Memorandum

To: *Todd Doherty (CWCB)*

From: *Windy Van Valkenburg (Town of Walden)*
Mark McCluskey (CDM)

Date: *October 27, 2011*

Subject: *Completion of Walden Water Supply Improvement Project*

Introduction

This memo is a summary of the tasks completed as part of the Walden Water Supply Improvement Project. This project was funded by a Water Supply Reserve Account (WSRA) grant via the Colorado Water Conservation Board (CWCB) and supported by the North Platte Basin Roundtable. We appreciate the support the Town of Walden (Town) received in funding and implementing this water supply improvement project. This project has helped secure the Town's water rights and repaired critical infrastructure in order for the Town to meet its current and future water demands. The Water Supply Improvement Project is complete.

The Town requested funds to improve its ability to physically divert its senior HiHo Ditch water right from a new collection gallery (infiltration system) adjacent to the river, rehabilitate its existing diversion dam and diversion system, obtain a water court decree giving the two original wells the right to pump as alternate points of diversion to the senior HiHo Ditch, and to change the use of its Walden Reservoir shares to municipal and augmentation uses, include this water in a plan for augmentation.

As stated in the WSRA grant application, the objectives for this project were to:

- Task 1 – Construct a new collection gallery (infiltration gallery) near the existing diversion structure at the Michigan River.
- Task 2 – Adjudicate the Town's two oldest municipal wells as alternate points of diversion to the senior HiHo Ditch.
- Task 3 – Rehabilitate the existing dam and diversion structure in the Michigan River.

- Task 4 – Change the use of the Town's shares in the Walden Reservoir to municipal and augmentation use including the augmentation of the Town's Hansen Park well or other wells and diversion structures.

The following sections of this memorandum explain each of the tasks as they were completed as part of the Walden Water Supply Improvement Project.

Task 1 Design a New Collection Gallery to Divert the Senior HiHo Ditch

This task started with the drilling and testing of test wells in the study area located just upstream of the Town's existing diversion structure. CDM worked with a water well contractor to construct five monitoring wells and a temporary well to determine the saturated thickness and transmissivity of the alluvium adjacent to the Michigan River in order to determine if a collection gallery is feasible as shown in **Figure 1**.

Figure 1. Wetland Area, Walden, Colorado

CDM worked with the well contractor to log the test wells and conduct an aquifer performance test using the temporary well and adjacent test holes to monitor water levels (**Figures 2 to 4**). The data was processed to determine the aquifer transmissivity in the study area and evaluation of the feasibility of constructing a collection gallery to capture the 1.0 cubic feet per second (cfs) associated with the HiHo Ditch right.

Figure 2. Drilling Test Holes

Figure 3. Logging Aquifer

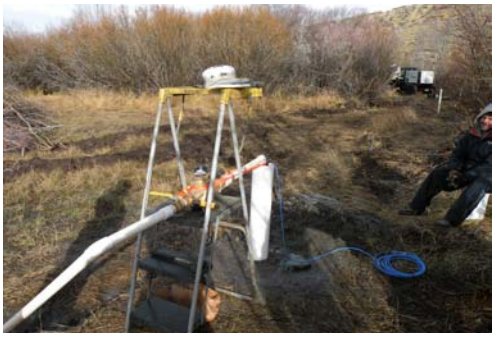

Figure 4. Conducting Aquifer Performance Test

The results of the aquifer performance test determined the transmissivity of the alluvial aquifer of 500-square-feet (ft^2)/day; which translates to an aquifer hydraulic conductivity 170 ft/day. The calculated transmissivity in the study area is not capable of supporting the proposed infiltration gallery at the rates the Town needs to meet its water demands. At this point this finding was conveyed to the Town and the CWCB. It was agreed that the proposed infiltration gallery was not feasible for construction and remaining task funds would be used to rehabilitate the existing diversion structure (Task 3).

Task 2 Decree the Town's Two Municipal Wells as Alternate Points of Diversion to the HiHo Ditch

The Town worked with CDM and the Town's Attorney, Tom Sharp, to decree the Town's two oldest municipal wells as Alternate Points of Diversion to the HiHo Ditch. The Town uses its two municipal wells to supply water due to the warmer temperature and clarity of the water from the wells. These factors make it easier to treat the water, so it is the Town's preferred method of diverting water. Historically, the Town has been allowed to pump the wells to supply the Town although they were not officially decreed as alternate points of diversion for the HiHo Ditch right.

The Town's attorney drafted an alternate point of diversion application with engineering support from CDM. CDM prepared a stream depletion analysis exhibit, which accompanied the application. The Town's Attorney and CDM addressed several comments received from the Division Engineer. The application is undergoing final approval and the Town expects the decree to be final in the next month.

In addition, a stream depletion accounting tool was developed to assist the Town and Division Engineer in tracking stream depletions associated with pumping from the Town's two municipal wells for administration on the Michigan River. This tool was developed in Microsoft *Excel* and will provide the Town with the amount of stream depletions from pumping the two municipal wells so that if and when water is diverted from the surface diversion structure it does not exceed the Town's rights on the Michigan River in times when there is a call on the river.

Task 3 Rehabilitate the Existing Surface Diversion Structure in the Michigan River

The key component of this project was to rehabilitate the existing diversion structure on the Michigan River. The existing diversion structure was built in the 1970s and was in need of repair. The intent of the project was to rehabilitate the existing structure by reconstructing the top 6 to 8 inches of the dam and replace the existing collection piping and gravel pack on the upstream portion of the diversion to increase the efficiency of the structure. CDM worked with the Town to prepare a design and bid package for the rehabilitation as planned. The project went out to bid and a contractor was selected (Atlas Industrial Holdings, LLC).

Construction on the existing diversion structure began on October 6, 2010. A coffer dam and bypass channel to divert flow around the existing structure was constructed. When the area surrounding the existing structure was dewatered, additional structural concerns were identified. There was loose steel rebar exposed at the bottom of the existing dam and piping of water was observed under the existing foundation (**Figure 5**). At this point it was determined the entire structure needed to be replaced for safety reasons.

Figure 5. Piping Under the Existing Diversion Structure

The Town worked with CDM and Atlas Industrial Holdings, LLC to develop a design and cost estimate to replace the entire existing diversion structure. The replacement of the existing diversion structure was not part of the scope of work; thus, the Town needed to pay for any additional costs associated with the full replacement of the diversion structure.

Construction to replace the diversion structure re-commenced on October 18th. The existing diversion structure was completely removed and construction of the new diversion structure was begun. The new structure was constructed on the underlying bedrock to provide additional structural stability (**Figure 6 and 7**). The dam was erected to the original designed height creating the head needed to provide sufficient flow through the upstream collection piping. The upstream collection piping was replaced with more efficient PVC slotted well screens to provide efficient flows to the Town's water plant (**Figures 8 and 9**). In addition, existing valves at the diversion structure were replaced to allow for the diversion structure to be shut off for repairs or potential environmental concerns with flow in the Michigan River.

Figure 6. Constructing Footing for New Diversion Structure

Figure 7. New Diversion Structure Dam prior to Installing Gravel Pack

Figure 8. Old Well Screen Removed from Diversion Structure

Figure 9. New Slotted Piping at the Diversion Structure

The new diversion structure was completed in early November 2010 and is currently being used by the Town to divert water from the Michigan River. The new structure is now able to divert the entire HiHo Ditch water right depending on the Town's water demands. The Town's utility superintendent, Mark Russell, has noticed a vast improvement in the Town's ability to divert water via the new diversion structure. This new structure will help the Town meet its current demands as well as future demands in Walden.

Task 4 Change the Use of the Town's Shares in Walden Reservoir

The Town of Walden owns six shares in Walden Reservoir. The shares the Town owns in the reservoir are decreed for irrigation use only; thus, the Town wanted to evaluate the potential for changing the use of their Walden Reservoir shares to cover municipal and augmentation uses.

Historically, the Town has not used their shares in Walden Reservoir due to the decreed use of the water rights associated with the shares. The Town wanted to determine the best way to use these shares to meet current and future water demands in Walden. This led to a couple different options:

- Change the use of the Walden Reservoir shares to municipal and augmentation uses
- Evaluate a potential trade of water rights for rights already decreed for municipal and/or augmentation rights on the Michigan River
- Evaluate the potential use of Walden Reservoir shares to irrigate the Town's parks, Jackson County court house, and cemetery

Each of these options was evaluated for their feasibility in meeting additional water supply needs for the Town under this task.

First, the Town evaluated to potential of changing the decreed use of the Town's shares in Walden Reservoir to add municipal and augmentation uses. In cooperation with the Town's Attorney and the Walden Reservoir Company, owner and operator of the Walden Reservoir, an evaluation of changing the decreed water use was discussed. In discussions with the Walden Reservoir Company it was decided that it was not beneficial to open the water rights of the Walden Reservoir Company in order to add additional uses to the original decree. This would require a detailed review of the water rights and require a potentially lengthy water court case, which may result in the loss of some existing water rights. It was decided by the Town to no longer pursue changing the decreed use of their Walden Reservoir shares.

The second option was to evaluate the potential for trading the Town's Walden Reservoir shares for water rights on the Michigan River that were already decreed for municipal and augmentation uses. Through a review of the water rights on Michigan River and its tributaries, a water right decreed for municipal use was identified for a potential trade. This water right was associated with Meadow Creek Reservoir and is owned by the Upper Michigan River Water Conservancy District. . The Silver Spur Ranch has shares of water in Meadow Creek Reservoir and may be able to use the Walden Reservoir shares on the ranch in lieu of Meadow Creek Reservoir shares. Silver Spur Ranch has operations along the Michigan River and Illinois River and could benefit from a potential trade for equivalent shares in Walden Reservoir. This option was discussed with the Town's water attorney and Division Engineer to determine the feasibility of the trade. It was discovered that there would be substantial stream loss getting water from Meadow Creek Reservoir to the Town’s diversion structure. This would only be accentuated in times of low flow on the Michigan River, when the Town would need access to this water the most to meet demands. Due to the high rate of stream loss in low flow periods it was decided to not pursue a trade of reservoir shares with Silver Spur Ranch at this time.

The third option was to evaluate the potential to use the Town's shares in Walden Reservoir to irrigate the Town's parks, Jackson County court house lawn, and cemetery. All of these areas can be irrigated with non-potable water and would not require going to water court to change the existing decree. This option would require approval from the Walden Reservoir Company to use the Town's shares in this manner and the construction of a non-potable pipeline to covey water from the reservoir to the areas to be irrigated.

To evaluate the feasibility of this option, the Town initiated an evaluation of the potential cost of constructing a pipeline from the reservoir to several locations within the Town. The evaluation looked at the requirements for potential easements, permitting and agreements that would have to be obtained prior to construction of a non-potable pipeline.

The probable cost to construct a pipeline was evaluated using two potential pipeline routes from the Walden Reservoir to the Town's non-potable demands. These proposed routes are shown in **Figure 10**.

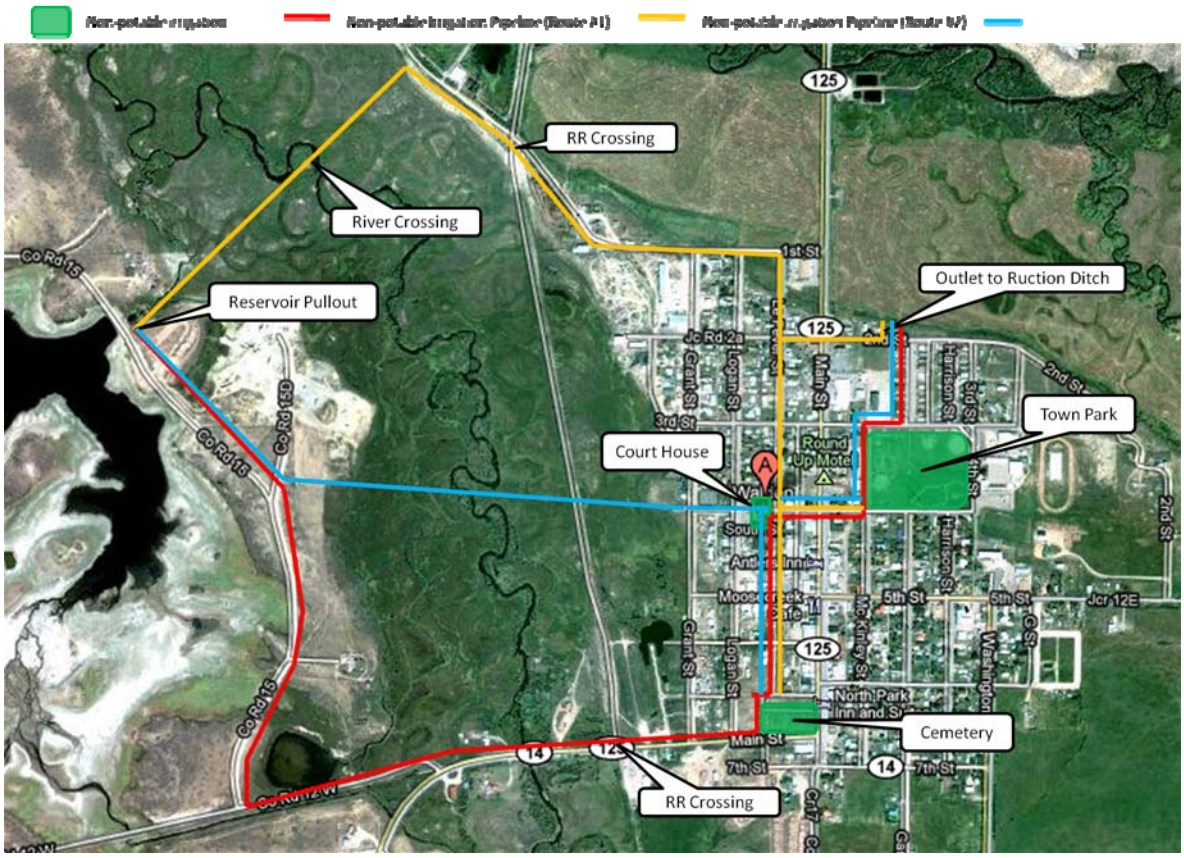

Figure 10. Proposed Routes for a New Non-Potable Irrigation Pipeline

Approval and an operational agreement with Walden Reservoir Company would need to be obtained prior to taking the next steps toward constructing a non-potable pipeline.

Summary

In summary, the Town was able to complete each of the tasks associated with this project. The Town evaluated the potential for a new collection gallery along the Michigan River, which was determined to have insufficient hydraulic properties to support the needed flow rates of the Town. The Town's two municipal wells were decreed as alternate points of diversion for the HiHo Ditch. The existing diversion structure was re-built to original design allowing the Town to capture its entire HiHo Ditch water right from the Michigan River as needed to meet current and future demands. Finally, the Town was able to evaluate three options to use their Walden Reservoir shares in order to meet current and future demands.