COLORADO
Parks and Wildlife
Department of Natural Resources

Water Resources Section – Capital, Parks
and Trails Branch
6060 Broadway
Denver, CO 80216
P 303.297.1192 | F 303.291.7456

28 December 2017

Ms. Linda Bassi, Chief
Stream and Lake Protection Section
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver CO 80203

SUBJ: Instream Flow Recommendations for Streams in Water Division 5, Rio Blanco County; Hahn Creek and Lost Creek, to be Presented at the January 22-23, 2018 CWCB Meeting

Dear Linda:

The information contained in and referred to in this letter form the scientific and biological basis for instream flow (ISF) recommendations for Hahn Creek and Lost Creek in Water Division 5. These flow recommendations will be presented for consideration by the Colorado Water Conservation Board (CWCB or Board) at their January, 2018 regular meeting. The field investigations relating to these ISF recommendations were conducted by Colorado Parks and Wildlife (CPW) personnel; these investigations were initiated and concluded in 2017. These stream reaches were first presented to interested parties at the ISF Workshop in January, 2017. It is the CPW staff's opinion that the information contained in this letter is sufficient for the Board's staff to initiate ISF appropriations on the above referenced water bodies and to specifically address the findings required in Rule 5(i) of the Instream Flow Program Rules.

The State of Colorado's Instream Flow (ISF) Program was created in 1973 when the Colorado General Assembly passed Senate Bill 97 which called for the recognition of "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). This statute vests the Board with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's ISF Program, the statute directs the Board to request instream flow recommendations from other state and federal agencies. The CPW is recommending these segments of Hahn Creek and Lost Creek to the Board for inclusion into the ISF Program. These two segments should be considered for inclusion into the ISF Program because they have natural environments that can be preserved to a reasonable degree with an instream flow water right.

CPW participates in the ISF Program and develops instream flow recommendations for the Board's consideration in an effort to address CPW's legislative declarations "… that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors … and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities" (See §33-1-101 (1) C.R.S.) and "… that the natural, scenic, scientific, and outdoor recreation areas … protected, preserved, enhanced and managed for the use, benefit, and enjoyment of the people of this state and (its) visitors … and that, to carry out such program and policy, there shall be a continuous operation of acquisition, development, and management of … lands, waters, and facilities." (See §33-10-101 (1) C.R.S.). In addition to these statutory directives, the current CPW strategic planning documents (*DOW Strategic Plan*, 2010 and 2016-17 Operational Plan) state that "[h]ealthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations…by protecting and enhancing the quality and quantity of aquatic habitats." and that "Ensuring the long term viability of native fish and wildlife … and sport fish populations." – these statements encapsulate CPW's primary objectives and provide a guide to the agency's linkage to the goals and objectives of the CWCB ISF Program.

Natural Environment

As stated above, Hahn Creek and Lost Creek were identified by CPW at the January, 2017 CWCB ISF workshop. CPW's interest in these streams is based on the fact that they were identified in the Colorado River Cutthroat Trout Conservation Agreement and Strategy (2006) as water bodies with conservation populations of Colorado River cutthroat trout. These documents, and others dealing with cutthroat trout management, can be found on the Colorado Parks and Wildlife website (see http://cpw.state.co.us/learn/Pages/Conservation-Trout.aspx). Hahn Creek and Lost Creek are therefore critical to the overall range-wide Colorado River cutthroat trout conservation effort. Therefore, the Hahn Creek and Lost Creek fish populations are important to CPW and, in our opinion, are worthy of protection via an instream flow water right.

Attached you will find summary information on the Hahn Creek and Lost Creek fish populations. This data was collected by CPW biologists utilizing standard electrofishing techniques. The data shows multiple age classes of Colorado River cutthroat trout; fortunately, no other trout species appear to be present in the Lost Creek system at this point in time. This population structure is indicative of natural reproduction; no stocking of fish occurs in the Lost Creek basin. Therefore, CPW is of the opinion that there is a flow dependant natural environment in both of these creeks.

Flows Necessary to Preserve the Natural Environment

In 2017, CPW personnel collected stream cross section data to be used as input into the R2CROSS model. Two cross section data sets were collected on Hahn Creek and one on Lost Creek. Pebble count data was collected at both locations in case the standard R2CROSS analysis yielded out-of-range results thus requiring the use of the Thorne and Zevenbergen (T&Z) R2CROSS subroutine. The T&Z subroutine utilizes the D84 particle size from the pebble count and several other equations to vary the roughness coefficient and calculate velocity within the R2CROSS staging table. The field data sheets and R2CROSS runs are attached. On both streams, the T&Z subroutine was needed due to out-of-range results using the R2CROSS

standard procedure. The results of the R2CROSS analysis for each of the two creeks are summarized on the attached FACT SHEETS. For Hahn Creek, the initial R2CROSS generated flow recommendations were 2.6 cfs Summer and 1.6 cfs Winter. Similarly, for Lost Creek, the initial R2CROSS generated flow recommendations were 2.3 cfs Summer and 1.3 cfs Winter.

Some USGS stream gage data exists for the Lost Creek basin; there is a historic gage at the bottom of the Lost Creek basin. At the time of our 2017 field data collection, we observed that there is considerable drainage basin area (the Long Park Creek sub basin and upper Lost Creek above the confluence with Hahn Creek) that does not contribute stream flow to the system outside of the spring runoff period. These observations led us to several conclusions relative to the ISF recommendations for the Lost Creek basin. All of the flow in the non-runoff period measured at the Lost Creek Gage comes from Hahn Creek; we abandoned the idea of ISF recommendations on upper Lost Creek (above Hahn Creek) and on Long Park Creek - both of these creeks were essentially dry at the time of our field visit. We then concluded that the USGS StreamStats program was the best water availability tool for the Hahn Creek sub basin and the USGS gage was best for the Lost Creek flows. Using StreamStats, the Hahn Creek R2CROSS flow recommendations were refined as follows:

- 2.6 cfs (5/1 - 8/31)
- 1.6 cfs (9/1 - 10/31) (needed for cutthroat rearing and growth)
- 0.75 cfs (11/1 - 4/30) (for overwintering adults and juveniles - limited by water availability per StreamStats)

Using the Lost Creek gage records, the Lost Creek R2CROSS flow recommendations were also refined to be:

- 2.3 cfs (4/1 - 8/15)
- 1.8 cfs (8/16 - 9/30) (needed for cutthroat rearing and growth)
- 1.3 cfs (10/1 - 3/31) for overwintering adults and juveniles

Final water availability adjustments may still have to be made to these flow recommendations after the detailed water availability analyses are completed by CWCB staff.

As stated above, the purpose of this letter is to formally transmit these ISF recommendations from CPW to CWCB for the Board's consideration for the 2018 appropriation year. Please refer to the fact sheets and supporting documentation (attached) for additional information.

CPW personnel will be present at the January, 2018 CWCB meeting to answer any questions that the Board might have regarding these flow recommendations. We appreciate your consideration.

Sincerely,

Jay W. Skinner
CPW Instream Flow Program Coordinator

Attachments (as stated)

FACT SHEET

Hahn Creek

Water Division 5, Rio Blanco County

Upper Terminus: The headwaters at a point approximately located at 40 degrees 6' 18.67" N, 107 degrees 29' 59.77" W

Lower Terminus: The confluence with Lost Creek at approximately 40 degrees 5' 58.0" N, 107 degrees 27' 42.67" W

Approximate Length: 3.2 miles

Natural Environment:

Hahn Creek has a high value natural environment worthy of immediate instream flow protection. It waslisted in the Colorado River Cutthroat Trout Conservation Plan as a stream with a pure conservation population of the species; Hahn Creek continues to support a self-sustaining population of Colorado River cutthroat trout (CRN). Hahn Creek was last sampled in August, 2015 utilizing standard electrofishing techniques. The 2015 data shows multiple age classes (5 or more) of CRN and a wide range of sizes from young of the year (1 inch) to 11 inch adults. Hahn Creek's natural environment also has a diverse macroinvertebrate community and some beaver dam complexes in the headwaters.

R2CROSS Results:

In 2017, CPW and CWCB personnel collected R2CROSS and Wolman Pebble Count data at 2 sites within the proposed ISF segment. The pebble count data was used to develop flow recommendations because the standard (constant Manning's "n") R2CROSS runs did not have in-range values to accurately develop summer flow recommendations. Both summer and winter flows come by way of averaging the results from each cross section (2.6 cfs Summer/1.6 cfs Winter). The results of the user supplied d84 R2CROSS modeling runs are summarized in the following table:

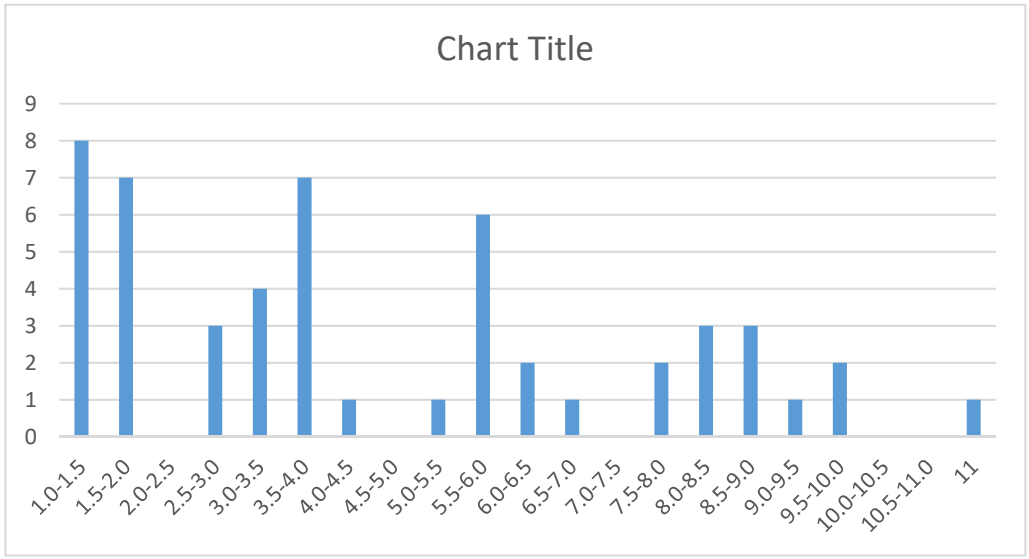
Date	Q Measured	250% - 40%	Flow meeting two criteria	Flow meeting three criteria
8/23/2017	0.81 cfs	N/A*	1.2 cfs	2.4 cfs
8/23/2017	0.98 cfs	N/A*	1.9 cfs	2.7 cfs

"*" = User supplied d84 and Thorne and Zevenbergen subroutine used to calculate results; highlighted values used for ISF recommendation.

CPW recommends an instream flow to protect the Hahn Creek CRN conservation population in the following amounts: 2.6 cfs for the summer seaaon and 1.6 cfs for the winter. After taking into consideration water availability (using USGS StreamStats), 2.6 cfs is only available through 8/31 and the winter base flows in Hahn Creek fall to 0.75 cfs November through April. The final CPW flow recommendations for Hahn Creek are 2.6 cfs (5/1 - 8/31), 1.6 cfs (9/1 – 10/31) is needed for the CRN rearing and growth season, and 0.75 cfs (11/1 – 4/30) for overwintering adults and juveniles. These flows should be sufficient to preserve the Hahn Creek natural environment to a reasonable degree.

27967 Hahn Creek 8/28/2015
WR0704 1 mi. ABV Lost Creek
TWO-PASS REMOVAL

Species	Bin	Numfish
CRN	1.0-1.5	8
CRN	1.5-2.0	7
CRN	2.0-2.5	0
CRN	2.5-3.0	3
CRN	3.0-3.5	4
CRN	3.5-4.0	7
CRN	4.0-4.5	1
CRN	4.5-5.0	0
CRN	5.0-5.5	1
CRN	5.5-6.0	6
CRN	6.0-6.5	2
CRN	6.5-7.0	1
CRN	7.0-7.5	0
CRN	7.5-8.0	2
CRN	8.0-8.5	3
CRN	8.5-9.0	3
CRN	9.0-9.5	1
CRN	9.5-10.0	2
CRN	10.0-10.5	0
CRN	10.5-11.0	0
CRN	11	1



From: Eyre - DNR, Tory [mailto:tory.eyre@state.co.us]
Sent: Monday, December 04, 2017 12:00 PM
To: Jay Skinner
Subject: Lost and Hahn Creek

Hi Jay,

Both Hahn and Lost Creek are conservation populations of CRCT. A 1999 sample in Hahn Creek showed an A rating in purity. I do not have a rating for Lost Creek but the genetics we do have show they are pure as far as we know.

Attached are LF histograms and the associated bins from the most recent samples from both Haughn and Lost Creeks. I put them in an excel format so that you can alter them for whatever design you want but I can do a more formal format with our seal and such if you would like.

Thanks,

Tory

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Tory Eyre
Aquatic Biologist
COLORADO
Parks and Wildlife
Department of Natural Resources
P 970.878.6074 | C 970.942.3053
73485 Highway 64, Meeker, CO 81641
Tory.Eyre@state.co.us | cpw.state.co.us

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: HAHN CREEK					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION:					
DATE: 8/23/17	OBSERVERS: JAY SKINNER, JEFF BEASSLER, BRANDY LOGAN				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: RIO BLANCO	WATERSHED:	WATER DIVISION: 6	DOW WATER CODE:		
MAP(S): USGS:					
USFS:					

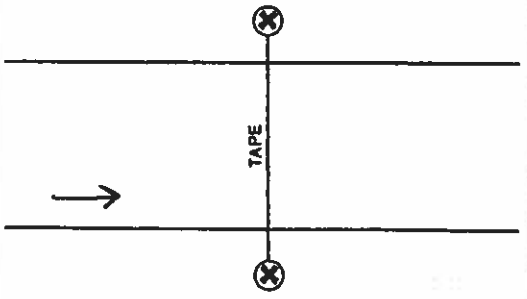
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES (NO)	METER TYPE: MARSH			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE:		PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	9.0 ft	6.98
③ WS Downstream	6.0 ft	6.44
SLOPE		

SKETCH



LEGEND:
- Stake ⊗
- Station ①
- Photo ◇①→
- Direction of Flow ←→

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: ____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO: 1	DATE: 8/23	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 12:46

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
REW	6.44										
LEW	6.42										
LPIN	0		5.30								
GL	1.5		5.55								
	3.0		6.05								
	4.2		6.05								
LEW	4.4		6.42	.20					.02		
	4.7		6.70	.20					.06		
	5.0		6.70	.25					.21		
	5.3		6.80	.30					.29		
	5.6		6.65	.25					.30		
	5.9		6.65	.25					.21		
	6.2		6.60	.20					.32		
	6.5		6.70	.20					.50		
	6.8		6.75	.25					.55		
	7.1		6.70	.25					.59		
	7.4		6.80	.30					.59		
	7.7		6.75	.35					.63		
	8.0		6.70	.30					.68		
	8.3		6.70	.20					.74		
	8.6		6.7	.20					.76		
	8.9		6.75	.20					.76		
	9.2		6.70	.20					.77		
	9.5		6.60	.25					.72		
	9.8		6.70	.20					.69		
	10.1		6.65	.20					.65		
	10.4		6.65	.20					.54		
	10.7		6.60	.15					.31		
	11.0		6.55	.10					.29		
	11.3		6.60	.15					.32		
	11.6		6.55	.15					.27		
	11.9		6.55	.10					.21		
	12.2		6.55	.10					.21		
REW	12.6		6.44	.10					0		
	13.3		5.90								
	14.0		5.75								
GL	14.7		5.55								
RPIN	15.5		5.20								
TOTALS:											

End of Measurement	Time:	Gage Reading: _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME:	Hahn Creek
XS LOCATION:	
XS NUMBER:	1
DATE:	8/23/2017
OBSERVERS:	J. Skinner, J. Baessler, B. Logan
1/4 SEC:	
SECTION:	
TWP:	
RANGE:	
PM:	
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	
USGS MAP:	
USFS MAP:	
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.036 ft / ft

Level and Rod Survey

CHECKED BY:.....DATE.....

ASSIGNED TO: .....DATE.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 36					
	S	0.00	5.30			0.00	0.00	0.00
1	GL	1.50	5.55			0.00	0.00	0.00
		3.00	6.05			0.00	0.00	0.00
		4.20	6.05			0.00	0.00	0.00
	LEW	4.40	6.42	0.20	0.02	0.05	0.00	6.22
		4.70	6.70	0.20	0.06	0.06	0.00	6.50
		5.00	6.70	0.25	0.21	0.08	0.02	6.45
		5.30	6.80	0.30	0.29	0.09	0.03	6.50
		5.60	6.65	0.25	0.30	0.08	0.02	6.40
		5.90	6.65	0.25	0.21	0.08	0.02	6.40
		6.20	6.60	0.20	0.32	0.06	0.02	6.40
		6.50	6.70	0.20	0.50	0.06	0.03	6.50
		6.80	6.75	0.25	0.55	0.08	0.04	6.50
		7.10	6.70	0.25	0.59	0.08	0.04	6.45
		7.40	6.80	0.30	0.59	0.09	0.05	6.50
		7.70	6.75	0.35	0.63	0.11	0.07	6.40
		8.00	6.70	0.30	0.68	0.09	0.06	6.40
		8.30	6.70	0.20	0.74	0.06	0.04	6.50
		8.60	6.70	0.20	0.76	0.06	0.05	6.50
		8.90	6.75	0.20	0.76	0.06	0.05	6.55
		9.20	6.70	0.20	0.77	0.06	0.05	6.50
		9.50	6.60	0.25	0.72	0.08	0.05	6.35
		9.80	6.70	0.20	0.69	0.06	0.04	6.50
		10.10	6.65	0.20	0.65	0.06	0.04	6.45
		10.40	6.65	0.20	0.54	0.06	0.03	6.45
		10.70	6.60	0.15	0.31	0.05	0.01	6.45
		11.00	6.55	0.10	0.29	0.03	0.01	6.45
		11.30	6.60	0.15	0.32	0.05	0.01	6.45
		11.60	6.55	0.15	0.27	0.05	0.01	6.40
		11.90	6.55	0.10	0.21	0.03	0.01	6.45
		12.20	6.55	0.10	0.21	0.04	0.01	6.45
	REW	12.60	6.44	0.00	0.00	0.00	0.00	0.00
		13.30	5.90			0.00	0.00	0.00
		14.00	5.75			0.00	0.00	0.00
1	GL	14.70	5.55			0.00	0.00	0.00
	S	15.50	5.20			0.00	0.00	0.00
					Totals	1.71	0.81	

STREAM NAME: Hahn Creek
XS LOCATION: 0
XS NUMBER: 1

Thorne-Zevenbergen D84 Correction Applied
User Supplied D84 = 0.24

GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

Velocity based on test of R/D84>1

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.55	13.20	0.82	1.25	10.88	14.02	100.0%	0.78	61.77	5.68
	5.60	12.88	0.80	1.20	10.25	13.69	97.6%	0.75	56.26	5.49
	5.65	12.56	0.77	1.15	9.61	13.35	95.2%	0.72	50.90	5.30
	5.70	12.23	0.73	1.10	8.99	13.01	92.8%	0.69	45.84	5.10
	5.75	11.91	0.70	1.05	8.39	12.67	90.4%	0.66	41.07	4.90
	5.80	11.53	0.68	1.00	7.80	12.27	87.5%	0.64	36.73	4.71
	5.85	11.14	0.65	0.95	7.23	11.88	84.7%	0.61	32.68	4.52
	5.90	10.76	0.62	0.90	6.69	11.48	81.9%	0.58	28.91	4.32
	5.95	10.54	0.58	0.85	6.15	11.24	80.1%	0.55	25.09	4.08
	6.00	10.33	0.55	0.80	5.63	11.00	78.4%	0.51	21.53	3.82
	6.05	10.11	0.51	0.75	5.12	10.76	76.7%	0.48	18.23	3.56
	6.10	8.82	0.53	0.70	4.68	9.42	67.2%	0.50	17.06	3.65
	6.15	8.72	0.49	0.65	4.24	9.28	66.2%	0.46	14.23	3.36
	6.20	8.63	0.44	0.60	3.81	9.14	65.2%	0.42	11.63	3.06
	6.25	8.54	0.40	0.55	3.38	9.00	64.2%	0.38	9.26	2.74
	6.30	8.45	0.35	0.50	2.95	8.86	63.2%	0.33	7.13	2.42
	6.35	8.36	0.30	0.45	2.53	8.72	62.2%	0.29	5.26	2.08
	6.40	8.27	0.26	0.40	2.12	8.58	61.2%	0.25	3.64	1.72
WL	6.45	8.14	0.21	0.35	1.70	8.42	60.0%	0.20	2.64	1.55
	6.50	7.90	0.16	0.30	1.30	8.15	58.2%	0.16	1.45	1.11
	6.55	7.67	0.12	0.25	0.91	7.89	56.3%	0.12	0.70	0.76
	6.60	6.13	0.10	0.20	0.58	6.33	45.1%	0.09	0.35	0.59
	6.65	5.03	0.06	0.15	0.30	5.17	36.9%	0.06	0.12	0.40
	6.70	3.52	0.03	0.10	0.10	3.61	25.7%	0.03	0.03	0.25
	6.75	0.75	0.02	0.05	0.02	0.78	5.6%	0.02	0.00	0.08
	6.80	0.02	0.00	0.00	0.00	0.02	0.1%	0.00	0.00	0.00

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: HAUN CREEK					CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: DOWNSTREAM FROM XS 1					
DATE: 8/23/17	OBSERVERS: JS, JB, BL				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: RIO BLANCO	WATERSHED:	WATER DIVISION: 6	DOW WATER CODE:		
MAP(S):	USGS:				
	USFS:				

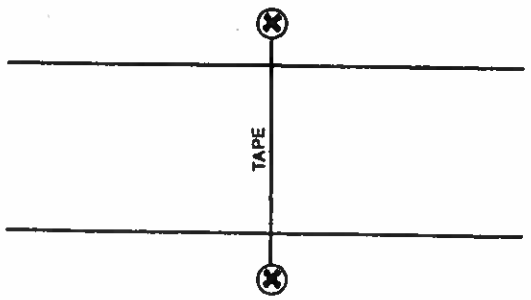
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / (NO)	METER TYPE:			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:		PHOTOGRAPHS TAKEN: (YES) NO	NUMBER OF PHOTOGRAPHS:	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	5.29 / 5.24
② WS Upstream	6.0	5.23
③ WS Downstream	14.5	5.55
SLOPE		

SKETCH



LEGEND:
- Stake ⊗
- Station ①
- Photo ◇①→
- Direction of Flow ←→

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: _____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

COMMENTS

FISH observed

$d_{84} = 97\ mm = \frac{ft}{12in} \frac{1in}{2.54cm} \frac{1cm}{10mm} = 0.32\ ft$

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
HAHN CREEK	2	8/23/17	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1:39 PM

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
GL	-5.0		4.83								
LPIN	0		4.81								
	2		5.0								
LEW	4		5.29	0							
	4.3		5.45	.15					Ø		
	4.6		5.44	.15					Ø		
	4.9		5.43	.15					.37		
	5.2		5.43	.10					.77		
	5.5		5.49	.2					1.29		
	5.8		5.43	.15					.92		
	6.1		5.38	.10					.99		
	6.4		5.47	.20					.82		
	6.7		5.54	.25					.49		
	7.0		5.52	.25					.58		
	7.3		5.51	.2					.75		
	7.6		5.50	.25					.74		
	7.9		5.49	.2					1.03		
	8.2		5.45	.2					.57		
	8.5		5.50	.2					.58		
	8.8		5.47	.2					1.38		
	9.1		5.50	.2					.97		
	9.4		5.54	.35					.81		
	9.7		5.50	.3					.79		
	10.0		5.60	.3					.48		
	10.3		5.49	.25					.07		
	10.6		5.44	.2					.05		
	10.9		5.40	.15					.05		
	11.2		5.44	.2					.23		
	11.5		5.44	.2					Ø		
	11.8		5.34	.1					.02		
	12.1		5.42	.15					.27		
	12.4		5.39	.15					.25		
	12.7		5.37	.1					.44		
	13.0		5.40	.15					.35		
	13.3		5.38	.1					Ø		
	13.6		5.33	.1					Ø		
14.3	13.9		5.34	.1					Ø		
	14.1		5.40	.15					.34		
REW	14.3		0	0							
	16.0		4.98								
	16.5		4.75								
GL TO HDWN	17.8		3.70								

End of Measurement	Time: 1:58	Gage Reading: _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME:	Hahn Creek
XS LOCATION:	
XS NUMBER:	2
DATE:	8/23/2017
OBSERVERS:	J. Skinner, J. Baessler, B. Logan
1/4 SEC:	NE
SECTION:	34
TWP:	2N
RANGE:	90W
PM:	6th
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	
USGS MAP:	
USFS MAP:	
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.0156 ft / ft

Level and Rod Survey

CHECKED BY:.....DATE.....

ASSIGNED TO: .....DATE.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 42					
1	GL	0.00	4.83			0.00	0.00	0.00
	S	5.00	4.81			0.00	0.00	0.00
		7.00	5.00			0.00	0.00	0.00
	LEW	9.00	5.29	0.00		0.00	0.00	0.00
		9.30	5.45	0.15	0.00	0.05	0.00	5.30
		9.60	5.44	0.15	0.00	0.05	0.00	5.29
		9.90	5.43	0.15	0.37	0.05	0.02	5.28
		10.20	5.43	0.10	0.77	0.03	0.02	5.33
		10.50	5.49	0.20	1.29	0.06	0.08	5.29
		10.80	5.43	0.15	0.92	0.05	0.04	5.28
		11.10	5.38	0.10	0.99	0.03	0.03	5.28
		11.40	5.47	0.20	0.82	0.06	0.05	5.27
		11.70	5.54	0.25	0.49	0.08	0.04	5.29
		12.00	5.52	0.25	0.58	0.08	0.04	5.27
		12.30	5.51	0.20	0.75	0.06	0.05	5.31
		12.60	5.50	0.25	0.74	0.08	0.06	5.25
		12.90	5.49	0.20	1.03	0.06	0.06	5.29
		13.20	5.45	0.20	0.57	0.06	0.03	5.25
		13.50	5.50	0.20	0.58	0.06	0.03	5.30
		13.80	5.47	0.20	1.38	0.06	0.08	5.27
		14.10	5.50	0.20	0.97	0.06	0.06	5.30
		14.40	5.54	0.35	0.81	0.11	0.09	5.19
		14.70	5.50	0.30	0.79	0.09	0.07	5.20
		15.00	5.60	0.30	0.48	0.09	0.04	5.30
		15.30	5.49	0.25	0.07	0.08	0.01	5.24
		15.60	5.44	0.25	0.05	0.08	0.00	5.19
		15.90	5.40	0.15	0.05	0.05	0.00	5.25
		16.20	5.44	0.20	0.23	0.06	0.01	5.24
		16.50	5.44	0.20	0.00	0.06	0.00	5.24
		16.80	5.34	0.10	0.02	0.03	0.00	5.24
		17.10	5.42	0.15	0.27	0.04	0.01	5.27
		17.40	5.39	0.15	0.25	0.04	0.01	5.24
		17.70	5.37	0.10	0.44	0.03	0.01	5.27
		18.00	5.40	0.15	0.35	0.05	0.02	5.25
		18.30	5.38	0.10	0.00	0.03	0.00	5.28
		18.60	5.33	0.10	0.00	0.03	0.00	5.23
		18.90	5.34	0.10	0.00	0.03	0.00	5.24
		19.10	5.40	0.15	0.34	0.03	0.01	5.25
	REW	19.30	5.29	0.00		0.00	0.00	0.00
		21.00	4.98			0.00	0.00	0.00
		21.50	4.75			0.00	0.00	0.00
1	S/GL	22.80	3.70			0.00	0.00	0.00
					Totals	1.86	0.98	

STREAM NAME: Hahn Creek
XS LOCATION: 0
XS NUMBER: 2

Thorne-Zevenbergen D84 Correction Applied
User Supplied D84 = 0.24

GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

Velocity based on test of R/D84>1

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.83	16.12	0.48	0.77	7.66	16.42	100.0%	0.47	16.96	2.22
	4.87	15.67	0.45	0.73	7.10	15.96	97.2%	0.44	14.99	2.11
	4.92	15.03	0.42	0.68	6.33	15.31	93.3%	0.41	12.41	1.96
	4.97	14.40	0.39	0.63	5.60	14.67	89.3%	0.38	10.09	1.80
	5.02	13.70	0.36	0.58	4.89	13.96	85.0%	0.35	8.06	1.65
	5.07	13.08	0.32	0.53	4.22	13.33	81.2%	0.32	6.23	1.47
	5.12	12.47	0.29	0.48	3.59	12.71	77.4%	0.28	4.65	1.30
	5.17	11.85	0.25	0.43	2.98	12.08	73.6%	0.25	3.30	1.11
	5.22	11.23	0.21	0.38	2.40	11.45	69.8%	0.21	2.29	0.95
WL	5.27	10.61	0.17	0.33	1.85	10.82	65.9%	0.17	1.37	0.74
	5.32	10.21	0.13	0.28	1.34	10.41	63.4%	0.13	0.71	0.53
	5.37	9.26	0.09	0.23	0.85	9.42	57.4%	0.09	0.33	0.39
	5.42	6.85	0.06	0.18	0.44	6.96	42.4%	0.06	0.13	0.29
	5.47	4.11	0.04	0.13	0.17	4.18	25.4%	0.04	0.03	0.19
	5.52	1.41	0.02	0.08	0.03	1.45	8.8%	0.02	0.00	0.08
	5.57	0.20	0.02	0.03	0.00	0.21	1.3%	0.02	0.00	0.01

PEBBLE COUNT

Site: HAHN
Party: JWS
Reach:
Date: 8/23/17

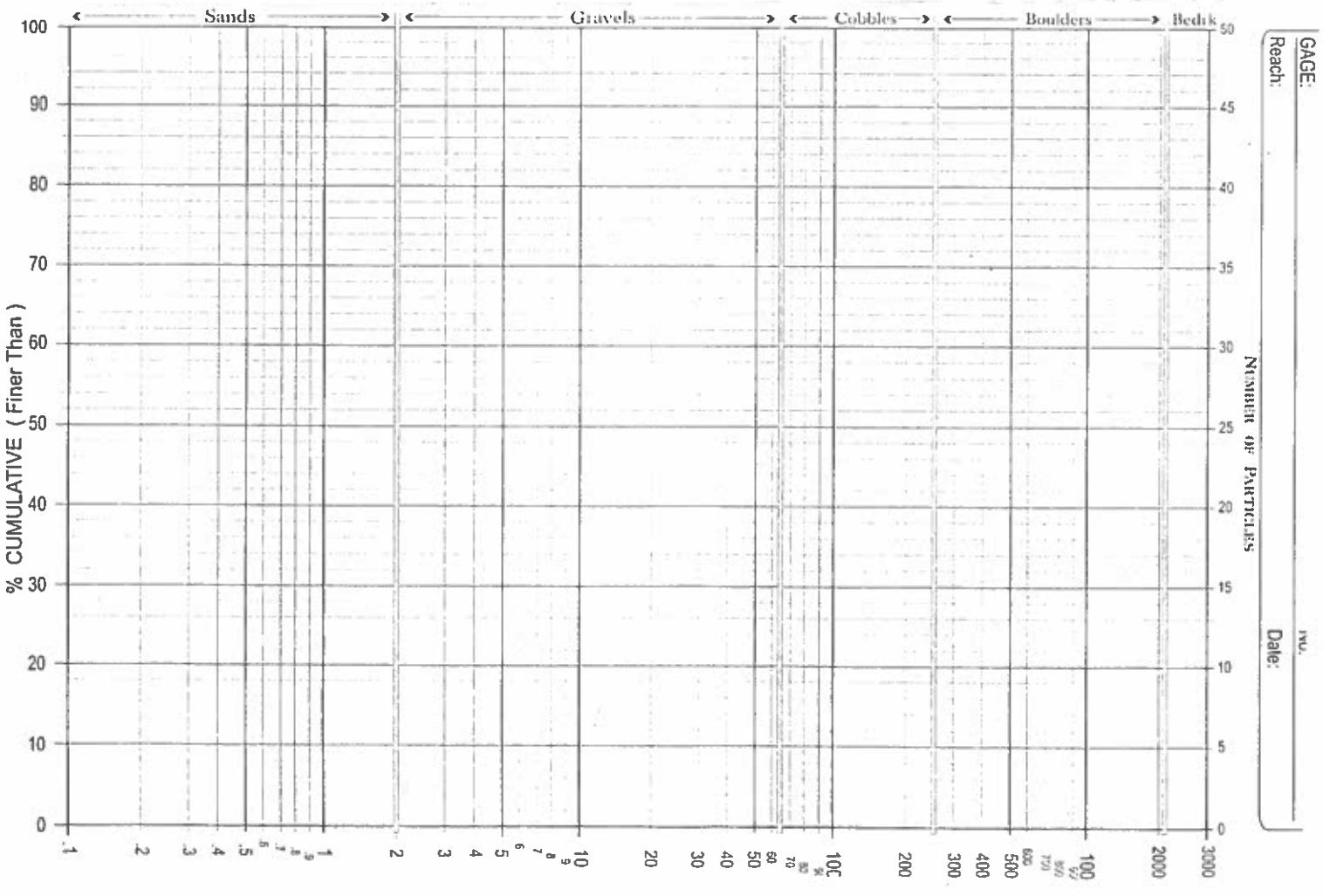
Inches	PARTICLE	Millimeters	PARTICLE COUNT 1 2 3	TOT #	ITEM %	% CUM
	Silt / Clay	< .062				
	Very Fine	.062 - .125				
	Fine	.125 - .25				
	Medium	.25 - .50				
	Coarse	.50 - 1.0				
.04 - .08	Very Coarse	1.0 - 2	II			
.08 - .16	Very Fine	2 - 4	IIII			
.16 - .22	Fine	4 - 5.7	IIII			
.22 - .31	Fine	5.7 - 8	IIII			
.31 - .44	Medium	8 - 11.3	IIII IIII II			
.44 - .63	Medium	11.3 - 16	IIII IIII I			
.63 - .89	Coarse	16 - 22.6	IIII IIII III			
.89 - 1.26	Coarse	22.6 - 32	IIII IIII IIII 7			
1.26 - 1.77	Very Coarse	32 - 45	IIII IIII III			
1.77 - 2.5	Very Coarse	45 - 64	IIII IIII I			
2.5 - 3.5	Small	64 - 90	IIII I			
3.5 - 5.0	Small	90 - 128	IIII IIII			
5.0 - 7.1	Large	128 - 180	I			
7.1 - 10.1	Large	180 - 256				
10.1 - 14.3	Small	256 - 362	III			
14.3 - 20	Small	362 - 512				
20 - 40	Medium	512 - 1024				
40 - 80	Large-Vry Large	1024 - 2048				
	Bedrock					
			TOTALS →			

Reach: Date:

TOT #	ITEM %	% CUM

Reach: Date:

TOT #	ITEM %	% CUM




LONG PARK TRAIL 1809
SALT PARK TRAIL 1805

LONG PARK TRAIL
SALT PARK TRAIL 1805
1806