200	$ -	$ -	$ 200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 200
CCB-6.5	Piney Creek Reach 1 to 2 (SEMSWA)	$ 2,350	$ 515	22%	$ 63	$ -	$ -	$ 63	$ 39	$ 25	$ 75	$ 150	$ 125	$ -	$ -	$ -	$ -	$ 477
CCB-5.16A,B,C	Cherry and Piney Creeks in CCSP	$22,500	$19,500	87%	$ -	$ -	$ -	$ -	$ 450	$ 1,400	$ 1,000	$ 1,355	$ 1,900	$ 2,000	$ 920	$ 960	$ 1,500	$ 11,485
CCB-5.14D	Cherry Creek Stream Reclamation - Remaining Sections (not included in Reaches 3 and 4) from Valley Country Club to Soccer Fields	$ 2,980	$ 745	25%	$ -	$ -	$ -	$ -	$ -	$ 100	$ 100	$ 545	$ -	$ -	$ -	$ -	$ -	$ 745

CCBWQA 3/16/23 Workshop – Follow up

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Multi-pronged approach

	March 29, 2023		Current Project Budget			Proposed 2023 Budget				Proposed 2024 Budget	Proposed 2025 Budget	Proposed 2026 Budget	Proposed 2027 Budget	Proposed 2028 Budget	Proposed 2029 Budget	Proposed 2030 Budget	Proposed 2031 Budget	Proposed 2032 Budget	2023-2032 Total
Project No.	Project Title		Total	Authority Portion	Authority Portion	Design	Capital	Water	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
CCB-5.14C	Cherry Creek Stream Reclamation - Reach 3		$ 2,567	$ 640	25%	$ 130	$ -	$ -	$ 130	$ 510	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 640
CCB-5.14C	Cherry Creek Stream Reclamation - Reach 4		$ 2,720	$ 680	25%	$ -	$ 475	$ -	$ 475	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 475
CCB-5.16A	Cherry Creek - Reservoir to Lake View Drive Alternatives Analysis		$ 200	$ 200	100%	$ 200	$ -	$ -	$ 200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 200
CCB-6.5	Piney Creek Reach 1 to 2 (SEMSWA)		$ 2,350	$ 515	22%	$ 63	$ -	$ -	$ 63	$ 39	$ 25	$ 75	$ 150	$ 125	$ -	$ -	$ -	$ -	$ 477
CCB-5.16A,B,C	Cherry and Piney Creeks in CCSP		$22,500	$19,500	87%	$ -	$ -	$ -	$ -	$ 450	$ 1,400	$ 1,000	$ 1,355	$ 1,900	$ 2,000	$ 920	$ 960	$ 1,500	$ 11,485
CCB-5.16A	Cherry Creek Reach 1 from Muller Stream Assessment		$12,000	$ 9,000	75%	$ -	$ -	$ -	$ -	$ 315	$ 1,400	$ 1,000	$ 1,355	$ 1,900	$ 2,000	$ 920	$ 110	$ -	$ 9,000
CCB-5.16B,C	Cherry Creek Reaches 2-3 from Muller Stream Assessment		$10,500	$10,500	100%	$ -	$ -	$ -	$ -	$ 135	$ -	$ -	$ 135	$ -	$ -	$ 135	$ 580	$ 1,500	$ 2,485
CCB-5.14D	Cherry Creek Stream Reclamation - Remaining Sections (not included in Reaches 3 and 4) from Valley Country Club to Soccer Fields		$ 2,980	$ 745	25%	$ -	$ -	$ -	$ -	$ -	$ 100	$ 100	$ 545	$ -	$ -	$ -	$ -	$ -	$ 745

CCBWQA 3/16/23 Workshop – Follow up

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Multi-pronged approach

17	**CIP Analysis and Breakdown (1000$)**	
18	$ 11,685	Subtotal of projects in CCSP
19	$ 9,200	Subtotal of Reach 1
20	$ 4,822	Subtotal of projects upstream of Reach 1
21	$ 2,337	Subtotal of projects upstream of CCSP
22	$ 14,022	Subtotal of Workshop Priority Reaches (Piney Creek downstream of Parker Rd. and Cherry Creek downstream of drop structure at Aurora Soccer Complex which is south of Arapahoe Road)
23	47%	% of Workshop priority reaches as of the total CCBWQA's 10-year CIP
24	$ 30,006	Grand Total of CCBWQA's 10-year CIP
25		
26	Breakdown of Workshop Priority Reaches	
27	66%	% of funding for Reach 1
28	34%	% of funding for reaches upstream of Reach 1
29		

CCBWQA 3/16/23 Workshop – Follow up

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Multi-pronged approach

What are your thoughts on this approach?

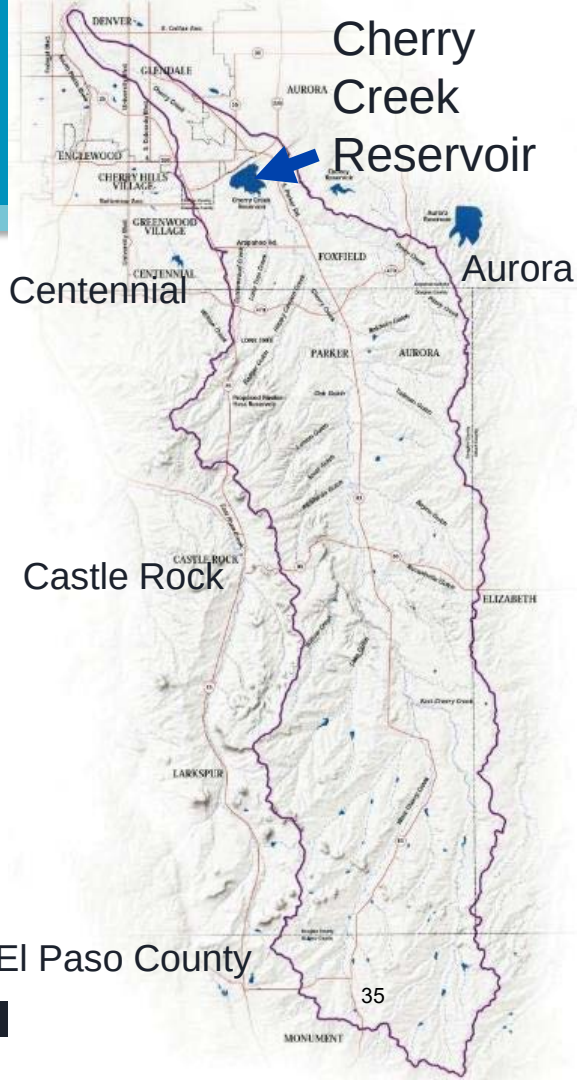
Cherry Creek Basin Water Quality Authority

WQCC Lake Nutrients Criteria RMH

April 10-11, 2023

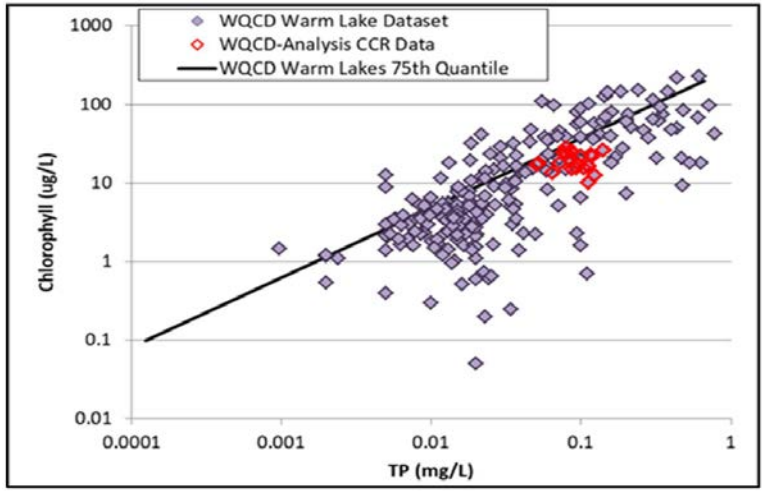
Cherry Creek Reservoir Reg. 38 (COSPCH02)

- Cherry Creek Basin Water Quality Authority established by statute
- Cherry Creek Reservoir watershed area: ~ 390 sq. miles
- Regulation 72 includes requirements for:
  - Point Sources/Wastewater (72.4); TP limit 0.05 mg/L
  - Nonpoint Sources & ISDSs (72.6)
  - Stormwater (72.7)
  - Nutrient Monitoring (72.8)
  - Reporting (72.9)
- Reg. 38: chlorophyll-a standard of 18 ug/L, with allowed exceedance 1X/5 years
- Reg. 72 focuses on nutrient controls (particularly phosphorus) to meet chlorophyll-a standard



Uniqueness & Site-Specific Standards

- Reservoir not well represented by Division's methodology.
- Elevated background TP in basin (0.2 mg/L) and extreme N:P ratios in the Cherry Creek Reservoir.
- Significant nutrient controls and reductions for point sources required under CR 72.
- Advanced stormwater and nonpoint source controls required under CR 72.
- Reservoir Destratification System in place.
- Robust long-term data set available to support site-specific standards.
- CCBWQA working towards site-specific standards and better understanding watershed nutrient loading and reservoir dynamics (HSPF & CE-QUAL-W2 models).



Source: Hydros Consultants 2022

Summary: CCBWQA's Position on Cherry Creek Reservoir (COSPCH02)

- CCBWQA supports the Division's April 2023 Consolidated Proposal (Exhibit AF) for Cherry Creek Reservoir (COSPCH02):
  - No addition of TP and TN standards at this time.
  - Division's SBP language:

    The commission may also consider revised site-specific nutrients standards for the following lake and reservoir segments that have existing nutrient control regulations in future rulemaking hearings if information to support appropriate and protective revisions is developed:

    Upper South Platte River: 6b (COSPUS06b; Chatfield Reservoir)
    Cherry Creek: 2 (COSPCH02; Cherry Creek Reservoir)

    The commission did not adopt total nitrogen or total phosphorus table value standards for either waterbody in this rulemaking hearing.
- CCBWQA plans to utilize its extensive long-term data, supported by linked watershed and reservoir models if needed, to develop appropriate and protective site-specific standards for the Cherry Creek Reservoir.