May 27th
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Cherry Creek (Quebec to Iliff) Corridor Improvement Project

CASFM Project Award

Creating Better Places, **Together.**

DENVER PARKS & RECREATION
ARAPAHOE COUNTY OPEN SPACES
DENVER WATER
MHFD MILE HIGH FLOOD DISTRICT
Southeast Metro Stormwater Authority
DENVER TRANSPORTATION & INFRASTRUCTURE
MULLER ENGINEERING COMPANY
stream landscape architecture + planning
COLORADO Colorado Water Conservation Board Department of Natural Resources
WESTERN STATES RECLAMATION
CEI

Project Description

In 2014, Mile High Flood District (MHFD) and the City and County of Denver's Department of Transportation and Infrastructure (CCD DOTI) set out to provide channel stabilization on a severely eroded reach of Cherry Creek downstream of the Cherry Creek Reservoir. By the time construction started five years later, a total of eight public agencies had invested in the project to help transform this reach of Cherry Creek from a public and environmental hazard into a 40-acre open space that not only improves channel stability and flood conveyance, but also provides huge benefits in recreation, ecological health, and water quality. Through the partnership formed among several public agencies, this project maximized the public benefit well beyond the original vision and scope.

Prior to the project, a two-mile stretch of Cherry Creek between South Holly Street and East Iliff Avenue had never received channel stabilization improvements. Increased runoff caused by urbanization in the surrounding watershed, coupled with an extremely erodible sandy channel, resulted in up to 20 feet of vertical downcutting and over 50 feet of lateral migration in several locations. The rate of erosion was exacerbated by the location of this reach being downstream of Cherry Creek Dam, bringing about lower sediment loads and annual dam gate flushes.

In response, a stabilization project was initiated for design of one grade control structure downstream of Quebec in 2013. During this design effort, it became clear that a localized improvement would result in a large structure that may not be consistent with the overall vision for the corridor.

The team took a step back to look at the entire reach between Holly and Iliff, resulting in a bigger picture visioning effort starting in 2014. A vision plan was developed that looked holistically at the corridor, including channel stabilization measures, environmental and water quality benefits, road and bridge improvements, open space enhancements, and opportunities to increase quality of life for the surrounding public. The vision plan provided a tool to collaborate and fundraise, expanding the slate of partners well beyond the original two.

Project Partners:

City and County of Denver - DOTI	Southeast Metro Stormwater Authority
City and County of Denver - Parks	Mile High Flood District
Arapahoe County Open Space	Denver Water
Arapahoe County Public Works	Colorado Water Conservation Board (CWCB)

In 2017, enough funds had been raised to initiate a first phase of final design and construction between Quebec and Iliff. A grant from CWCB helped to round out funding. This reach had experienced the worst of the erosion to date and was posing the biggest threat to properties and infrastructure.

Another major factor for selecting this reach was that Denver Water offered a land transfer to convert a portion of their private property, that spanned across the Cherry Creek corridor, into open space for Denver and Arapahoe County. This ultimately joined open spaces upstream and downstream of their property into one continuous open space that stretches over 5.3 miles. This land was converted into open space at no cost to the project.

The final design phase between Quebec and Iliff involved stream restoration and open space improvements along the one mile stretch of Cherry Creek. Project improvements were also coordinated with an adjacent Iliff road improvement project where our project was able to provide water quality treatment facilities for roadway drainage within Cherry Creek floodplain benches. The project improvements are presented on the next page.

Design was led by **Muller Engineering Company** (Muller) and **Stream Landscape Architecture** (Stream) with assistance from:

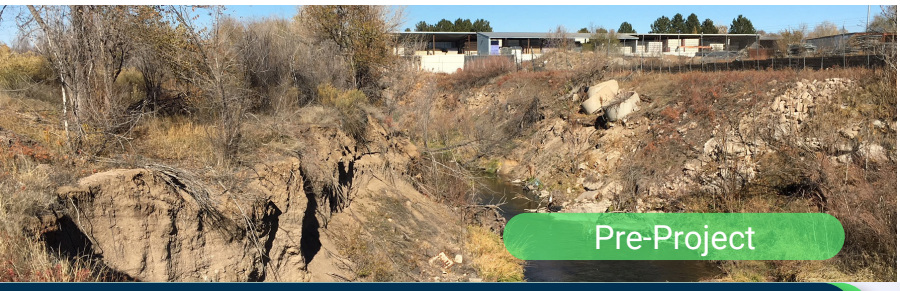
Pinyon Environmental - Hazardous Materials Mitigation	CTL Thompson – Geotechnical
Great Ecology – Revegetation	Hydrosystems KDI – Irrigation
Corvus Environmental – Environmental Permitting	Topographic Land Surveyors – Survey
ERC – Geomorphology	

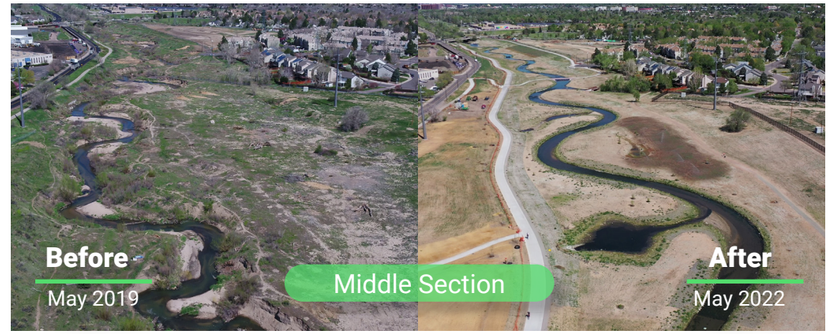
Construction was led by **Concrete Express, Inc. (CEI) and Western States Reclamation**:

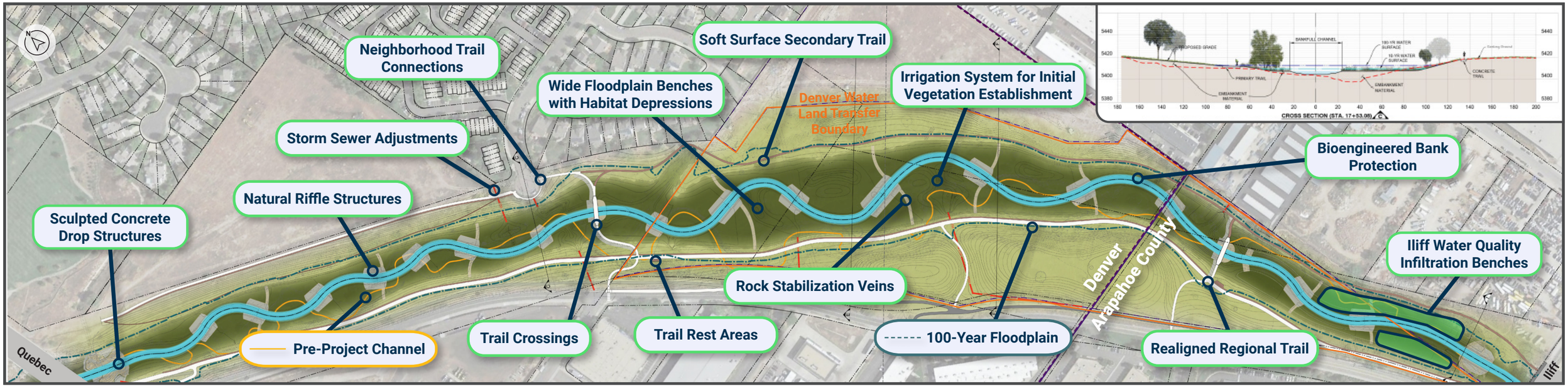
Construction started in August 2019 and was recently completed. The majority of the construction effort overlapped with the COVID shutdown and overcame all challenges that came with the pandemic with **no stoppages or delays.**

The total construction cost was approximately $12.5M and the total project cost was approximately $16M. **Both design and construction were completed under budget.**

Future final design and construction phases between Holly and Quebec will be evaluated using the **vision plan** as a guide as funds become available.







Project Improvements Stats

Civil

- 16 riffle structures
- 2 sculpted concrete trail crossing drop structures
- 1 modified grouted boulder drop structure
- 1 sculpted concrete boulder cascade tie-in drop structure
- 20,400 cubic yards of riprap
- 4,420 square yards of sheet pile
- 60,000 cubic yards of earthwork
- 10,000 linear feet of bank protection
- 9 storm sewer outfall renovations
- 2 water quality diversion structures and benches

Recreation

- 3 trail crossings
- 5,300 linear feet of new primary concrete trail
- 1,900 linear feet of new secondary concrete trail
- 3,400 linear feet of new secondary soft surface trail
- 3 rest areas, 6 boulder seats, 4 trash cans, 8 dog waste stations

Revegetation

- 66,600 square yards of erosion control blanket
- 287 trees, 95 cottonwood poles, 73,700 wetland plugs, 1,928 willow stakes
- 1,840 linear feet of willow logs, 40 acres of seed
- 9,200 linear feet of irrigation mainline
- 28,600 linear feet of irrigation laterals

Construction Highlights

- 24 drone flights
- 3,300 CABI hours supervising landfill excavation
- 150 cubic yards of asbestos-contaminated material disposed
- 2 stabilized RACS areas (Regulated Asbestos Contaminated Soil)
- $180,000 worth of "rock" picking prior to final seeding
- Thousands of pounds of concrete debris
- 1 trailer, 1 couch, lots of tires, 1 perfectly preserved 1974 pocket calendar unearthed
- 3 planned releases from Cherry Creek Dam for gate maintenance (2 large releases of 1,300 cfs, 1 small release of 250 cfs)
- 1 unexpected release of 1,000 cfs from Cherry Creek Dam
- 2 "mystery manholes" and 1 "mystery outfall" unearthed along 100-year-old Denver Water infiltration gallery

Judging Criteria

Does the project incorporate creative, unique, or innovative solutions?

With a continual movement towards more environmentally friendly, natural designs, this project broke the mold from the upstream and downstream reaches of Cherry Creek. Nature-based channel design features, including wide floodplain benches, a sinuous active channel with riffle pool complexes and riparian vegetation were implemented to improve floodplain connection, raise the groundwater table, and create a high functioning, low maintenance stream system.

Riffle structures were a key part of the stabilization plan. These structures repurposed semi-rounded rock from gold mining spoils near Fairplay. This rock provided cost savings and a more natural function and look.

Sculpted concrete in combination with boulders (also from the Fairplay gold mine) were used to mimic natural landforms at larger drop structures to disguise needed structural stability as natural channel features.

The Cherry Creek team worked with the Iliff road improvement team to incorporate water quality treatment facilities into the channel design. Instead of traditional water quality basins, infiltration benches were set into the Cherry Creek floodplain benches to treat the incoming roadway drainage, saving space and maintenance operations.

The pre-project site had extensive weeds and little to no topsoil, requiring a creative approach to restoring soil properties to promote effective vegetative growth. Importing topsoil for the entire site was cost prohibitive. Through strategic soil testing, incorporating amendments along with aged wood chips into the native soil were found to provide the right soil chemistry and moisture retaining properties to support healthy plant life at a lower cost.

Realigning the regional Cherry Creek trail along with incorporating a secondary trail provided an enhanced trail experience for both high-speed regional trail users and those looking for a more casual and peaceful trail experience.

Does the project enhance the public health, safety, and welfare?

The public health, safety, and welfare was most dramatically enhanced by stabilizing eroding, steep, caving banks that ranged from 10 to 20 feet high. Raising the channel bed and regrading and stabilizing the banks reduced the threat of unsafe conditions and damage to residential properties, roadways, trails, and utilities.

Additional ways this project enhanced public health, safety, and welfare include:

1. Maximizing the flood-prone width of the corridor allows storm flows to spread out, which, in combination with grade control, bank protection, and healthy vegetation, will strengthen the flood corridor.
2. Stabilizing the flood corridor enhances water quality by reducing erosion and promoting infiltration and vegetative filtering, thus protecting the downstream watershed.
3. Removing exposed hazardous material within the project site. An environmental investigation was conducted during design to explore past landfill activity that occurred. This investigation revealed large amounts of construction debris (e.g., concrete, asphalt) and potential for asbestos throughout the site. A mitigation plan was developed during design to beneficially reuse non-asbestos construction debris as channel fill, remove intact asbestos debris via a "pick-and-go" method, and cap areas of friable asbestos material.
4. Enhancing trail safety through improvements to the regional trail and creating a secondary trail system. Realigning the trail puts trail-users away from vehicular interface areas and roadways and closer to nature. Introducing new access and egress points (e.g., ramps, channel crossings/bridges, trail connections) created a more equitable and safer community. The trail system was expanded to include separated secondary trails to accommodate slower traffic, mixed modes of travel, and to lower the overall 'load' on the regional trail. Finally, safety was enhanced by widening the overall trail cross-section with a soft-surface lane to create more capacity and allow more room for passing and to add 'safe-zone' pull-off areas with seating and shade.

Can the project serve as a model for other communities and/or projects?

A major key to the success of this project was creating a visioning plan to align stakeholders. Without buy-in and participation from multiple stakeholders, this project would not have been completed. Once involved, all stakeholders worked in a positive and collaborative manner to accomplish a multitude of project goals.

Transfer of private property to open space along major drainageways allows for so many more opportunities. In addition to providing continuous connection of open space areas, publicly owned open spaces allow public works and open space dollars to work together.

MHFD's Project Partners process allowed CEI and Western States to be brought in at the early stages of the design process, providing the opportunity for the design and construction teams to become one team. The partnership allowed for a trusting/collaborative culture to form, logistics to be worked out, value engineering to take place, and surprises during construction to be minimized.

Mitigation of hazardous materials within the site was an expensive operation. Conducting a pre-project hazardous materials investigation allowed the project team to plan for these costs during the design process rather than react to them during construction.

An integrated channel design that blends community benefits with geomorphic and hydraulic requirements is an important design philosophy. This project enhanced community value with health and wellbeing, providing equitable access to nature, and providing a place to exercise, lower stress, and learn. Community value was made a priority on this project instead of being an afterthought.

Due to the degraded state of the pre-project site, higher levels of disturbance were required to restore the creek and open space corridor. Success of the project requires that healthy stands of vegetation establish to accomplish the environmental, drainage, and open space goals. In light of this, the project invested in an irrigation system to kick-start the vegetative process. In addition, a post-construction services contract and O&M manual were put in place to ensure that the project is cared for, and functions as intended into the future.

Summary

The Cherry Creek Corridor Improvement Project exemplifies the power of partnership and perseverance to achieve a wide range of goals through multi-purpose improvements that blend public infrastructure with nature-based environmental enhancements and recreational amenities while making efficient use of project dollars. The project serves as a model for holistic thinking and thoughtfully implements all elements of stream health and function.

Find out more about the project through these related links:

1. MHFD Project Link: https://mhfd.org/residents/work-in-your-area/cherry-creek-restoration-project/
2. Denver Water Article and Video: https://www.denverwater.org/tap/creating-new-urban-oasis-along-cherry-creek
3. Vision Plan Document: https://mullereng.sharefile.com/d-s446e354309184af7aa13e2f4190abda0