



FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid



I. APPLICANT INFORMATION

- A. Applicant Name: Clark Fork Coalition
 Mailing Address: 140 S 4th St W #1
 City: Missoula State: MT Zip: 59801
 Telephone: 406-542-0539 ext 203 E-mail: karen@clarkfork.org
- B. Contact Person (if different than applicant): Jed Whiteley
 Address: 140 S 4th St W #1
 City: Missoula State: MT Zip: 59801
 Telephone: 406-531-0256 E-mail: jed@clarkfork.org
- C. Landowner and/or Lessee Name (if different than applicant): Gayland Enockson
 Mailing Address: 11115 Lolo Creek Rd.
 City: Lolo State: MT Zip: 59847-9467
 Telephone: 406-240-8889 E-mail: _____

II. PROJECT INFORMATION

- A. Project Name: Lolo Creek Fish Screen
 River, stream, or lake: Lolo Creek
 Location: Township: 11N Range: 20W Section: 6
 Latitude: 46.743079 Longitude: -114.151944 *within project (decimal degrees)*
 County: Missoula

B. Purpose of Project:

The purpose of the Lolo Creek Fish Screen project is to increase wild trout populations in Lolo Creek by eliminating what FWP has identified as the number one greatest negative impact to wild fish populations on the creek. This is the severe entrainment problem at the Lolo Ditch diversion which would be completely mitigated by the construction of the fish screen proposed by this project.

Lolo Ditch fish screen

C. Brief Project Description (attach additional information to end of application):

Lolo Creek is the third largest drainage in the Bitterroot watershed draining 274 square miles of land and its upper tributaries are strongholds for bull trout and Westslope cutthroat trout. The Lolo Creek watershed also recruits brown trout, rainbow trout, and mountain whitefish to the Bitterroot River fishery. The stream is impacted by dewatering and high water temperatures in its lower reaches, fish entrainment at the major irrigation diversions and sediment/fish passage issues in the upper section.

Restoring Lolo Creek is a top priority for CFC, as outlined in our 2017 Bitterroot Strategy document. CFC has had success tackling sediment and fish passage issues in the headwaters through road decommissioning projects. For the lower creek CFC is actively working on dewatering and high water temperatures through instream flow projects. These are all worthy goals and projects but FWP's fish biologist on Lolo Creek, Ladd Knotek, has identified screening the Lolo Ditch as the single most important restoration project for wild fish in the entire watershed. In his estimate thousands of trout and whitefish die annually due to this one diversion. This is a devastating loss to the fish populations on Lolo Creek year after year.

The Lolo Ditch is the largest irrigation diversion on Lolo Creek with the capacity to divert over 75% of the water in the creek during low flow periods. When irrigation diversions become such a large percentage of the flow they essentially become the best habitat for the fish and the fish become entrained in large numbers. The Lolo Ditch leaves the Lolo watershed basin soon after the diversion and travels almost 4 miles south to its terminus. This means that all the fish in the ditch have no chance to return to the creek and die due to being left high and dry in a field or eaten by a predator. CFC has worked with FWP in the past to carry out a fish rescue through electrofishing certain pools left in the ditch when it is turned off at the end of October and has saved thousands of trout this way. These rescued trout represent only a small fraction of the trout that are lost yearly and installation of this screen will mean an end to the need for FWP and CFC employees along with volunteers to spend time and resources on this fish rescue every year.

The Coalition has hired an experienced engineering firm to design the project. The field survey, analysis of alternatives, and initial selection of preferred fish screen design with the water users is complete. The preferred design is a corrugated water screen (CWS), a newer design that was selected as the top choice due to its lack of moving parts, ease of maintenance, and in large part due to its much lower cost when compared to a FCA screen. The engineers estimate of \$250,000 to construct the FCA screen was \$85,000 over the \$165,000 construction estimate on the CWS. CFC and our partners on the project, which include the USFWS and MT FWP, believe that the CWS is a technology that will lead to more much needed fish screens being installed in Montana to protect our fisheries due to its price tag and ease of maintenance.

(LARGER TEXT VERSION AFTER SIGNATURE PAGE)

D. Length of stream or size of lake that will be treated: 37 miles

E. Project Budget:

Grant Request (Dollars): \$ 70,000

Matching Dollars: \$ 148,280

Matching In-Kind Services:* \$ _____

**salaries of government employees are not considered matching contributions*

Total Project Cost: \$ 218,280

F. **Attach** itemized (line item) budget – see *budget template*

Attach specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other information

G. necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire*. (<http://fwp.mt.gov/fwpDoc.html?id=36110>)

H. **Attach** land management & maintenance plans that will ensure protection of the reclaimed area.

III. PROJECT BENEFITS (attach additional information to end of application):

A. What species of fish will benefit from this project?

The project will benefit Westslope cutthroat trout, bull trout, mountain whitefish, brown trout, rainbow trout, cuttbow hybrids, and brook trout.

Lolo Ditch fish screen

- B. How will the project protect or enhance wild fish habitat?

A key strategy behind CFC's work to improve the health and ecological functioning of the Clark Fork watershed focuses on improving connections between tributaries and their main stem rivers, including the seasonal migration of fish within the system. On Lolo Creek, the Lolo Ditch severely disrupts the connection for salmonids, because its water withdrawals make the ditch an irresistible channel – particularly for out-migrating fish. The project will completely end fish entrainment at the Lolo Ditch diversion, retaining thousands of wild fish that would be currently lost to the system on a yearly basis.

- C. Will the project improve fish populations and/or fishing? To what extent?

The project will greatly improve fish populations on Lolo Creek, its tributaries and the Bitterroot River. Every tributary of Lolo Creek but one lies upstream of the Lolo Ditch diversion, forcing migrating fish to run the diversions gauntlet on their upstream and downstream migrations. FWP believes up to 99% of out migrating salmonids are being entrained and ultimately killed by the Lolo Ditch.

- D. Will the project increase public fishing opportunity for wild fish and, if so, how?

This project will have a large and immediate positive impact on wild fish numbers, leading to greatly increased angling opportunities for the public.

- E. The project agreement includes a 20-year maintenance commitment. Please discuss your ability to meet this commitment.

The Clark Fork Coalition and its partners will take responsibility for fish screen maintenance in coordination with the water users. The Coalition is launching a long-term project stewardship fund so that it can meet its project monitoring and maintenance responsibilities into the future.

- F. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?

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Lolo Ditch fish screen

G. What public benefits will be realized from this project?

Public benefits from this project will include: increased fish numbers, enhanced fishing opportunities and an improved tourism economy. The project will not only positively effect Lolo Creek but the lower Bitterroot mainstem.

H. Will the project interfere with water or property rights of adjacent landowners? (explain):

The project will not interfere with the water supply, water rights, or property rights of adjacent landowners. There are no water rights issues involved in this project.

I. Will the project result in the development of commercial recreational use on the site? (explain):

No, there is no planned development of commercial recreational use at the site of the project.

J. Is this project associated with the reclamation of past mining activity?

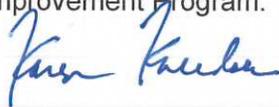
No.

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: _____



Date: _____

5/29/19

Sponsor (if applicable): _____

Submittal: Applications must be signed and received before December 1 and June 1 of each year to be considered for the subsequent funding period. Late or incomplete applications will be rejected.

Mail to: Montana FWP Fish Management Bureau PO Box 200701 Helena, MT 59620-0701	Email: Michelle McGree mmcgree@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov
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Applications may be rejected if this form is modified.

RESPONSE II C: BRIEF PROJECT DESCRIPTION (LARGER TEXT)

Lolo Creek is the third largest drainage in the Bitterroot watershed draining 274 square miles of land and its upper tributaries are strongholds for bull trout and Westslope cutthroat trout. The Lolo Creek watershed also recruits brown trout, rainbow trout, and mountain whitefish to the Bitterroot River fishery. The stream is impacted by dewatering and high water temperatures in its lower reaches, fish entrainment at the major irrigation diversions and sediment/fish passage issues in the upper section.

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Lolo Ditch fish screen
BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables must be completed or the application will be returned

WORK ITEMS (ITEMIZE BY CATEGORY)	NUMBER OF UNITS	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST	CONTRIBUTIONS			
					FUTURE FISHERIES REQUEST	IN-KIND SERVICES**	IN-KIND CASH	TOTAL
Personnel***								
Survey, Conceptual Design & Preliminary Design	1	Each	\$12,685.00	\$ 12,685.00			12,685.00	\$ 12,685.00
Final Design	1	Each	\$14,800.00	\$ 14,800.00			14,800.00	\$ 14,800.00
Construction Staking	12	Hour	\$110.00	\$ 1,320.00			1,320.00	\$ 1,320.00
Permitting	1	LS	\$3,000.00	\$ 3,000.00			3,000.00	\$ 3,000.00
Oversight	45	Hour	\$110.00	\$ 4,950.00			4,950.00	\$ 4,950.00
Project Management	1	LS	\$17,650.00	\$ 17,650.00			17,650.00	\$ 17,650.00
			Sub-Total	\$ 54,405.00	\$ -	\$ -	\$ 54,405.00	\$ 54,405.00
Travel								
Mileage	250	mile	\$0.58	\$ 145.00			145.00	\$ 145.00
Per diem				\$ -				\$ -
			Sub-Total	\$ 145.00	\$ -	\$ -	\$ 145.00	\$ 145.00
Construction Materials****								
Corrugated Water Screen w/Components + Supplier On-Site for Installation	1	Each	\$71,000.00	\$ 71,000.00			71,000.00	\$ 71,000.00
Access Walkway for Fish Screen	1	Each	\$4,000.00	\$ 4,000.00	3,000.00		1,000.00	\$ 4,000.00
15" Sluice Gate	1	Each	\$1,250.00	\$ 1,250.00	1,250.00			\$ 1,250.00
12" Pipe to Bypass	7	Linear Feet	\$20.00	\$ 140.00	140.00			\$ 140.00
Embankment & Structural Backfill Material	140	Cubic Yards	\$35.00	\$ 4,900.00	3,500.00		1,400.00	\$ 4,900.00
Cast-In-Place Concrete, Rebar, Formwork	38	Cubic Yards	\$650.00	\$ 24,700.00	24,700.00			\$ 24,700.00
Bedding Material	15	Cubic Yards	\$38.00	\$ 570.00	540.00		30.00	\$ 570.00
12" PVC Fish Return	195	Linear Feet	\$20.00	\$ 3,900.00	2,600.00		1,300.00	\$ 3,900.00
Erosion Control Components	1	Each	\$750.00	\$ 750.00	750.00			\$ 750.00
Clearing & Grubbing	1	Each	\$2,000.00	\$ 2,000.00	1,000.00		1,000.00	\$ 2,000.00
			Sub-Total	\$ 113,210.00	\$ 37,480.00	\$ -	\$ 75,730.00	\$ 113,210.00
Equipment and Labor								
Fish Screen Delivery	1	Each	\$2,500.00	\$ 2,500.00			2,500.00	\$ 2,500.00
Labor	120	Hours	\$45.00	\$ 5,400.00	5,400.00			\$ 5,400.00
Hydraulic Excavator	60	Hours	\$150.00	\$ 9,000.00	9,000.00			\$ 9,000.00

Lolo-Ditch fish screen
BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Dump Truck	40	Hours	\$120.00	\$	4,800.00	4,800.00		\$	4,800.00
Skid Steer	40	Hours	\$100.00	\$	4,000.00	4,000.00		\$	4,000.00
Pickup Truck	80	Hours	\$60.00	\$	4,800.00	4,800.00		\$	4,800.00
Welder	20	Hours	\$50.00	\$	1,000.00	1,000.00		\$	1,000.00
Generator	40	Hours	\$40.00	\$	1,600.00	1,600.00		\$	1,600.00
Compactor	24	Hours	\$80.00	\$	1,920.00	1,920.00		\$	1,920.00
Misc. Tools	1	Each	\$1,500.00	\$	1,500.00		1,500.00	\$	1,500.00
			Sub-Total	\$	36,520.00	\$ 32,520.00	\$ -	\$ 4,000.00	\$ 36,520.00
Mobilization									
Mobilization	1	Each	\$14,000.00	\$	14,000.00		14,000.00	\$	14,000.00
				\$	-			\$	-
				\$	-			\$	-
				\$	-			\$	-
			Sub-Total	\$	14,000.00	\$ -	\$ -	\$ 14,000.00	\$ 14,000.00
TOTALS				\$	218,280.00	\$ 70,000.00	\$ -	\$ 148,280.00	\$ 218,280.00

OTHER REQUIREMENTS:

All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used for calculations). Describe here or in text.

Reminder: Government salaries cannot be used as in-kind match

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a minimum of two competitive bids for the cost of undertaking the project.

****The Review Panel recommends a maximum fencing cost of \$1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

MATCHING CONTRIBUTIONS (do not include requested funds)

CONTRIBUTOR	IN-KIND SERVICE	IN-KIND CASH	TOTAL	Secured? (Y/N)
Private Donor	\$ -	\$ 6,000.00	\$ 6,000.00	Y
Bitterroot Trout Unlimited	\$ -	\$ 2,500.00	\$ 2,500.00	Y
Weeden Foundation	\$ -	\$ 10,000.00	\$ 10,000.00	Y
New Belgium Brewing	\$ -	\$ 2,000.00	\$ 2,000.00	Y
WSCTU	\$ -	\$ 10,000.00	\$ 10,000.00	Y
USFWS-NFPP	\$ -	\$ 90,000.00	\$ 90,000.00	N
Private Donors/Foundation	\$ -	\$ 19,780.00	\$ 19,780.00	N
Montana TU	\$ -	\$ 5,000.00	\$ 5,000.00	N
Jerry Metcalf Foundation	\$ -	\$ 3,000.00	\$ 3,000.00	Y
	\$ -	\$ -	\$ -	
TOTALS	\$ -	\$ 148,280.00	\$ 148,280.00	

Lolo Ditch fish screen

Conceptual Analysis Decision Matrix - Maclay Ditch Fish Screen

Screen Type	Screen Siting Location	Cost	Short Term Maintenance (On-Site Cleaning)	Long Term Maintenance (Parts, Mechanical)	Power Required?	Can Screen Accommodate Moderate-High Ditch Flow Variability	Other Factors	Does Screen Meets NMFS Guidelines?
FCA	In-Ditch	High	Low	Low	No	Yes* (If one bay can be shut off)	- Well established, proven technology - Would require substantial footprint - Would require lengthy piped fish return.	Yes.
Corrugated Water	In-Ditch	Low	Low-Medium	Low	No	Yes	- Minimal case studies - fabrication has just recently started. - Would require lengthy piped fish return. - Doesn't fit existing canal flow regime as well, increases backwater into the headgate. - Simple design, relatively compact footprint.	Considered "experimental"
Vertical Plate w/Paddlewheel	In-Ditch	Low	Low	Moderate	No	Yes* (If bays can be shut off)	- Would require piped fish return. - Would likely require fencing for public safety - Moderate footprint sized - Variability to fit relatively low head applications. - Allows cleaning of screen with no power source.	Yes.
Vertical Plate w/Powered Brushes	In-Ditch or in Channel	Moderate	Low	High	Yes	Possibly	- Would require piped fish return. - Optimally would require higher flow depths than project can accommodate to reduce footprint size	Yes.
Rotary Drum Screen	In-Ditch	High	Low	Moderate	No	No	-Would require piped fish return. - Would require more depth than site can accommodate	Yes.
Traveling Belt	Headgate Mounted	Very High	Low	High	Yes	Yes	-Complex, proprietary. Requires power source - Would require significant increase in water surface elevation. - Fish don't enter screen/ditch	Yes.
Cone Screen	In-Ditch or In-Channel	Very High	Low	High	Yes	Yes	-Generally operates better with deeper intakes. Doesn't fit site well.	Certain models do.

Results of conceptual screening:

1). Conceptual alternatives analysis recommends the FCA screen, corrugated water screen, and vertical plate with paddlwheel screens to be investigated further.

Lolo Ditch fish screen



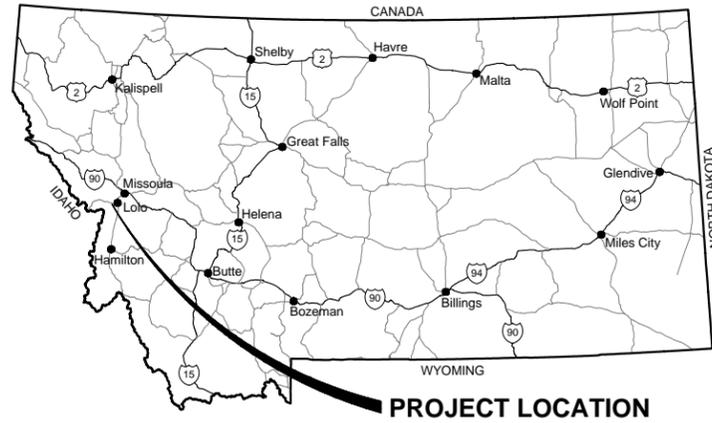
OPINION OF PROBABLE COST - FISH SCREEN ALTERNATIVES - CONCEPTUAL DESIGN

PROJECT		DATE
Lolo Creek-Maclay Ditch Fish Screen	Revised Estimates	5/8/2019

FISH SCREEN ALTERNATIVE - CORRUGATED WATER SCREEN - 38 CFS					
ITEM NO.	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1	Mobilization & Demobilization	Lump Sum	1	\$14,300.00	\$14,300.00
2	Construction Staking	Lump Sum	1	\$1,200.00	\$1,200.00
3	Erosion Control	Lump Sum	1	\$1,000.00	\$1,000.00
4	Supply & Install Corrugated Water Screens & Hardware	Lump Sum	1	\$67,000.00	\$67,000.00
5	Supply and Install Acess Walkway	Lump Sum	1	\$4,000.00	\$4,000.00
6	Supply and Install 15" Sluice Gate	Lump Sum	1	\$1,400.00	\$1,400.00
7	12" Pipe to Bypass	Linear Feet	7	\$60.00	\$420.00
8	Excavation & Backfill (Fish Screen Structure)	Lump Sum	1	\$8,000.00	\$8,000.00
9	Supply & Install Cast-In-Place Hydraulic Concrete	Cubic Yard	36	\$925.00	\$33,300.00
10	Bedding Material	Cubic Yard	15	\$50.00	\$750.00
11	Fish Return Pipe (15" PIP, Includes excavation/embankment)	Linear Feet	195	\$45.00	\$8,775.00
12	Remove and Relocate Flume	Lump Sum	1	\$2,500.00	\$2,500.00
SUBTOTAL					\$142,645.00
TOTAL W/CONTINGENCY (20%)					\$164,100.00

FISH SCREEN ALTERNATIVE - FCA SCREEN - CUSTOM DUAL SCREEN - 38 CFS - (24 CFS & 14 CFS MODULE)					
ITEM NO.	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
1	Mobilization & Demobilization	Lump Sum	1	\$20,900.00	\$20,900.00
2	Construction Staking	Lump Sum	1	\$1,200.00	\$1,200.00
3	Erosion Control	Lump Sum	1	\$1,000.00	\$1,000.00
4	Supply & Install FCA Fish Screens (Screen & Inlet Flume Only)	Lump Sum	1	\$110,000.00	\$110,000.00
5	Excavation & Embankment (Fish Screen Structure)	Lump Sum	1	\$12,000.00	\$12,000.00
6	12" Pipe to Bypass	Linear Feet	10	\$60.00	\$600.00
7	Supply & Install Cast-In-Place Hydraulic Concrete	Cubic Yard	54	\$925.00	\$49,950.00
8	Bedding Material	Cubic Yard	25	\$50.00	\$1,250.00
9	Fish Return Pipe (15" PIP, includes excavation/embankment)	Linear Feet	195	\$45.00	\$8,775.00
10	Remove and Relocate Flume	Lump Sum	1	\$2,500.00	\$2,500.00
SUBTOTAL					\$208,175.00
TOTAL W/CONTINGENCY (20%)					\$249,900.00

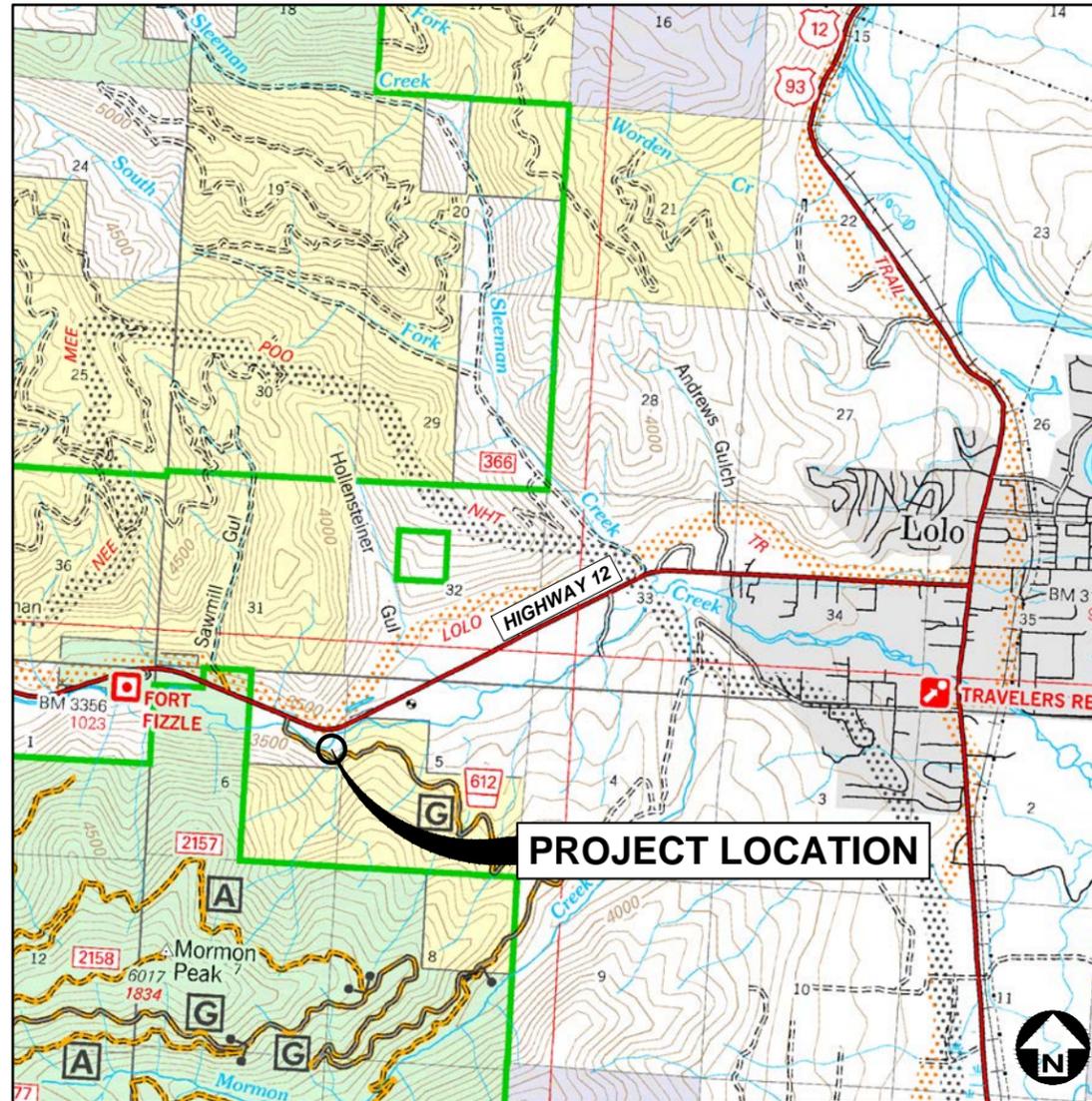
SHEET 1	COVER
SHEET 2	GENERAL NOTES AND LEGEND
SHEET 3	OVERALL SITE PLAN & CONTROL TABLE
SHEET 4	LOLO CREEK PLAN & PROFILE
SHEET 5	MACLAY DITCH PLAN & PROFILE
SHEET 6	ALTERNATIVE 1 - VERTICAL PLATE SCREEN WITH PADDLEWHEEL
SHEET 7	ALTERNATIVE 2 - CORRUGATED WATER SCREEN
SHEET 8	ALTERNATIVE 3 - FCA SCREEN
SHEET 9	FISH SCREEN RETURN
SHEET 10	SITE PHOTOS



CLARK FORK COALITION LOLO CREEK-MACLAY DITCH FISH SCREEN

CONCEPTUAL DESIGN

SECTION 6, TOWNSHIP 11 NORTH, AND RANGE 20 WEST
LATITUDE 46.74307965 N, LONGITUDE 114.15194444 W



PLANS PREPARED FOR:

CLARK FORK COALITION



APPROVED BY:

RYAN ELLIOTT, P.E.
GREAT WEST ENGINEERING



PLANS PREPARED BY:

BRENT PILON, P.E.



NO.	REVISION DESCRIPTION	BY	DATE	SET NO.
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ABBREVIATIONS

⊙	AT	LPG	LIQUID PROPANE GAS
Δ	ANGLE OF DEFLECTION, DELTA ANGLE	LT	LEFT
<PT	ANGLE POINT	MAX	MAXIMUM
AB	ANCHOR BOLT	MD	MEASURE DOWN
ABDN	ABANDON	MFD	MANUFACTURED
AC	ASBESTOS CONCRETE	MFR	MANUFACTURE, MANUFACTURER
ADDN	ADDITIONAL	MH	MANHOLE
ADJ	ADJACENT	MIN	MINIMUM
AFF	ABOVE FINISHED FLOOR	MISC	MISCELLANEOUS
ALT	ALTERNATE	MJ	MECHANICAL JOINT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	MOV	MOTOR OPERATED VALVE
APPROX	APPROXIMATE	MPWSS	MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS
APVD	APPROVED	N	NORTH
ARCH	ARCHITECTURE, ARCHITECTURAL	NE	NORTHEAST
ASPH	ASPHALT	NG	NATURAL GAS
AVE	AVENUE	NIC	NOT IN CONTRACT
AVG	AVERAGE	NO	NUMBER
BFV	BUTTERFLY VALVE	NOM	NOMINAL
BLDG	BUILDING	NTS	NOT TO SCALE
BLK	BLOCK	NW	NORTHWEST
BLVD	BOULEVARD	OC	ON CENTER
BM	BEAM, BENCHMARK	OD	OUTSIDE DIAMETER
BOT	BOTTOM	OF	OVERFLOW
BRG	BEARING	OH	OVERHEAD
BRKT	BRACKET	OHP	OVERHEAD POWER
BVC	BEGIN VERTICAL CURVE	OHT	OVERHEAD TELEPHONE
C-C	CENTER TO CENTER	OPNG	OPENING
CHAN	CHANNEL	PC	POINT OF CURVATURE
CHK	CHECK	PCC	POINT OF COMPOUND CURVATURE
CI	CAST IRON	PE	PLAIN END, POLYETHYLENE
CIPC	CAST-IN-PLACE CONCRETE	PERP	PERPENDICULAR
CIRC	CIRCULAR	PI	POINT OF INTERSECTION
CJ	CONSTRUCTION JOINT, CONTROL JOINT	PL	PROPERTY LINE
CL	CENTER LINE	PNL	PANEL
CLR	CLEAR, CLEARANCE	PRC	POINT OF REVERSE CURVATURE
CMP	CORRUGATED METAL PIPE	PREFAB	PREFABRICATED
CMU	CONCRETE MASONRY UNITS	PRELIM	PRELIMINARY
CO	CLEANOUT	PREP	PREPARE, PREPARATION
COL	COLUMN	PROP	PROPERTY
CONC	CONCRETE	PRV	PRESSURE REDUCING VALVE
CONSTR	CONSTRUCTION	PSF	POUNDS PER SQUARE FOOT
CONT	CONTINUE, CONTINUED, CONTINUOUS	PSI	POUNDS PER SQUARE INCH
CONTR	CONTRACTOR	PT	POINT, POINT OF TANGENCY
COORD	COORDINATE	PVC	POLYVINYL CHLORIDE
CP	CONTROL PANEL, CONTROL POINT	PVI	POINT OF VERTICAL INTERSECTION
CPLG	COUPLING	PVMT	PAVEMENT
CTR	CENTER	R, RAD	RADIUS
CTV	CABLE TELEVISION	RC	REINFORCED CONCRETE
CU	CUBIC, COPPER	RCP	REINFORCED CONCRETE PIPE
CF	CUBIC FEET	RD	ROAD
CULV	CULVERT	RDCR	REDUCER
CY	CUBIC YARD	REBAR	REINFORCEMENT BAR
DET	DETAIL	REF	REFERENCE
DI	DUCTILE IRON, DRAIN INLET	REINF	REINFORCE
DIA, ∅	DIAMETER	REQD	REQUIRED
DIAG	DIAGONAL	RR	RAILROAD
DIM	DIMENSION	RST	REINFORCING STEEL
DR	DRIVE	RT	RIGHT
DWG	DRAWING	R/W	RIGHT-OF-WAY
E	EAST	S	SOUTH, SANITARY SEWER
EA	EACH	SAN	SANITARY
EL, ELEV	ELEVATION	SCH	SCHEDULE
ELB	ELBOW	SD	STORM DRAIN
ELEC	ELECTRIC, ELECTRICAL	SDWK	SIDEWALK
ENCL	ENCLOSE	SE	SOUTHEAST
ENGR	ENGINEER	SECT	SECTION
EOP	EDGE OF PAVEMENT	SF	SQUARE FOOT
EQ	EQUAL, EQUALLY	SHT	SHEET
EQ SP	EQUALLY SPACED	SIM	SIMILAR
EQUIP	EQUIPMENT	SLP	SLOPE
EQUIV	EQUIVALENT	SPEC	SPECIFICATION
EVC	END VERTICAL CURVE	SQ	SQUARE
EW	EACH WAY	SSTL	STAINLESS STEEL
EXC	EXCAVATE	STA	STATION
EXP	EXPANSION	SS	SANITARY SEWER SERVICE
EXP JT	EXPANSION JOINT	STD	STANDARD
EXST	EXISTING	ST	STREET
FCV	FLOW CONTROL VALVE	STL	STEEL
FD	FLOOR DRAIN	STRUCT	STRUCTURE
FDN	FOUNDATION	SW	SOUTHWEST
FES	FLARED END SECTION	SYM	SYMMETRICAL
FET	FLARED END TERMINAL	TB	THRUST BLOCK
FF	FINISHED FLOOR	TBC	TOP BACK OF CURB
FG	FINISH GRADE	TBM	TEMPORARY BENCH MARK
FHYD	FIRE HYDRANT	TEL	TELEPHONE
FJ	FLANGE JOINT	TEMP	TEMPORARY
FL	FLOW LINE	THRU	THROUGH
FLEX	FLEXIBLE	TYP	TYPICAL
FM	FORCEMAIN	UG	UNDERGROUND
FT	FOOT, FEET	UGP	UNDERGROUND POWER
FO	FIBER OPTIC	UGT	UNDERGROUND TELEPHONE
FTG	FOOTING, FITTING	UTIL	UTILITY
G	NATURAL GAS	V	VALVE, VOLT
GA	GAGE, GAUGE	VB	VALVE BOX
GAL	GALLON	VERT	VERTICAL
GALV	GALVANIZED	VOL	VOLUME
GND	GROUND	W	WEST, WATER
GVL	GRAVEL	WTR	WATER
HB	HOSE BIB	WD	WOOD
HDPE	HIGH DENSITY POLYETHYLENE	W/	WITH
HOR, HORIZ	HORIZONTAL	W/O	WITHOUT
HWD	HIGHWAY	WL	WETLAND
HYD	HYDRANT	WM	WIRE MESH, WATER METER
ID	INSIDE DIAMETER	WS	WATERSTOP, WATER SURFACE, WATER SERVICE
IE	INVERT ELEVATION	WT	WEIGHT
IN	INCH	WV	WATER VALVE
INV	INVERT	WWF	WELDED WIRE FABRIC
JB	JUNCTION BOX	WWM	WELDED WIRE MESH
JT	JOINT	XFMR	TRANSFORMER
K	RATE OF VERTICAL CURVATURE	X-ING	CROSSING
LBS	POUNDS	XS	CROSS SECTION
LF	LINEAR FEET	YD	YARD
LN	LANE		

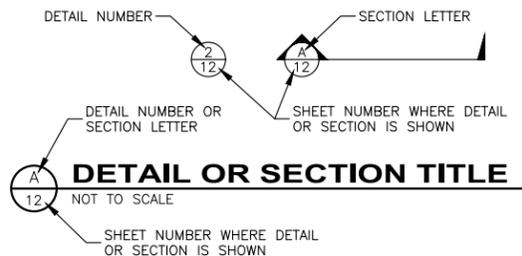
LEGEND

EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION
---	---	MAJOR CONTOUR	⊙	⊙	STUMP
---	---	MINOR CONTOUR	⊙	⊙	SHRUB/BUSH
---	---	OVERHEAD TELEPHONE	☀	☀	TREE--CONIFER
---	---	UNDERGROUND TELEPHONE	☀	☀	TREE--DECIDUOUS
---	---	CABLE TELEVISION	☀	☀	TREE LINE
---	---	FIBER OPTIC	⊙	⊙	COMMUNICATION MANHOLE
---	---	NATURAL GAS	⊙	⊙	COMMUNICATION VAULT
---	---	OVERHEAD POWER	⊙	⊙	TELEPHONE RISER
---	---	UNDERGROUND POWER	⊙	⊙	CABLE TV RISER
---	---	SANITARY SEWER	⊙	⊙	NATURAL GAS METER
---	---	SANITARY SEWER SERVICE	⊙	⊙	NATURAL GAS RISER
---	---	SANITARY SEWER FORCEMAIN	⊙	⊙	NATURAL GAS VALVE
---	---	STORM DRAIN	⊙	⊙	LIGHT POLE
---	---	STORM CULVERT	⊙	⊙	STREET LIGHT POLE
---	---	WATER	⊙	⊙	POWER RISER
---	---	WATER SERVICE	⊙	⊙	PAD MOUNTED TRANSFORMER
---	---	CHAINLINK FENCE	⊙	⊙	POWER VAULT
---	---	BARBED WIRE FENCE	⊙	⊙	UTILITY POLE
---	---	WOOD FENCE	⊙	⊙	GUY WIRE
---	---	PAVED ROAD	⊙	⊙	SANITARY MANHOLE
---	---	GRAVEL ROAD	⊙	⊙	SANITARY CLEANOUT
---	---	PROPERTY/LOT LINE	⊙	⊙	SANITARY LAMPHOLE
---	---	PROPERTY EASEMENT	⊙	⊙	STORM MANHOLE
---	---	PROPERTY SETBACK	⊙	⊙	STORM ROUND INLET
---	---	RIGHT-OF-WAY	⊙	⊙	STORM SQUARE INLET
---	---	CITY LIMIT/DISTRICT BOUNDARY	⊙	⊙	STORM CATCH BASIN
---	---	RAILROAD	⊙	⊙	11.25' ELBOW
---	---	DITCH	⊙	⊙	22.50' ELBOW
---	---	WATER EDGE	⊙	⊙	45' ELBOW
---	---	WETLAND	⊙	⊙	90' ELBOW
---	---	BUILDING	⊙	⊙	TEE
---	---	BENCHMARK	⊙	⊙	CROSS
---	---	CONTROL POINT	⊙	⊙	CAP
---	---	PROPERTY PIN	⊙	⊙	FIRE HYDRANT
---	---	BORING	⊙	⊙	GATE VALVE
---	---	MONITORING WELL	⊙	⊙	REDUCER
---	---	TEST PIT	⊙	⊙	WATER METER
---	---	BOLLARD	⊙	⊙	WELL
---	---	MAIL BOX	⊙	⊙	CURB STOP
---	---	SIGN	⊙	⊙	FROST FREE HYDRANT

GENERAL NOTES:

1. THIS IS A STANDARD LEGEND AND ABBREVIATION LIST. THEREFORE, NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED ON THIS PROJECT.
2. EXISTING UNDERGROUND UTILITIES SHOWN ARE FROM THE BEST INFORMATION AVAILABLE. THIS INFORMATION IS APPROXIMATE AND MAY BE INCOMPLETE. FOR ACCURATE LOCATION, THE CONTRACTOR SHALL CONTACT, PRIOR TO EXCAVATION, THE UTILITIES UNDERGROUND LOCATION CENTER AT: 1-800-424-5555.

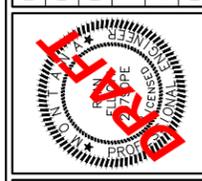
GENERAL DESIGN DESIGNATIONS:



CONCEPTUAL DESIGN

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1-18277
 DESIGNED: RME
 DRAWN: BLP
 CHECKED: JRW
 APPROVED: RME
 DATE: NOVEMBER 12, 2018

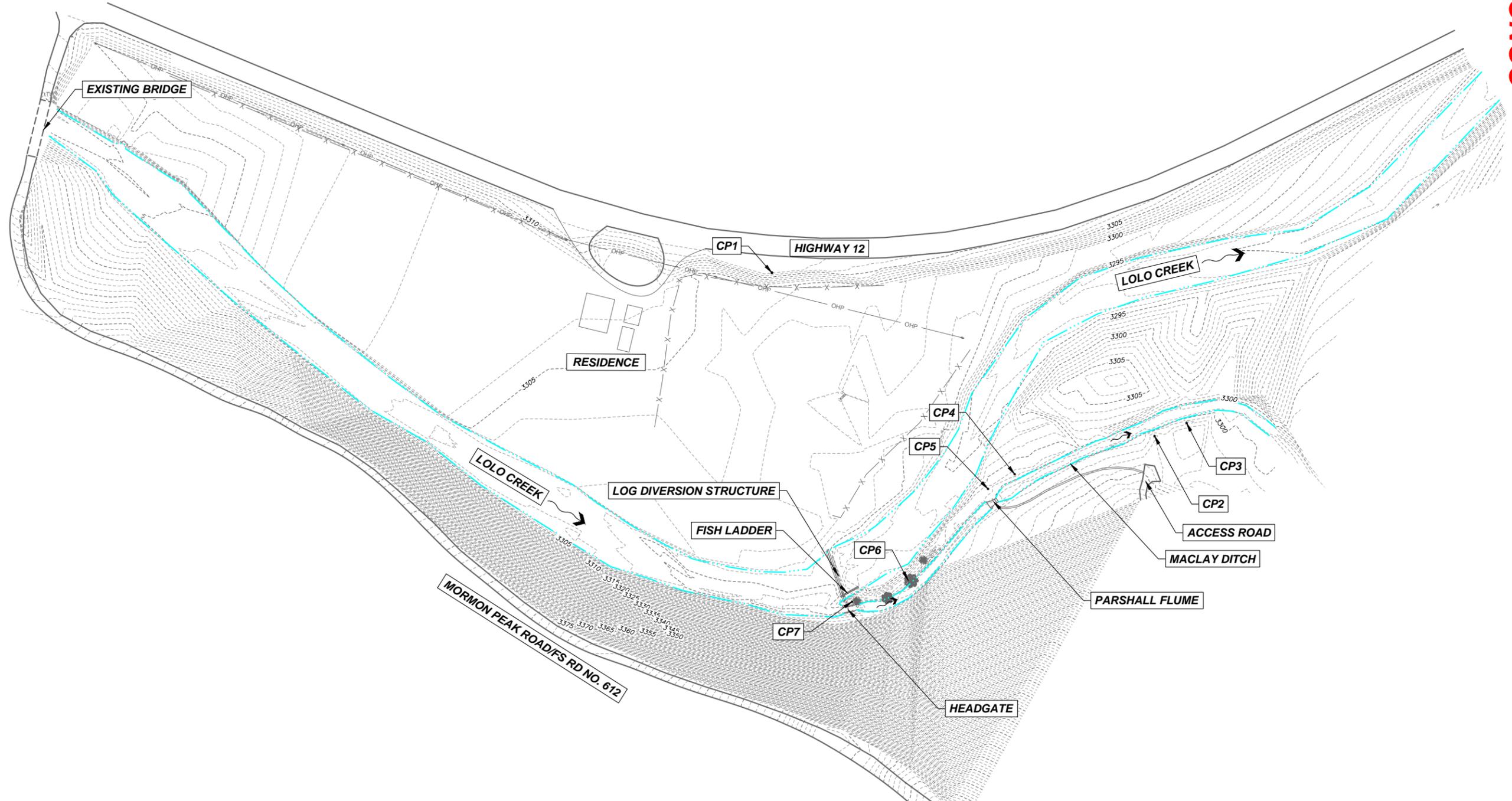


CLARK FORK COALITION
LOLO CREEK-MACLAY DITCH FISH SCREEN
 GENERAL NOTES AND LEGEND

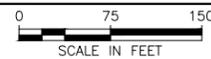
SHEET NO.
2
 OF 10

CONTROL POINT COORDINATE TABLE				
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP1	944216.97	804135.05	3312.35	REBAR W/RPC
CP2	943990.50	804666.85	3303.26	REBAR W/RPC
CP3	944008.49	804711.33	3303.34	REBAR W/RPC
CP4	943937.50	804472.55	3301.41	REBAR W/RPC
CP5	943917.20	804435.37	3301.88	REBAR W/RPC
CP6	943790.57	804324.38	3302.56	REBAR W/RPC
CP7	943760.81	804246.39	3305.81	REBAR W/RPC
CP99	946812.98	820235.45	3193.36	NGS MONUMENT - PID DH9363

SURVEY NOTES:
 1. RPC = RED PLASTIC CAP



OVERALL EXISTING SITE PLAN & CONTROL TABLE



CONCEPTUAL DESIGN

NO.	REVISION DESCRIPTION	BY	DATE

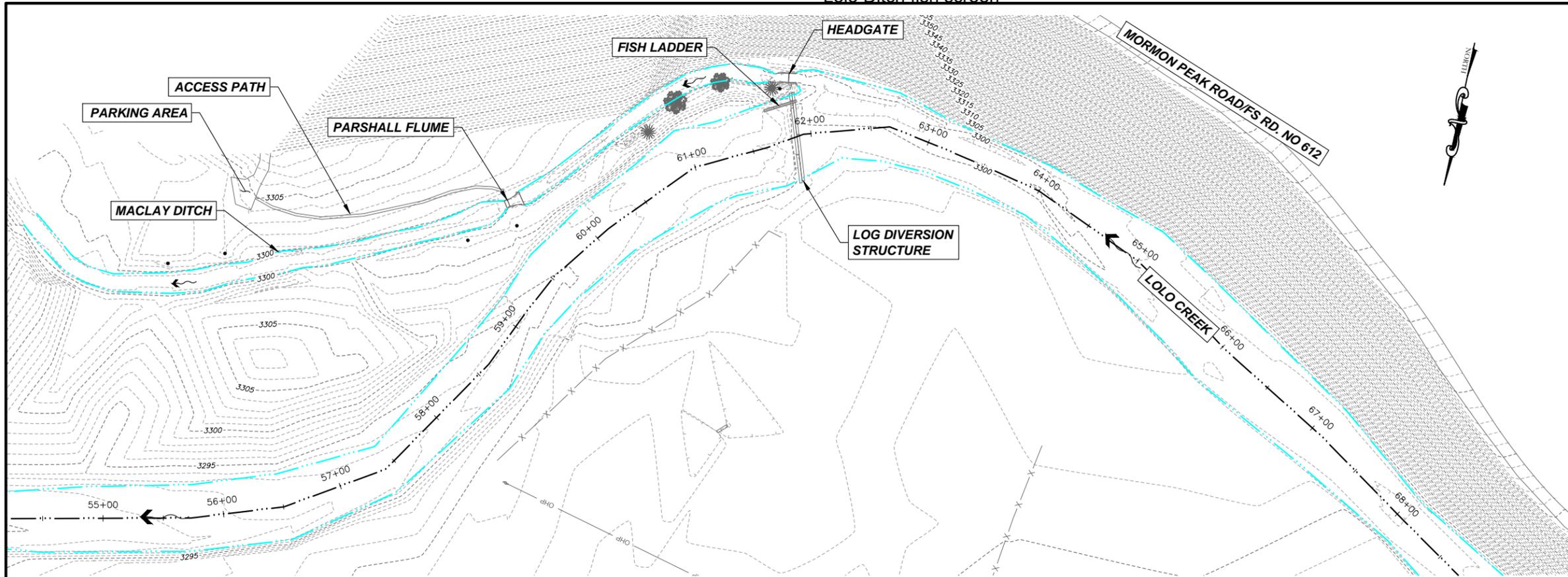
PROJECT: 1-18277
 DESIGNED: RME
 DRAWN: BLP
 CHECKED: JRW
 APPROVED: RME
 DATE: NOVEMBER 12, 2018



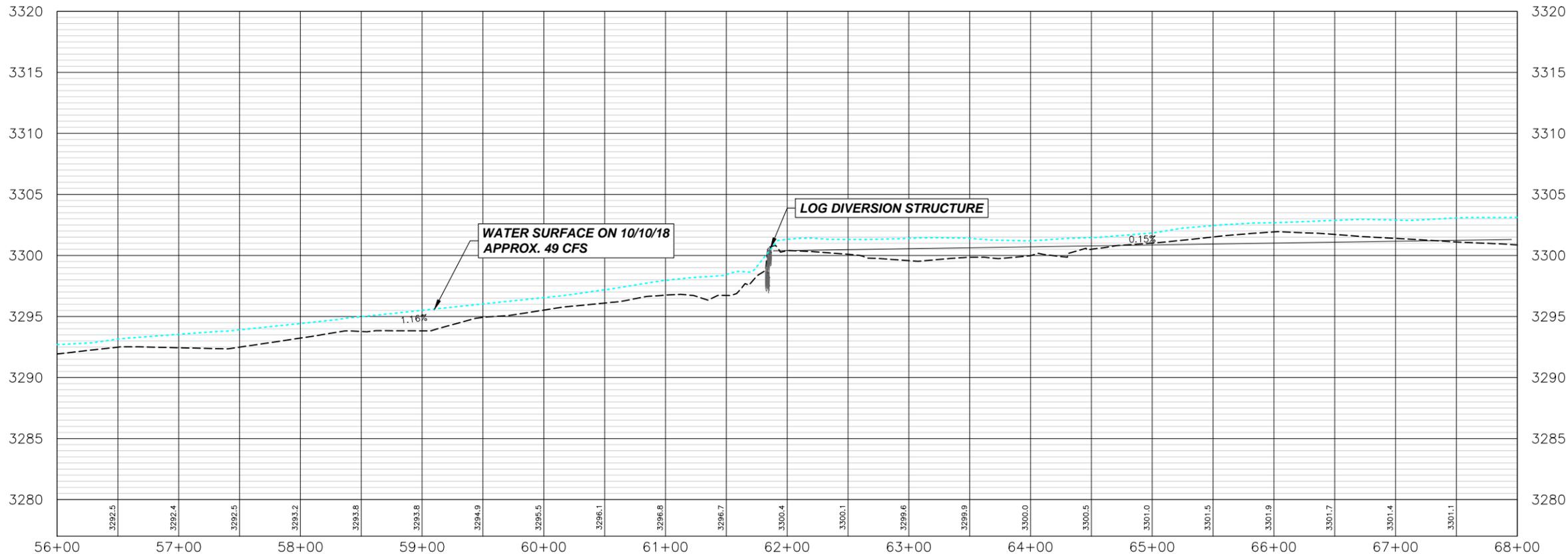
CLARK FORK COALITION
LOLO CREEK-MACLAY DITCH FISH
SCREEN
 OVERALL SITE PLAN & CONTROL TABLE

SHEET NO.
3
 OF 10

Lolo Ditch fish screen



PLAN VIEW OF LOLO CREEK - STA. 56+00 TO STA. 68+00



PROFILE VIEW OF LOLO CREEK - STA. 56+00 TO STA. 68+00

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 10'

CONCEPTUAL DESIGN

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1-18277
DESIGNED: RME
DRAWN: BLP
CHECKED: JRW
APPROVED: RME
DATE: NOVEMBER 12, 2018



CLARK FORK COALITION
LOLO CREEK-MACLAY DITCH FISH
SCREEN
 LOLO CREEK PLAN & PROFILE
 STA. 56+00 TO STA. 68+00

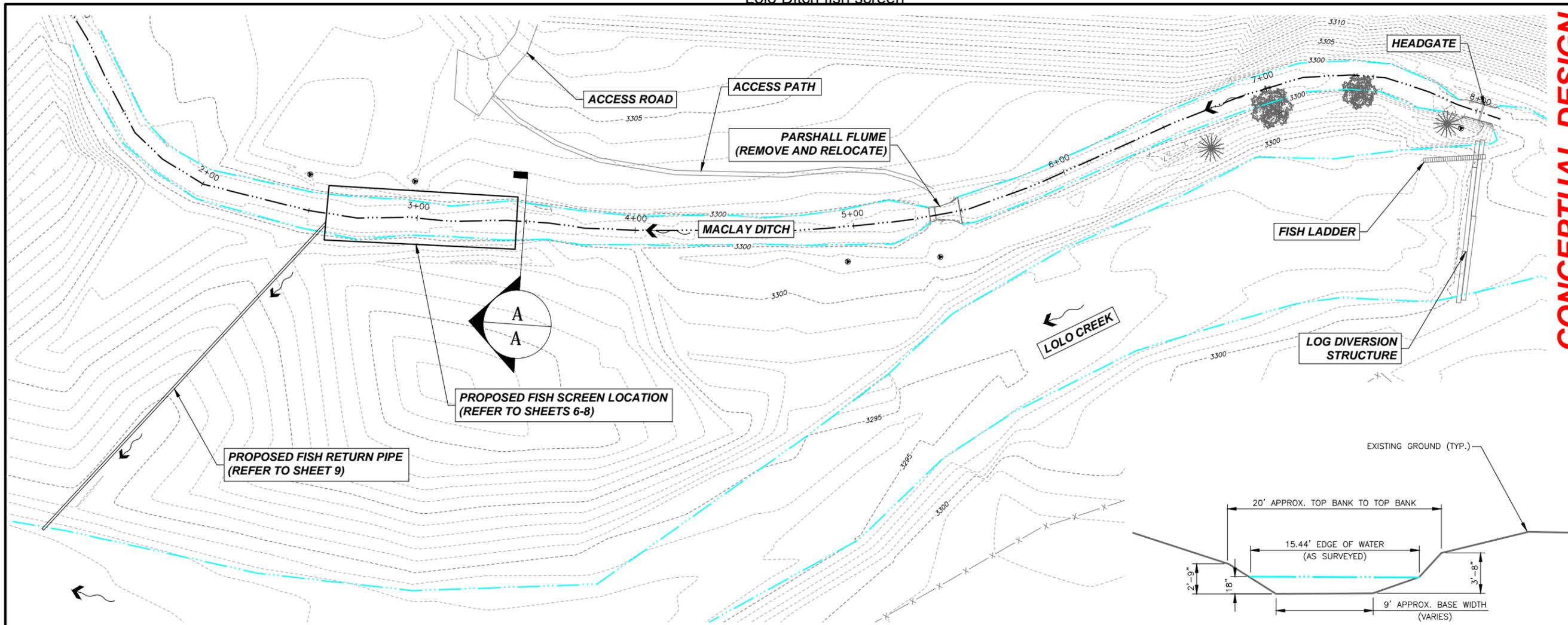
SHEET NO.

4

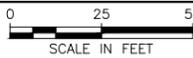
OF 10

F:\1-18277-CFC Lolo Creek Fish Screen\CADD 1-18277\Sheets\1-18277-4-Lolo Creek Plan & Profile.dwg

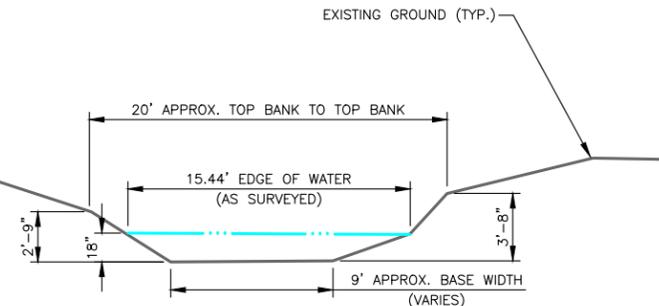
Lolo Ditch fish screen



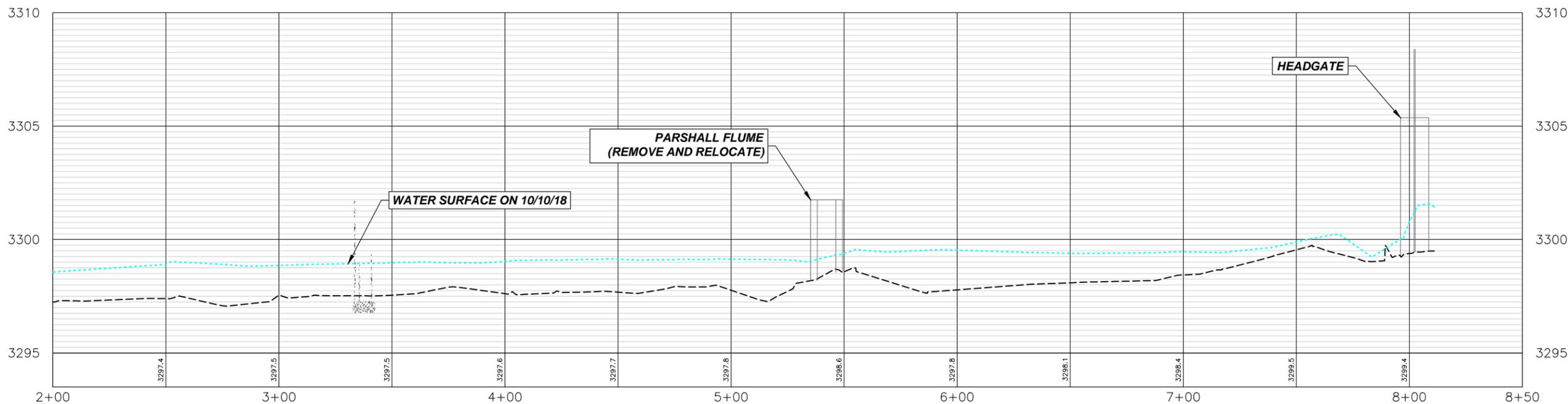
PLAN VIEW OF MACLAY DITCH - STA. 52+00 TO STA. 58+50



SECTION A-A: EXISTING DITCH SECTION



SCALE: 1" = 10'



PROFILE VIEW OF MACLAY DITCH - STA. 2+00 TO STA. 8+50

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'

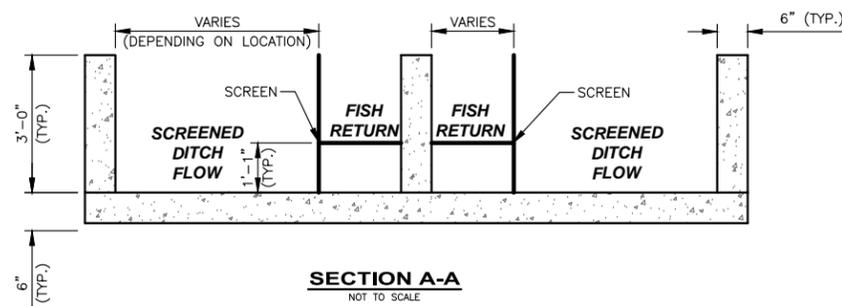
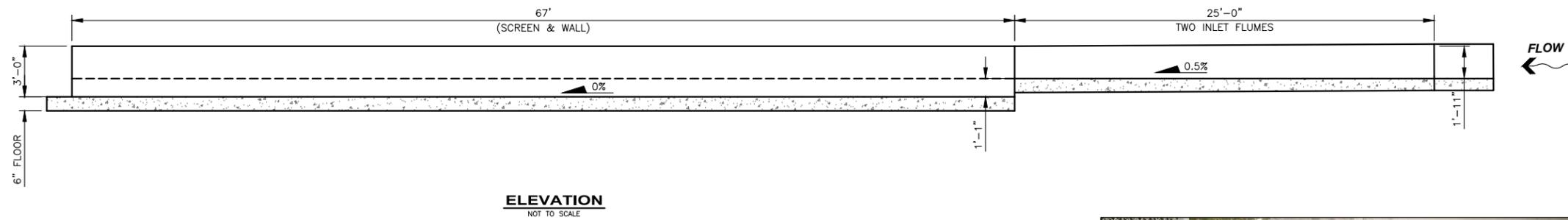
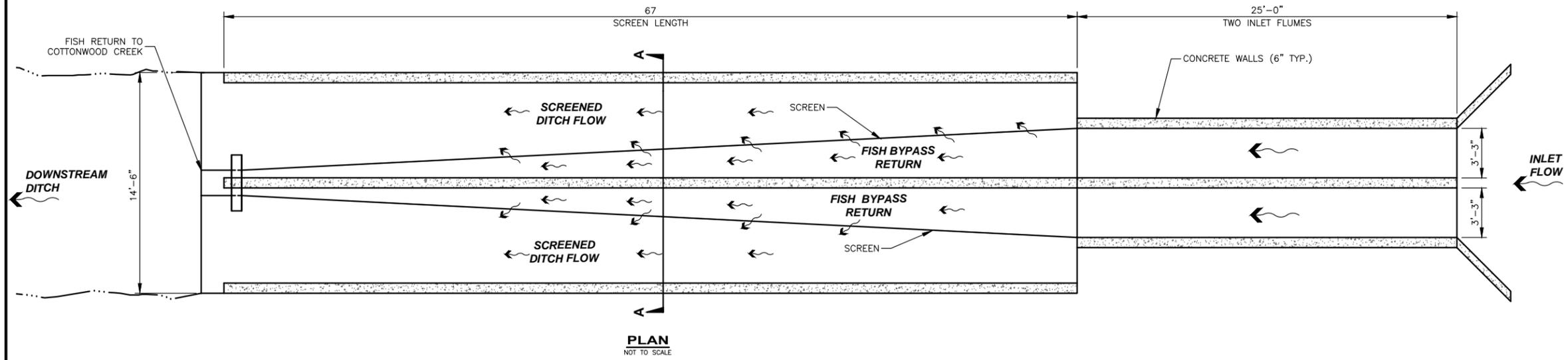
CONCEPTUAL DESIGN

PROJECT: 1-18277	DESIGNED: RME
BY: DATE	DRAWN: BLP
REVISION DESCRIPTION	CHECKED: JRW
NO.	APPROVED: RME
	DATE: NOVEMBER 12, 2018



CLARK FORK COALITION
LOLO CREEK-MACLAY DITCH FISH SCREEN
 MACLAY DITCH PLAN & PROFILE
 STA. 52+00 TO STA. 58+50

SHEET NO.
5
 OF 10



FCA - DUAL CUSTOM SCREEN DETAILS - 38 CFS SCREEN W/BYPASS FLOW



VIEW OF SIMILAR DUAL-CUSTOM FCA SCREEN (PHOTO COURTESY OF FCA)

CONCEPTUAL DESIGN

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1-18277
DESIGNED: RME
DRAWN: BLP
CHECKED: JRW
APPROVED: RME
DATE: NOVEMBER 12, 2018

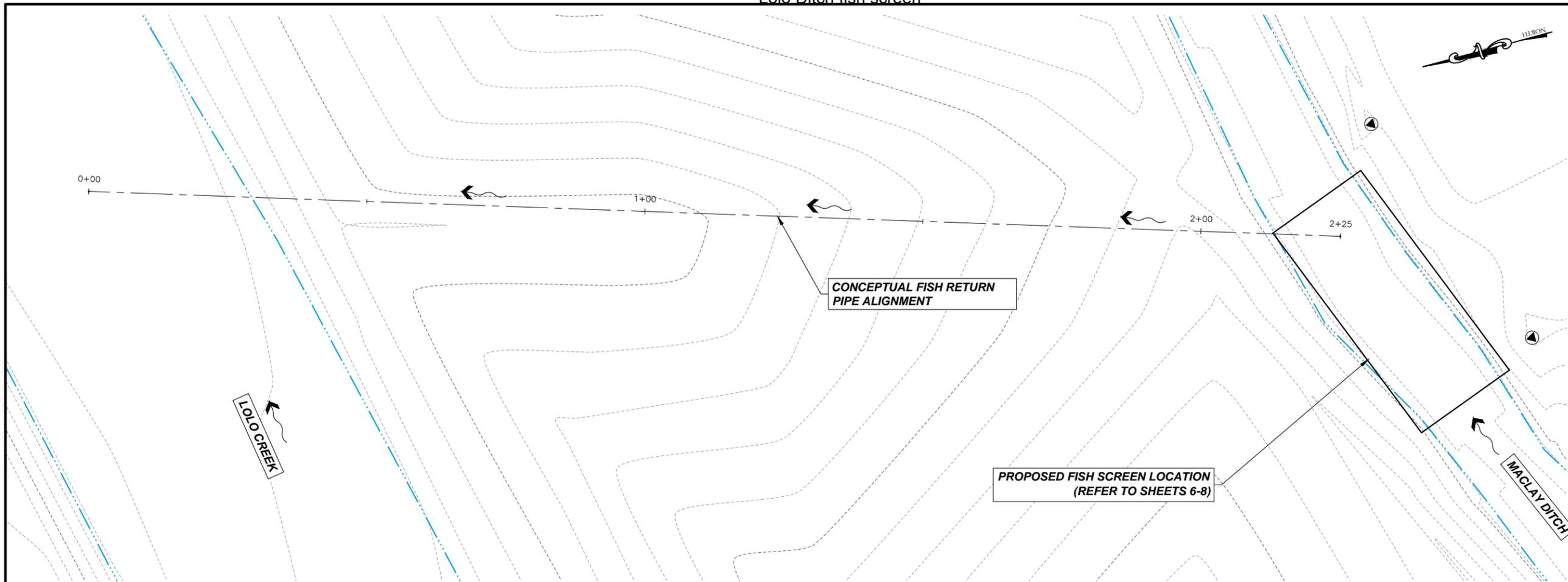


CLARK FORK COALITION
 LOLO CREEK-MACLAY DITCH FISH
 SCREEN
 ALTERNATIVE 3 - FCA SCREEN

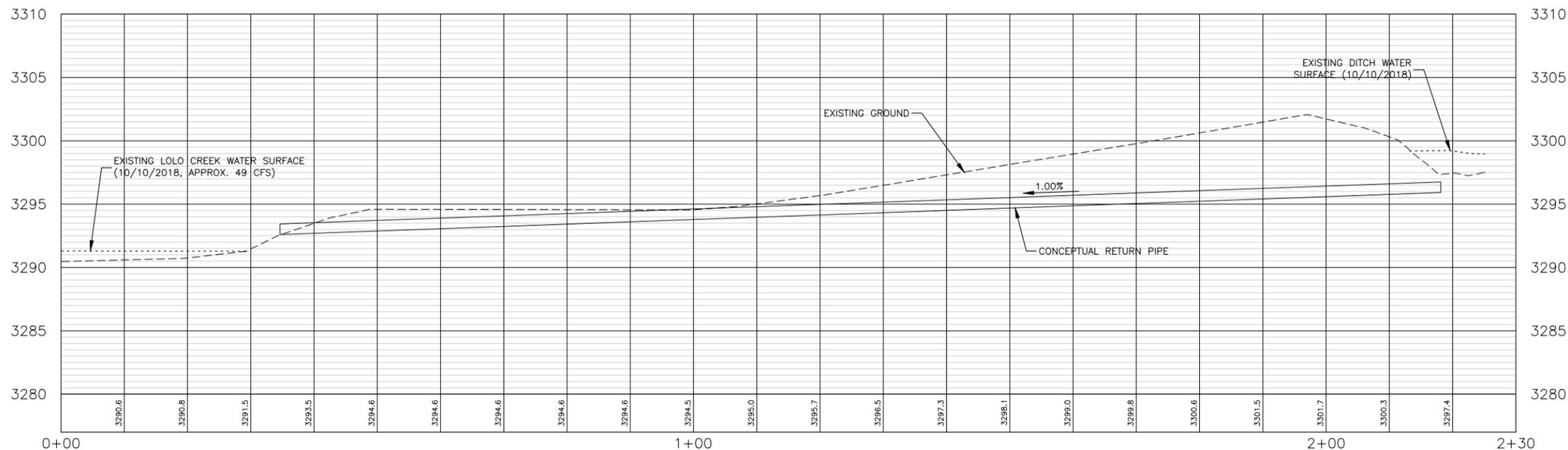
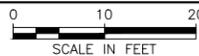
SHEET NO.

8

OF 10



PLAN VIEW OF CONCEPTUAL FISH RETURN - STA. 0+00 TO STA. 2+30



PROFILE VIEW OF CONCEPTUAL FISH RETURN - STA. 0+00 TO STA. 2+30

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 10'

CONCEPTUAL DESIGN

NO.	REVISION DESCRIPTION	BY	DATE

PROJECT: 1-18277
DESIGNED: RME
DRAWN: BLP
CHECKED: JRW
APPROVED: RME
DATE: NOVEMBER 12, 2018



CLARK FORK COALITION
LOLO CREEK-MACLAY DITCH FISH SCREEN
FISH SCREEN RETURN

SHEET NO.

9

OF 10



OVERALL VIEW OF PROJECT SITE: DIVERSION, HEADGATE & DITCH



VIEW OF LOG DIVERSION STRUCTURE LOOKING TOWARDS HEADGATE



VIEW OF LOLO CREEK DOWNSTREAM NEAR GENERAL FISH RETURN LOCATION



VIEW OF MACLAY DITCH DOWNSTREAM OF FLUME



VIEW OF EXISTING FLUME



VIEW OF EXISTING HEADGATE



VIEW OF FISH LADDER AT RIGHT BANK

CONCEPTUAL DESIGN

PROJECT: 1-18277	DESIGNED: RME
DRAWN: BLP	CHECKED: JRW
APPROVED: RME	DATE: NOVEMBER 12, 2018
NO.	REVISION DESCRIPTION



CLARK FORK COALITION
**LOLO CREEK-MACLAY DITCH FISH
 SCREEN**
 SITE PHOTOS

Corrugated Water Screens

In Fall 2018, The Clark Fork Coalition (CFC) and Trout Unlimited (TU) presented two projects to the Future Fisheries review committee that proposed using a Corrugated Water Screen (CW Screen) to screen priority ditches in the Bitterroot basin. One proposal was rejected, and one recommended for funding, but later cut due to budget limitations.

During the review, the committee expressed concerns with funding CW screens, a fish screen that is not yet approved by NOAA's National Marine Fisheries Service (NMFS). The concern was primarily for projects that are targeting large fish that may have more difficulty passing over a screen, or ESA-listed species.

Since that meeting, CFC and TU have done a great deal more research on these screens and have discussed them at length with engineers, project managers using CW Screens in other states, and agency partners. Based on these conversations, we still believe that this technology is one of the most promising on the market today and worth Future Fisheries' investment. Below, we've outlined our rationale for selecting this screen design.



A CW Screen being installed by Trout Unlimited on the South Fork Chalk Creek, Utah

1. CW Screens were designed by Brent Mefford, a retired engineer who spent over 30 years testing fish screen designs at BOR's lab in Colorado. The CW Screens, while not yet NMFS approved, are designed to meet NMFS criteria, limiting potential impacts to fish of all sizes. This is similar to the Coanda screen which is also not NMFS approved, but has a proven track record in Montana. NMFS criteria include approach velocities, sweeping velocities, screen face material, bypass design and operations/maintenance (cleaning mechanisms).
2. CW screens have been tested on juvenile and young of year (30-55mm) fish with no indication of injury or delayed mortality.
3. While CW screens have not been rigorously tested on live, adult fish, hydraulic analyses and initial testing indicate that adult fish would pass over the screen within 2 seconds, without risk of injury or impingement (sweeping velocities > downward velocities). New data from the USFW shows over 100 endangered fish (suckers and chubs) exceeding 400mm have been successfully saved from entrainment by the 60 cfs screen in Green River, Utah in the last several weeks.
4. George Jordan and the US Fish and Wildlife Service support these screens being used to protect ESA-listed species and are contributing \$90,000 to the Lolo Ditch project. CW screens are currently being used in other states to protect ESA-listed fish, including the Green River, UT (razorback sucker, bonytail chub and Colorado pike minnow).
5. TU and CFC have called project managers and even visited several of these installations in other states (see attached summary from Green River, UT). These projects are all performing as designed.

Lolo Ditch fish screen

6. CW screens are substantially cheaper than other screens on the market. In both projects proposed in fall 2018, the second ranking alternative was a Farmers Conservation Alliance Screen. For TU this would have meant a project cost increase of \$26,000 and for CFC an additional \$85,000.

Our organizations appreciate the questions posed by the Future Fisheries committee. Certainly, projects of this investment level require scrutiny and a critical eye. We hope that you will trust that our groups, through thorough conversations with engineers, USFWS, Montana FWP biologists, USFS biologists and partners from successful projects in other states, have done our due diligence in selecting these screens as the best alternative for our projects. Fish screens are inherently difficult to fund, and we will need Future Fisheries support. We believe this technology provides an otherwise unprecedented combination of cost savings and effectiveness that will help us do more with less, and collectively reduce native fish entrainment.

Thank you for your consideration,



Christine Brissette

Trout Unlimited



Jed Whiteley

Clark Fork Coalition

Link to South Fork Chalk Creek CW Screen video (2-5 cfs):

<https://www.youtube.com/watch?v=vn5kDD9KAzg&feature=youtu>

See attachment for Green River CW Screen summary (60cfs)



MEMORANDUM

Date: November 12, 2018

To: Will McDowell, Clark Fork Coalition
Jed Whitely, Clark Fork Coalition

From: Ryan Elliott, PE / Great West Engineering

Subject: **Conceptual Design Submittal** – Lolo Creek (Maclay Ditch) Fish Screen

This memorandum documents the design notes & questions for discussion pertaining to the conceptual design submittal of the Maclay Ditch Fish Screen:

General Design Notes:

- All screens were conceptually designed to not require any modifications to the existing diversion structure. This essentially eliminates an “headgate” mounted or in channel screens due to additional head requirements at the headgate location.
- All screens were conceptually designed for 38 cfs. This amounts to approximately 5-10% return flow (2 to 4 cfs). Total inflow would then be around 40-42 cfs.
- Screen selection assumes powered screens will not be viable at the site. Please confirm.
- No headgate modifications are assumed/explored in this scope of work.
- Vertical plate with paddlewheel could be constructed out of modular steel for the units (assuming a 3 bay assembly). These could then be bolted together at the site. The cost estimate for the vertical plate screen currently shows it housed in a concrete structure. Three modular bays will be a cost increase of the two bays in concrete (approx. \$10-\$15K).
- Access constraints could make concrete delivery more challenging. Recommend CFC speak with a local concrete company for specific site access.
- Some ditch regrading may be necessary for the Corrugated Water Screen Alternative, as it has a higher structure height w/head than the other alternatives.
- Screen siting location is slightly variable and is anticipated to occur just downstream of flume location to across from parking access, a distance of approximately 200 feet.
- Site is located in a FEMA Zone AE floodplain. Preliminary investigation shows the Q100 water surface elevation at the headgate to be close to the top of the headgate structure. Unsure if floodplain specific permitting is required at this point.

Lolo Ditch fish screen

General Design Questions/Clarifications:

- Please provide specific maximum design flow for the fish screen. Currently assumed at 38 cfs. We are in receipt of 2016-2017 provided DNRC ditch flow rates. If 2018 flow rates are available, please provide these too.
- Please provide the design plans for the rotary drum structure that was previously designed at the site.

To: Clark Fork Coalition

Attn: Will McDowell
Stream Restoration Director
140 South Fourth Street West
Missoula, MT 59801
Telephone: (406) 396-7716

BY Email: will@clarkfork.org

From: Lolo Ditch Association, representing owners of Maclay-Lolo Ditch

c/o Helena S. Maclay, Treasurer
P.O. Box 9197
Missoula, MT 59807-9197
Telephone: (406) 721-4210
Mobile: (406) 546-5800
Email: Maclay@montana.com

RE: Support for Application for Funding for Fish Screen on Lolo Ditch, Missoula County, Montana

The undersigned are the members of the Lolo Ditch Association, representatives of ditch owners for the Maclay-Lolo Ditch (“Lolo Ditch”).

We send this letter in support of Clark Fork Coalition’s application for funding for a fish screen on Lolo Ditch as described below. We understand that CFC has acquired data from stream studies supporting the need for a fish screen on Lolo Ditch to prevent entrapment of fish in Lolo Ditch.

We are advised that if the ditch owners support the application, Clark Fork Coalition (“CFC”) intends to apply for one or more grants to support funding for the final design and construction of a fish screen to be installed below the head gate for Lolo Ditch on Lolo Creek. We understand the application will be made in 2018 for installation no later than December 31, 2020. We understand the owners of the Lolo Ditch will not be required to provide funding or in-kind contributions, or have any liability, related to the fish screen, including, for example, design, permitting, construction, installation, routine maintenance (perhaps daily as required by stream conditions), and extraordinary repairs and replacement required to keep the fish screen in operating condition. We understand that CFC and/or its partners such as Montana Fish, Wildlife, and Parks will bear all costs and liabilities associated with the fish screen and will perform all routine and extraordinary maintenance on the fish screen after installation. We understand we will have the right to approve the design of the fish screen, the timing and method of installation, and the ultimate arrangements under which the fish screen is installed, operated, repaired, replaced and maintained. We understand the fish screen will not require changes to the existing head gate or other parts of the ditch system, except as directly needed at the fish screen site, and that the fish screen will allow the ditch users to get their full maximum water right of 1411 miners inches (35.25 cfs) into the ditch below the fish screen.

We have signed this letter on the dates indicated below. This letter may be signed in counterparts with the signature pages collected together. Corrections by a signer for the name of the

representative and/or contact information may be made on this document without approval by other signers. This letter may be transmitted electronically and shall be treated and accepted as original signatures. The parties agree to communicate regarding this letter and the fish screen project by electronic means as allowed by the Montana Uniform Electronic Transactions Act, Mont. Code Ann. § 30-18-101, et seq., and any written document may be created in original or may be an electronic record; any signature may be in original, or by electronic signature.

[Signature pages follow.]

Maclay Ranch LLC

BY: Helena S Maclay
Helena S. Maclay, Manager

Date: 11/28/18

P.O. Box 9197
Missoula, MT 59807-9197
Telephone: (406) 721-4210
Mobile: (406) 546-5800
Email: Maclay@montana.com

only one manager's signature is required

BY: _____
Elizabeth Maclay, Manager
Mobile: (406) 546-5300
Email: Libby@montana.com

Date: _____

MLIC Asset Holdings, LLC [former Maclay and Son Ranch/Bitterroot Trails]

Date: _____

Douglas Gibson
Director, MetLife Agricultural Investments
10801 Mastin Blvd, Suite 930
Overland park, KS 66210
Telephone: (913) 661-2259
Mobile: (515) 724-9386
Email: dagibson@metlife.com (with copy to rblack@metlife.com)

Larry R. Kolb

11-28-2018

Larry R. Kolb

Lazy K Ranch

619 Hazelbank Drive

Lolo, MT 59847

Telephone: (406) 273-0171

Mobile: (406) 544-6873

Or his representative:

Larry J. Kolb

135 West Main Street

Missoula, MT USA 59802

Office: (406) 549-6078

Mobile: (406) 240-9123

Email: lkolb@ksdpc.com

[Most of Former Schroeder Ranch/KeDoMa]

McIntosh Manor Water Users Association, Inc.

BY: *Dan Burke* Date: *11/28/18*

Dan Burke, *President*
P.O. Box 2847
Missoula, MT 59805
Mobile: (406) 240-1116
Email: shc-exec@hotmail.com

BY: _____ Date: _____

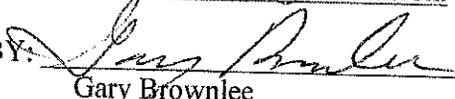
Gary Brownlee, *Treasurer*
Telephone: (406) 273-2359
Email: gsl1@msn.com

[Most of Former Schroeder Ranch/KeDoMa]

McIntosh Manor Water Users Association

BY: _____ Date: _____

Dan Burke
P.O. Box 2847
Missoula, MT 59805
Mobile: (406) 240-1116
Email: shc-exec@hotmail.com

BY:  _____ Date: 11-23-18

Gary Brownlee
Telephone: (406) 273-2359
Email: gsb1@msn.com

[Portions of Former Schroeder Ranch]



Helena S. Maclay

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Missoula, MT 59807-9197

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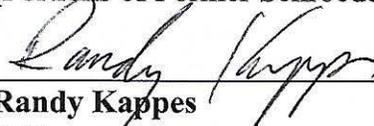
Date: 11/28/18



John W. Larson [contact through Helena S. Maclay]

Date: 11/28/18

[Portions of Former Schroeder Ranch]



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[Portions of Former Schroeder Ranch]

Randy Kappes

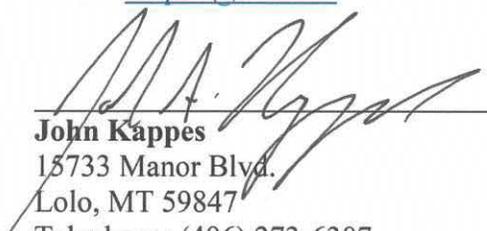
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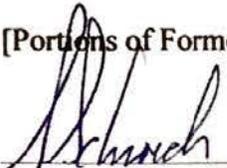
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[Portions of Former Schroeder Ranch]



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Lolo Ditch fish screen

From: [Knotek, William](#)
To: [McGree, Michelle](#)
Subject: Fisheries relevance and support for Lolo -Maclay Ditch Screen
Date: Friday, November 30, 2018 5:22:25 PM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)

Dear Michelle and Panel Members:

The Lolo-Maclay Diversion is located on the lower main stem of Lolo Creek, approximately 3 miles upstream of the Bitterroot River confluence. Lolo Creek is the largest tributary to the lower Bitterroot and serves as a crucial source of wild trout recruitment. It also represents one of the larger tributary systems in the greater Missoula area and helps to supply juvenile trout to this fishery, which is known to be recruitment-limited.

Fish entrainment in the Lolo-Maclay Diversion has been recognized as a major limiting factor for some time. **Trout losses in this ditch are higher than any other diversion in western Montana where I work.** We salvage > 1,000 juvenile trout per year out of this ditch from a few locations that are easy to access and this surely represents < 10% of the total number of salmonids that die when the diversion (>15 miles long) is turned off each fall. **There is no doubt that this diversion is entraining the majority of the trout attempting to migrate out of Lolo Creek to the Bitterroot River** and this is surely contributing to the recruitment issues in the adjacent river reaches. I don't believe it is an exaggeration to say that there are higher fish densities in this ditch than occur in Lolo Creek downstream of the diversion point.

Installing a fish screen on this diversion has been a regional priority for more than decade, but the issue of maintenance has prevented project installation. The Clark Fork Coalition and other groups have worked diligently to negotiate a fish screen project with the Lolo-Maclay water users over the past few years. The application to Future Fisheries in this funding cycle is the match funding that will allow screening to occur.

I strongly support this project and encourage panel members to grant the request for Future Fisheries funds. It would be very difficult to find a more worthy project or one that better fits the objectives of the Future Fisheries Improvement Program

Sincerely,

W. Ladd Knotek

Fisheries Management Biologist

Montana Fish, Wildlife & Parks

3201 Spurgin Road

Fish Entrainment Data - 2016

Lolo-Maclay Irrigation Canal

Background/Context: The Lolo-Maclay Canal is a large diversion of off lower Lolo Creek that is known to entrain very high numbers of trout and other fish species from lower Lolo Creek. Over the past decade, negotiations with the ditch company have been ongoing regarding fish screen installation and maintenance at the site. In recent years, fish salvage was conducted at several locations by electrofishing within the upper 1.5 miles of the canal (total canal length > 5 miles) to supplement the wild fishery and document diversion impacts. The data below provide an indication of the fish densities, species and sizes encountered in 2016 (typical of years ditch has been 'sampled').

Overall, we estimate that fish salvaged from the five sites below represent < 10% of the total entrainment in the canal. In addition, it is important to note that the lower Bitterroot and middle Clark Fork River sections in the Missoula area are recruitment limited and typically support 250-350 catchable trout per mile.

Fish Salvage Locations in Ditch

Site 1: Below headgate/return gate – 635 trout, 35 mountain whitefish, 15 longnose sucker, mult sculpin

Site 2: Balsamroot Dr -130 trout, 2 mountain whitefish, 5 longnose sucker, few sculpin

Site 3: Mormon Cr Rd Crossing – 410 trout, 10 mountain whitefish, 3 longnose sucker, few sculpin

Site 4: Nature Dr Crossing - 630 trout, 18 mountain whitefish, 1 longnose sucker, few sculpin

Site 5: Sapphire Dr Crossing - 275 trout, 9 mountain whitefish, 2 longnose sucker

TOTAL FISH SAVAGED AT 5 SITES (REPRESENTS < 5% OF TOTAL DITCH SYSTEM):

2,143 TROUT – Includes westslope cutthroat, rainbow x cutthroat hybrids, brown and brook trout (length range 65-520 mm)

75 MOUNTAIN WHITEFISH (90-120 mm)

27 LONGNOSE SUCKER (78-130 mm)

The is the worst fish entrainment situation that we are aware of in the region, particularly given the location and impact to the receiving river fishery.

22 April, 2019

TO: Michele McGree, Montana Fish Wildlife and Parks

FROM: Will McDowell and Jed Whiteley, Clark Fork Coalition

RE: TRIP REPORT ON VISIT TO GREEN RIVER CANAL FISH SCREEN, UTAH

On April 15-17 Jed Whiteley and Will McDowell traveled to Green River, Utah, and Grand Junction, Colorado to view fish passage and particularly fish entrainment equipment installed by the U.S. Bureau of Reclamation (Bureau) as part of the Upper Colorado River Fish Recovery Implementation Program. In particular, we wanted to see the corrugated water screen recently installed by the Bureau and its contractors on the Green River Canal right bank just north of Green River, Utah (39.0753,-110.1472).

The corrugated water screen installed at this location is the first larger size installation of this recently invented screen. The multi-panel screen on the Green River Canal is approximately 44 feet long and 6.5 feet wide. It consists of multiple modular panels of corrugated screen set at a slight incline below a concrete weir. During our visit, about 10 days after installation, the canal was running about 80 cfs, with 60 cfs being screened and routed downstream into the canal, about 5 cfs being discharged across the screen face into the fish bypass channel, and about 15 cfs unscreened flow being discharged downstream beyond the weir, and falling through a gate with a strong vertical drop, to avoid excessive sedimentation in the settling area above the weir. The Bureau contracted with Wild Fish Engineering (Brent Mefford) to provide the screen and the screen set-up and tuning.

Corrugated screen when dry. Looking downstream into the gated slot that allows sediment to be carried back to river. Not all screen setups will have this feature, but sediment is a huge problem on Colorado River.



PHOTO 1: Top of weir wall where screen begins. Note special screen cleaning brushes in background.

Lolo Ditch fish screen

The incline on this screen is adjustable, by turning screws on the underside of the upper end of the screen (see PHOTO 3). This setup had approximately 2.5 percent slope into the fish bypass, resulting in velocities of 4 to 5 feet/second across the screen. Floating material moves across the screen in a matter of less than two (2) seconds. Once it crosses the weir, it is highly improbable that a fish could hold itself on the screen for more than a couple seconds.

The Bureau works with the US Fish and Wildlife Service (USFWS) on tracking federally endangered fish of the Upper Colorado. The primary species they are tracking in this area are Colorado Pikeminnow and Humpback Chub, which vary in size from fry to three-foot long adult pikeminnows. Some of the native fish species spawn immediately above the Green River Canal diversion dam, and the fry move passively with the current, which is why it is deemed essential to screen this canal for native fish recovery, even though the flow diverted (80 cfs) is a minor part of the total river flow (approximately 2000 cfs while we were there, goes down to 800 cfs).

Tagged fish are tracked by USFWS using PIT tags and sensor arrays both above and below the screens and dams. In the first 10 days of operation the USFWS has already detected fish being passed over the Green River Canal corrugated screen, as well as fish swimming back out of the canal after encountering the screen weir. One interesting fact is that the concrete weir wall at the upper end of the screen is a deterrent to fish going over the screen. The native Colorado river fish are bottom-dwelling in habit, similar to the bull trout, and hesitate to swim to the surface to go over the weir, especially since flow over the weir is shallow. The Bureau has found in some sites in the Upper Colorado that simply passing the entire canal flow over a projecting vertical weir will deter many fish from traveling further down the canal, even without a screen, hence fewer fish are actually exposed to screens.

Cleaning the screen is necessary on the Colorado River, due to very heavy organic matter (slime) suspended in the water column of the very silty river water. The need for cleaning is approximately every two to three days at this facility. The cleaning is done using a special brush provided by the screen inventor, so that spiral brushes fit perfectly between the corrugations. Brushing from the bottom up, against the flow appears to be most effective, hence, a gangplank over the fish return canal is the best place to stand while brushing upward on the screen.

In smaller installations the modular screens can simply be set on angle iron in the box (either concrete or pre-fabricated steel). Hence, removal of smaller screen panels, if necessary, can be done by hand, or with a small piece of machinery, depending on panel size. Or the panels can be bolted in place.

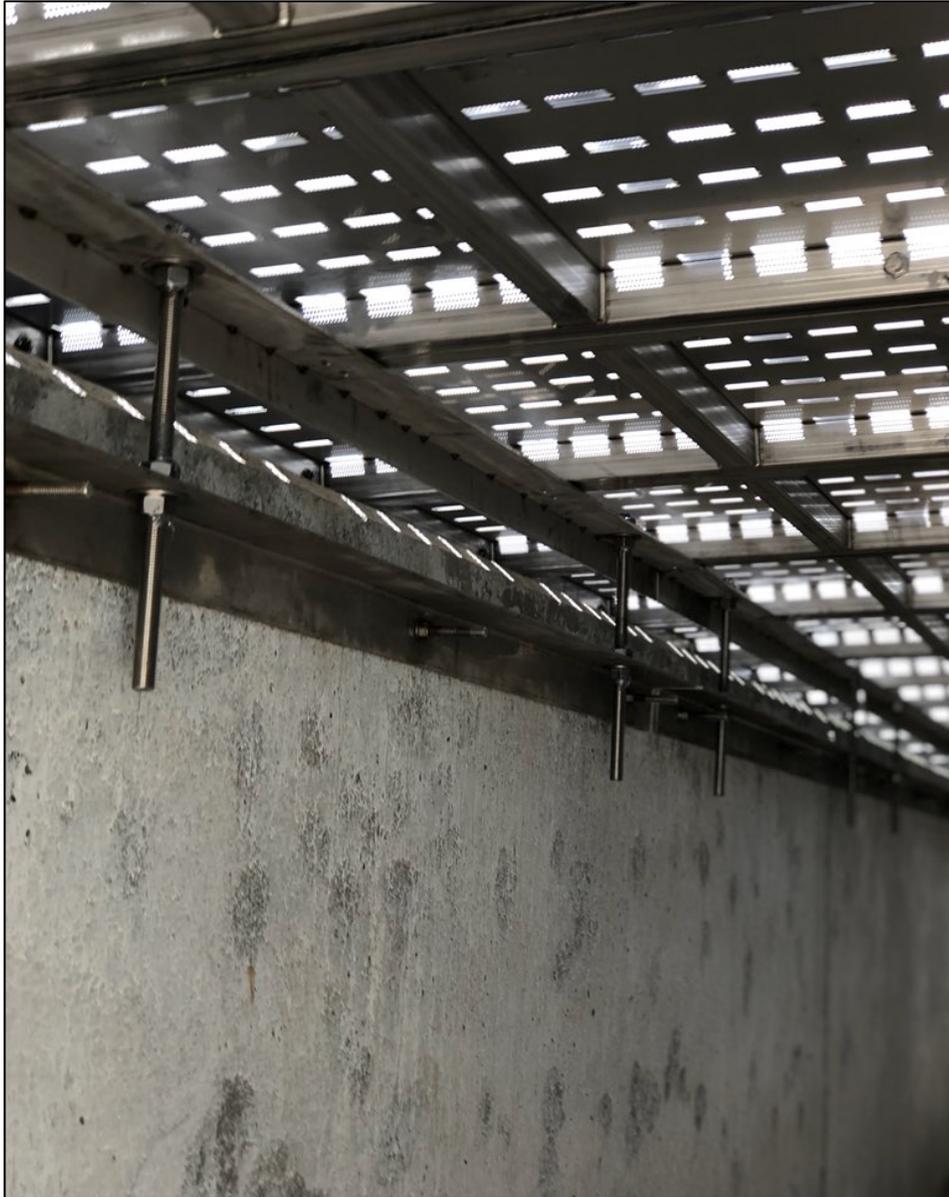
Lolo Ditch fish screen



PHOTO 2: Close up of corrugated water screen on Green River Canal in operation April 16, 2019. Note high water velocity, hydraulic jump and submergence of bottom of screen below my hand. Submergence increases screen intake, but can be reduced, if desired, by adjusting the outlet of the bypass channel, creating a small dropoff at end of screen.

The screen is made of stainless steel, with corrugations about 2.75 inches tall. The peaks are about 3.5 inches apart. The bottom of the trough is smooth stainless steel and the trough is 0.5 inch wide at the bottom, and widens as it ascends towards peaks of each corrugation. The first 0.37 inch up from the sides of troughs are smooth, and then the punch-plate holes (0.0938 inch or 3/32 inch) begin and go up and over the corrugations. The total open area of the screen is about 40 percent. The double baffle plates under the screen (PHOTO 3) are adjusted to between 10% and 20% open area, depending on the flow, to assure adequate bypass flow. The adjustment of the screen incline and the baffle plates should only need to be done once, at installation. Wild Fish Engineering was onsite to adjust incline and baffles at this site during installation and pre-testing.

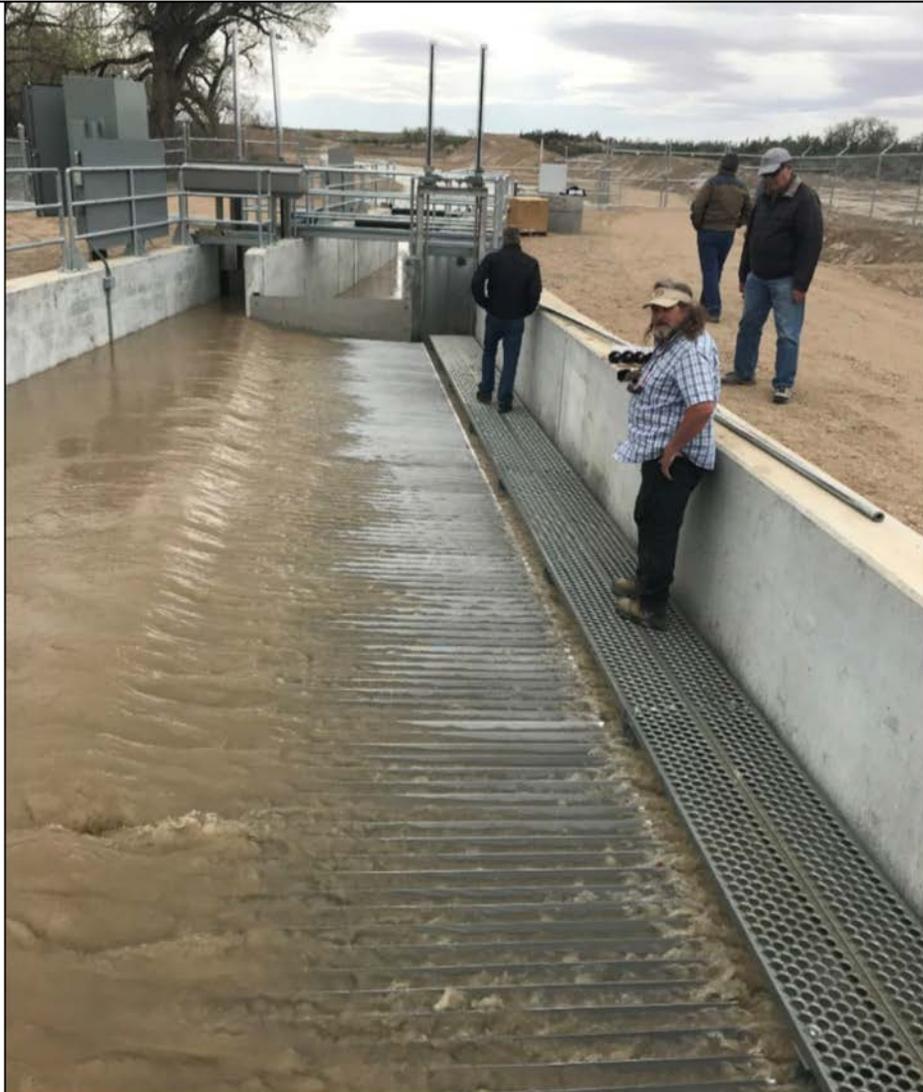
Lolo Ditch fish screen



Adjustable double baffle plates under the screen control the flow through the system, not the screen open area. Baffles should only have to be set once at screen installation. Note the bolts and nuts which are used to set the incline of the screen at installation. This allows you to adjust sweeping velocity across screen.

Lolo Ditch fish screen

Green River Canal fish screen in full operation with 60 cfs passing through screen. Bypass flow is going under the catwalk on right and back to river. One adjustment will be to raise the catwalk higher above the bypass flow to allow larger debris to exit easily. A gate at end of bypass channel controls whether there is backwater or a drop-off from screen to bypass channel. Obviously bypass channel must be well-watered to cushion fish coming off screen if there is a drop. Some flow is exiting at the gated slot sediment sluice in the upper left part of picture—in many installations this gate would be closed, and only opened occasionally to sluice out sediment. Pictured are Brent Mefford (inventor), the BuRec civil engineer designer/project manager and BuRec engineering supervisor from Denver. BuRec is favorably impressed with this screen for use with endangered Colorado River fish. BuRec Upper Colorado project has designed, built, and field-tested various types and scales of fish screens for over 15 years, up to a vertical plate traveling brush screen in western Colorado that has a 1640 cfs capacity. They cite ease of operation and maintenance as a big advantage of this screen type, as well as the hydraulic performance documentation from laboratory.



1. Fish rescued from the Lolo Ditch this year



2. One of many 5 gallon buckets worth of fish recued.



3. FWP biologists and volunteers rescuing trapped fish

