

## **Cost-Share Proposal Form for NorthWestern Energy (NWE) Project 2188 TAC Funds**

Project 2188 (Madison-Missouri River) License Protection, Mitigation and Enhancement (PM&E) projects are required to offset impacts to river resources from the continued operation of one or more of NWE's nine hydro developments (Hebgen, Madison, Hauser, Holter, Black Eagle, Rainbow, Cochrane, Ryan and Morony Dams). PM&E projects need to be prioritized toward in-river or on-the-ground measures that directly benefit fisheries and/or wildlife populations and their habitats:

**Priority 1:** 2188 License projects which meet License Article requirements and PM&E for fisheries or wildlife populations or their habitats within the main stem Madison River (Hebgen Reservoir to Three Forks) or Missouri River (Hauser Reservoir to Fort Peck Reservoir)

**Priority 2:** 2188 License projects which meet License Article requirements and PM&E for fisheries or wildlife populations or their habitats in primary tributaries or on adjacent lands and, in doing so, provide PM&E for Madison River (Hebgen Reservoir to Three Forks) or Missouri River (Hauser Reservoir to Fort Peck Reservoir) resources.

**Priority 3:** 2188 License PM&E projects which meet License Article requirements by providing scientific or other tangible PM&E benefits to Madison-Missouri River fisheries or wildlife populations or their habitats. These projects must be located in the greater Missouri River drainage upstream from Fort Peck Reservoir, but not necessarily located on the main stem Madison River or Missouri River or their adjacent lands or primary tributaries.

### **All TAC project proposals must include the following information:**

Project Title: **Prickly Pear Creek Fish Screen and Rock Ramp**

Date: 10/31/2022

Explain how this Project addresses a specific Project 2188 License Article(s);

“Article 414:...evaluate and enhance tributary spawning to increase...the contribution of natural reproduction to the Hauser Reservoir fishery; and evaluate the potential to enhance tributary spawning to increase natural reproduction in the Hauser Reservoir fishery.”

Provide justification for Priority 1, 2 or 3 (above) that you selected;

Prickly Pear Creek is a primary Missouri River drainage tributary (Priority 2) for migratory Lake Helena/Hauser Reservoir fish species.

Project Sponsor (submitted by): Pat Barnes Chapter of Trout Unlimited (Will Trimboth; President) in collaboration with FWP (Adam Strainer, Fisheries Biologist).

Location of Proposed Project: Prickly Pear Creek just NW of East Helena; approximately 0.35 miles downstream of Wylie Drive.

Geocode (in decimal degrees ex 46.89743) Lat: 46.60096 Long: -111.93583

Total Project Cost: \$89,563

TAC Funds (Cost-Share) Requested for Project: \$47,000

I. Introduction; brief statement of project to be completed with pertinent background information. The project includes developing a final design and the necessary permitting leading to the installation of a fish screen on an irrigation canal and an in-stream rock ramp below a diversion structure on Prickly Pear Creek near East Helena, MT.

The landowner, Prickly Pear Simmental Ranch, approached Montana Fish, Wildlife and Parks in 2021 with concerns about entrained fish, in their primary irrigation canal, plugging their irrigation infrastructure (center pivot sprinkler heads) during low flow periods annually from approximately August to October. The landowner was also concerned about annual fish mortality in the canal once the canal is turned off each September/October.

Over the summer of 2022 the landowner and Pat Barnes Chapter of Trout Unlimited funded an \$8,000 topographic and hydraulic survey, completed by Tetra Tech in Helena, MT, to develop an engineered entrainment mitigation concept plan (Appendix A), with alternatives, and FWP surveyed in the canal from July to September (Appendix B) to support developing entrainment mitigation alternatives.

Fisheries surveys in the canal (Appendix B), beginning in July 2022, identified an increasing number of entrained fish as creek flows reached the annually low flow period (10-20 CFS) from approximately July to October. During that period, diversion into the canal annually is approximately 30-50% of the total in-stream flow. Three fish (3 species) were observed just downstream of the canal headgate in early August and the landowner began reporting irrigation infrastructure plugged with fish in mid-September. The canal was closed on September 29<sup>th</sup> and FWP staff captured 68 fish (5 species; multiple ages classes of each species) in the uppermost 400 feet of the canal in only approximately five minutes of effort. Total canal length is approximately 2 miles; therefore, fish entrainment is estimated at over 2,000 fish annually. These results suggest that installing an in-canal fish screen will mitigate fish entrainment losses and improve annual irrigation inefficiencies for the landowner. In addition, installing a rock ramp at the irrigation structure headwall will increase fish passage and armor highly erosive banks to better protect the proposed fish screen location.

Topographic and hydraulic survey analysis led to the development of two fish screen alternatives and two rock ramp alternatives (Appendix A). Installing a Corrugated Water Screen in the canal and a 5% rock ramp immediately downstream of the irrigation headwall structure are the preferred and most cost-effective alternative to mitigate fish entrainment, fortify the immediate project area and increase fish passage at the site.

II. Objectives; explicit statement(s) of what is intended to be accomplished. Tetra Tech would be hired to develop the final engineered fish screen and rock ramp design, complete necessary permitting (310, 318, 404, etc.) and lead the screen and rock ramp construction/installation effort for Pat Barnes Chapter of Trout Unlimited. Post construction, the fish screen will be maintained by the landowner and FWP will monitor the fishery to ensure fish entrainment is mitigated, the project site is secure and functional and in-stream fish passage benefits are realized.

III. Methods; description of how Project objectives will be accomplished. Pat Barnes Chapter of Trout Unlimited will secure grant funding from Northwestern Energy and FWP's Future Fisheries Improvement Program (FFIP) to fund installation/construction of the preferred entrainment mitigation alternative (CWS & 5% rock ramp) developed by Tetra Tech in 2022 (Appendix A). If funded, Tetra Tech will be hired to develop a final design of the preferred alternative, permitting and install the preferred alternative in Spring/Summer 2023.

IV. Schedule; when the Project work will begin and end. Spring/Summer 2023.

V. Personnel; who will do the work? Identify Project leader or principal investigator. Pat Barnes Chapter of Trout Unlimited (Will Trimboth), in collaboration with FWP Staff (Adam Strainer), will lead the project and Tetra Tech will be hired to complete the objectives as described above and in Appendix A.

VI. Project budget must include amounts for the following:  
 Total Project Costs for the preferred alternative are below:



Engineer's Opinion of Construction Cost	
Date:	10/4/2022
Project #:	117-9162001
Project Name:	PPC-Simmetal Ditch Improvements
Engineers:	M Barnes

**CWS and 5% Riffle**

Project Status: Concept Design

Item #	Item Description	Qty	Unit	Unit Price	Total Cost
101	Mobilization, Bonding, and General Requirements (~10% of total bid price)	1	LS	\$4,000	\$4,000
102	Temporary Dewatering	1	WK	\$2,500	\$2,500
103	Riffle Rock - Boulder/Cobble	130	CY	\$125	\$16,250
104	Rock Riprap Bank Stabilization	37	CY	\$200	\$7,400
105	CWS - Screen Panel & Fabrication	1	LS	\$8,000	\$8,000
106	CWS - Installation	1	LS	\$2,500	\$2,500
107	Fish Return Pipe	30	FT	\$50	\$1,500
108	6-inch Parshall Flume	1	LS	\$4,500	\$4,500

Subtotal		\$46,650
Design		\$20,000
Permitting		\$5,000
Contingency	25%	\$17,913
<b>TOTAL</b>		<b>\$89,563</b>

Total Project Cost: \$89,563  
 MoTac Funding Request: \$47,000  
 FFIP Funding Request (pending): \$42,563

**NOTE** - Initial survey (Appendix A) cost: Prickly Pear Simmental Ranch (\$3K) & Pat Barnes Chapter of TU (\$5K)

**\*NorthWestern Energy TAC funds will not be used for agency overhead on projects that do not fund personnel. Applications for materials and equipment should not contain overhead.**

VII. Deliverables; describe work product (reports, habitat restoration, etc.) which will result from this Project. How will “success” for this project be monitored or demonstrated?  
 Fish entrainment will be mitigated and passage, year-round, enhanced. FWP will submit a final report for the proposed project in 2023.

VIII. Cultural Resources. Cultural Resource Management (CRM) requirements for any activity related to this Project must be completed and documented to NWE as a condition of any TAC grant. TAC funds may not be used for

any land-disturbing activity, or the modification, renovation, or removal of any buildings or structures until the CRM consultation process has been completed. Agency applicants must submit a copy of the proposed project to a designated Cultural Resource Specialist for their agency. Private parties or non-governmental organizations are encouraged to submit a copy of their proposed project to a CRM consultant they may have employed. Private parties and non-governmental organizations may also contact the NWE representative for further information or assistance. Applications submitted without this section completed, will be held by the TAC, without any action, until the information has been submitted.

Summarize here how you will complete requirements for Cultural Resource Management:

The project is requesting help from MoTac to fund a Cultural Resource survey, like past MoTac funded projects, prior to groundbreaking activities.

- IX. Water Rights. For projects that involve development, restoration or enhancement of wetlands, please describe how the project will comply with the Montana DNRC's "Guidance for Landowners and Practitioners Engaged in Stream and Wetland Restoration Activities", issued by the Water Resources Division on 9 March 2016.

Summarize here how you will comply with Montana water rights laws, policies and guidelines:

The landowner fully supports the proposed project and the existing point of diversion, and associated water rights, will not be affected during project implementation. Tetra Tech will be responsible for ensuing BMP's related to water rights are followed.

All TAC Project proposals should be 7 pages or less and emailed (as a WORD file) to each of:

- [Andrew.Welch@NorthWestern.com](mailto:Andrew.Welch@NorthWestern.com)
- [Jon.Hanson@Northwestern.com](mailto:Jon.Hanson@Northwestern.com)
- [Grant.Grisak@Northwestern.com](mailto:Grant.Grisak@Northwestern.com)

Further questions about TAC proposals or Project 2188 license requirements or related issues may be addressed to:

**Andy Welch**

*Manager, Hydro License Compliance*

[Andrew.Welch@NorthWestern.com](mailto:Andrew.Welch@NorthWestern.com)

☎ 406-444-8115

☎ 406-565-7549

208 N. Montana Ave

Suite 205

Helena, MT 59601

## **Appendix A**

Pat Barnes Chapter of Montana TU; Montana FWP

**To:**

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**Cc:** File

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**From:** Matt Barnes, PE, CFM

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**Date:** October 4, 2022

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**Subject:** Concepts for Fish Screen and Diversion Improvements on Simmetal Ditch-Prickly Pear Creek

## 1.0 INTRODUCTION

Tetra Tech was hired by Pat Barnes Chapter of Montana Trout Unlimited (PBTU) in partnership with Montana Fish, Wildlife, & Parks (FWP) and the landowners of the project site to evaluate concepts to add a fish screen and diversion improvements to an existing irrigation diversion on Prickly Pear Creek. The scope included topographic survey of the site, preliminary hydraulic analysis, and development of a concept plan sheet. This memo summarizes this work. The project is located in Lewis & Clark County, MT, northwest of East Helena, and shown in Figure 1.



Figure 1 – Project Location Map



## 2.0 SURVEY & ANALYSIS

Tetra Tech hired Morrison-Maierle to complete the topographic survey of the immediate diversion area and cross section data on the ditch and creek channel. The survey for completed on 8/24/2022. This data was used to create a digital terrain surface of the project area for use in the hydraulic analysis, conceptual design, and can be used for future design effort. Survey data was collected on the south channel of Prickly Pear Creek, Simmetal Ditch (named for this memo), and existing structures.

The hydraulic analysis was completed with HEC-RAS version 6.3 using the one-dimensional surface modeling capability. The model analyzes water surface elevations in the south channel of Prickly Pear Creek, the existing diversion, existing ditch, and with a new fish screen in the ditch. Based on input from FWP on the typical irrigation diversion flows, 4.0 cubic feet per second (cfs) was used for the design flowrate in the ditch. Low flows in Prickly Pear Creek can reach as low as 20 cfs according to mean daily data at USGS gage 06061500, Prickly Pear Creek at Clancy. Since this gage is located miles upstream and does not include several tributaries and diversions between the gage and the project location, 20 cfs was used for the design low instream flow.

Future hydraulic analysis will be required during design to determine diversion and streambank stability, floodplain permitting, and irrigation diversions.



Figure 2 – Existing Diversion and Headgate Structure

## 3.0 CONCEPT DESIGNS

### 3.1 FISH SCREEN OPTIONS

Two options for a fish screen have been evaluated. The first option is a corrugated water screen. The second option is a Farmers Conservation Alliance screen. The options are shown on the attached conceptual design sheets. Preliminary hydraulic analysis indicates that the water surface elevations required to deliver irrigation water for either screen are nearly the same.

A corrugated water screen (CWS) is a sloped screen that allows irrigation water to flow downward through perforated corrugation walls and downstream in the ditch. Screen bypass water flows along the bottom of the corrugations to a screen bypass pipe. The CWS panels are proprietary and made by Brent Mefford in Colorado (corrugatedwaterscreens.com). The panels are supported by a metal structure for screens of this size. CWS is a newer technology with less of a track record than comparable screens. The CWS option is shown on sheet EX-

1.



*Figure 3 – Corrugated Water Screen near Opportunity, MT*

A Farmers Conservation Alliance (FCA) screen is a horizontal screen that allows irrigation water to flow vertically through a flat perforated plate and downstream in the ditch. The plate narrows downstream to maintain flow depth and deliver screen bypass water to the return pipe. A description of how FCA screens operate is attached. FCA screens are proprietary to a company in Oregon ([farmerscreen.org](http://farmerscreen.org)) but they have a manufacturer in Seeley Lake. This structure is also metal. FCA screens have been in use across western Montana with a good track record. The FCA screen option is shown on sheets EX-2.





Figure 4 – FCA screen near Anaconda, MT

Table 1 – Fish Screen Concept Comparison

Consideration	CWS	FCA
Track Record	Newer Technology	Good
Typical Maintenance	Brush daily or weekly	Brush weekly
Bypass ability	Yes	No
NMFS (see reference)	No	Yes

## **3.2 DIVERSION OPTIONS**

The two options evaluated for diversion improvement are variations of the same concept design. One would construct a stable riffle from the existing diversion structure crest downstream at a slope of 5%. The second option would construct a similar riffle at a slope of 10%. Both design concepts would maintain the current operations of the irrigation system. The 10% slope may require additional stability with grout or larger boulders to resist scour and rolling of material.

The existing diversion crest provides adequate water surface elevations on the existing headgate to deliver irrigation water needs. The riffle downstream of the structure crest would only alter the downstream water depths and velocities to improve up and downstream fish passage. The riffle materials would be designed to remain stable at high flows and maintain surface water connectivity during low flows.



Figure 5 – Rock riffle with diversion crest at 5% slope near Hall, MT

Table 2 – Diversion Concept Comparison

Consideration	5% Riffle	10% Riffle
Track Record	Several in region working well	Some with grout having issues with passage and hydraulics
Stability	Good with appropriate material design	May require grout of large boulders
Fish Passage	Good	Ok at certain flows

#### 4.0 CONCEPTUAL COST ESTIMATE

The conceptual cost estimates for implementation of the project are included below. The quantities of construction are based on the conceptual designs shown on EX-1 and EX-2 and are approximate. The unit prices of the work are taken from similar past projects with inflation factored in depending on the year of the project. The cost for design and permitting is based on past experience on these projects. Bidding and construction inspection costs are not included at this time since they can vary widely based on funding requirements and owner preference. A 25% contingency has been included to account for the conceptual level of design. The cost estimates are summarized below and attached to this memo.

Table 3 – Conceptual Cost Estimates

Conceptual Design	Estimated Cost
CWS & 5% Riffle	\$89,563
FCA & 10% Riffle	\$105,031

#### 5.0 REFERENCES

United States Army Corps of Engineers (USACE). *HEC-RAS 6.3*, August 2022.

United States Army Corps of Engineers (USACE). *HEC-RAS Hydraulic Reference Manual, Version 6.0*, December 2020.

United States Army Corps of Engineers (USACE). *HEC-RAS User's Manual, Version 6.0*, December 2020.

Ven Te Chow. *Open-Channel Hydraulics*, 1959.

U.S. Bureau of Reclamation (BOR). *Rock Ramp Design Guidelines*, September 2007.

NMFS (National Marine Fisheries Service). 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon.

FCA (Farmers Conservation Alliance). [farmerscreen.org](http://farmerscreen.org)

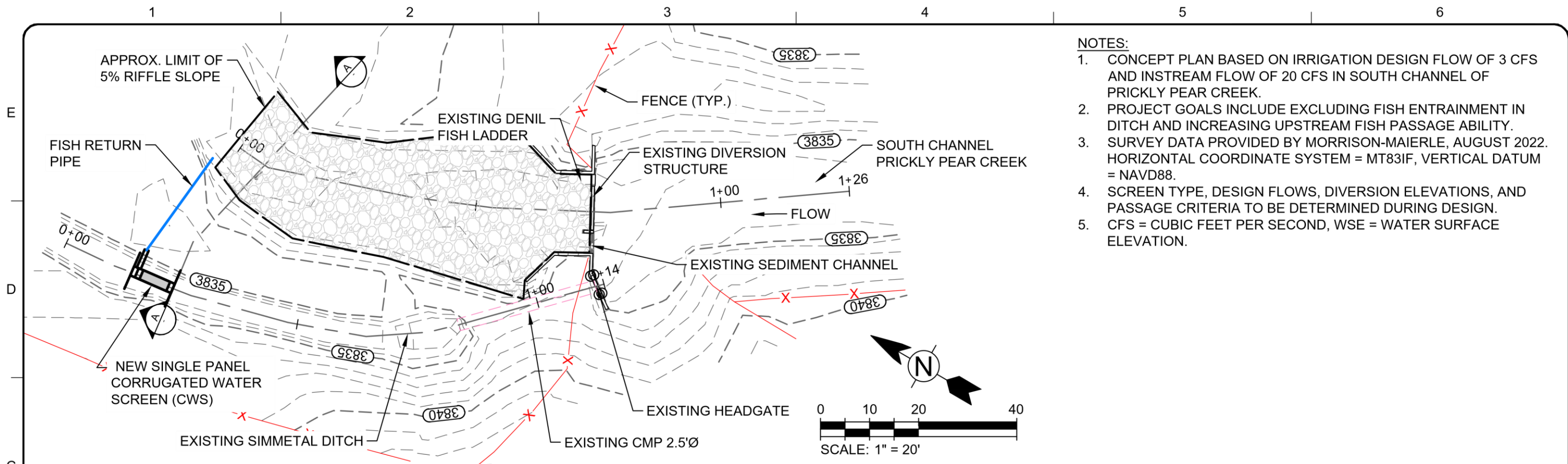
CWS (Corrugated Water Screen). [corrugatedwaterscreens.com](http://corrugatedwaterscreens.com)

## 6.0 ATTACHMENTS

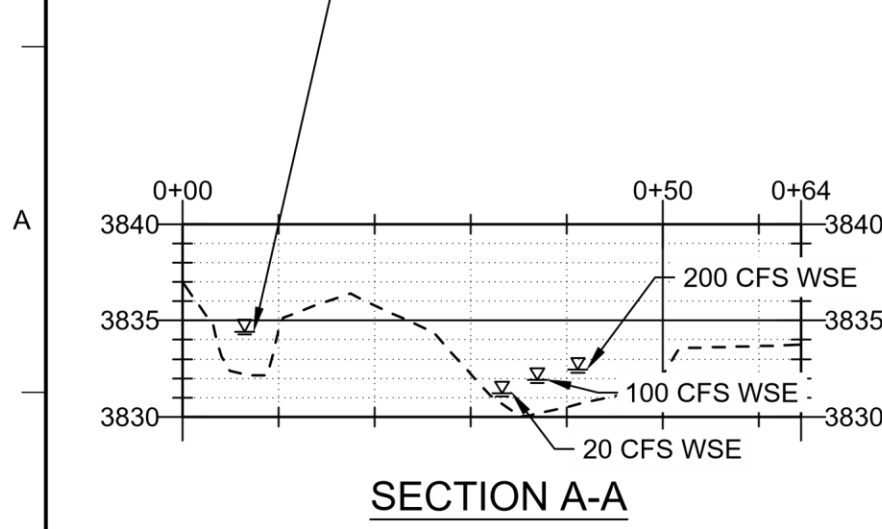
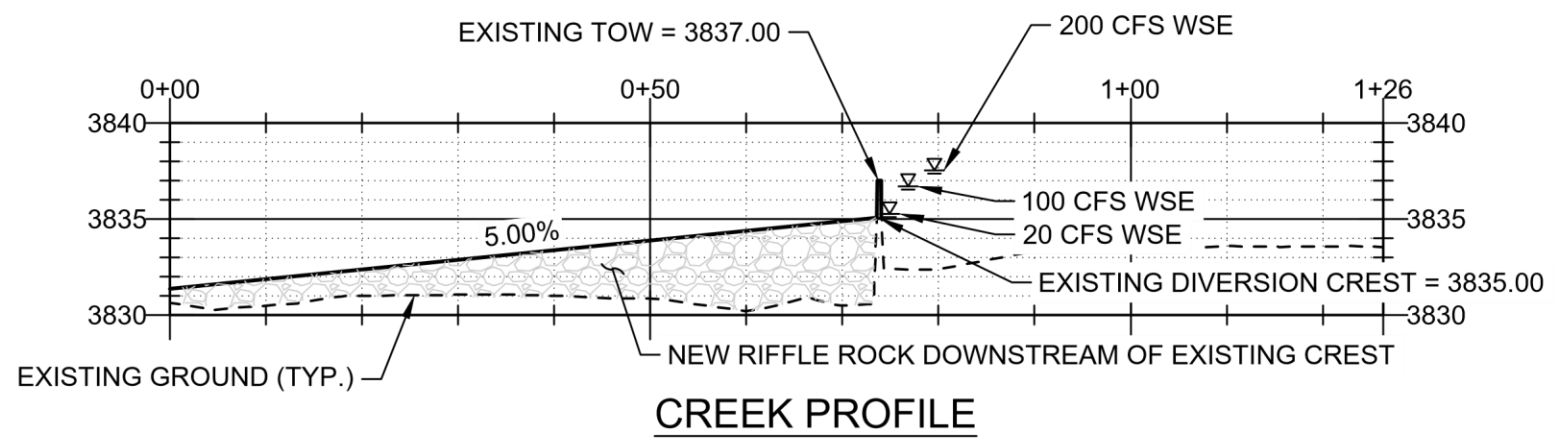
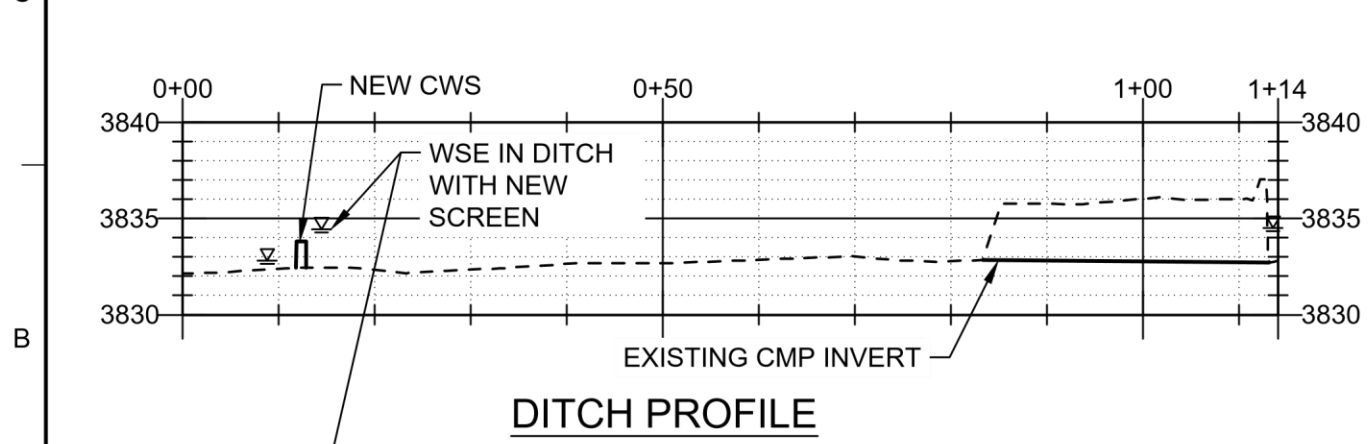
- Conceptual Design Sheets EX-1 and EX-2
- HEC-RAS Creek and Ditch combined profile results
- Conceptual Cost Estimates



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- NOTES:**
1. CONCEPT PLAN BASED ON IRRIGATION DESIGN FLOW OF 3 CFS AND INSTREAM FLOW OF 20 CFS IN SOUTH CHANNEL OF PRICKLY PEAR CREEK.
  2. PROJECT GOALS INCLUDE EXCLUDING FISH ENTRAINMENT IN DITCH AND INCREASING UPSTREAM FISH PASSAGE ABILITY.
  3. SURVEY DATA PROVIDED BY MORRISON-MAIERLE, AUGUST 2022. HORIZONTAL COORDINATE SYSTEM = MT83IF, VERTICAL DATUM = NAVD88.
  4. SCREEN TYPE, DESIGN FLOWS, DIVERSION ELEVATIONS, AND PASSAGE CRITERIA TO BE DETERMINED DURING DESIGN.
  5. CFS = CUBIC FEET PER SECOND, WSE = WATER SURFACE ELEVATION.



- CONCEPT NOTES:**
1. MAINTAIN EXISTING DIVERSION STRUCTURE, HEADGATE, AND CMP.
  2. CONSTRUCT RIFFLE DOWNSTREAM OF CONCRETE DIVERSION CREST WITH STABLE ROCK MATERIALS. OPTIONAL TO ADD OR MODIFY SEDIMENT GATE OR CHANNEL ON LEFT SIDE.
  3. SCREEN TYPES CONSIDERED INCLUDE CORRUGATED WATER AND FARMERS CONSERVATION ALLIANCE SCREENS. BOTH APPEAR EQUALLY FEASIBLE.

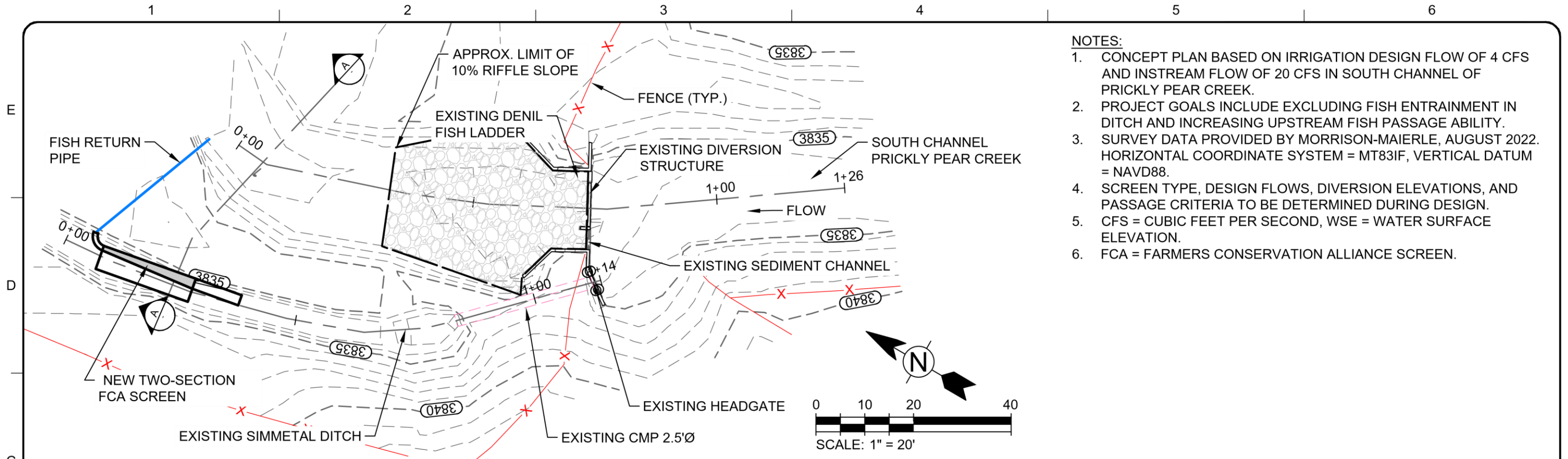
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<p><b>TETRA TECH</b> www.tetrattech.com 825 W. Custer Ave. Helena, Montana 59602 PHONE: 406-443-5210 FAX: 406-442-7182</p>																										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">MARK</th> <th style="width: 5%;">DATE</th> <th style="width: 60%;">DESCRIPTION</th> <th style="width: 10%;">BY</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	MARK	DATE	DESCRIPTION	BY																					PAT BARNES CHAPTER TROUT UNLIMITED MONTANA FISH, WILDLIFE, & PARKS  SIMMETAL DITCH IMPROVEMENTS LEWIS & CLARK COUNTY, MT  FISH SCREEN & DIVERSION CONCEPT CWS & 5% RIFFLE SLOPE
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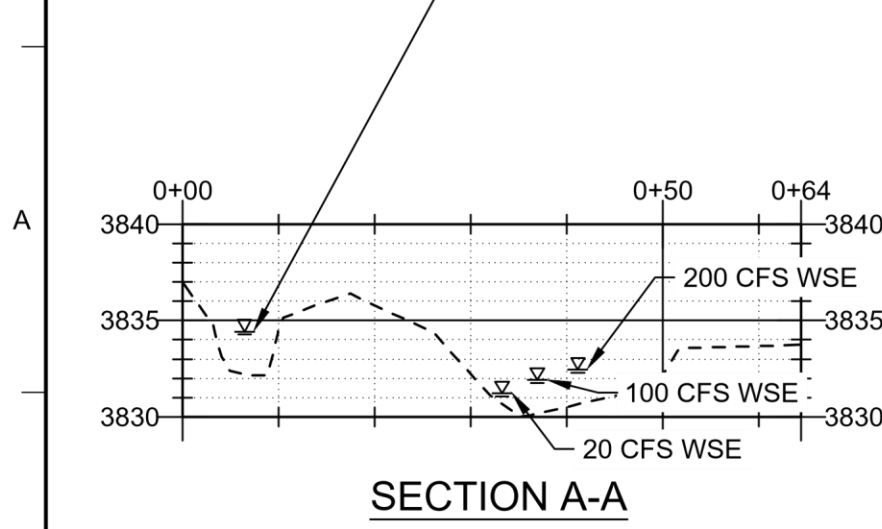
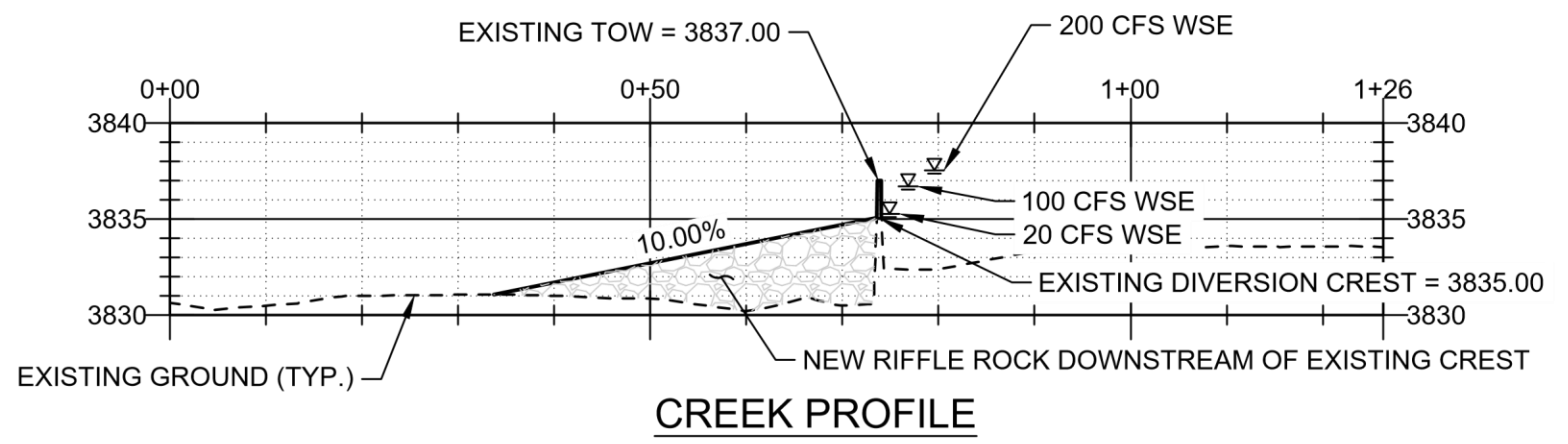
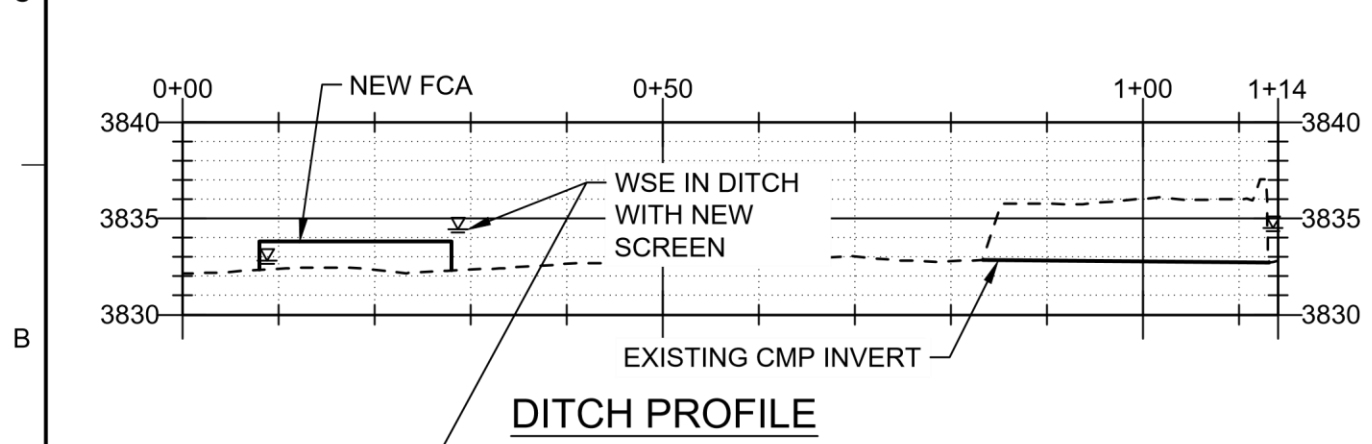
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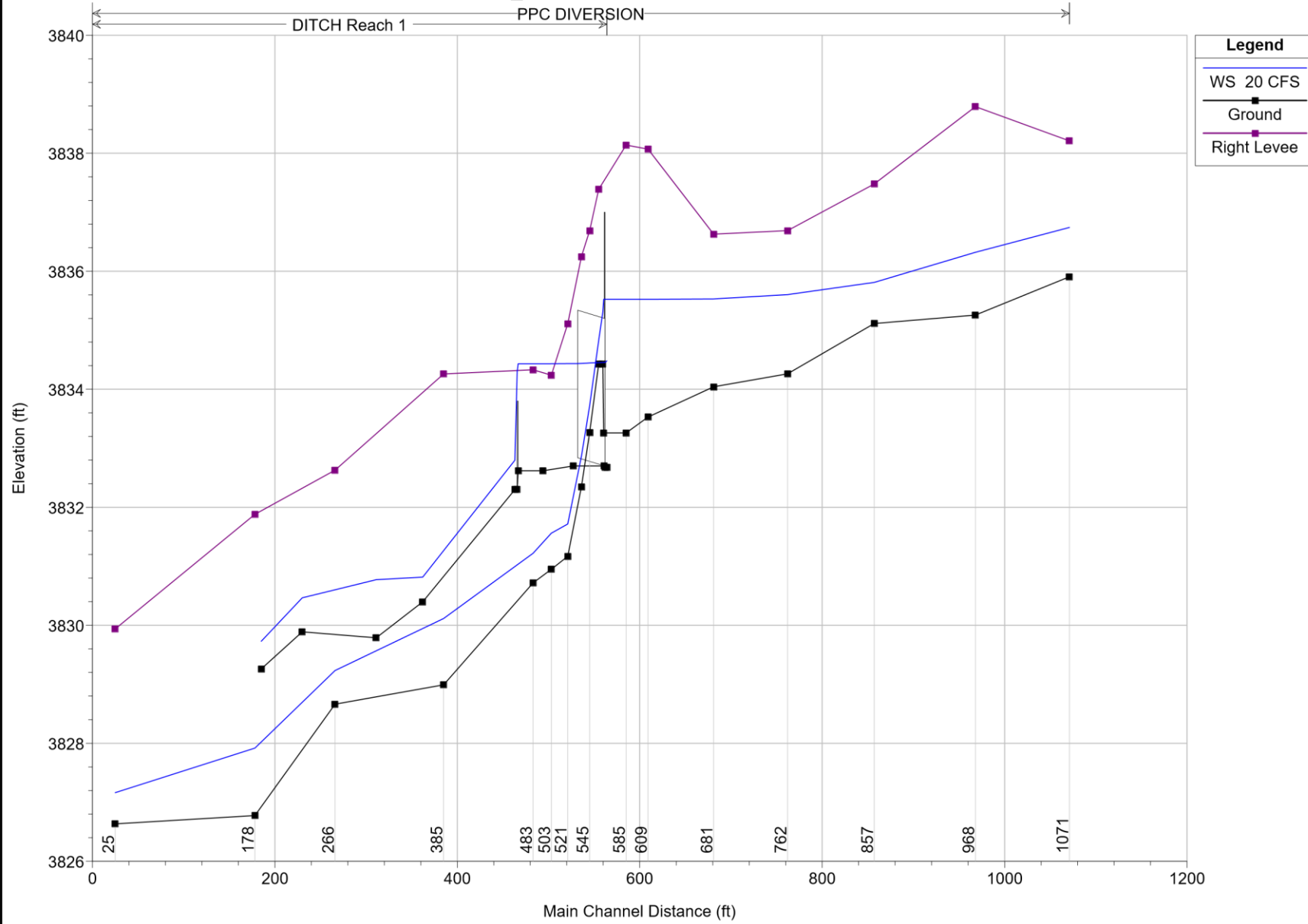


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**DRAFT**  
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<p><b>TETRA TECH</b> www.tetrattech.com 825 W. Custer Ave. Helena, Montana 59602 PHONE: 406-443-5210 FAX: 406-442-7182</p>	MARK	DATE	DESCRIPTION	BY	PAT BARNES CHAPTER TROUT UNLIMITED MONTANA FISH, WILDLIFE, & PARKS  SIMMETAL DITCH IMPROVEMENTS LEWIS & CLARK COUNTY, MT  FISH SCREEN & DIVERSION CONCEPT FCA SCREEN & 10% RIFFLE SLOPE	Project No.: 117-9162001
						Designed By: MDB
					Drawn By: MDB	Checked By: ###
						<b>EX 2</b>

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**CWS and 5% Riffle**

**Project Status:**  
Concept Design

**Engineer's Opinion of Construction Cost**  
 Date: 10/4/2022  
 Project #: 117-9162001  
 Project Name: PPC-Simmetal Ditch Improvements  
 Engineers: M Barnes

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107	Fish Return Pipe	30	FT	\$50	\$1,500
108	6-inch Parshall Flume	1	LS	\$4,500	\$4,500
Subtotal					\$46,650
Design					\$20,000
Permitting					\$5,000
Contingency 25%					\$17,913
<b>TOTAL</b>					<b>\$89,563</b>

**FCA and 10% Riffle**

**Project Status:** Concept Design

Item #	Item Description	Qty	Unit	Unit Price	Total Cost
101	Mobilization, Bonding, and General Requirements (~10% of total bid price)	1	LS	\$4,000	\$4,000
102	Temporary Dewatering	1	WK	\$2,500	\$2,500

103	Riffle Rock - Boulder/Cobble	65	CY	\$125	\$8,125
104	Rock Riprap Bank Stabilization	37	CY	\$200	\$7,400
105	FCA - Fabrication	1	LS	\$28,000	\$28,000
106	FCA - Installation	1	LS	\$3,000	\$3,000
107	Fish Return Pipe	30	FT	\$50	\$1,500
108	6-inch Parshall Flume	1	LS	\$4,500	\$4,500
Subtotal					\$59,025
Design					\$20,000
Permitting					\$5,000
Contingency		25%			\$21,006
<b>TOTAL</b>					<b>\$105,031</b>



## **Appendix B**

# Fisheries Investigation

## Prickly Pear Creek Fish Entrainment in the Prickly Pear Simmental Ranch canal near East Helena, MT

### Summary

An irrigation canal diverting water from Prickly Pear Creek on the Prickly Pear Simmental Ranch near East Helena, Montana is annually responsible for fish entrainment, affecting at least five fish species in the drainage, which results in seasonally plugged irrigation infrastructure and is lethal to all entrained fish post diversion shut-off. Fisheries surveys in the canal, beginning in July 2022, identified an increasing number of entrained fish as creek flows reached the annually low flow period (10-20 CFS) from approximately July to October. During that period, diversion into the canal annually is approximately 30-50% of the total in-stream flow. Three fish (3 species) were observed just downstream of the canal headgate in early August and the landowner began reporting irrigation infrastructure plugged with fish in mid-September. The canal was closed on September 29<sup>th</sup> and FWP staff captured 68 fish (5 species; multiple ages classes of each species) in the uppermost 400 feet of the canal in only approximately five minutes of effort. Total canal length is approximately 2 miles; therefore, fish entrainment is estimated at over 2,000 fish annually. These results suggest that installing an in-canal fish screen will mitigate fish entrainment losses and improve annual irrigation inefficiencies.

### Study Area

An irrigation structure and canal responsible for fish entrainment is located on Prickly Pear Creek on the Prickly Pear Simmental Ranch and the diversion structure head gate is approximately 0.35 miles downstream of Wylie Drive (Figure 1). The stream is diverted by a concrete headwall with a fixed wheel headgate (Photo 1) that feeds approximately two miles of canal for both center pivot and flood irrigation infrastructure (Photo 2). The ranch has the headgate open annually from approximately late June to October.



Figure 1. Project Area – Prickly Pear Creek irrigation diversion and canal located on the Prickly Pear Simmental Ranch near East Helena.





Photo 1. Diversion structure and fixed-wheel headgate (June 9, 2022; 110 CFS).



Photo 2. View of from the headgate pipe looking downstream into the irrigation canal (June 9, 2022).

### **Survey Methods**

Two types of fisheries surveys were conducted in the canal during summer/fall of 2022 to monitor landowner reported fish entrainment. FWP staff used backpack electrofishing survey techniques (Photo 3) in three sections of the canal (approximately 100 meters each) in July and August and in the canal, immediately downstream of the headgate, post canal shut off (September 29). In addition, FWP staff used a mini fyke net (Photo 4) to passively capture fish for one net-night in August. Survey location, effort and results were recorded.





Photo 3. An example of backpack electrofishing survey techniques (Helena IR, 2018).



Photo 4. Mini-fyke net survey technique (August 10, 2022).



## Results

### July

Three sections of the canal (Figure 2), all within the first mile, were electrofished on July 13 and no fish were captured in approximately 30 minutes of shocking. No other surveys were conducted in July.



Figure 2. Electrofishing sections within the irrigation canal.

### August

Three electrofishing sections (Figure 2), established in July 2022, were duplicated in the canal on August 10 and no fish were captured in approximately 15 minutes of shocking. In addition, a mini-fyke net was deployed on August 10 for one net-night just downstream of the canal headgate (Figure 3). Three juvenile fish (3 species; Photo 5) were captured in the mini-fyke.



Figure 3. Mini-fyke net survey location.



Photo 5. Mini-fyke net survey results. A sculpin (left to right), rainbow trout and brown trout.

### September

Prickly Pear Simmental Ranch reported fish plugging their center pivot sprinkler heads (Photo 6) just before they turned off the canal on September 29. FWP staff electrofished approximately 400 feet of the dewatered canal (Photo 7), beginning at the headgate, on September 30. In total, electrofishing resulted in 68 total fish (5 species). The effort, approximately only five minutes of shocking time, yielded 35 brown trout (range 2.7 to 13.5-inches), 24 rainbow trout (range 2.7 to 10.5-inches), 6 longnose dace (range 2.6 to 3.2-inches), 2 rocky mountain (RM) scuplin (range 1.5 to 3.2-inches) and 1 white sucker (5.4-inches) (Photo 8). The latter three species are native fish species.



Photo 6. Evidence of plugged center pivot sprinkler heads, fed by the canal, as reported by Prickly Pear Simmental Ranch staff on September 27.





Photo 7. Dewatered canal looking upstream at headgate pipe (left to right) and location of August mini-fyke net survey location and downstream from August mini-fyke net survey location.



Photo 8. Dewatered canal electrofishing effort examples (clockwise from top left): adult brown trout, 4 species (RM sculpin, rainbow trout, brown trout and longnose dace), adult rainbow trout and a white sucker.

### Discussion

Historically, Prickly Pear Creek from approximately East Helena to the mouth has seen over a century of habitat degradation, seasonal pollution and dewatering issues responsible for creating limiting factors to the overall fishery. This portion of the creek has seen an incredible amount of effort in recent decades to restore large portions of critical habitat, maintain annual instream flow and increase public access. These projects have involved many area collaborators (FWP, NWE, Pat Barnes TU, PPLT, LCCo WQPD, HVID, LHWG, LCCo CD, private landowners, etc.), with the goal of returning Prickly Pear Creek into a thriving fishery and a healthy, functioning, accessible and stable stream corridor.



Habitat restoration has included increasing stream access to the historic floodplain, bank stabilization, habitat development, irrigation structure navigation and recreational access. Cumulatively these projects have benefitted the overall fishery by increasing available habitat to both resident and migratory fish in the drainage throughout all life histories.

Prickly Pear Creek discharge consistently reaches 10-20 CFS annually, measured at the USGS gauge near Clancy (USGS Gauge 06061500), from summer to fall (Figure 4) and in canal flow from June to October is typically 3-5 CFS (Prickly Pear Simmental Ranch, *personal communication*). Historically, reaches of Prickly Pear Creek downstream of the headgate went dry annually; however, the Lewis and Clark County Water Quality Protection District began leasing water for in-stream flow from the Helena Valley Irrigation District (HVID) canal in 2012 and the creek has not been dry since.

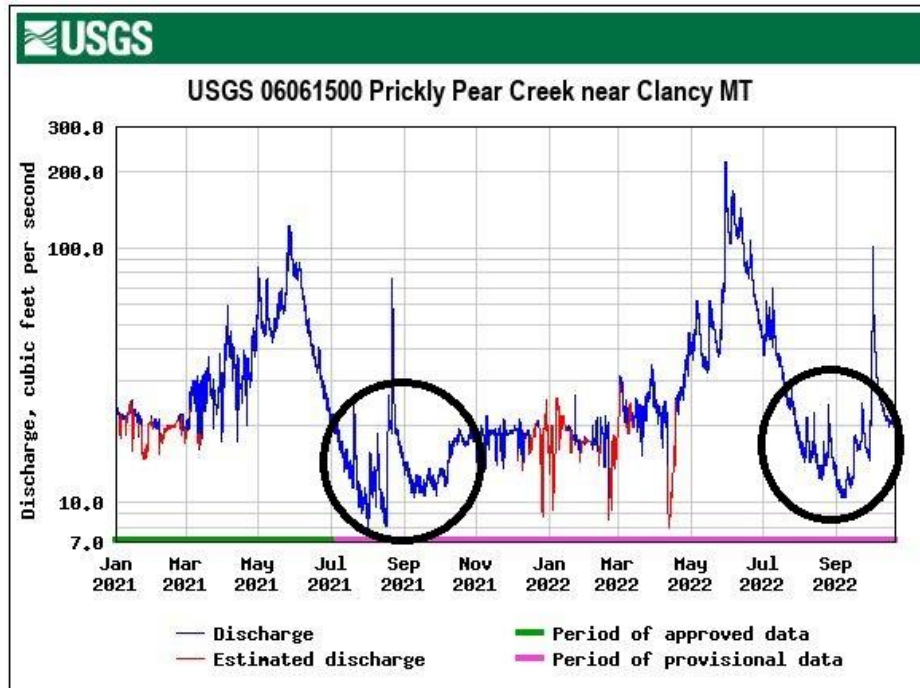


Figure 4. Prickly Pear Creek stream discharge, as measured at USGS gauge 06061500, from January 2021 to September 2022. Black circles indicate low annual flow periods each summer/fall.



Figure 5. Prickly Pear Creek Burnham Section electrofishing survey location. Start of the section is approximately 1.6 miles downstream of the Prickly Pear Simmental canal headgate.



FWP has been monitoring the fishery, via a catch-per-unit-effort (CPUE) electrofishing survey targeting rainbow and brown trout, within a standardized stream section (Figure 5), since 2003. The 2010 survey identified 22.6 total fish (rainbow and brown trout combined) per 1,000 feet. In 2014, two years HVID water was leased to sustain in-stream flow in summer and fall, combined total fish numbers increased to 38.7 per 1,000 feet (71% increase). In 2022, combined total fish numbers were 170% higher than pre-2012 levels and large migratory fish, like kokanee salmon (Photo 9), from Hauser Reservoir/ Lake Helena are beginning to be observed in historic degraded habitat and seasonally dewatered stream reaches and above historic low water fish barriers (irrigation structures).



Photo 9. Kokanee Salmon surveyed in the Burnham Section on Prickly Pear Creek in September 2022.

Lastly, a September 2022 FWP electrofishing survey on Prickly Pear Creek at FWP's Upper Prickly Pear Fishing Access Site (FAS), a new FAS in 2018, FWP yielded a 28.5-inch brown trout (Photo 10) while it was likely migrating upstream to spawn. Progeny from the large, migratory brown trout, or other adfluvial fish species (fish migrating out of Lake Helena) in the drainage, could possibly be traced to the entrained fish observed in the Prickly Pear Simmental Ranch irrigation canal in 2022.



Photo 10. A 28.5-inch brown trout captured by FWP in September 2022 in Prickly Pear Creek adjacent to Upper Prickly Pear Creek FAS.

### **Conclusion and Management Implications**

Trout numbers in Prickly Pear Creek within the standardized Burnham electrofishing survey, have risen 170% since 2010 and both resident and migratory fish have better access to suitable stream habitat and flows that are clearly benefitting the overall fishery. Identifying and mitigating drainage-wide limiting factors, like the fish entrainment reported and observed in Prickly Pear Simmental irrigation canal, has significantly benefited the Prickly Pear Creek fishery over the past two decades and will continue to be the goal of all collaborators moving forward.

Collectively, this information suggests that installing a fish screen on the Prickly Pear Simmental irrigation canal will further benefit the overall fishery and drive the Prickly Pear Creek restoration legacy into the future. In addition, installing a fish screen will reduce irrigation infrastructure inefficiencies for a landowner who 1) initially identified the entrainment issue and approached potential mitigation partners and 2) is a willing participant, financially, in mitigating the issue.