

Memo

To: Doug Martin, NRDP
From: Tim Ranf, Pioneer
CC: George Austiguy, Colette Lemieux, Pioneer
Date: 7/23/2014
Re: Cottonwood Creek Crossing and Fish Screen Design

Introduction and Purpose

The Kohrs and Manning Ditch Company (KMDC) diverts water from both the Clark Fork River (CFR) and Cottonwood Creek near the north end of Deer Lodge, Montana, and conveys it seven (7) miles north to irrigate over 1,400 acres of agricultural land, mostly on the east side of Interstate 90. The KMDC has three water rights on Cottonwood Creek (approximately 48 cfs) and nine irrigation rights on the Clark Fork (approximately 180 cfs). The Kohrs-Manning Ditch (KMD) typically flows from May through September. Normally in May, all of Cottonwood Creek is diverted to the KMD; the CFR diversion structure, located upstream from Cottonwood Creek, is typically opened in mid- to late-May.

According to a 2012 Capital Improvements Plan (CIP, March 2012), several key elements of the KMDC's infrastructure require upgrades, including their diversion on the CFR, the crossing and diversion at Cottonwood Creek, and the Johnson Creek aqueduct. The Montana Natural Resource Damage Program (NRDP) working in conjunction with the KMDC, the Deer Lodge Valley Conservation District (DLVCD), the Watershed Restoration Coalition for the Upper Clark Fork (WRC), and Grant Kohrs Ranch/US National Park Service (USNPS), has hired Pioneer Technical Services (Pioneer) to:

- Develop and evaluate conceptual alternatives and costs for the Cottonwood Creek crossing and appurtenant structures;
- Select a preferred alternative;
- Complete a conceptual design and cost estimate for the preferred alternative; and
- Prepare the final design, bid specifications and permitting for this integrated ditch crossing, fish passage and fish screen project.

The purpose of this memorandum is to define project goals, preliminary design criteria and a preliminary set of alternatives to support design development.

Project Goals

The Cottonwood Crossing Primary Project Goals include:

- Upgrade the Cottonwood Creek Diversion Structure.
- Provide upstream fish passage in Cottonwood Creek from the confluence with the CFR for the fish passage design flow range.
- Establish a design flow range with KMDC irrigators.
- Prevent fingerling and larger fish in Cottonwood Creek from being entrained into the KMD.

Preliminary Design Criteria

Preliminary Design Criteria include:

- The Cottonwood Creek diversion structure shall be capable of diverting up to 40 cfs from Cottonwood Creek into the KMD and passing across Cottonwood Creek a flow equivalent to the design flow for the CFR diversion structure to the KMD.

- The Cottonwood Creek diversion structure shall be designed to remain stable up to the 100-year flow from the Cottonwood Creek drainage and the CFR Drainage (not co-incident).
- The Cottonwood Creek diversion structure shall not co-mingle CFR water with Cottonwood Creek Water.
- The fish screen approach velocity shall be not exceed 0.8 fps (NMFS Salmonid Fingerling Criteria).
- The fish screen maximum opening dimension shall be 0.25 inches (NMFS Salmonid Fingerling Criteria).
- Maximum fish passage design flow: The diversion structure shall be capable of safely passing salmonid fingerlings and older age class up to the Cottonwood Creek flow with a 2-year recurrence interval.
- Minimum fish passage design flow: The diversion structure shall be capable of safely passing salmonid fingerlings and older age class for flows greater than the Cottonwood Creek flow determined to represent the lower practical flow limit for fish passage. This low flow design estimate will be developed during the feasibility study and selected with stakeholder input.

Preliminary Conceptual Alternatives

1. Reconstruct Cottonwood Creek diversion with a fish ladder and a siphon crossing to convey the KMD CFR flow across Cottonwood Creek. Construct a fish screen in the KMD down ditch from the Cottonwood Diversion structure.
2. Reconstruct Cottonwood Creek diversion with a fish ladder. Convey flow from the KMD CFR diversion in a pipe from the CFR to a location down-ditch from the Cottonwood Diversion structure. Construct a fish screen in the KMD down ditch from the Cottonwood Diversion structure.
3. Reconstruct Cottonwood Creek diversion with a fish ladder and use a flume to convey KMD CFR flows across Cottonwood Creek. Construct a fish screen in the KMD down ditch from the Cottonwood Diversion structure.
4. Construct a fish passable bypass structure and channel to connect Cottonwood Creek above the Cottonwood Creek diversion structure with the CFR. Route the bypass channel to outlet upstream of the KMD CFR Point of Diversion. The fish passable bypass channel would carry sufficient flow to maintain fish passage; the majority of Cottonwood Creek flow would continue downstream to the diversion structure.
5. Reconstruct Cottonwood Creek diversion with a fish ladder, move the KMD CFR Point of Diversion downstream of the Cottonwood Creek\CFR confluence. Construct a fish screen in the KMD down ditch from the Cottonwood Diversion structure.
6. Construct a fish passable bypass structure and channel to connect Cottonwood Creek above the Cottonwood Creek diversion structure with the CFR. Route the bypass channel to outlet downstream of the KMD CFR POD. Construct a flume on the KMD to convey CFR flows over the bypass channel.