# COTTONWOOD WETLANDS

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# Memorandum

**To:** Chuck Reid, Manager, CCBWQA

**Cc:** Rick Goncalves, Chairman TAC

**From:** William P. Ruzzo, P.E.

**Date:** December 27, 2012

**Re:** Cottonwood Wetlands PRF Rehabilitation – Project Summary

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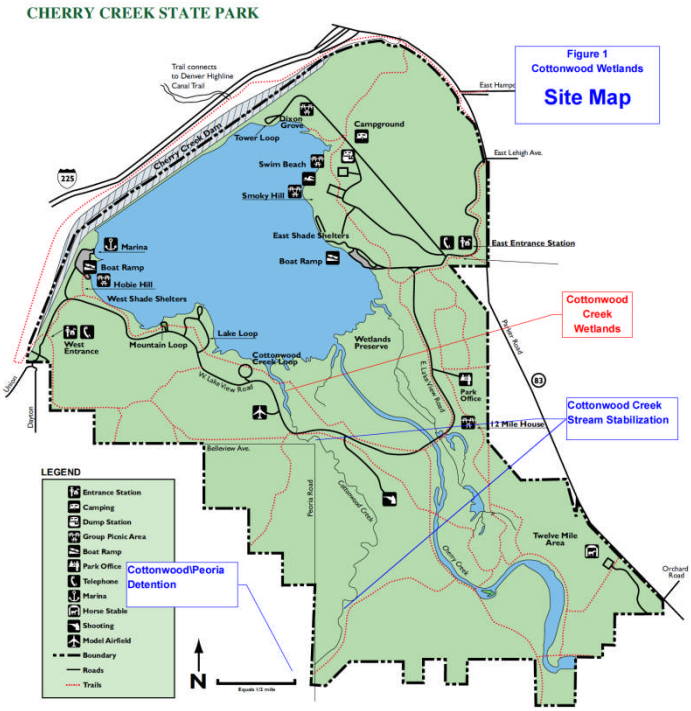
Presented in this memorandum is a summary of the Cottonwood Wetlands Pollutant Reduction Facility (PRF) Rehabilitation project (Cottonwood Wetlands PRF or Project.

## BACKGROUND AND PURPOSE

The Cottonwood Wetlands PRF[1] was constructed by the Authority around 1997 for the purpose of trapping sediment from the highly eroded Cottonwood Creek channel within the Park boundaries to prevent sediment and attached pollutants from entering the Reservoir. This project was followed by the Cottonwood\Peoria Wetlands (2001) and the first Phase of Cottonwood Creek reclamation (2004) within the Park. See Figure 1, Site Map.




Despite these upstream stabilization measures, routine monitoring of the inflow and outflow phosphorus loads beginning in 1997 showed that by 2005, the "…*effectiveness of the pond system was greatly reduced*[2]. Restoration of Cottonwood Wetlands

[1] Previously referred to as the Cottonwood Perimeter Road Pond in earlier Authority documents.
[2] Chadwick Ecological Consultants, Inc. March 2006. *Cherry Creek Reservoir 2005 Annual Aquatic Biological-Nutrient Monitoring Study and Cottonwood Creek Phosphorus Reduction Facility Monitoring.*

was identified as a necessary project in the 2005 annual inspection report[3] and included in the Authority's 5-year CIP budget. However, rehabilitation of the Cottonwood Wetlands was delayed until the upstream reaches of Cottonwood Creek from West Lakeview Road (aka perimeter road) to Peoria Street were stabilized to minimize additional sedimentation of the Cottonwood Wetlands PRF.

Phase II of Cottonwood Creek Reclamation was finished in 2008 completing reclamation of the 2.2-miles of highly eroded channel within the Park boundary. The Authority then began preparing plans for rehabilitation of the Cottonwood Wetlands in 2008 by retaining Muller Engineering Company[4] to prepare final plans and construction documents.

## INVESTIGATION PHASE – Clay Pigeon Debris

During design of the rehabilitation project, clay pigeons were found at the site in early 2009. Some types of clay pigeons are classified as a solid waste since they contain polynuclear-aromatic hydrocarbons (PAH). In discussions with the Colorado Department of Public Health and Environment (CDPHE) it was determined that only material containing clay pigeons disturbed during construction must be removed and disposed in a qualified landfill. It is not necessary to remove clay pigeons from the entire project site, if they are left undisturbed. Therefore, the Authority redesigned the Cottonwood Wetlands PRF to minimize excavation in areas of the project where clay pigeons were known to exist in order to reduce cost of offsite, landfill disposal.

**Figure 2 - Clay Pigeon Debris**

The area affected by the PRF and clay pigeon debris is owned by the US Army Corps of Engineers (Corps) and is in the possession of CPW pursuant to a long term lease. The Authority could not assume responsibility for removing waste material from property it does not own, especially since the placement of that material resulted from the actions of third parties over whom the Authority had no control. Because the PRF could not be rehabilitated until the clay pigeons were removed and because of economies of scale, contractor scheduling issues and other matters of contract administration, rehabilitation of the PRF and the removal of the clay pigeons was determined to be best treated as an integrated project and managed by a single owner, CPW.

## DESIGN APPROACH

The primary purpose of the Project was to restore the sedimentation function of the PRF, which had become clogged with sediment since construction reducing water quality benefits. However, to avoid damaging the existing cottonwood, sedge, cattail, and rush wetlands that had become

[3] William P. Ruzzo, PE, LLC April 25, 2005. *Annual Inspection of PRF's at Cherry Creek State Park.*
[4] October 1, 2008. *Agreement for Engineering Design Services – Cottonwood Wetlands Project.*

established since construction, the main creek channel was realigned to avoid existing wetlands, which also avoided the known clay pigeon areas. In addition, the main channel was aligned to create a serpentine pathway with localized pools through the pond area to maximize the contact between storm runoff and the existing and newly planted vegetation further improving water quality. These modifications are illustrated in Figure 3 below where the green color represents existing wetlands.

Rehabilitation of the Project did not restore the original sedimentation capacity because of the reduced pond surface area occupied by wetlands. However, the modifications discussed above were considered to offset reduction in sedimentation capacity, particularly since the upstream channel was now stabilized reducing future sediment transport into the Project.

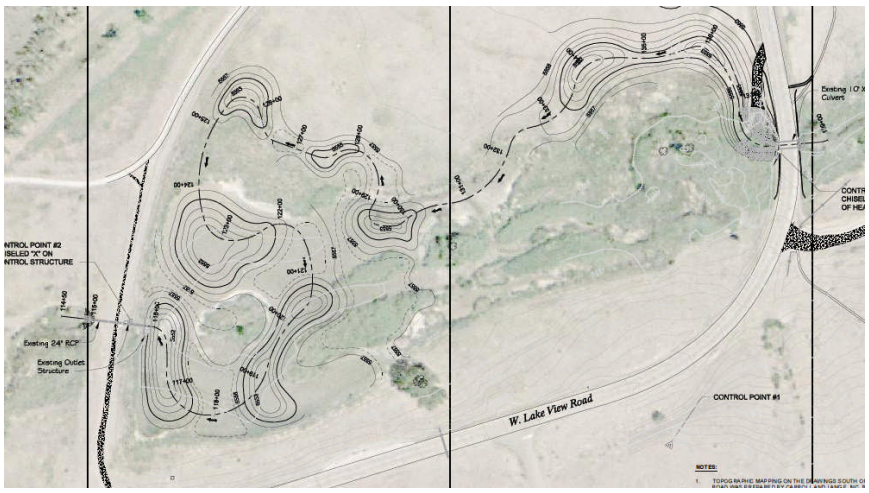



**Figure 3 General Project Plan**

## FUNDING AGREEMENT

Because of the shared responsibility by both parties for the Project, the Authority and CPW entered into a funding agreement in September 2011 to share project costs. Key provisions of the agreement included:

1. Both parties allocated funds for the project to cover all costs, including PRF rehabilitation and clay pigeon removal and disposal.

2. CPW pays for all costs associated with removal and proper, off-site disposal of clay pigeon debris.

3. The Authority pays for all costs associated with rehabilitation of the Cottonwood Creek Wetlands PRF.

4. CPW and the Authority already incurred expenses related to the project that were not their responsibility and therefore each party receives credit for the expenses when determining how the final project costs will be shared. The construction contract administration and quantities have been developed to clearly separate PRF rehabilitation costs from clay pigeon disposal costs.

5. The project was constructed per plans prepared for and approved by the Authority.

The funding agreement was amended (First Amendment) on April 16, 2012 to adjust expected project costs due to greater quantities of sediment that needed to be removed.

## PROJECT MANAGEMENT

CPW agreed to manage construction of the project and, with approval of the Authority, contracted with the Authority's consultant to provide construction observation services to oversee the rehabilitation of the Cottonwood Wetlands PRF. CPW managed project bidding and construction contracting paying all project costs from a separate State account initially funded by the State. The Authority provided overall project guidance and direction related to rehabilitation of the PRF working cooperatively with CPW throughout construction. After completion of the Project and all project costs were accounted for, the Authority reimbursed CPW for the balance of the Authority's cost share.

## CONSTRUCTION

A single bid was received for the Project and opened on November 22, 2011. Since the bid amount of $326,781[5] compared favorable to the engineer's opinion of probable cost ($337,267) adjusting for increased sediment removal costs, the Project was awarded to 53-Corporation, LLC of Castle Rock. The notice to proceed with construction was issued on January 17, 2012.

To facilitate sediment removal, the pond was drained starting October 7, 2011 which revealed that the pond had experienced greater sedimentation than previously estimated and would require more excavation and sediment removal. During construction of the Project, the Authority also had another project[6] under construction within Cherry Creek State Park by 53-Corporation, which needed earth materials. After determining the suitability of the sediment for use in the 12-Mile Park project, the Authority directed the contractor to haul sediment from the Cottonwood Wetlands project and place it at the 12-Mile Park project to reclaim the wetlands damaged during breach of the Cherry Creek channel. This exchange of material between projects reduced costs to import materials for the two projects and export materials from the Park to preserve flood storage volume[7].


**Figure 4 - Beginning excavation**

[5] Amount includes the base bid and optional work but not clay pigeon removal.
[6] Cherry Creek Stream Reclamation at 12-Mile Park – Phase I
[7] William P. Ruzzo, PE, LLC July 26, 2012. *Tower Loop, Cottonwood Wetlands, and Cherry Creek @ 12-Mile Park*

In late May of 2012, it was discovered that the original dam embankment for the Cottonwood Wetlands PRF was constructed from 0.5 to 1.5-feet below the design elevation. The contractor was issued a change order to raise the embankment to the original design elevation. On June 6, 2012 a significant storm event occurred over Cottonwood Creek and lower Cherry Creek basin that resulted in minor flood damages at the Cottonwood Wetlands project[8]. The investigation concluded that if the dam embankment had not been raised,"…*it is likely that the dam would have overtopped resulting in significant damage downstream of the dam and to the Cottonwood Wetlands project*."

The Cottonwood Wetlands project was complete as of July 9, 2012. Final project costs and allocation of costs between the Authority and CPW are shown in the adjacent table. The cost allocated to CPW represents the final costs to remove and dispose clay pigeons disturbed as the result of the Project. CPW originally received an estimate of $90,000 to just characterize the solid and hazardous[9] wastes on the site, which costs did not include any removal of clay pigeon debris.

| TOTAL PROJECT COSTS | Total | Authority | CPW |
|---|---|---|---|
| Preliminary Engineering | $ 39,750.00 | $ 39,750.00 | $ - |
| Final Design Engineering | $ 29,637.00 | $ 10,607.50 | $ 19,029.50 |
| Construction Engineering | $ 93,494.50 | $ 80,761.00 | $ 12,733.50 |
| Construction | $306,805.66 | $ 289,089.32 | $ 17,716.34 |
| Environmental testing | $ 810.20 | $ - | $ 810.20 |
| Total | ***$470,497.36*** | ***$ 420,207.82*** | ***$ 50,289.54*** |

## SEDIMENT SAMPLES

Prior to construction, samples of the sediment were obtained and tested for total phosphorus content[10]. The average total phosphorus (TP) concentration of 744 mg/kg for the Cottonwood Wetlands is consistent with the Authority's results for sediment removed from the Cottonwood Peoria Street wetlands (average of 743 mg/kg). TP concentrations in sediment ponds are approximately 50% higher than found in stream bed and stream banks, which are typically around 500-mg/kg.

## WATER QUALITY BENEFITS

Water quality benefits of the Cottonwood Wetlands have been documented in the Authority's annual report of activities to the Water Quality Control Commission required by Control Regulation No. 72. The Authority collects data upstream and downstream of the Cottonwood Wetlands and the Cottonwood Peoria Wetlands which allows each segment of the treatment train

[8] William P. Ruzzo June 7, 2012. *Preliminary Report on the June 6, 2012 Flood Event on Recent Completed PRFs in Cherry Creek State Park.*

[9] Since clay pigeon debris was found there was a possibility that lead from the shot would also be found. Samples of the sediment containing clay pigeons were tested and found to be less than maximum contaminant limits.

[10] William P. Ruzzo, January 12, 2012. *Cottonwood Wetlands PRF Rehabilitation – Soil Phosphorus Content.*

(i.e.: Cottonwood\Peoria Pond, Cottonwood Creek Reclamation, and Cottonwood Wetlands) to be evaluated independently.

The Annual Report for 2011[11] shows that, prior to rehabilitation of the Cottonwood Wetlands, the 2011, flow weighted total phosphorus (TP) into the Project was 101-ug/l and discharged from the Project was 81-ug/l. Measurements during 2012 showed that TP[12] discharged from the Project varied from 87-ug/l to 36-ug/l which is a noticeable improvement in water quality. It is also noted that the discharge TP is less than the proposed in-stream standard for TP, which is 170-ug/l.

[11] CCBWQA March 31, 2012. *Annual Report on Activities Cherry Creek Basin Water Quality Authority.*
[12] One measurement taken in March 2012 during construction resulted in a TP of 156-ug/l.