

MEMORANDUM

To: Honorable Mayor and Members of the Council
Thru: Mark Marlowe, Director of Castle Rock Water
From: David Van Dellen, Stormwater Manager
Date: December 3, 2019
Title: Five Year Stormwater Capital Plan Justification

Summary

The purpose of this memo is to document increases in capital need and cost for stormwater capital projects in the five-year capital plan. The need for these projects can be summarized in six broad categories:

1. Improving or at least maintaining water quality;
2. Protecting the safety of the public;
3. Complying with and minimizing the cost of complying with Federal and State regulatory requirements;
4. Preventing private property damage;
5. Preventing public infrastructure damage; and
6. Minimizing future costs for stormwater infrastructure.

In 2017, the SW Division completed a Stormwater Master Plan Update which laid out a priority schedule for short-term and long-term capital needs. Over the past two years, the SW Division has implemented projects in accordance with the master plan schedule and has consistently experienced higher costs than originally projected in the 2017 Plan. Additionally, the consistent growth in our community is placing more and more pressure on the Town's drainageways accelerating the need for projects in the five-year window. The SW Division estimates an additional \$12.8 million is needed to keep in step with the master plan and continued growth in our community.

The 2017 Plan identifies seventeen major drainageway projects within the next five-year window (see **Attachment A**). The SW Division has conducted reconnaissance inspections of the proposed projects and found that additional scope is needed in order to address critical problem areas beyond those identified in the 2017 Plan. The 2017 Plan identified a total five-year CIP cost of \$14.2 million. An additional \$12.8 million has been identified for a total five-year CIP need of \$27.0 million. See **Attachment B** for further detail on the five-year stormwater capital costs. Photographs of problem areas within the project reaches are provided in **Attachment C**.

Discussion

Below are summaries of the proposed Stormwater capital projects for 2020 through 2024.

East Plum Creek Stabilization – Meadows Pkwy and CR-1 Diversion

This project has several phases planned in the five-year capital plan. Phases include improvements at the Meadows Parkway bridge, improvements at a water supply intake structure, CR-1 and other improvements near Castle Rock Parkway. Improvements at the Meadows Parkway bridge include bank protection and grade control structures to protect the adjacent railroad, recreation trail, utility crossings and the bridge and enhance production of water supply wells in the area. Improvements at CR-1 include bank protection and grade control structures to protect the water supply intake structure, sanitary sewer and trail crossing. Additional improvements are planned between Meadows Parkway and Castle Rock Parkway bridges to bring this reach of East Plum Creek into a sustainable and stable condition. This work on East Plum Creek provides regional water quality benefit within the Chatfield Watershed by reducing excess nutrient loading in the system and improving water quality upstream of both of the Town's water supply intakes as well as Chatfield Reservoir, a future drinking water supply for the Town. These water quality benefits help provide for compliance with state regulatory requirements regarding water quality in Chatfield Reservoir. East Plum Creek is also the highest risk area in the Town for flooding with a history of major damage to transportation systems and loss of life in the 1965 flood. The cost of improvements at Meadows Parkway are in the amount of \$3.8 million, costs of improvements at CR1 are in the amount of \$2 million and additional costs near Castle Rock Parkway Bridge are in the amount of \$1.9 million.

Hangmans Gulch Stabilization at Castle Rock Recreation Center

This project is located adjacent to the Castle Rock Recreation Center on Douglas County School District Property. The tributary channel has experienced significant channel degradation from upstream residential development. Although this is not an immediate risk to the public where the erosion is occurring, significant sediment and nutrient transport from this area is causing degradation of water quality in East Plum Creek as well as downstream trail impacts. Improvements in this area will preserve natural open space; improve water quality in East Plum Creek above our water supply intake in Sedalia; help meet state regulatory requirements for water quality in Chatfield Reservoir, a future drinking water supply for Castle Rock; and reduce public risk to the downstream regional trail system. The total project cost is \$925,000 and this phase is scheduled through 2022. Additional project phases addressing reaches further upstream are planned for 2023 and beyond in the amount of \$1.1 million.

6400 East Tributary Stabilization at Paintbrush Park

This project is located adjacent to Paintbrush Park in the Meadows. The tributary channel is showing early signs of impacts from development. Increased flows from development have resulted in channel erosion that sets the stage for unraveling of the natural channel. Steep

vertical banks up to 15 feet immediately adjacent to the trail and other park features places public infrastructure at risk of damage. Public safety issues with these steep banks are also apparent. Should this project be delayed, this will increase the cost to reconstruct a healthy channel in the future. The total project cost is \$855,000.

6400 West Tributary Stabilization

This project is located in the western part of the Meadows Subdivision. The tributary channel is experiencing erosion which poses risks to a sanitary sewer crossing, adjacent trails and private residential property. Improvements within the five-year capital plan are necessary to avoid damages to Town infrastructure and private property. The cost of this project on 6400 West Tributary is \$320,000.

6400 South Tributary Stabilization

This project is located near Castle View High School in the Meadows. The tributary channel is experiencing severe erosion resulting in sediment and nutrient discharges into the Plum Creek basin ultimately impacting Chatfield Reservoir. The steep vertical banks and rapid channel degradation threaten the adjacent trail, the railroad and water infrastructure that crosses the tributary. Several mature pine trees have been lost due to the progressive erosion in this channel. The cost of this project on 6400 South Tributary is \$2.2 million.

Omni Tributary Stabilization between Prairie Hawk and Red Hawk Drive

This project is located adjacent to the Red Hawk Golf Course and single-family development in the Red Hawk Subdivision. The tributary channel has experienced significant degradation resulting from development. Significant bank and channel erosion threatens private property, public roadway and utility infrastructure. Active migrating vertical banks threaten residential property immediately adjacent to the channel. Active channel downcutting results in on-going sediment deposition in the regional detention pond at Prairie Hawk Drive. Delays in this project will result in the need for sediment removal operations to maintain pond volume at an annual cost of \$50,000. The total project cost is \$900,000.

Gambel Ridge at Crystal Valley Pkwy

This project is located at the future Crystal Valley Parkway Interchange. Gambel Ridge is a steep narrow drainage immediately adjacent to the Parkway. The new East Plum Creek trail crosses this drainage and several water supply wells are located in this area. These improvements include bank protection and grade control structures that will protect the the new trail, Town water supplies on East Plum Creek and the future interchange. These water quality benefits help provide for compliance with state regulatory requirements regarding water quality in Chatfield Reservoir. The cost of this project on Gambel Ridge Tributary is \$1.5 million.

Industrial Tributary Stabilization

This project is located east of the Phillip S. Miller Park adjacent to the old Acme Brick site. Industrial Tributary is heavily wooded with mature pine trees and scrub oak. The channel has dropped significantly due to erosion and threatens private property, utilities and open space. A future trail is planned for this corridor. Sediment transport from this area

frequently clogs downstream roadway culverts reducing their capacity for flood control. The design approach for this reach took into consideration the sensitive habitat and narrow floodplain corridor. Improvements will occur along the channel thalweg with disturbances to the banks only in locations where intermittent grade control structures are needed. This project will be awarded for construction in December 2019 and construction will occur in early 2020. The construction cost for this project is \$1.5 million.

Parkview Tributary Storm Sewer Improvements

The Parkview Tributary Storm Sewer Improvements project is a smaller drainageway in older parts of Town located east of Rock Park and north of 5th Street. An existing concrete channel was constructed as part of a residential subdivision in the 1970s that transects several backyards and poses flood risks to adjacent homes. This project will convert the open channel to a buried storm sewer pipe system to protect private property and more safely convey storm flows through the neighborhood. This project is critical to keep ahead of upstream development which creates higher risk for downstream property owners. The cost of this project is \$660,000 in 2020. Additional design work for improvements in Rock Park are scheduled for 2024 in the amount of \$156,000.

Craig and Gould North Infrastructure Improvements

This project is located in the historic Craig and Gould neighborhood north of 5th Street in downtown Castle Rock. This project will provide storm sewer to capture street drainage and runoff from the neighborhood. Craig and Gould has had a history of flooding issues due to the lack of standard curb and gutter and storm sewer in the area. These issues include at least two reports of flooding in homes and damages to private property. The Town has implemented interim improvements to reduce flooding concerns, however a permanent solution that involves an outfall system under the railroad is required to eliminate these concerns. Additionally, the current street cross section increases the potential for inflow to the sanitary sewer through manholes in the street. This project will reduce this potential by reversing the crown in the street. The project will add water quality treatment to the historic neighborhood reducing pollutants entering East Plum Creek. Basically, the streets have inverted crowns and function as the stormwater collection system. This does not meet Town standards for stormwater collection and this project is part of the overall infrastructure replacement project budgeted in the Town's Capital Improvement Program. The cost of this project is \$1.3 million.

Village North Storm Sewer Improvements

This project is located in the commercial/industrial area north of Wolfensberger on Park Street, Malibu Street and Caprice Drive. This area has a history of flooding within the street and adjacent businesses due to a lack of storm sewer infrastructure in the right-of-way. These improvements will protect adjacent private property and provide regional water quality to support urban renewal projects in the future. The cost of this project is \$1.6 million.

McMurdo Gulch Reclamation Improvements

This project is located adjacent to Castle Oaks Drive between Terrain and Cobblestone Ranch. The Town is pursuing a participation agreement with the Cherry Creek Basin Water

Quality Authority to fund the next phases of this project. These improvements are needed to address progressive degradation occurring on McMurdo Gulch resulting from upstream development. This project also provides a water quality benefit to Cherry Creek by reducing harmful phosphorus concentrations by 20 to 30% through the project reach. Castle Rock has drinking water supplies in the Cherry Creek Watershed and will likely be purchasing more water supplies in the future. Improving water quality in Cherry Creek Watershed will also help move the region toward compliance with State Regulatory requirements for Cherry Creek Reservoir. Not meeting these regulatory requirements puts pressure on the Town and others in the basin to develop more costly wastewater treatment processes to meet the requirements, both in the basin and Rueter-Hess Reservoir where the Town also has water supplies. The five year cost of this multi-phase project is \$2.9 million of which Cherry Creek is asked to contribute \$620,000 and the Town has budgeted the remaining \$2.3 million.

Cherry Creek Stabilization

This project is located adjacent to a future regional park in Cobblestone Ranch (fka Liberty Village). Improvements include bank protection and grade control structures to protect the adjacent recreational trail, water supply wells and the regional park. This work on Cherry Creek provides regional regulatory water quality benefit within Cherry Creek Watershed by reducing excess nutrient loading in the system. The cost of this project on Cherry Creek is \$600,000.

Other Capital Priorities

Other capital priorities include \$1 million in budgeted storm sewer rehabilitation work to address aging infrastructure, \$900,000 for master planning and floodplain delineation studies to stay current on priorities and risks, \$1 million in minor drainageway improvements to reduce erosion downstream of development and \$1.2 million in detention pond retrofits to reduce maintenance burden and improve water quality.

Budget Impact

An increase in the amount of \$12.8 million has been estimated for the Stormwater capital project schedule from 2020 to 2024. This increase in cost is attributed to escalation in construction costs since original master plan estimates, increase in scope of work and acceleration of the capital improvement schedule to keep in step with growth. **Attachment B** provides a list of all projects in the five year CIP and increases since the last budget cycle.

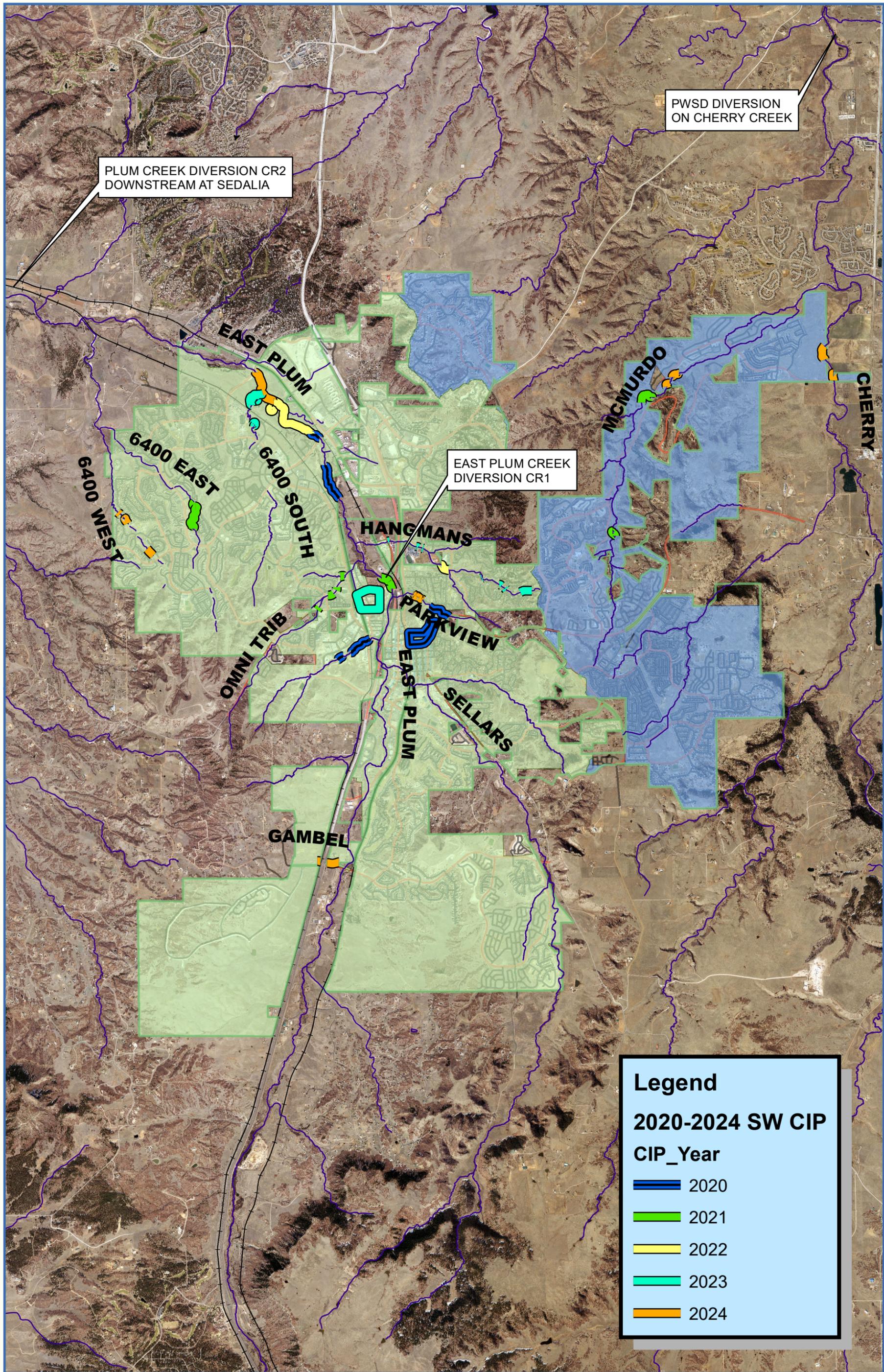
Attachments

- Attachment A: Five Year Stormwater Capital Plan Exhibit
- Attachment B: Five Year Stormwater Capital Project Cost Table
- Attachment C: Project Photographs

Attachment B – Five Year Stormwater Capital Cost Table

Proposed 2020 CIP Budget	2020	2021	2022	2023	2024	Total	Increase from 2019 Budget
E. Plum - Meadows	\$3,800					\$3,800	1,287% \$3,526
E. Plum - CR1	\$250	\$1,700				\$1,950	72% \$1,746
E. Plum - Other	\$300	\$200	\$883	\$95	\$446	\$1,926	37% \$522
Hangmans Gulch	\$125	\$800		\$1,115	\$52	\$2,092	80% \$932
Sellars Gulch					\$55	\$55	67% \$22
6400 South Trib.	\$200	\$2,000				\$2,200	66% \$1,855
6400 West Trib.					\$322	\$322	74% \$137
6400 East-Paintbrush	\$150	\$705				\$855	147% \$510
Omni Trib-Red Hawk	\$156	\$735				\$891	181% \$517
Gambel Ridge-CV Pkwy				\$260	\$1,230	\$1,490	40% \$427
Parkview Trib.	\$660				\$156	\$816	663% \$709
Industrial Trib.	\$1,488					\$1,488	0% \$0
Craig & Gould North	\$1,332					\$1,332	0% \$0
Village North Storm	\$1,620					\$1,620	620% \$1,395
McMurdo Gulch	\$340	\$1,942				\$2,282	109% \$1,189
Cherry Creek		\$101	\$478			\$579	31% \$137
Other	\$1,994	\$274	\$885	\$936	\$880	\$4,969	40% \$1,422
Total	\$12,395	\$8,457	\$2,246	\$2,406	\$2,985	\$28,489	100% \$14,296
Change from 2019 Budget	385%	136%	-3%	-14%	15%		

*Costs shown in \$1,000s.



PWSD DIVERSION ON CHERRY CREEK

PLUM CREEK DIVERSION CR2 DOWNSTREAM AT SEDALIA

EAST PLUM CREEK DIVERSION CR1

Legend

2020-2024 SW CIP

CIP_Year

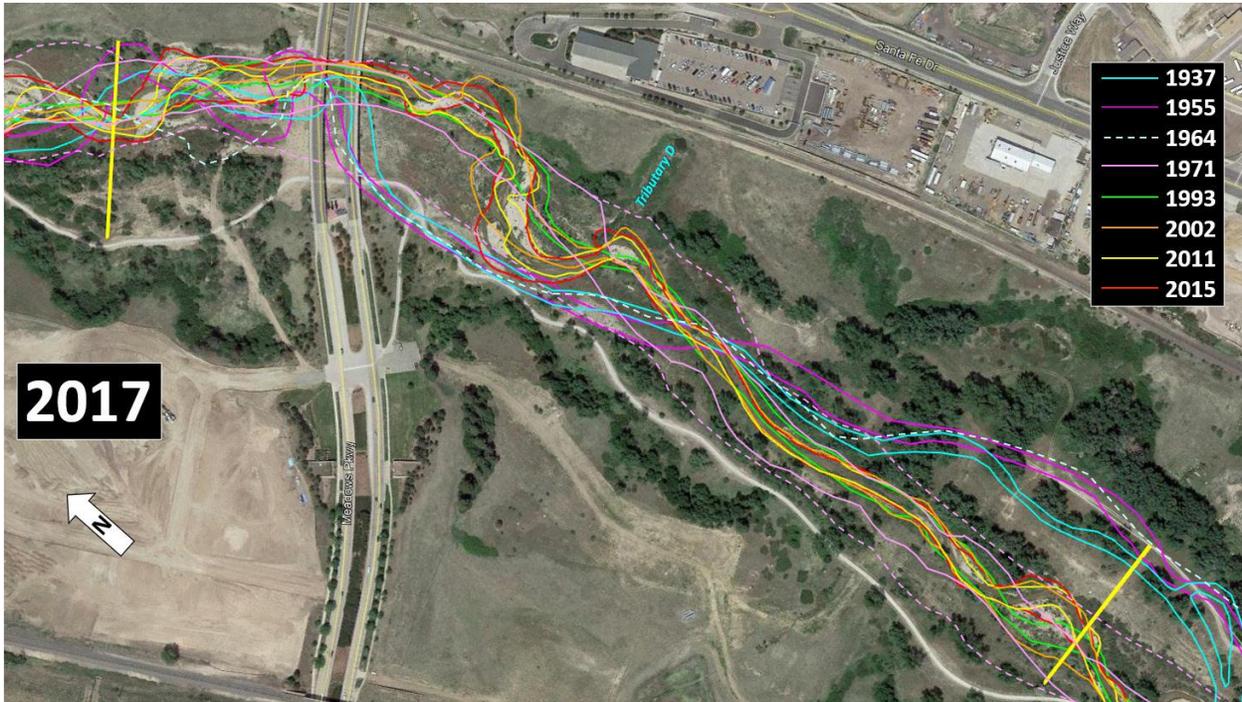
- 2020
- 2021
- 2022
- 2023
- 2024



ATTACHMENT C - PHOTOGRAPHS



1 Historic Geomorphic Surfaces at EPC Reach 5 Showing Progressive Down-cutting



2 Historic Bankline Locations at EPC Reach 5 Showing Continual Meandering of Channel
*Graphical images provided by: Olsson



Bank erosion
threatens trail

3 - EAST PLUM CREEK AT MEADOWS PARKWAY



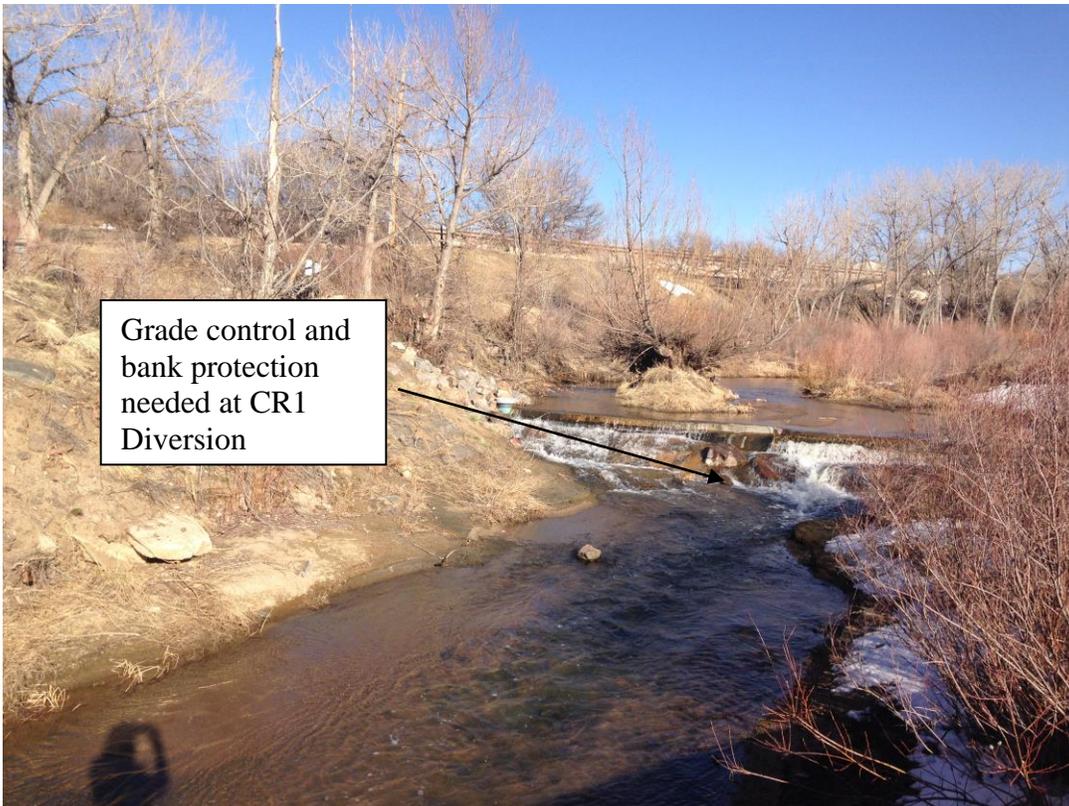
Incised channel
downstream of
Meadows Parkway

4 - EAST PLUM CREEK AT MEADOWS PARKWAY



Bank erosion
threatens sewer
interceptor

5 - EAST PLUM CREEK AT CR1



Grade control and
bank protection
needed at CR1
Diversion

6 - EAST PLUM CREEK AT CR1



7 - HANGMANS GULCH AT RECREATION CENTER



8 - HANGMANS GULCH AT RECREATION CENTER



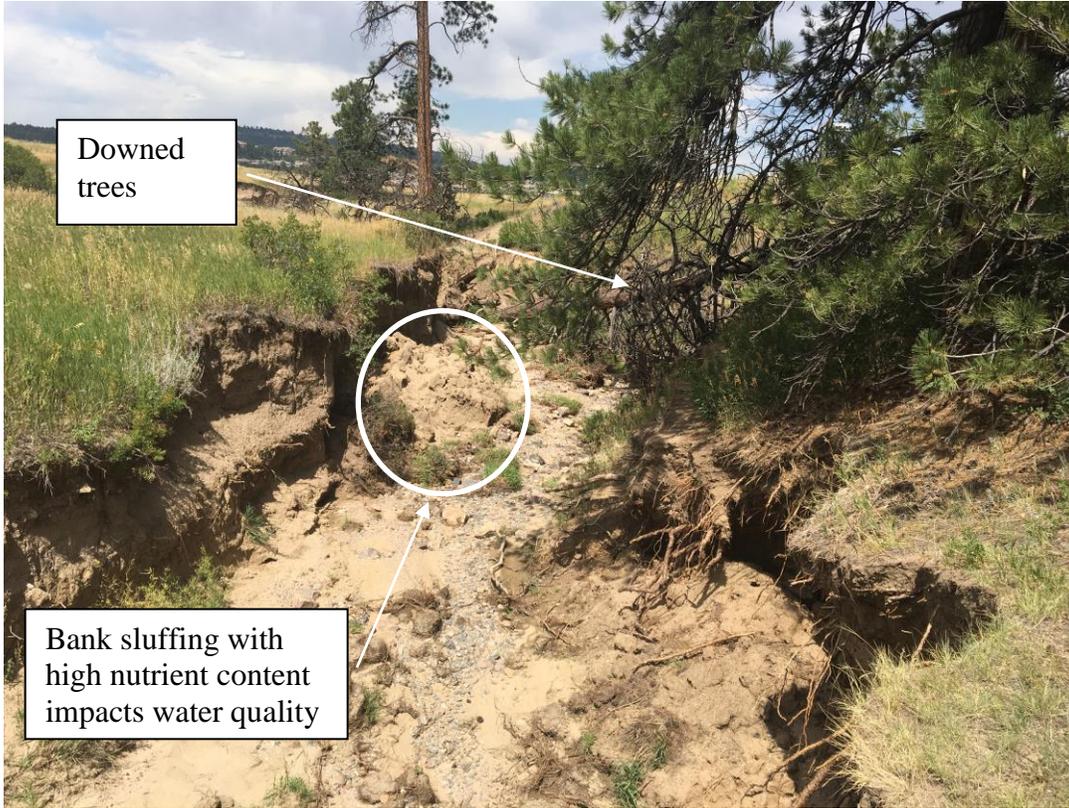
Channel erosion
impacting trail and
threatening railroad

9 - 6400 SOUTH TRIBUTARY



Channel erosion
impacting trail and
open space

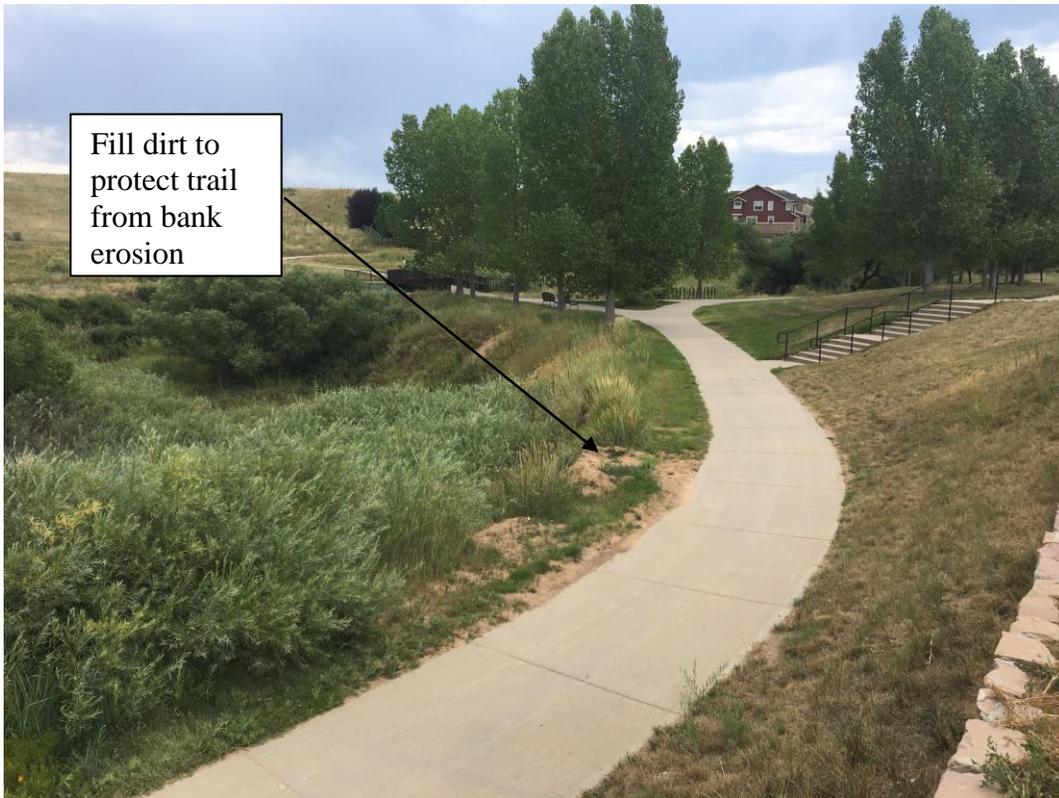
10 - 6400 SOUTH TRIBUTARY



Downed trees

Bank sluffing with high nutrient content impacts water quality

11 - 6400 SOUTH TRIBUTARY

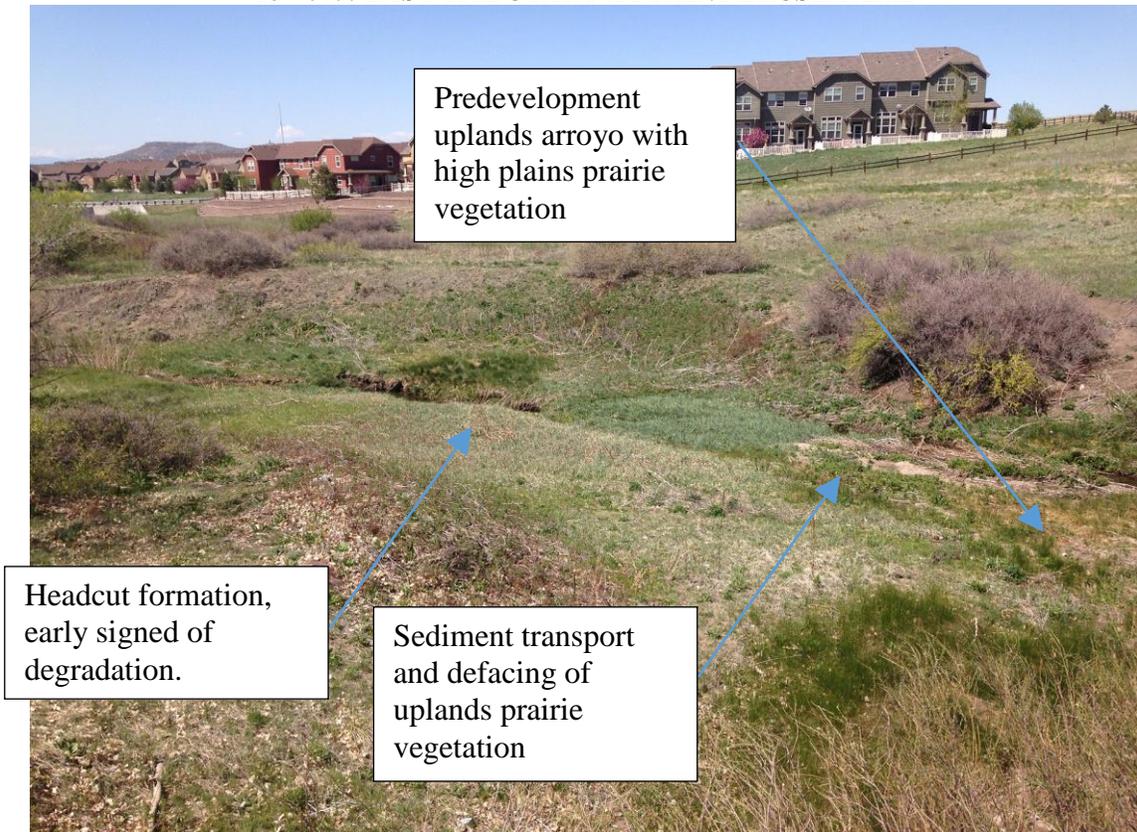


Fill dirt to protect trail from bank erosion

12 - 6400 EAST TRIBUTARY AT PAINT BRUSH PARK



13 - 6400 EAST TRIBUTARY AT PAINT BRUSH PARK



14 - 6400 EAST TRIBUTARY AT PAINT BRUSH PARK



Root exposure
early sign of
unraveling

15 - 6400 EAST TRIBUTARY AT PAINT BRUSH PARK



Paint Brush Park
immediately
adjacent to 6400
East Tributary

16 - 6400 EAST TRIBUTARY AT PAINT BRUSH PARK



Active bank failure adjacent to residential

17 - OMNI TRIBUTARY



Channel erosion exposes valve box to raw waterline

18 - OMNI TRIBUTARY



Channel erosion threatens trail crossing

19 - OMNI TRIBUTARY



Approximately 6,700 cubic yards of sediment removed from pond in 2017 due to upstream channel degradation

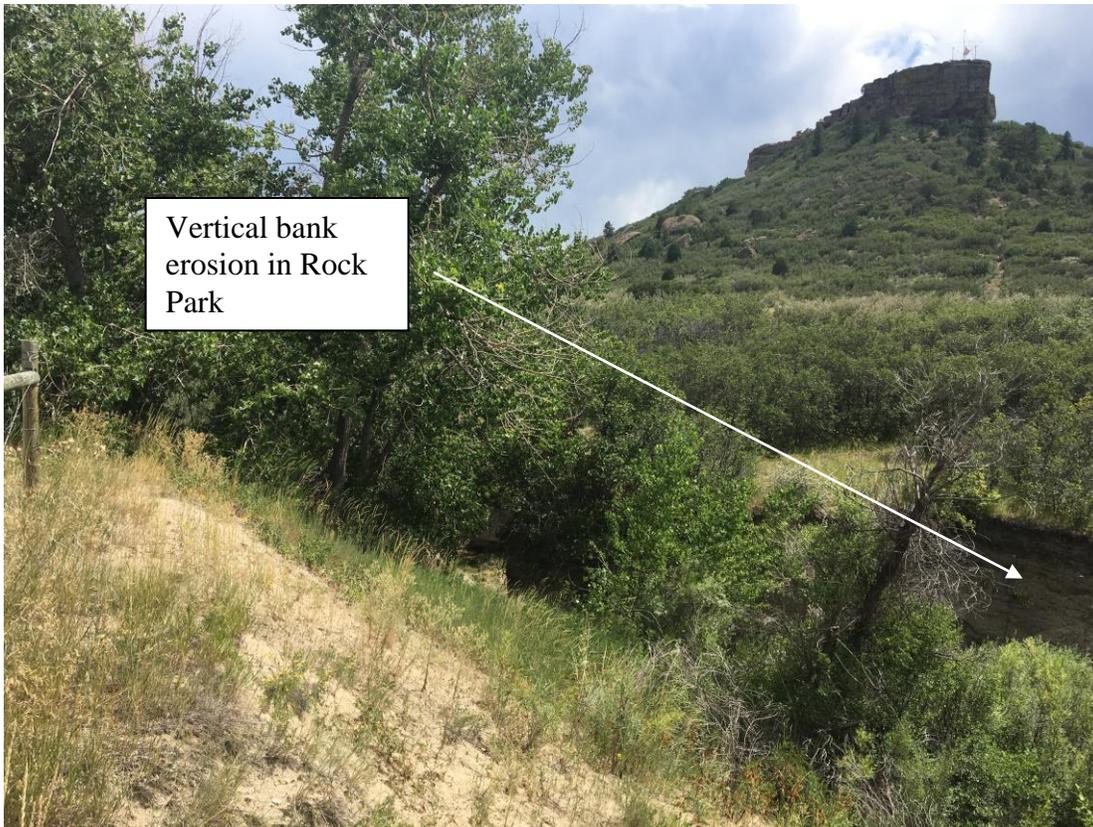
Buried Concrete Trickle Channel

20 - OMNI TRIBUTARY



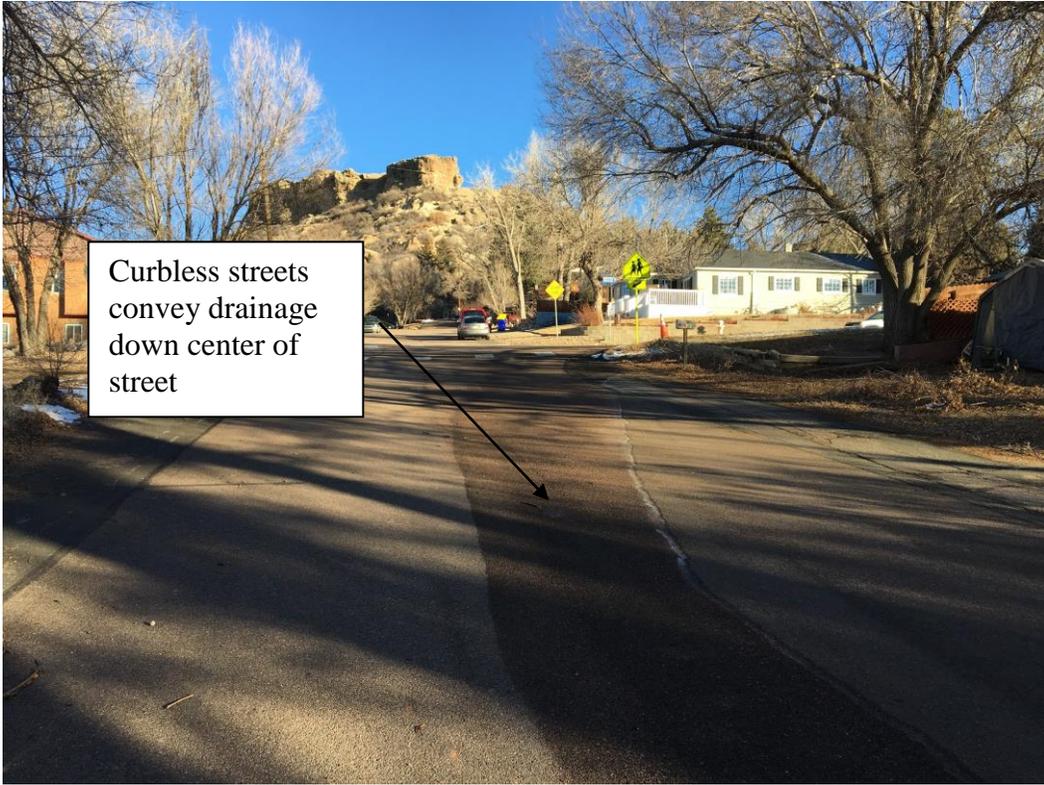
East Plum Creek
Trail crossing over
Gambel Ridge
Tributary

21 - GAMBEL RIDGE TRIBUTARY



Vertical bank
erosion in Rock
Park

22 - PARKVIEW TRIBUTARY



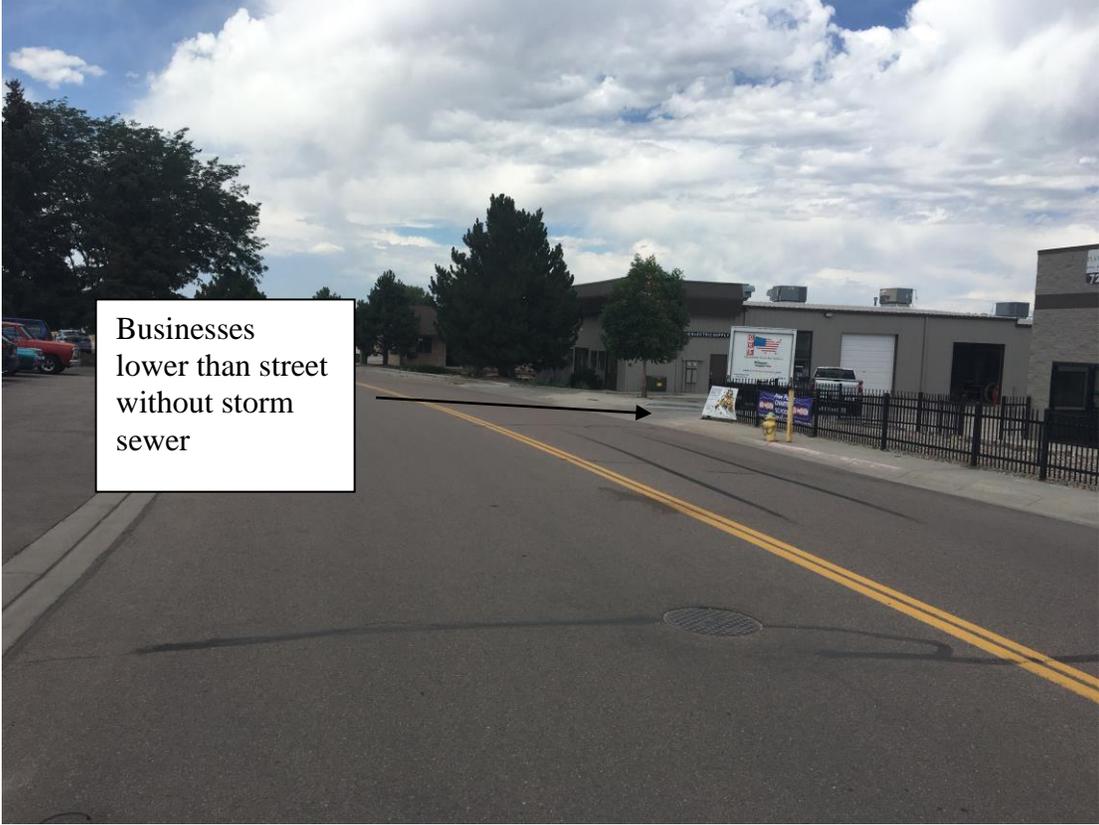
Curbless streets
convey drainage
down center of
street

23 - LEWIS STREET AT CRAIG AND GOULD NORTH



Deteriorated
alley pavement
with poor
drainage

24 ALLEY AT CRAIG AND GOULD NORTH



Businesses
lower than street
without storm
sewer

25 - PARK STREET AT VILLAGE NORTH



Businesses
lower than street
without storm
sewer

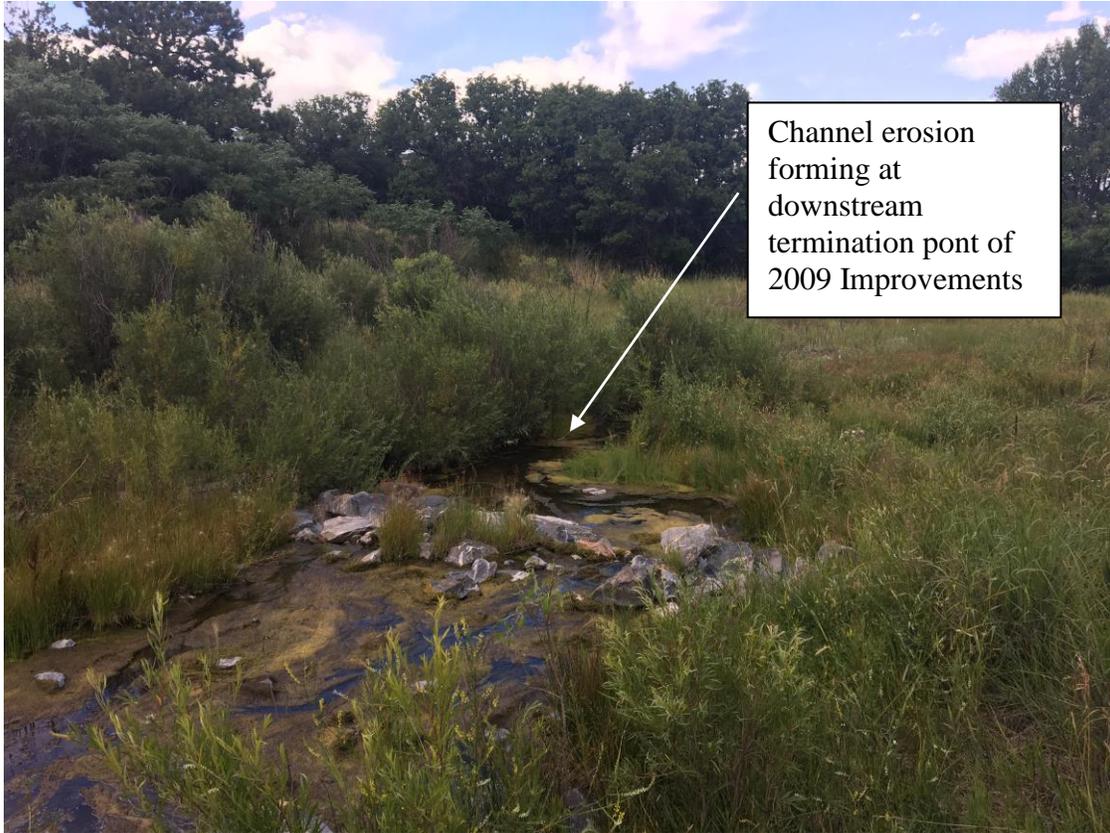
26 - PARK STREET AT VILLAGE NORTH



27 - MCMURDO GULCH



28 - MCMURDO GULCH



29 - MCMURDO GULCH



30 - MCMURDO GULCH



Cherry Creek bend
immediately adjacent
to future regional park

31 – CHERRY CREEK