

MEMORANDUM

JRS ENGINEERING CONSULTANT, LLC

TO: Chuck Reid, Manager - CCBWQA
CC: Rick Goncalves, Chairman, TAC
FROM: James R. "Jim" Swanson, P.E.
DATE: December 6, 2017
SUBJECT: Piney Creek Stream Reclamation - Reach 6, U/S of Caley

BACKGROUND AND PURPOSE:

UDFCD and SEMSWA initially entered into an intergovernmental agreement (IGA), on December 22, 2006, for stream reclamation improvements on Piney Creek at Caley Drive. The Authority entered into this intergovernmental agreement (IGA), on September 3, 2014, with UDFCD and SEMSWA. This agreement established funding for needed stream reclamation improvements through Reaches 6 and 7 of Piney Creek; reach locations are shown in Exhibit 1 attached hereto. Since the Authority entered into the initial IGA with UDFCD and SEMSWA, six amendments were executed on 9/10/2015, 12/16/2015, 12/23/2016, 3/02/2016, 9/28/2016 and 3/29/17. Each amendment increased project funding. To date the Authority's funding contribution totals \$2,250,000.

EXISTING CONDITIONS:

Piney Creek, in this project area, has severely eroded and continues to experience significant erosion during storm events. This continued erosion threatened water quality within the basin, sensitive riparian areas and wildlife habitat as well as existing trails and utilities. The project includes grade control / drop structures and bank stabilization that will mitigate the existing erosion and minimize future erosion on Piney Creek. Typical pre-project conditions are shown in Photos 1, 2 and 3 documenting Piney Creek's degradation within Reach 6, upstream of Caley Drive.



Photo 1 - Existing Condition



Photo 2 - Existing Condition

DESIGN APPROACH:

The design approach to reclamation of this project reach is the combination of a natural bioengineering approach connecting the streambed to the overbanks and a more engineered approach in areas where topography or site conditions constrain the channel geometry.

Three constructed Grouted Boulder Drop Structures and a 140-linear foot section of void filled channel bottom rip-rap lining, constructed at a two tenths percent longitudinal grade, was incorporated into the Project to flatten and control the longitudinal grade. Sheet-pile cut-off walls installed at each Grouted Boulder Drop Structure protects the channel gradient from damage during a larger flood event and anchors the lower end of the project reach. The sideslopes along the stream channel was graded with flatter slopes to reconnect higher channel flows to the riparian corridor. Outer bank protection at the channel bends protects the bank from eroding in a storm event. This channel reconstruction reduces channel velocity, shear forces and stream power allowing for more filtration and infiltration and thus reducing erosion and nutrient transport.

The Project was designed to raise the streambed and re-establish the water table to prevent further loss of vegetation and down cutting, erosion and sediment transport. The overall project goal was to restore and enhance the aquatic, wetland and riparian functions of Piney Creek. In-progress construction for the Cherry Creek Stream Reclamation Channel Improvements constructed in 2016/2017 is shown in Photos 4, 5 and 6.



Photo 3 - Existing Condition



Photo 5 – Channel Construction



Photo 4 – Connection to the Antelope Creek Box Culvert under Arapahoe Road



Photo 6 – Boulder Drop Structure Construction

CONSTRUCTED PROJECT:

The 1,600 linear foot Piney Creek Reach 6, U/S of Caley Stream Reclamation Channel Improvements Project contract was awarded to Edge Contracting, Inc., in the amount of \$2,073,617.95. The Notice to Proceed was issued on November 28, 2016. The work was substantially complete on September 30, 2017. The final Project cost totaled \$2,100,935.36. The constructed improvements are shown in Photos 7, 8 and 9.



Photo 8 – Constructed Channel



Photo 7 – Constructed Channel



Photo 9 – Constructed Channel

WATER QUALITY BENEFITS:

An assessment of the stream stabilization and water quality benefits for the entire project was made by the Authority¹ and found to include reductions in sediment and other pollutant loads, including phosphorus and nitrogen. These benefits are supported by Authority data, literature research and quantitative analysis. Based on the outcome of this assessment, it is calculated that 30 lbs of phosphorus per year will be eliminated from being transported downstream from the Piney Creek – Reach 6, U/S of Caley stream reclamation improvements. The project was found to lower stream velocities, channel shear and stream power from that found prior to the stream reclamation, all which minimizes the transport of sediment and pollutants.

SUMMARY:

Project Length = 1,600 linear feet.

Water Quality Benefits ≈ 30 # / year Phosphorus removal.

Total Construction Cost = \$2,100,935.36.

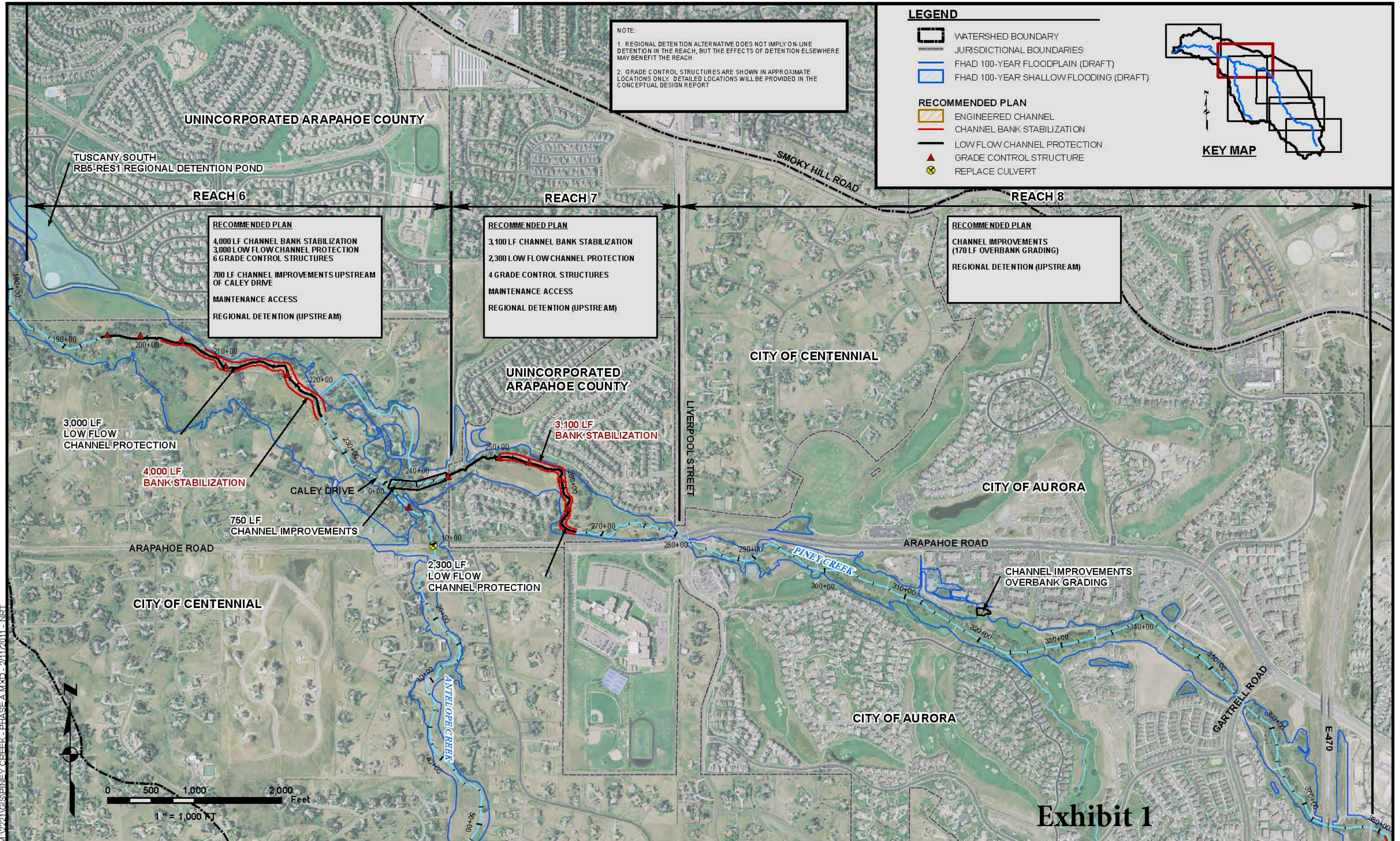
Authority's Share = \$525,234.

Project Partners: UDFCD, CCBWQA & SEMSWA.

Engineer: Olsson Associates.

Contractors: Edge Contracting, Inc.

¹ CCBWQA Technical Advisory Committee, June 16, 2011. *Stream Reclamation, Water Quality Benefit Evaluation – Interim Report.*



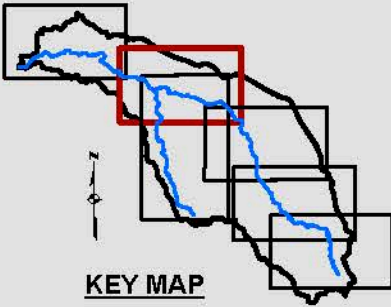
NOTE:
 1. REGIONAL DETENTION ALTERNATIVE DOES NOT IMPLY ON-LINE DETENTION IN THE REACH, BUT THE EFFECTS OF DETENTION ELSEWHERE MAY BENEFIT THE REACH
 2. GRADE CONTROL STRUCTURES ARE SHOWN IN APPROXIMATE LOCATIONS ONLY. DETAILED LOCATIONS WILL BE PROVIDED IN THE CONCEPTUAL DESIGN REPORT

LEGEND

- WATERSHED BOUNDARY
- JURISDICTIONAL BOUNDARIES
- FHAD 100-YEAR FLOODPLAIN (DRAFT)
- FHAD 100-YEAR SHALLOW FLOODING (DRAFT)

RECOMMENDED PLAN

- ENGINEERED CHANNEL
- CHANNEL BANK STABILIZATION
- LOW FLOW CHANNEL PROTECTION
- GRADE CONTROL STRUCTURE
- REPLACE CULVERT



RECOMMENDED PLAN

- 4,000 LF CHANNEL BANK STABILIZATION
- 3,000 LF LOW FLOW CHANNEL PROTECTION
- 6 GRADE CONTROL STRUCTURES
- 700 LF CHANNEL IMPROVEMENTS UPSTREAM OF CALEY DRIVE
- MAINTENANCE ACCESS
- REGIONAL DETENTION (UPSTREAM)

RECOMMENDED PLAN

- 3,100 LF CHANNEL BANK STABILIZATION
- 2,300 LF LOW FLOW CHANNEL PROTECTION
- 4 GRADE CONTROL STRUCTURES
- MAINTENANCE ACCESS
- REGIONAL DETENTION (UPSTREAM)

RECOMMENDED PLAN

- CHANNEL IMPROVEMENTS (170 LF OVERBANK GRADING)
- REGIONAL DETENTION (UPSTREAM)

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Exhibit 1