BH Eaton and Whitney Ditch Fish Passage

1-13-17


Timnath
E Harmony Rd
E Harmony Rd
74
Colorado Blvd
15
Kechter Rd
72
257
21
Project Location
Fossil Creek Reservoir Natural Area
70
County Rd 32 E
392
392
392
392
Windsor
S Co Rd 5
9
13
7th St
E County Rd 30
Eastman Park Dr
257
25
Northern Colorado Regional Airport
Steeplechase Dr


Fish passage at both structures would re-connect 13.1 miles of habitat within the Cache la Poudre River.
3.9 miles to next diversion upstream
Whitney Ditch
0.1 miles between diversion structures
B H Eaton Ditch
9.0 miles to next diversion downstream

Steps to Date

- Step 1 – Get buy in from Ditch Companies
  - Find Knowledgeable professionals to help.
  - Meetings, meetings, meetings
  - Create guiding principles
  - Field Trip of Successful Projects
- Complete a Design Study
  - Funded by CWCB

Partners

- Whitney Ditch Company - Stan Everitt & Judy Firestein
- BH Eaton Ditch Company - Cody Wooldridge
- Northern Water – Amy Johnson & Jerry Gibbens
- Parks and Wildlife – Matt Kondratieff, Eric Richer, Boyd Wright
- Larimer County – Jeffrey Boring
- City of Greeley – Eric Reckentine – Christie Coleman
- Central Water – Randy Ray
- Flywater – Corey Engen

Guiding Principles

- Does not injure ditch company or shareholders
- Protects existing water rights, is consistent with state water law
- Does not impair the ability of the ditch companies to supply historic water allocations
- Improves maintenance and operations of the Diversion Structures, ie. debris, sedimentation
- Provides wildlife passage (Small bodied native fish) 12 months out of the year depending on water availability
- CPW design guideline target of 2 feet per second, minimum depth of ½ foot based on water in system.
- Consider entrainment issues / possibilities
- Reduces risk of trespass
- Project primarily funded with grants
- Improves site security (reduce vandalism)

Whitney and BH Eaton Fish Passage Improvement Feasibility Study – Final Report

November 2016

Figure 1 – Aerial View of Whitney and BH Eaton Diversion Area

Executive Summary

OneFish Engineering, LLC (OneFish) and FlyWater, Inc. (FlyWater) were hired by the Town of Windsor to perform a fish passage feasibility study for the Whitney and BH Eaton diversion structures located on the Cache la Poudre River (Poudre River).

- The primary purpose of the project is to restore upstream fish passage to native fish species; sport fish such as rainbow and brown trout would also benefit from improved passage.
- Additional objectives include possible improvements to diversion operation, bank stabilization upgrades, potential fish screening at each diversion, and understanding the expected permit requirements.

Fish Passage

A range of fish passage options were evaluated for each diversion. Some key requirements included

- Year round operation
    - Year round passage does not include times when the river is being completely diverted into the ditches
    - Year round passage does not include high flow – such as flood flows
- Passage for flows up to 640 cfs, any flow above this is considered high flow
- Maximum velocity of 2 ft/s
- No injury to existing water rights

Target Species

"In the South Platte River Basin, nearly half of the 29 native species have been extirpated or are listed as threatened, endangered or of special concern." (Ficke, 2015) One of the primary reasons given for the decline in populations is river fragmentation caused by barriers, such as culverts or diversion dams, between reaches of river. Improving river connectivity and habitat for the native species has become a prime consideration for Colorado Parks and Wildlife (CPW) and other organizations.

The primary species targeted for upstream passage at the Whitney diversion and the BH Eaton diversion structures are:

- Brassy Minnow
  - The brassy minnow is listed as Threatened by CPW due to its decline in distribution and abundance. It is identified by its greenish brassy color and is typically between 2 and 4 inches in length.
- Orange Spotted Sunfish
  - The orange spotted sunfish is widely distributed and not listed by CPW. It is identified by a greenish silver back and sides with reddish orange spots. It is typically between 2 and 3 inches long, occasionally reaching 4 inches long.
- Plains Topminnow
  - Although not a species of concern, native populations of plains topminnows are only found within the South Platte River Basin (Snyder and Bjork, 2012). The plains topminnow are typically between 1.5 and 2.5 inches long.
- Iowa Darter
  - Iowa darters are noted as Species of Special Concern by CPW. They are olive brown in color and typically about 2 inches long.

Plains Topminnow

Orange Spotted Sunfish

Brassy Minnow

Iowa Darter

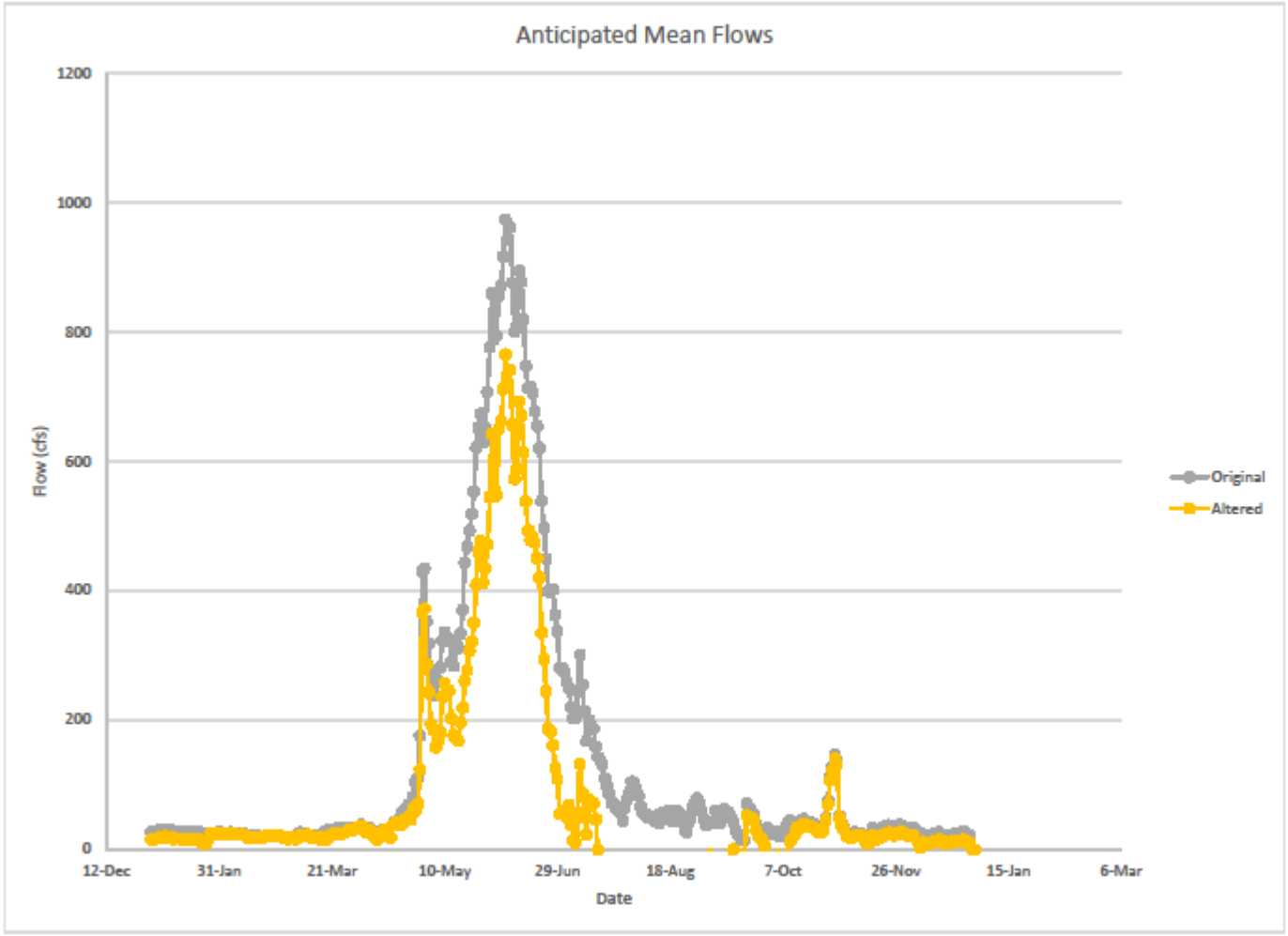

Anticipated Mean Flows
1200
1000
800
600
400
200
0
Flow (cfs)
12-Dec
31-Jan
21-Mar
10-May
29-Jun
18-Aug
7-Oct
26-Nov
15-Jan
6-Mar
Date
Original
Altered

Figure 10 – Whitney Diversion Structure

Rock Ramp at the Whitney Diversion

Figure 11 – BH Eaton Diversion Structure

Rock Ramp with Rock Weirs at the BH Eaton Diversion

Diversion Improvements

The most promising upgrade to the Whitney diversion would be the installation of Obermeyer weirs covering the central 30 feet of the diversion structure. This area currently uses manual lay-flat stanchions; these are raised to provide irrigation water during low flow and lowered to reduce water levels during high flow.

Figure 5 – Obermeyer Weirs

Obermeyer weirs use a durable air bladder to raise and lower a steel plate to regulate water level (Figure 5); they can operate from utility or solar power. The weirs are operated from the side of the river, simplifying operation of the diversion and improving safety since personnel would not need to enter the river.

Bank Stabilization

Figure 6 – Potential Areas for Bank Stabilization

Bank stability was assessed along the entire river from approximately 800 feet upstream of the Whitney diversion to 150 feet downstream of the BH Eaton diversion. No areas of immediate concern were found, as most critical areas have been well stabilized. Two areas were identified that could benefit from improvements in the long term (Figure 6).

- The north bank of the river 400 to 800 feet upstream of the Whitney diversion shows signs of sloughing. This area is of particular concern since it acts as a dyke between the river and adjacent reservoirs; there is also a buried natural gas line in this area. The stability could be improved either using riprap or the preferred vegetated reinforced soil slope (VRSS) design.

- The south bank of the river immediately below the BH Eaton diversion acts as a dyke between the river and canal. It is currently reinforced with large pieces of broken concrete and other "urban rip-rap" material. The stability and appearance could be improved either using traditional riprap or the preferred VRSS design.

Fish Screening

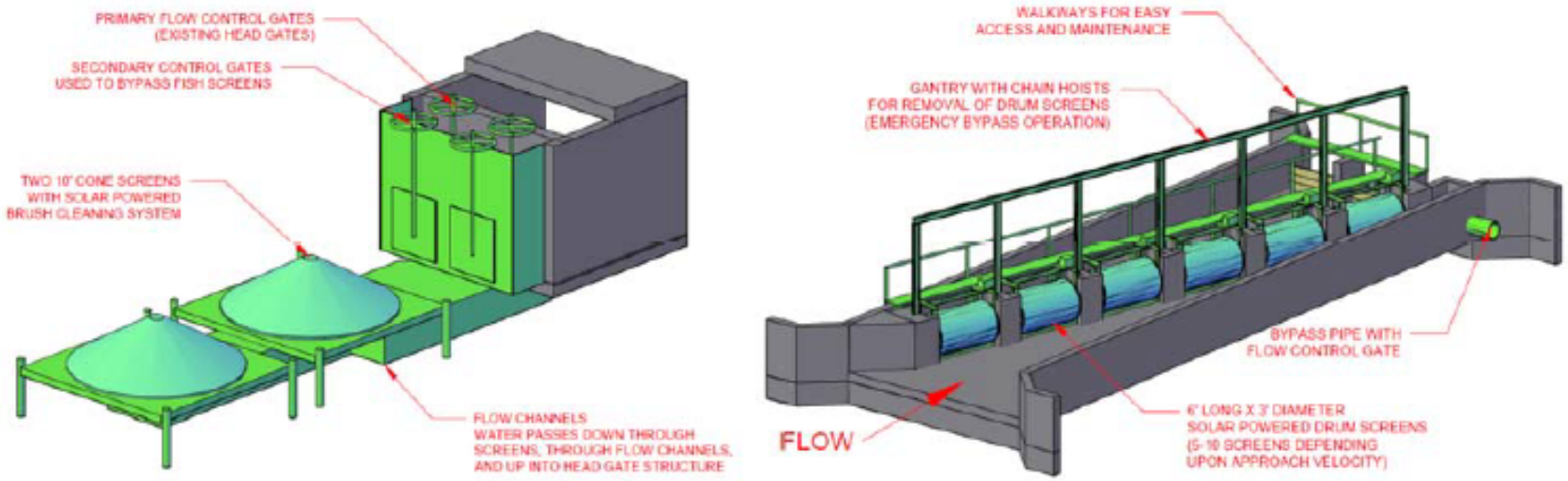
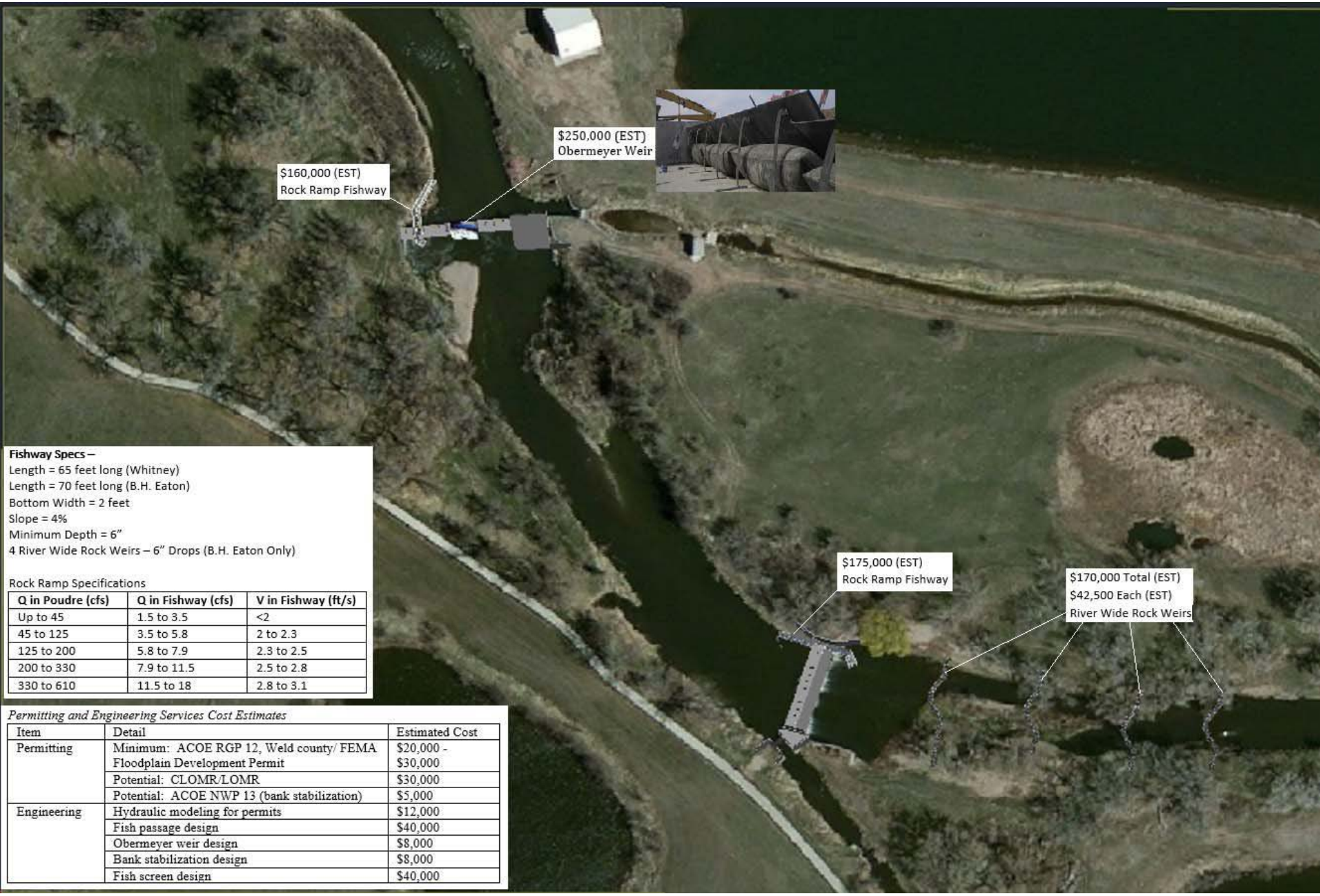


Figure 7 – Cone and Drum Screens for the Whitney Diversion

A variety of methods for providing fish screening at each diversion were considered; conceptual designs were developed for the most promising options.

- Two viable options were developed for the Whitney diversion (Figure 7).
  - Cone screens could be installed on the river in front of the head gates. This would provide the best possible fish protection, as fish would never leave the river.
  - A drum screen system could be installed ~¼ mile down the canal. This would protect the screen structure from debris on the river, and would provide reliable and effective fish protection.
- The recommended option for the BH Eaton diversion would be the installation of a drum screen system on the canal immediately below the head gates. This would protect the screen structure from debris on the river, and would provide reliable and effective fish protection.



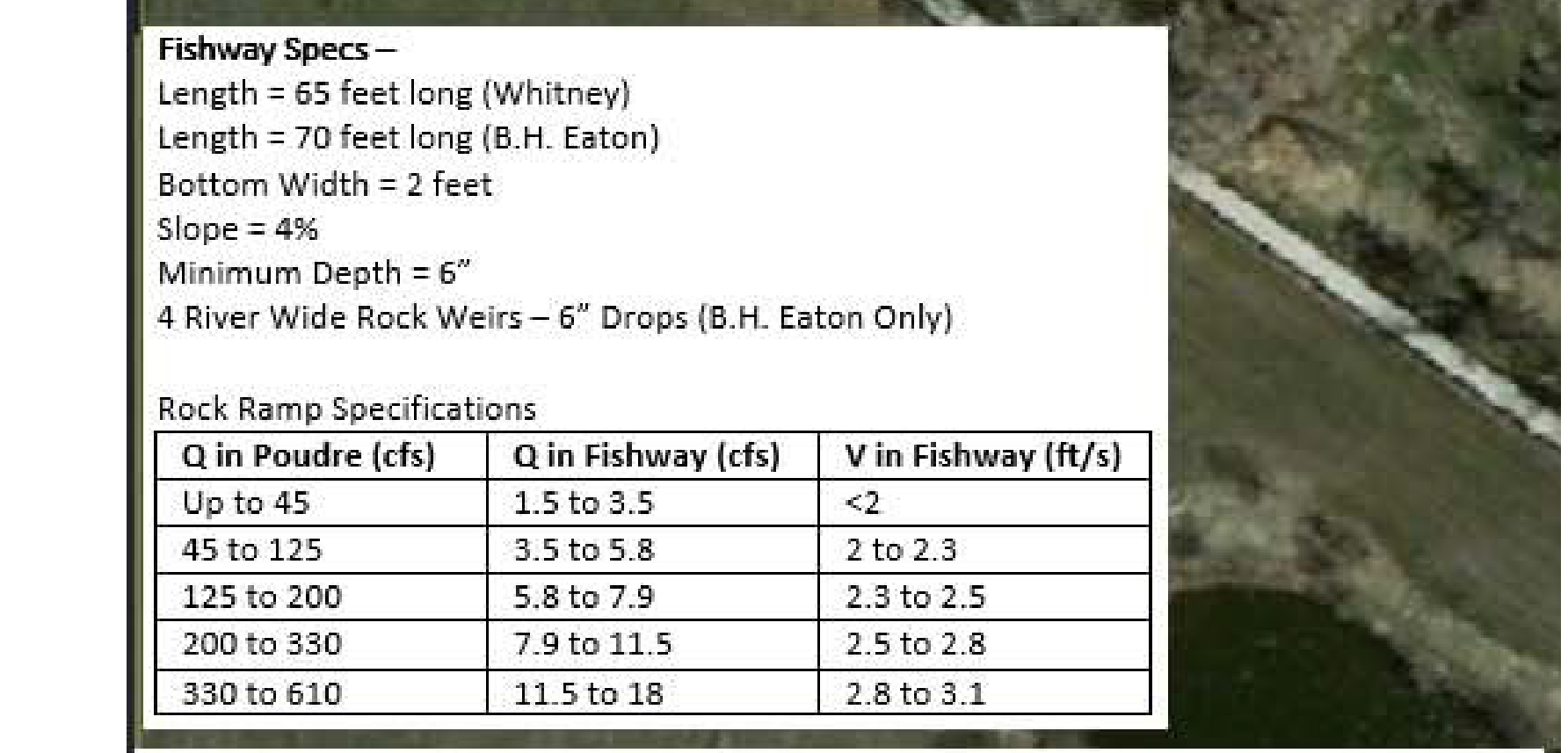
Fishway Specs –
Length = 65 feet long (Whitney)
Length = 70 feet long (B.H. Eaton)
Bottom Width = 2 feet
Slope = 4%
Minimum Depth = 6"
4 River Wide Rock Weirs – 6" Drops (B.H. Eaton Only)

Rock Ramp Specifications

Q in Poudre (cfs)	Q in Fishway (cfs)	V in Fishway (ft/s)
Up to 45	1.5 to 3.5	<2
45 to 125	3.5 to 5.8	2 to 2.3
125 to 200	5.8 to 7.9	2.3 to 2.5
200 to 330	7.9 to 11.5	2.5 to 2.8
330 to 610	11.5 to 18	2.8 to 3.1

Permitting and Engineering Services Cost Estimates

Item	Detail	Estimated Cost
Permitting	Minimum: ACOE RGP 12, Weld county/ FEMA Floodplain Development Permit	$20,000 - $30,000
	Potential: CLOMR/LOMR	$30,000
	Potential: ACOE NWP 13 (bank stabilization)	$5,000
Engineering	Hydraulic modeling for permits	$12,000
	Fish passage design	$40,000
	Obermeyer weir design	$8,000
	Bank stabilization design	$8,000
	Fish screen design	$40,000



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Next Steps

- Meeting with regulatory agencies
  - Get verbal commitment of impacts of projects to Ditch Companies
- Continue to seek funding