COLORADO
Parks and Wildlife
Department of Natural Resources
Water Resources Section
6060 Broadway
Denver, CO 80216

January 14, 2019

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

Subject: Instream Flow Recommendations for Streams in Water Division 2, Huerfano County; Baker and Bonnett Creeks, to be Presented at the January 28-29, 2019 CWCB Meeting

Dear Ms. Bassi:

The information contained in and referred to in this letter forms the scientific and biological basis for instream flow (ISF) recommendations for Baker and Bonnett Creeks in Water Division 2. These flow recommendations will be presented for consideration by the Colorado Water Conservation Board (CWCB or Board) at their January 2019 regular meeting. The field investigations relating to these ISF recommendations were conducted by US Forest Service (USFS) personnel in 1992 and by Division of Wildlife (DOW) personnel in 2006. Supplementary information was collected by Colorado Parks and Wildlife (CPW) personnel in 2016. These stream reaches were first presented to the Board in 2009. At the January 2009 meeting, the Board declared its intent to appropriate on these streams, Cucharas Creek, Chaparral Creek, Dodgeton Creek, and two segments of the Huerfano River. Because of opposition from Huerfano County Water Conservancy District and other interests, the ISF appropriations were put on hold to allow the opposing parties to complete a study establishing their water needs and file for necessary additional water rights. A stipulation was signed by the parties that postponed a formal hearing of the appropriations. Per the terms of the stipulation, the Board took action to move forward the Huerfano River and Cucharas Creek appropriations in 2010 and the Dodgeton Creek and Chaparral Creek appropriations in 2011. The opposers requested the Baker Creek appropriation be made after January 2013. The postponement period has concluded, and it is now CPW staff's opinion that the information contained in this letter is sufficient to recommend ISF appropriations on Baker and Bonnett Creeks to the Board and to specifically address the findings required in Rule 5(i) of the Instream Flow Program Rules.

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 broad statutory guidelines, CPW's current strategic planning document (CPW Strategic Plan, 2015) explains current agency goals to, "[c]onserve wildlife and habitat to ensure healthy sustainable populations and ecosystems." In order to, "protect and enhance water resources for fish and wildlife populations," by pursuing, "partnerships and agreements to enhance instream flows, protect reservoir levels, and influence water management activities," and to, "[a]dvocate for water quality and quantities to conserve aquatic resources." In addition to the CPW strategic plan, the agency's fish and wildlife conservation activities are also directed by the State Wildlife Action Plan (2002, Revised 2015). The goals and priorities from these documents direct CPW to advocate for the preservation of the state's fish and wildlife resources and natural environment, and therefore link CPW's mission to the goals and priorities of CWCB's ISF/NLL Program.

Recommended Segments

CPW is proposing ISF recommendations on Baker Creek from its headwaters to the USFS boundary and on Bonnett Creek from its headwaters to the confluence with the Cucharas River.

Natural Environment

As stated above, Baker and Bonnett Creeks were first proposed by DOW in 2009. DOW's interest was based on the fact that the streams contain suitable habitat for brook trout and observations by CPW staff indicate the stream supports brook trout. CPW is of the opinion that there are flow dependent natural environments in Baker and Bonnett Creeks that can be preserved to a reasonable degree by ISF appropriations.

Flows Necessary to Preserve the Natural Environment

In 2006 and 2016, CPW (DOW) personnel collected stream cross-section data to be used as input into the R2CROSS model. Initial biological instream flow recommendations were developed utilizing the standard application of the R2CROSS methodology (Espegren 1996). R2CROSS uses field data that has been collected in a riffle habitat types; riffles are typically the limiting habitat type in streams during low flow events. The field data includes a survey of stream channel geometry, a longitudinal slope of the water surface, and a streamflow measurement at the designated cross-section. After processing this data with R2CROSS, winter and summer flow recommendations were developed utilizing the standard R2CROSS criteria described in Nehring

(1979) and Espergren (1996); the R2CROSS hydraulic criteria of interest are average depth, average velocity, and wetted perimeter. Maintaining these hydraulic parameters at adequate levels across riffle habitat types will also maintain aquatic habitat in pools and runs for most life stages of fish and aquatic invertebrates (Nehring 1979).

Cross-section data sets were collected on the reaches identified above. The field data sheets and resulting R2CROSS outputs are attached. The results of the R2CROSS analysis are summarized on the attached recommendation summary reports. R2CROSS biological recommendations were further refined with a preliminary water availability analysis. CPW conducted a preliminary evaluation of the hydrology in these streams to determine if water is physically available for an ISF appropriation. Representative hydrographs for each of these reaches are based on USGS StreamStats, a software product that estimates mean monthly flow statistics. Winter water availability reduced the baseflow recommendations on both reaches. CPW determined that the reduced winter flow rates should be sufficient for overwintering fish. Final detailed water availability analyses will be performed by CWCB staff and presented in the Executive Summaries provided to the Board prior to the January 2019 meeting.

The proposed flow recommendations below should be sufficient to preserve the natural environment to a reasonable degree:

- Baker Creek
  - 2.1 cfs is recommended from May 1 through June 30;
  - 1.4 cfs is recommended from July 1 through August 31;
  - 0.5 cfs is recommended from September 1 through March 31;
  - 1.0 cfs is recommended April 1 through April 30.
- Bonnett Creek
  - 1.0 cfs is recommended from April 1 through June 30;
  - 0.6 cfs is recommended from July 1 through August 31;
  - 0.4 cfs is recommended from September 1 through March 31.

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 2019 appropriation year. Please refer to the attached recommendation summary reports and supporting documentation for additional information. If CWCB staff has any further questions or needs clarification regarding these flow recommendations, please contact us.

CPW personnel will be present at the January 2019 CWCB meeting to answer any questions that the Board might have regarding these flow recommendations. We appreciate your consideration.

Sincerely,

Katie Birch
CPW Instream Flow Program Coordinator
Attachments (as stated)

Stream: Baker Creek

Colorado Parks and Wildlife
Recommendation Summary

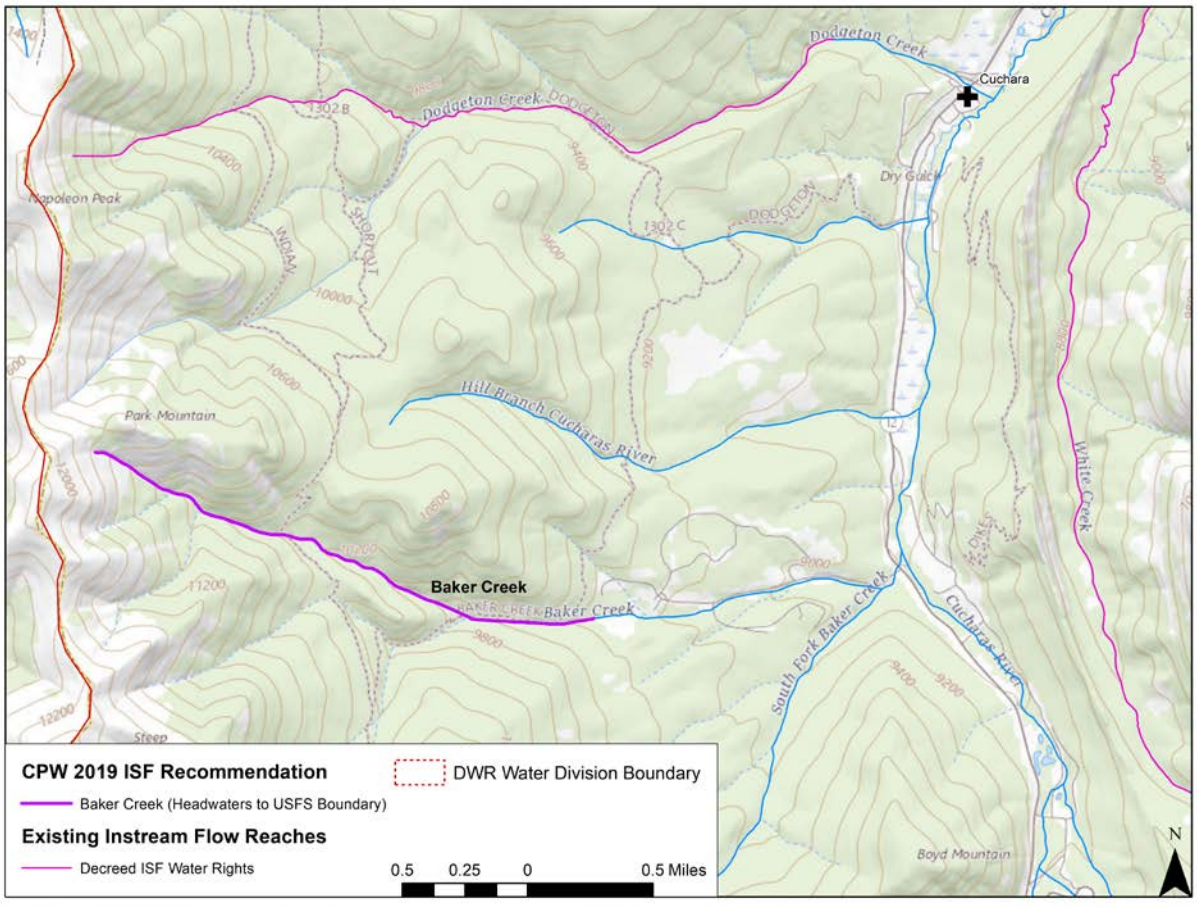
Water Division: 2
Water District: 16
CPW Watercode: 29101

Segment: Headwaters to USFS Boundary

Upper Terminus: Headwaters
13S 485496.58 4134666.58 UTM

Lower Terminus: USFS Boundary
13S 488637.74 4133589.16 UTM

ISF Recommendation: 2.1 cfs (5/1 to 6/30)
1.4 cfs (7/1 to 8/31)
0.5 cfs (9/1 to 3/31)
1.0 cfs (4/1 to 4/30)



Introduction

The information contained in this report and the associated supporting documents form the basis for the instream flow recommendation to be considered by the Colorado Water Conservation Board (Board). It is Colorado Parks and Wildlife (CPW) staff's opinion that the information contained in this report is sufficient for the Board's staff to begin the investigations required to support the findings required in Rule 5(i) of the Instream Flow Rules.

CPW is sending this instream flow recommendation to the Board to meet CPW's legislative declaration, "… 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 of this state are to be protected, preserved, enhanced and managed for the use, benefit, and enjoyment of the people of this state and visitors of this state… and that to carry such program and policy there shall be a continuous operation of acquisition, development, and management of outdoor recreation lands, waters, and facilities (C.R.S. §33-10-101 (1))."

In addition to these broad statutory guidelines, CPW's current strategic planning document (CPW Strategic Plan, 2015) explains current agency goals to, "[c]onserve wildlife and habitat to ensure healthy sustainable populations and ecosystems." In order to, "protect and enhance water resources for fish and wildlife populations," by pursuing, "partnerships and agreements to enhance instream flows, protect reservoir levels, and influence water management activities," and to, "[a]dvocate for water quality and quantities to conserve aquatic resources." In addition to the CPW strategic plan, the agency's fish and wildlife conservation activities are also directed by the State Wildlife Action Plan (2002, Revised 2015). The goals and priorities from these documents direct CPW to advocate for the preservation of the state's fish and wildlife resources and natural environment, and therefore link CPW's mission to the goals and priorities of CWCB's ISF/NLL Program.

Instream Flow Recommendation

The subject of this report is a segment of Baker Creek beginning at its headwaters and extending downstream to the US Forest Service (USFS) Boundary. The proposed segment is located southwest of the Town of Cuchara. The recommendation for this segment is discussed below. The entire reach is located on public lands managed by the USFS in the Pike and San Isabel National Forests.

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	USFS Boundary	2.1	0%	100%

Natural Environment

Baker Creek is a first order, high-gradient stream, with a somewhat confined channel. Substrate

ranges from boulder to cobble. There is some large wood in the channel adding channel complexity. Observations by CPW staff indicate the stream environment of Baker Creek supports brook trout (*Salvelinus fontinalis*).

Biological Flow Quantification

Methodology

CPW staff used the R2CROSS methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2CROSS method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect, surveying the stream channel geometry, and measuring the stream discharge. Copies of field data collected for this proposed segment are included as an attachment.

Field data is processed in the R2CROSS model to develop these initial recommendations. The recommendations are designed to address the unique biological requirements of each stream without regard to water availability. The R2CROSS method utilizes three hydraulic parameters, average depth, percent wetted perimeter, and average velocity to develop biologic instream flow recommendations. CPW has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

Results

In 2006 and 2016, stream cross-section information, flow data, and natural environment observations were collected by CPW (DOW) staff to quantify the instream flow needs for this reach of the Baker Creek using R2CROSS.

For this segment of stream, three data sets were collected with the results shown in Table 1 above. Table 1 shows who collected the data (Party), the date the data was collected, the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's equation (240% and 40% of Q), the hydraulic equation that was used, and the corresponding summer flow recommendation meeting all 3 hydraulic criteria and the winter flow recommendation meeting 2 of 3 hydraulic criteria.

Table 1. Results of R2CROSS transect measurements and the resulting flow recommendations.

	Party	Date Measured	Q measured	40%-250%	Hydraulic Equation	Flow Meeting Two Criteria	Flow Meeting Three Criteria
1	DOW	5/11/2006	1.46 cfs	0.6 – 3.6 cfs	Manning's	0.6 cfs	2.1 cfs
2	CPW	11/21/2016	0.74 cfs	0.3 – 1.9 cfs	Manning's	1.2 cfs	Out of Confidence Interval
				Mean		**0.9 cfs**	**2.1 cfs**

CPW's initial recommendation is 2.1 cfs, summer, and 0.9 cfs, winter, based on 2006 and 2016 data collection efforts. This recommendation is based on the physical and biological data collected to date and does not incorporate any water availability constraints.

Hydrologic Data

CPW staff conducted a preliminary evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. The hydrograph below is based on US Geological Survey (USGS) StreamStats, a software product that estimates mean monthly flow statistics for the contributing basin. Figure 1 below displays the StreamStats hydrograph, the initial R2CROSS recommendations, and the proposed ISF recommendations refined by water availability.

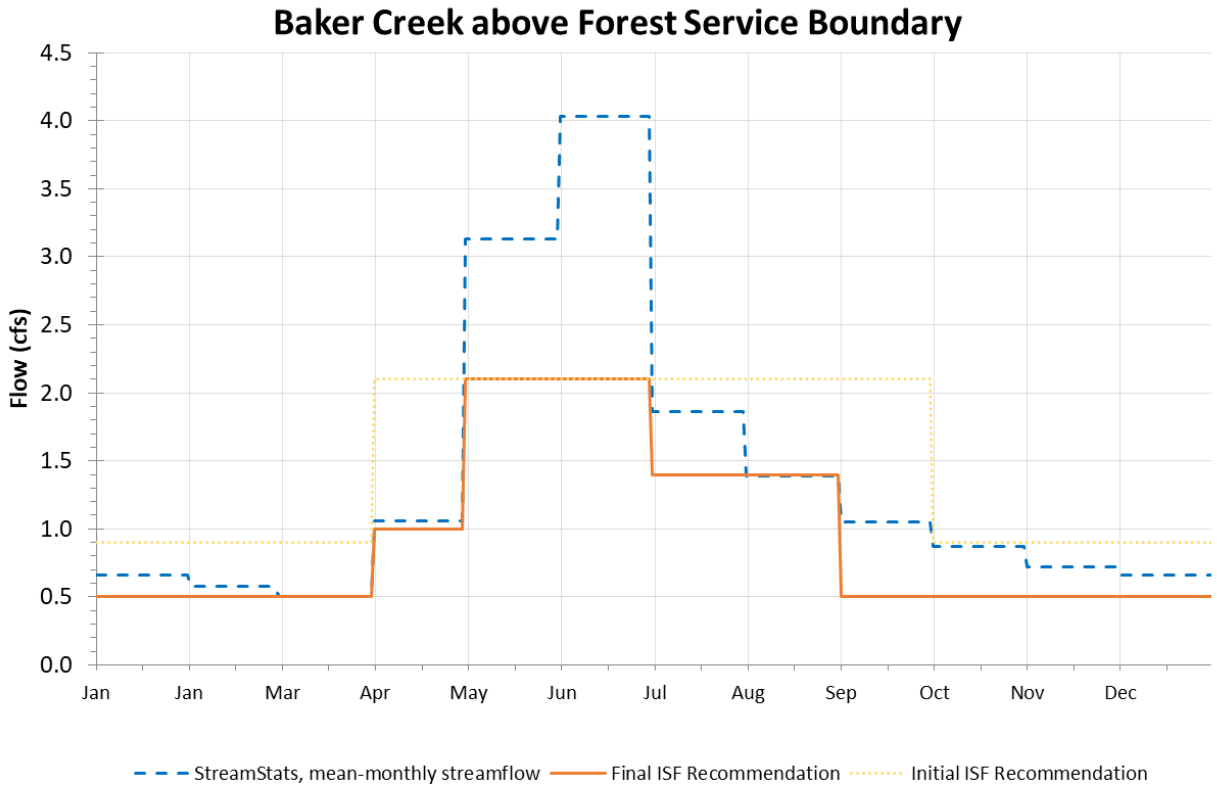


Figure 1. Hydrograph showing the USGS StreamStats monthly mean flow estimates for Baker Creek above the USFS boundary, and initial and adjusted CPW winter and summer seasonal recommended flows.

Recommended Flow Rates

After incorporating the preliminary water availability information, the original instream flow recommendation was modified. During the baseflow period, the proposed winter flow recommendation was reduced from 0.9 cfs to 0.5 cfs. This reduced base flow rate is needed for fish overwintering and will maintain velocities that prevent freezing and achieve adequate depths at microhabitats across the reach – preserving habitat availability within the wetted channel. The proposed summer flows will preserve the natural environment by achieving all three instream flow criteria during the snowmelt runoff period. Because this period is limited from May to the end of June, CPW recommends protection of the rising and receding limbs of the hydrograph on either

end of runoff. This combination will support fish spawning, development, and rearing. The proposed flows below are sufficient to preserve the natural environment to a reasonable degree in this reach of Baker Creek:

- 2.1 cfs is recommended from May 1 through June 30;
- 1.4 cfs is recommended from July 1 through August 31;
- 0.5 cfs is recommended from September 1 through March 31;
- 1.0 cfs is recommended April 1 through April 30.

If additional water is determined to be available in further investigations, the CPW would recommend appropriating the additional water up to the initial, biological recommended flow amounts to preserve the natural environment to a reasonable degree.

Existing Water Right Information

CPW staff has analyzed the water rights tabulation and consulted with the Division of Water Resources (DWR) Water Commissioner to identify any potential water availability problems due to existing diversions. Records indicate that there are no existing water rights located within this reach of Baker Creek. There is an existing water right downstream of the proposed ISF reach, CS&WD BAKER CREEK INTAKE (ID: 1600707). This water right is for Cuchara's municipal water system.

CPW and CWCB staff have met with the Cucharas Collaborative and Huerfano County Water Conservancy District water users; they have been made aware of these proposed ISF recommendations and have expressed no major issues or concerns.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Baker Creek								CROSS-SECTION NO.: 5	
CROSS-SECTION LOCATION: @ SF. Area									
WP#22 37 20 56.7 105 07 24.6									
DATE: 5/11/06	OBSERVERS: Uppendahl								
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 17	TOWNSHIP: 3	N/S	RANGE: 69	E/W	PM:		
COUNTY: Huerfano	WATERSHED: Cucharas		WATER DIVISION: 2		DOW WATER CODE:				
MAP(S):	USGS: Cucharas Pass								
	USFS:								

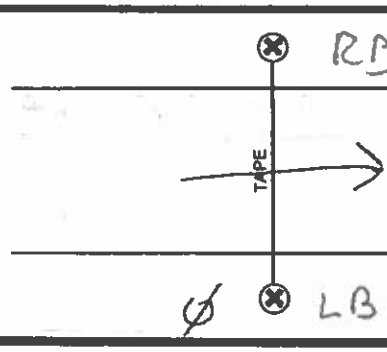
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: FLO-MATE			
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	12.0	7.45
③ WS Downstream	3.5	9.20
SLOPE	1.75 / 15.5 = 0.1129	

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

FORM #ISF FD 1-85

8.5 4.3 / 8

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Baker Ck | CROSS-SECTION NO. 5 | DATE: 5/11/06 | SHEET 1 OF 1

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: ____ ft | TIME: 19:00

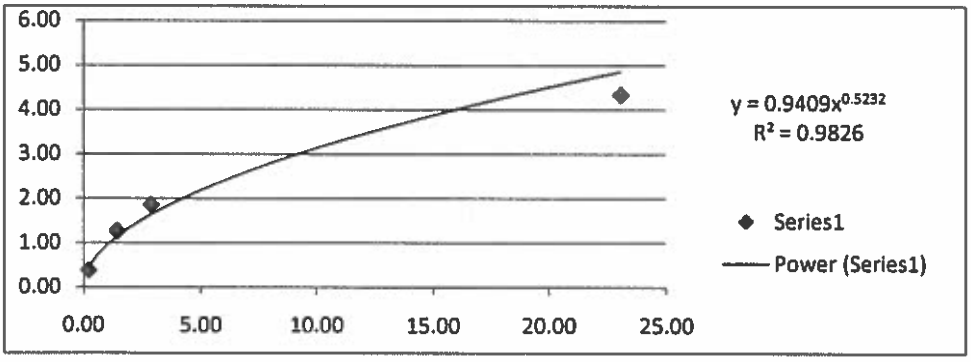
Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser-vation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft²)	Discharge (cfs)
Top Stake	Ø		7.15								
	1.0		7.85								
GL	2.0		8.40								
	3.0		8.70								
	4.0		8.75								
WL	4.7		9.05	Ø							
	5.0			.25				.36			
	5.3			.35				.81			
	5.6			.45				1.79			
	5.9			.45				2.20			
	6.2			.45				2.10			
	6.5			.40				1.68			
	6.8			.40				1.32			
	7.1			.40				.90			
	7.4			.30				.30			
	7.7			.20				.32			
	8.0			.10				.26			
	8.3			.05				.01			
WL	8.6		9.05	Ø				Ø			
	9.0		8.95								
	10.0		8.70								
GL	11.0		8.40								
	14.0		7.80								
S Top	18.0		6.60								
TOTALS:											1.46

End of Measurement | Time: 19:30 | Gage Reading: ____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

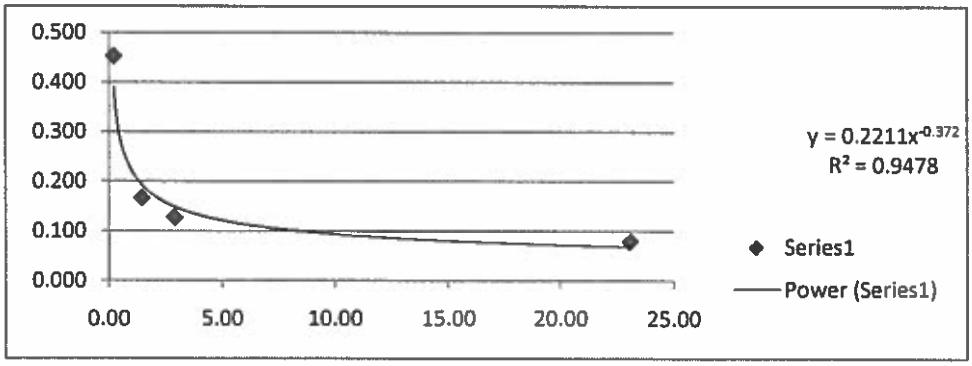
Site	Baker Creek
Date	5/11/2006
Location	37 20 56.7 105 07 24.6
Area	1.14
Width	3.90
D84 @ Riffle	0.53
Slope	0.1129
Gravity	32.20
Depth (Max)	0.45
Depth (Mean)	0.29
WP	4.08
Hydraulic Radius	0.28
Relative Roughness	0.53
Shear Velocity	1.01
Q	1.46
V	1.28
Manning's n	0.1669
V Friction Factor	1.27
Q Friction Factor	1.45
D84 calculation mm	161
D84 calculation	0.53
R2X D84 Calculation	0.61
D84 calculation mm	186
Difference	25

		0.2	50%
	Bank Full	Ave. Depth	WP
	5.31	0.58	1.56
	0.53	0.53	0.53
	0.11	0.11	0.11
	32.2	32.2	33.2
		0.2	
	9.38		4.69
	0.57	0.20	0.33
	1.44	0.85	1.11
	4.34	0.38	1.86
	0.079	0.453	0.128
	4.34	0.38	1.86
	23.06	0.22	2.90

Q_Depth =	0.22	0.61	= Hey
Q_WP =	2.90	0.85	= Bathurst
Q_Velocity =	1.12		



Q 1.0 v	1.12
Manning's n	0.212
Q 1.0 n	1.12



COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME:	Baker Creek
XS LOCATION:	at Ski Area
XS NUMBER:	05/11/06 - 05
DATE:	11-May-06
OBSERVERS:	Uppendahl
1/4 SEC:	NE
SECTION:	17
TWP:	31 S
RANGE:	69 W
PM:	0.75
COUNTY:	HUERFANO
WATERSHED:	CUCHARAS RIVER
DIVISION:	2
DOW CODE:	0
USGS MAP:	CUCHARAS PASS
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.11290323

INPUT DATA CHECKED BY: .....DATE.....

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

STREAM NAME: Baker Creek
XS LOCATION: at Ski Area
XS NUMBER: 05/11/06 - 05

DATA POINTS= 24

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
TOP WS	0.00	7.15			0.00		0.00	0.00	0.0%
	1.00	7.95			0.00		0.00	0.00	0.0%
1 GL	2.00	8.40			0.00		0.00	0.00	0.0%
	3.00	8.70			0.00		0.00	0.00	0.0%
	4.00	8.75			0.00		0.00	0.00	0.0%
WL	4.70	9.05	0.00	0.00	0.00		0.00	0.00	0.0%
	5.00	9.30	0.25	0.36	0.39	0.25	0.08	0.03	1.9%
	5.30	9.40	0.35	0.81	0.32	0.35	0.11	0.09	5.8%
	5.60	9.50	0.45	1.79	0.32	0.45	0.14	0.24	16.6%
	5.90	9.50	0.45	2.20	0.30	0.45	0.14	0.30	20.4%
	6.20	9.50	0.45	2.10	0.30	0.45	0.14	0.28	19.5%
	6.50	9.45	0.40	1.68	0.30	0.40	0.12	0.20	13.8%
	6.80	9.45	0.40	1.32	0.30	0.40	0.12	0.16	10.9%
	7.10	9.45	0.40	0.90	0.30	0.40	0.12	0.11	7.4%
	7.40	9.35	0.30	0.30	0.32	0.30	0.09	0.03	1.9%
	7.70	9.25	0.20	0.32	0.32	0.20	0.06	0.02	1.3%
	8.00	9.15	0.10	0.26	0.32	0.10	0.03	0.01	0.5%
	8.30	9.10	0.05	0.01	0.30	0.05	0.02	0.00	0.0%
WL	8.60	9.05	0.00	0.00	0.30		0.00	0.00	0.0%
	9.00	8.95			0.00		0.00	0.00	0.0%
	10.00	8.70			0.00		0.00	0.00	0.0%
1 GL	11.00	8.40			0.00		0.00	0.00	0.0%
	14.00	7.80			0.00		0.00	0.00	0.0%
TOP WS	18.00	6.60			0.00		0.00	0.00	0.0%
TOTALS ————					4.08	0.45 (Max.)	1.14	1.46	100.0%

Manning's n = 0.1669
Hydraulic Radius= 0.27913361

STREAM NAME: Baker Creek
XS LOCATION: at Ski Area
XS NUMBER: 05/11/06 - 05

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.14	1.14	0.0%
8.80	1.14	2.31	102.9%
8.82	1.14	2.20	93.4%
8.84	1.14	2.10	84.1%
8.86	1.14	2.00	75.0%
8.88	1.14	1.89	66.2%
8.90	1.14	1.80	57.6%
8.92	1.14	1.70	49.2%
8.94	1.14	1.61	41.0%
8.96	1.14	1.52	33.0%
8.98	1.14	1.43	25.3%
9.00	1.14	1.34	17.8%
9.01	1.14	1.30	14.1%
9.02	1.14	1.26	10.5%
9.03	1.14	1.22	7.0%
9.04	1.14	1.18	3.4%
9.05	1.14	1.14	0.0%
9.06	1.14	1.10	-3.4%
9.07	1.14	1.06	-6.7%
9.08	1.14	1.03	-10.0%
9.09	1.14	0.99	-13.2%
9.10	1.14	0.95	-16.3%
9.12	1.14	0.88	-22.4%
9.14	1.14	0.82	-28.2%
9.16	1.14	0.75	-33.8%
9.18	1.14	0.69	-39.3%
9.20	1.14	0.63	-44.5%
9.22	1.14	0.57	-49.7%
9.24	1.14	0.52	-54.7%
9.26	1.14	0.46	-59.5%
9.28	1.14	0.41	-64.2%
9.30	1.14	0.36	-68.7%

WATERLINE AT ZERO
AREA ERROR = 9.050

STREAM NAME: Baker Creek
XS LOCATION: at Ski Area
XS NUMBER: 05/11/06 - 05

Constant Manning's n

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

	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	8.40	9.00	0.59	1.10	5.31	9.38	100.0%	0.57	10.89	2.05
	8.45	8.67	0.56	1.05	4.87	9.03	96.3%	0.54	9.66	1.98
	8.50	8.33	0.53	1.00	4.45	8.68	92.6%	0.51	8.52	1.92
	8.55	8.00	0.51	0.95	4.04	8.33	88.9%	0.48	7.46	1.85
	8.60	7.67	0.48	0.90	3.65	7.99	85.2%	0.46	6.47	1.77
	8.65	7.33	0.45	0.85	3.27	7.64	81.4%	0.43	5.57	1.70
	8.70	7.00	0.42	0.80	2.91	7.29	77.7%	0.40	4.73	1.62
	8.75	5.80	0.45	0.75	2.59	6.08	64.9%	0.43	4.40	1.70
	8.80	5.48	0.42	0.70	2.31	5.75	61.3%	0.40	3.77	1.63
	8.85	5.17	0.40	0.65	2.05	5.42	57.8%	0.38	3.20	1.56
	8.90	4.85	0.37	0.60	1.80	5.08	54.2%	0.35	2.69	1.49
	8.95	4.53	0.34	0.55	1.56	4.75	50.7%	0.33	2.22	1.42
	9.00	4.22	0.32	0.50	1.34	4.42	47.1%	0.30	1.82	1.35
WL	9.05	3.90	0.29	0.45	1.14	4.08	43.5%	0.28	1.46	1.28
	9.10	3.54	0.27	0.40	0.95	3.70	39.5%	0.26	1.16	1.21
	9.15	3.18	0.25	0.35	0.79	3.32	35.4%	0.24	0.90	1.14
	9.20	2.97	0.21	0.30	0.63	3.08	32.9%	0.21	0.66	1.04
	9.25	2.76	0.18	0.25	0.49	2.85	30.4%	0.17	0.45	0.92
	9.30	2.55	0.14	0.20	0.36	2.61	27.8%	0.14	0.28	0.79
	9.35	2.25	0.10	0.15	0.24	2.29	24.5%	0.10	0.16	0.66
	9.40	1.95	0.07	0.10	0.13	1.98	21.1%	0.07	0.06	0.49
	9.45	1.05	0.04	0.05	0.04	1.06	11.3%	0.04	0.01	0.34

3/3 = 2.1

2/3 - 0.6

90OP = 2.20

STREAM NAME: Baker Creek
XS LOCATION: at Ski Area
XS NUMBER: 05/11/06 - 05

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.46	cfs
CALCULATED FLOW (Qc)=	1.46	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	9.05	ft
CALCULATED WATERLINE (WLc)=	9.05	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.45	ft
MAX CALCULATED DEPTH (Dc)=	0.45	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.28	ft/sec
MANNING'S N=	0.167	
SLOPE=	0.11290323	ft/ft
.4 * Qm =	0.6	cfs
2.5 * Qm=	3.6	cfs

RECOMMENDED INSTREAM FLOW:

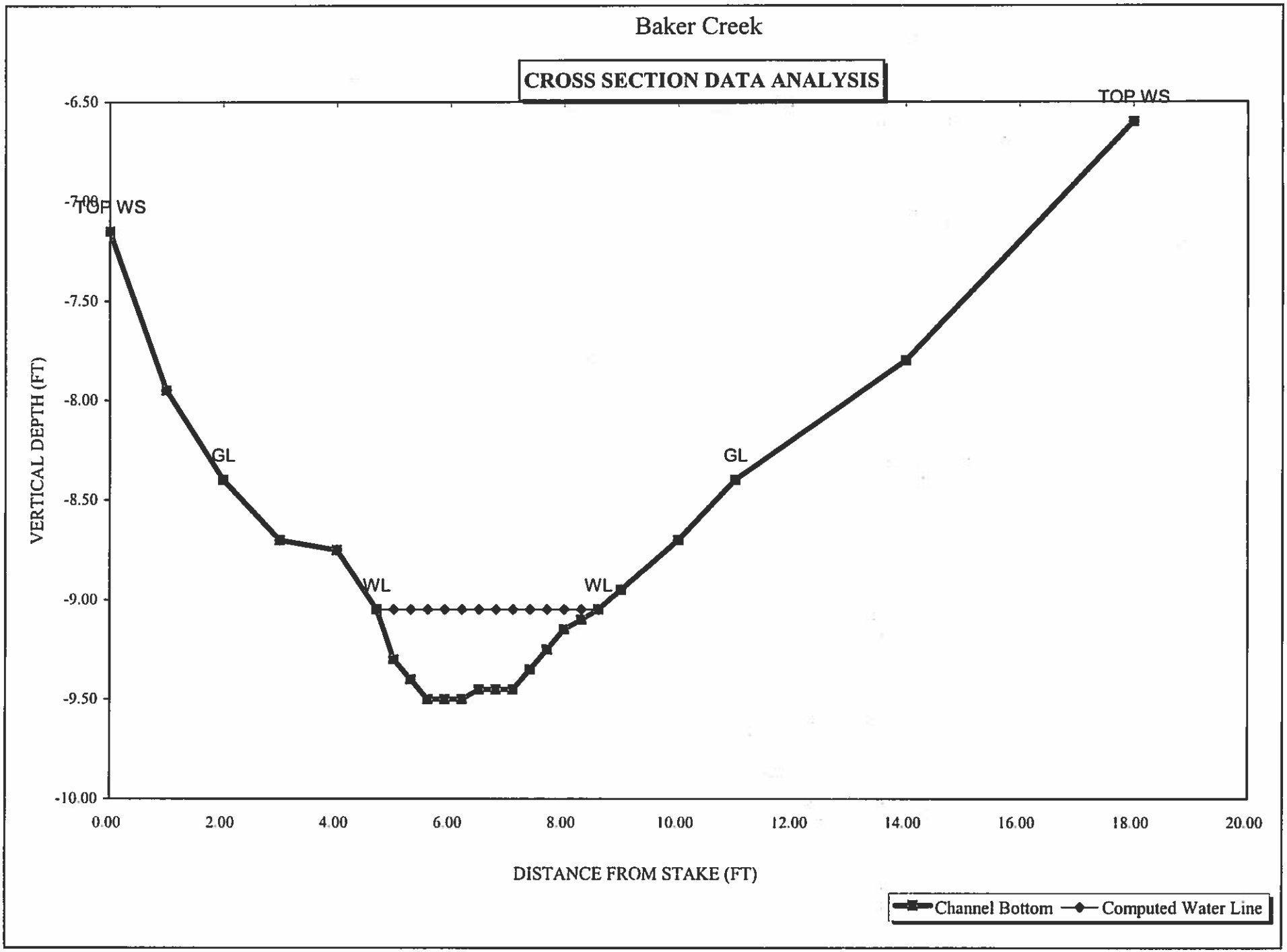
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

RECOMMENDATION BY: ..... AGENCY ..... DATE .....

CWCB REVIEW BY: ..... DATE .....

Baker Creek


CROSS SECTION DATA ANALYSIS
TOP WS
TOP WS
GL
GL
WL
WL
-6.50
-7.00
-7.50
-8.00
-8.50
-9.00
-9.50
-10.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

STREAM NAME: Baker Creek
XS LOCATION: at Ski Area
XS NUMBER: 05/11/06 - 05

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.85

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	8.40	9.00	0.59	1.10	5.31	9.38	100.0%	0.57	23.01	4.33
	8.45	8.67	0.56	1.05	4.87	9.03	96.3%	0.54	19.41	3.98
	8.50	8.33	0.53	1.00	4.45	8.68	92.6%	0.51	16.22	3.65
	8.55	8.00	0.51	0.95	4.04	8.33	88.9%	0.48	13.41	3.32
	8.60	7.67	0.48	0.90	3.65	7.99	85.2%	0.46	10.96	3.00
	8.65	7.33	0.45	0.85	3.27	7.64	81.4%	0.43	8.84	2.70
	8.70	7.00	0.42	0.80	2.91	7.29	77.7%	0.40	7.02	2.41
	8.75	5.80	0.45	0.75	2.59	6.08	64.9%	0.43	6.95	2.68
	8.80	5.48	0.42	0.70	2.31	5.75	61.3%	0.40	5.59	2.42
	8.85	5.17	0.40	0.65	2.05	5.42	57.8%	0.38	4.43	2.16
	8.90	4.85	0.37	0.60	1.80	5.08	54.2%	0.35	3.46	1.93
	8.95	4.53	0.34	0.55	1.56	4.75	50.7%	0.33	2.65	1.70
	9.00	4.22	0.32	0.50	1.34	4.42	47.1%	0.30	1.99	1.48
WL	9.05	3.90	0.29	0.45	1.14	4.08	43.5%	0.28	1.46	1.28
	9.10	3.54	0.27	0.40	0.95	3.70	39.5%	0.26	1.06	1.11
	9.15	3.18	0.25	0.35	0.79	3.32	35.4%	0.24	0.75	0.95
	9.20	2.97	0.21	0.30	0.63	3.08	32.9%	0.21	0.48	0.76
	9.25	2.76	0.18	0.25	0.49	2.85	30.4%	0.17	0.28	0.58
	9.30	2.55	0.14	0.20	0.36	2.61	27.8%	0.14	0.15	0.43
	9.35	2.25	0.10	0.15	0.24	2.29	24.5%	0.10	0.07	0.30
	9.40	1.95	0.07	0.10	0.13	1.98	21.1%	0.07	0.03	0.19
	9.45	1.05	0.04	0.05	0.04	1.06	11.3%	0.04	0.00	0.08

Data Input & Proofing

STREAM NAME:	Baker Creek
XS LOCATION:	at Ski Area
XS NUMBER:	05/11/06 - 05
DATE:	5/11/2006
OBSERVERS:	Uppendahl
1/4 SEC:	NE
SECTION:	17
TWP:	31 S
RANGE:	69 W
PM:	6:00 PM
COUNTY:	HUERFANO
WATERSHED:	CUCHARAS RIVER
DIVISION:	2
DOW CODE:	
USGS MAP:	CUCHARAS PASS
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.112903226 ft / ft

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

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

Total Data Points = 24

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	TOP WS	0.00	7.15			0.00	0.00	0.00
		1.00	7.95			0.00	0.00	0.00
1	GL	2.00	8.40			0.00	0.00	0.00
		3.00	8.70			0.00	0.00	0.00
		4.00	8.75			0.00	0.00	0.00
	WL	4.70	9.05	0.00	0.00	0.00	0.00	0.00
		5.00	9.30	0.25	0.36	0.08	0.03	9.05
		5.30	9.40	0.35	0.81	0.11	0.09	9.05
		5.60	9.50	0.45	1.79	0.14	0.24	9.05
		5.90	9.50	0.45	2.20	0.14	0.30	9.05
		6.20	9.50	0.45	2.10	0.14	0.28	9.05
		6.50	9.45	0.40	1.68	0.12	0.20	9.05
		6.80	9.45	0.40	1.32	0.12	0.16	9.05
		7.10	9.45	0.40	0.90	0.12	0.11	9.05
		7.40	9.35	0.30	0.30	0.09	0.03	9.05
		7.70	9.25	0.20	0.32	0.06	0.02	9.05
		8.00	9.15	0.10	0.26	0.03	0.01	9.05
		8.30	9.10	0.05	0.01	0.02	0.00	9.05
	WL	8.60	9.05	0.00	0.00	0.00	0.00	0.00
		9.00	8.95			0.00	0.00	0.00
		10.00	8.70			0.00	0.00	0.00
1	GL	11.00	8.40			0.00	0.00	0.00
		14.00	7.80			0.00	0.00	0.00
	TOP WS	18.00	6.60			0.00	0.00	0.00

Totals	1.14	1.46

World Geodetic System (WGS) 1984

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Baker Creek					CROSS-SECTION NO.: 1 (upper)
CROSS-SECTION LOCATION: Baker Creek above ski area @ forest service Boundary					
DATE: 11/21/16	OBSERVERS: CT & JS				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: Huerfano	WATERSHED: Cucharas River		WATER DIVISION: 2		DOW WATER CODE: 29101
MAP(S):	USGS: 37.348683, -105.127762				
	USFS:				

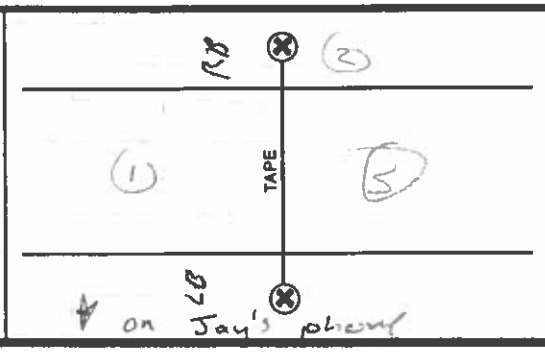
SUPPLEMENTAL DATA

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	LB 9.31 / RB 9.29
② WS Upstream	0 + 7.0 ft	9.25
③ WS Downstream	0 + 8.0 ft	9.64
SLOPE	0.39 / 15 = 0.026	

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

FORM #ISF FD 1-85

Data Input & Proofing

STREAM NAME:	Baker Creek
XS LOCATION:	Abv. Ski area @ USFS boundary
XS NUMBER:	1
DATE:	11/21/2016
OBSERVERS:	Cody Tyler and Jay Skinner
1/4 SEC:	37.348683, -105.127762
SECTION:	
TWP:	
RANGE:	
PM:	
COUNTY:	Huerfano
WATERSHED:	Cucharas River
DIVISION:	2
DOW CODE:	29101
USGS MAP:	
USFS MAP:	
TAPE WT:	0.0106 lbs / ft (Level and Rod Survey)
TENSION:	99999 lbs
SLOPE:	0.026 ft / ft

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

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

Total Data Points = 28

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
1	S/GL	0.00	8.20			0.00	0.00	0.00
		1.00	8.70			0.00	0.00	0.00
		1.50	9.00			0.00	0.00	0.00
	WL	1.80	9.31	0.00	0.00	0.00	0.00	0.00
		2.20	9.60	0.25	1.29	0.10	0.13	9.35
		2.60	9.60	0.25	0.92	0.10	0.09	9.35
		3.00	9.55	0.20	0.83	0.08	0.07	9.35
		3.40	9.50	0.25	0.68	0.10	0.07	9.25
		3.80	9.50	0.20	0.61	0.08	0.05	9.30
		4.20	9.50	0.15	0.36	0.06	0.02	9.35
		4.60	9.50	0.15	0.61	0.06	0.04	9.35
		5.00	9.50	0.20	0.76	0.08	0.06	9.30
		5.40	9.45	0.20	0.61	0.08	0.05	9.25
		5.80	9.50	0.15	0.42	0.06	0.03	9.35
		6.20	9.45	0.15	0.66	0.06	0.04	9.30
		6.60	9.50	0.20	0.87	0.08	0.07	9.30
		7.00	9.45	0.15	0.30	0.06	0.02	9.30
		7.40	9.40	0.10	0.13	0.04	0.01	9.30
		7.80	9.45	0.15	0.16	0.06	0.01	9.30
		8.20	9.40	0.05	0.02	0.02	0.00	9.35
		8.60	9.45	0.15	0.00	0.06	0.00	9.30
		9.00	9.45	0.10	0.00	0.04	0.00	9.35
		9.40	9.40	0.10	0.00	0.06	0.00	9.30
	WL	10.20	9.29	0.00	0.00	0.00	0.00	0.00
		11.00	9.10			0.00	0.00	0.00
		12.00	8.80			0.00	0.00	0.00
		13.50	8.60			0.00	0.00	0.00
1	S/GL	14.50	8.00			0.00	0.00	0.00
					Totals	1.28	0.74	

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME:	Baker Creek
XS LOCATION:	Abv. Ski area @ USFS boundary
XS NUMBER:	1
DATE:	21-Nov-16
OBSERVERS:	Cody Tyler and Jay Skinner
1/4 SEC:	37.348683, -105.127762
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Huerfano
WATERSHED:	Cucharas River
DIVISION:	2
DOW CODE:	29101
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

*** NOTE ***
Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod

CHANNEL PROFILE DATA

SLOPE:	0.026

INPUT DATA CHECKED BY: .....DATE.....

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

STREAM NAME: Baker Creek
XS LOCATION: Abv. Ski area @ USFS boundary
XS NUMBER: 1

DATA POINTS= 28

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1 S/GL	0.00	8.20			0.00		0.00	0.00	0.0%
	1.00	8.70			0.00		0.00	0.00	0.0%
	1.50	9.00			0.00		0.00	0.00	0.0%
WL	1.80	9.31	0.00	0.00	0.00		0.00	0.00	0.0%
	2.20	9.60	0.25	1.29	0.49	0.25	0.10	0.13	17.4%
	2.60	9.60	0.25	0.92	0.40	0.25	0.10	0.09	12.4%
	3.00	9.55	0.20	0.83	0.40	0.20	0.08	0.07	9.0%
	3.40	9.50	0.25	0.68	0.40	0.25	0.10	0.07	9.2%
	3.80	9.50	0.20	0.61	0.40	0.20	0.08	0.05	6.6%
	4.20	9.50	0.15	0.36	0.40	0.15	0.06	0.02	2.9%
	4.60	9.50	0.15	0.61	0.40	0.15	0.06	0.04	4.9%
	5.00	9.50	0.20	0.76	0.40	0.20	0.08	0.06	8.2%
	5.40	9.45	0.20	0.61	0.40	0.20	0.08	0.05	6.6%
	5.80	9.50	0.15	0.42	0.40	0.15	0.06	0.03	3.4%
	6.20	9.45	0.15	0.66	0.40	0.15	0.06	0.04	5.4%
	6.60	9.50	0.20	0.87	0.40	0.20	0.08	0.07	9.4%
	7.00	9.45	0.15	0.30	0.40	0.15	0.06	0.02	2.4%
	7.40	9.40	0.10	0.13	0.40	0.10	0.04	0.01	0.7%
	7.80	9.45	0.15	0.16	0.40	0.15	0.06	0.01	1.3%
	8.20	9.40	0.05	0.02	0.40	0.05	0.02	0.00	0.1%
	8.60	9.45	0.15	0.00	0.40	0.15	0.06	0.00	0.0%
	9.00	9.45	0.10	0.00	0.40	0.10	0.04	0.00	0.0%
	9.40	9.40	0.10	0.00	0.40	0.10	0.06	0.00	0.0%
WL	10.20	9.29	0.00	0.00	0.81		0.00	0.00	0.0%
	11.00	9.10			0.00		0.00	0.00	0.0%
	12.00	8.80			0.00		0.00	0.00	0.0%
	13.50	8.60			0.00		0.00	0.00	0.0%
1 S/GL	14.50	8.00			0.00		0.00	0.00	0.0%
TOTALS ----------					8.54	0.25 (Max.)	1.28	0.74	100.0%

Manning's n = 0.1170
Hydraulic Radius= 0.1499014

STREAM NAME: Baker Creek
XS LOCATION: Abv. Ski area @ USFS boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.28	1.40	9.3%
9.05	1.28	3.65	185.2%
9.07	1.28	3.46	170.3%
9.09	1.28	3.27	155.4%
9.11	1.28	3.08	140.7%
9.13	1.28	2.90	126.2%
9.15	1.28	2.71	111.8%
9.17	1.28	2.53	97.6%
9.19	1.28	2.35	83.6%
9.21	1.28	2.17	69.7%
9.23	1.28	2.00	56.0%
9.25	1.28	1.82	42.4%
9.26	1.28	1.74	35.7%
9.27	1.28	1.65	29.0%
9.28	1.28	1.57	22.4%
9.29	1.28	1.48	15.8%
9.30	1.28	1.40	9.3%
9.31	1.28	1.32	2.8%
9.32	1.28	1.23	-3.6%
9.33	1.28	1.15	-10.0%
9.34	1.28	1.07	-16.3%
9.35	1.28	0.99	-22.5%
9.37	1.28	0.84	-34.7%
9.39	1.28	0.68	-46.7%
9.41	1.28	0.53	-58.2%
9.43	1.28	0.40	-68.6%
9.45	1.28	0.29	-77.7%
9.47	1.28	0.19	-84.9%
9.49	1.28	0.12	-90.8%
9.51	1.28	0.07	-94.2%
9.53	1.28	0.05	-96.0%
9.55	1.28	0.03	-97.5%

WATERLINE AT ZERO
AREA ERROR = 9.314

STREAM NAME: Baker Creek
XS LOCATION: Abv. Ski area @ USFS boundary
XS NUMBER: 1

Constant Manning's n

STAGING TABLE

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

	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	8.20	14.17	0.98	1.40	13.93	14.83	177.0%	0.94	27.36	1.96
	8.31	13.75	0.90	1.29	12.33	14.35	96.8%	0.86	22.83	1.85
	8.36	13.56	0.86	1.24	11.65	14.14	95.4%	0.82	20.97	1.80
	8.41	13.38	0.82	1.19	10.98	13.93	94.0%	0.79	19.17	1.75
	8.46	13.20	0.78	1.14	10.31	13.72	92.5%	0.75	17.45	1.69
	8.51	13.01	0.74	1.09	9.66	13.51	91.1%	0.71	15.81	1.64
	8.56	12.83	0.70	1.04	9.01	13.31	89.7%	0.68	14.23	1.58
	8.61	12.56	0.67	0.99	8.37	13.02	87.8%	0.64	12.78	1.53
	8.66	12.09	0.64	0.94	7.76	12.53	84.5%	0.62	11.54	1.49
	8.71	11.62	0.62	0.89	7.17	12.04	81.2%	0.60	10.38	1.45
	8.76	11.16	0.59	0.84	6.60	11.56	78.0%	0.57	9.29	1.41
	8.81	10.76	0.56	0.79	6.05	11.15	75.2%	0.54	8.24	1.36
	8.86	10.51	0.52	0.74	5.52	10.88	73.3%	0.51	7.19	1.30
	8.91	10.26	0.49	0.69	5.00	10.61	71.5%	0.47	6.20	1.24
	8.96	10.01	0.45	0.64	4.49	10.33	69.7%	0.43	5.28	1.17
	9.01	9.77	0.41	0.59	4.00	10.07	67.9%	0.40	4.42	1.11
	9.06	9.56	0.37	0.54	3.51	9.83	66.3%	0.36	3.62	1.03
	9.11	9.33	0.33	0.49	3.04	9.57	64.5%	0.32	2.90	0.95
	9.16	9.07	0.28	0.44	2.56	9.29	62.6%	0.28	2.25	0.87
	9.21	8.81	0.24	0.39	2.13	9.00	60.7%	0.24	1.67	0.78
	9.26	8.55	0.20	0.34	1.70	8.71	58.8%	0.20	1.17	0.69
WL	9.31	8.22	0.16	0.29	1.28	8.35	56.3%	0.15	0.75	0.59
	9.36	7.78	0.11	0.24	0.88	7.90	53.3%	0.11	0.42	0.47
	9.41	6.88	0.07	0.19	0.50	6.98	47.0%	0.07	0.18	0.36
	9.46	4.41	0.05	0.14	0.22	4.48	30.2%	0.05	0.06	0.27
	9.51	1.20	0.06	0.09	0.07	1.24	8.3%	0.06	0.02	0.30
	9.56	0.73	0.03	0.04	0.02	0.75	5.0%	0.03	0.00	0.18

1.8 cfs

0.3 cfs

STREAM NAME: Baker Creek
XS LOCATION: Abv. Ski area @ USFS boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.74	cfs
CALCULATED FLOW (Qc)=	0.75	cfs
(Qm-Qc)/Qm * 100 =	-1.5	%
MEASURED WATERLINE (WLm)=	9.30	ft
CALCULATED WATERLINE (WLc)=	9.31	ft
(WLm-WLc)/WLm * 100 =	-0.2	%
MAX MEASURED DEPTH (Dm)=	0.25	ft
MAX CALCULATED DEPTH (Dc)=	0.29	ft
(Dm-Dc)/Dm * 100	-14.3	%
MEAN VELOCITY=	0.59	ft/sec
MANNING'S N=	0.117	
SLOPE=	0.026	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	1.8	cfs

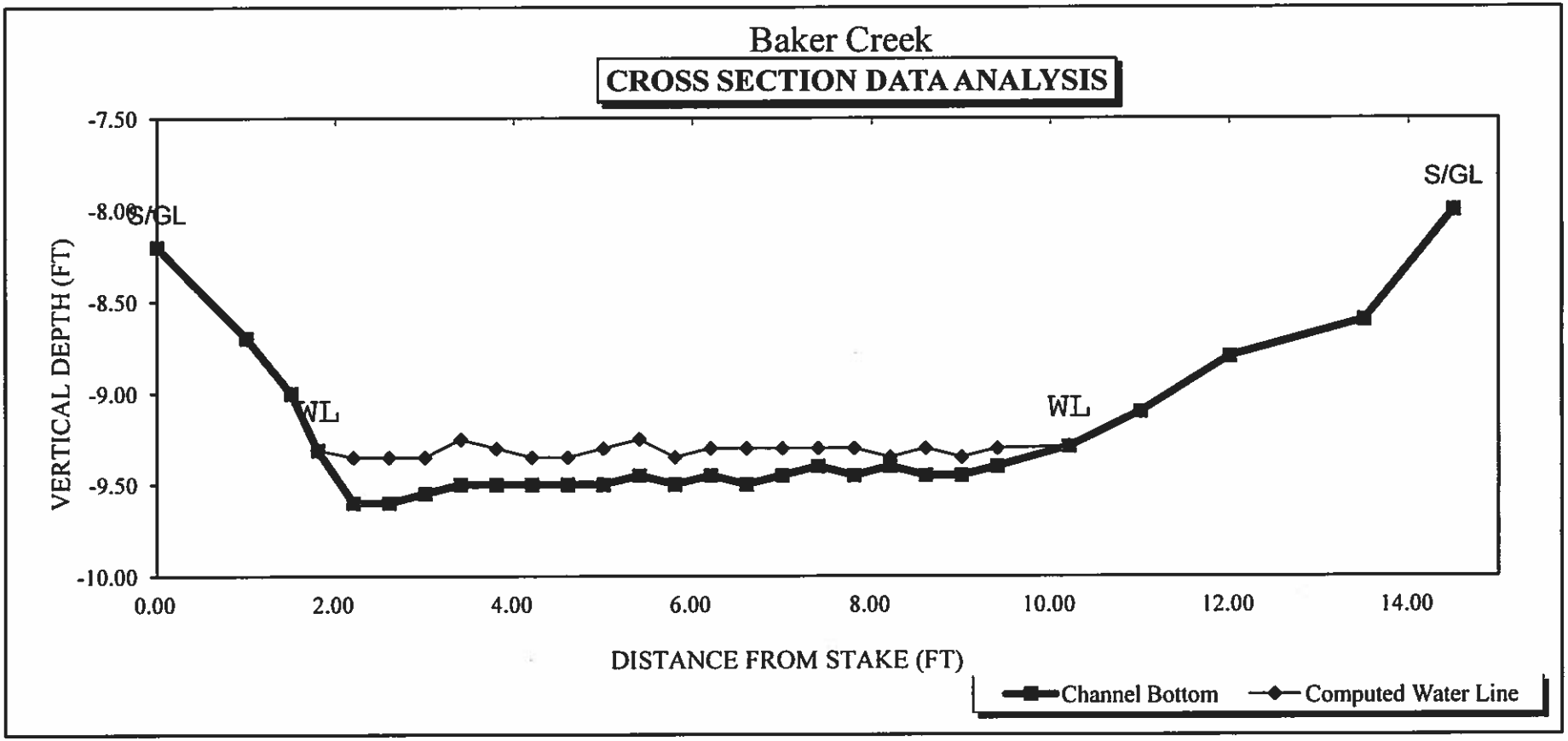
RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

RECOMMENDATION BY: ..... AGENCY ..... DATE: .....

CWCB REVIEW BY: ..... DATE: .....


Baker Creek
CROSS SECTION DATA ANALYSIS
-7.50
-8.00
-8.50
-9.00
-9.50
-10.00
VERTICAL DEPTH (FT)
S/GL
S/GL
WL
WL
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Starting Edge was incorrectly keyed into FlowTracker, the notes have been annotated with the correction. -Brian Epstein

Discharge Measurement Summary

Date Generated: Wed Jul 24 2013

File Information

File Name	BAKERLT.001.WAD
Start Date and Time	2010/10/26 11:14:36

Site Details

Site Name	BAKER CR AT LO TERM
Operator(s)	BE

System Information

Sensor Type	FlowTracker
Serial #	P2354
CPU Firmware Version	3.7
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.6%	5.3%
Velocity	1.2%	10.6%
Width	0.2%	0.2%
Method	3.2%	-
# Stations	6.6%	-
Overall	**7.6%**	**11.9%**

Summary

Averaging Int.	40	# Stations	9
Start Edge	REW ~~LEW~~	Total Width	3.700
Mean SNR	36.0 dB	Total Area	1.160
Mean Temp	32.09 °F	Mean Depth	0.314
Disch. Equation	Mid-Section	Mean Velocity	1.0079
		Total Discharge	**1.1692**

Measurement Results

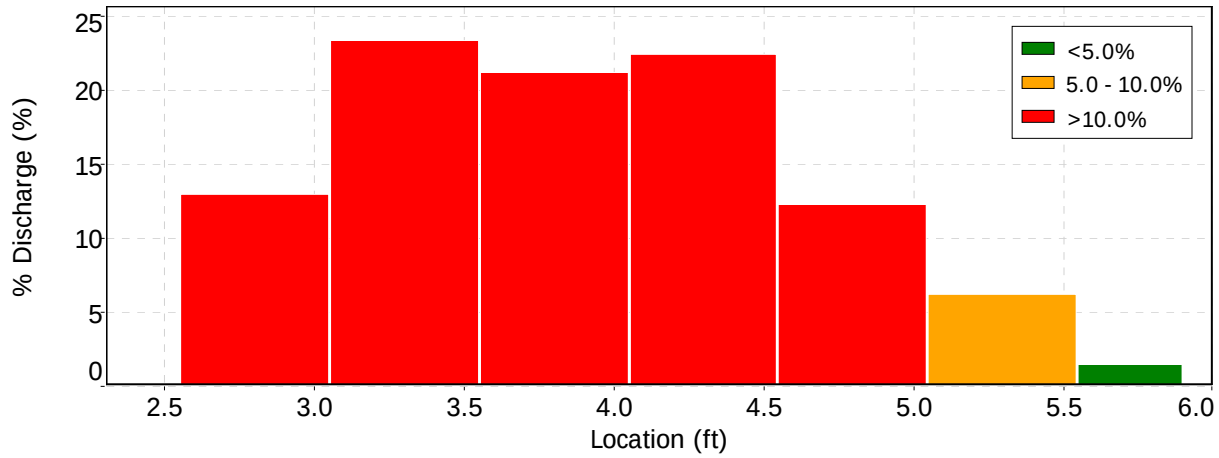
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	11:14	2.30	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	11:14	2.80	0.6	0.330	0.6	0.132	0.9196	1.00	0.9196	0.165	0.1518	13.0
2	11:15	3.30	0.6	0.410	0.6	0.164	1.3333	1.00	1.3333	0.205	0.2734	23.4
3	11:16	3.80	0.6	0.430	0.6	0.172	1.1526	1.00	1.1526	0.215	0.2479	21.2
4	11:18	4.30	0.6	0.360	0.6	0.144	1.4587	1.00	1.4587	0.180	0.2625	22.4
5	11:19	4.80	0.6	0.420	0.6	0.168	0.6854	1.00	0.6854	0.210	0.1439	12.3
6	*11:22*	*5.30*	*0.6*	*0.300*	*0.6*	*0.120*	*-0.4856*	*-1.00*	*0.4856*	*0.150*	*0.0728*	*6.2*
7	11:22	5.80	None	0.100	0.0	0.0	0.0000	1.00	0.4856	0.035	0.0170	1.5
8	11:22	6.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

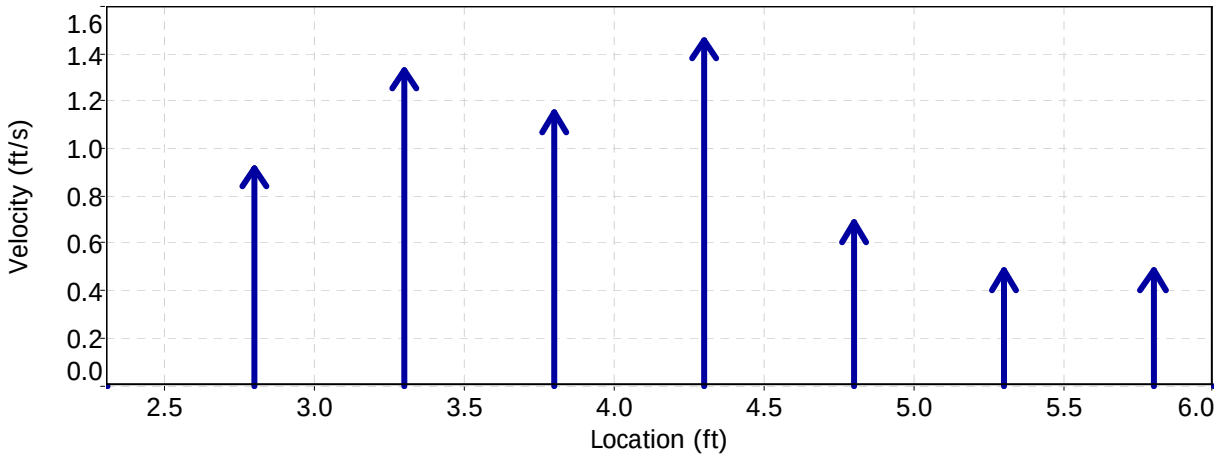
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

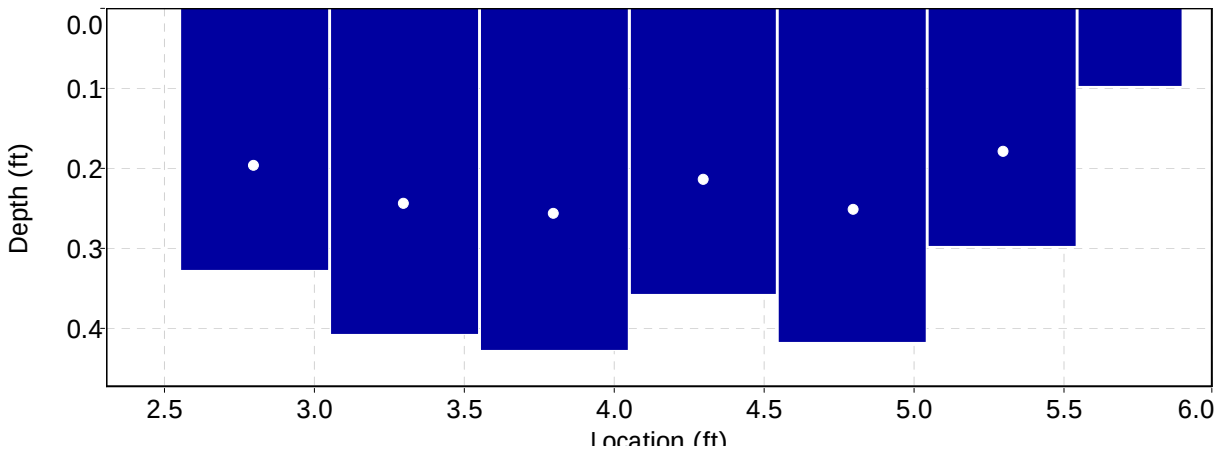
Discharge Measurement Summary

Date Generated: Wed Jul 24 2013

File Information		Site Details	
File Name	BAKERLT.001.WAD	Site Name	BAKER CR AT LO TERM
Start Date and Time	2010/10/26 11:14:36	Operator(s)	BE







Discharge Measurement Summary

Date Generated: Wed Jul 24 2013

File Information		Site Details	
File Name	BAKERLT.001.WAD	Site Name	BAKER CR AT LO TERM
Start Date and Time	2010/10/26 11:14:36	Operator(s)	BE

Quality Control

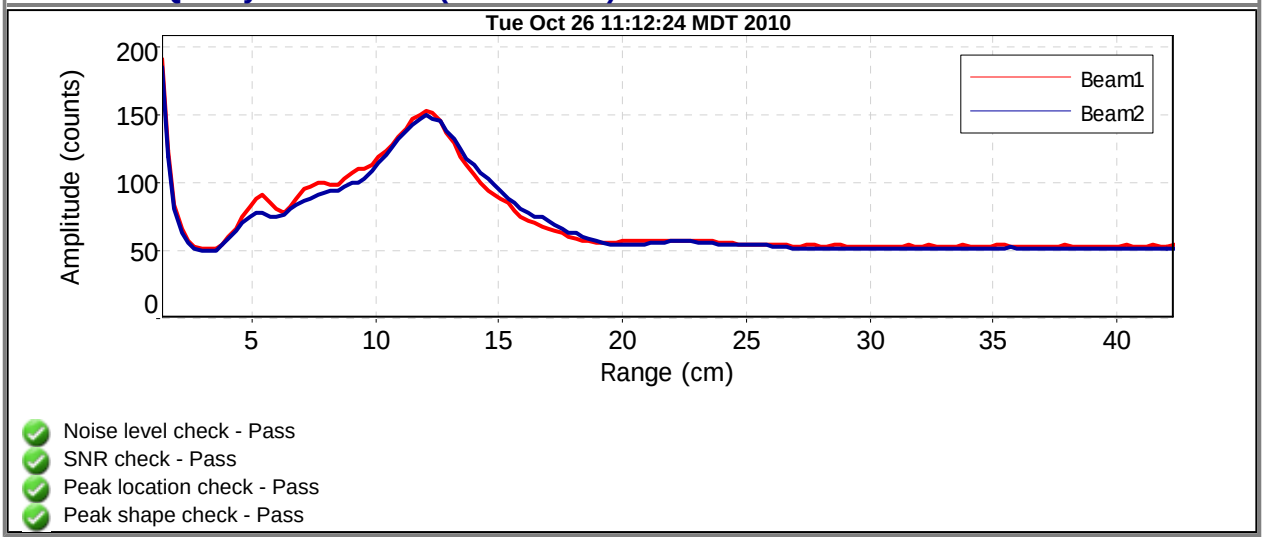
St	Loc	%Dep	Message
6	5.30	0.6	High angle: -177

Discharge Measurement Summary

Date Generated: Wed Jul 24 2013

File Information		Site Details	
File Name	BAKERLT.001.WAD	Site Name	BAKER CR AT LO TERM
Start Date and Time	2010/10/26 11:14:36	Operator(s)	BE

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

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Colorado Water Conservation Board
Department of Natural Resources

Discharge Measurement Summary

Date Generated: Fri Nov 21 2014

File Information

File Name	BKRCRLTQ.001.WAD
Start Date and Time	2014/08/07 13:16:48

Site Details

Site Name	BAKER CR NR PROP LT
Operator(s)	BJE

System Information

Sensor Type	FlowTracker
Serial #	P2355
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.5%	2.9%
Velocity	1.7%	6.5%
Width	0.2%	0.2%
Method	2.6%	-
# Stations	3.3%	-
Overall	**4.7%**	**7.2%**

Summary

Averaging Int.	40	# Stations	15
Start Edge	REW	Total Width	4.400
Mean SNR	41.5 dB	Total Area	2.023
Mean Temp	49.59 °F	Mean Depth	0.460
Disch. Equation	Mid-Section	Mean Velocity	0.8038
		Total Discharge	**1.6259**

Supplemental Data

#	Time	Location	Gauge Height	Rated Flow	Comments
1	Thu Aug 7 13:22:16 MDT 2014	4.099			VERY LIGHT RAIN STRT

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	13:16	2.60	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	13:16	2.90	0.6	0.500	0.6	0.200	0.6936	1.00	0.6936	0.150	0.1040	6.4
2	13:17	3.20	0.6	0.480	0.6	0.192	0.5928	1.00	0.5928	0.144	0.0853	5.2
3	13:18	3.50	0.6	0.410	0.6	0.164	0.5079	1.00	0.5079	0.123	0.0625	3.8
4	13:20	3.80	0.6	0.480	0.6	0.192	0.4347	1.00	0.4347	0.144	0.0626	3.8
5	*13:22*	*4.10*	*0.6*	*0.480*	*0.6*	*0.192*	*0.1923*	*1.00*	*0.1923*	*0.144*	*0.0277*	*1.7*
6	*13:23*	*4.40*	*0.6*	*0.470*	*0.6*	*0.188*	*0.2411*	*1.00*	*0.2411*	*0.141*	*0.0340*	*2.1*
7	*13:24*	*4.70*	*0.6*	*0.400*	*0.6*	*0.160*	*0.4715*	*1.00*	*0.4715*	*0.120*	*0.0565*	*3.5*
8	13:25	5.00	0.6	0.490	0.6	0.196	1.6145	1.00	1.6145	0.147	0.2373	14.6
9	13:27	5.30	0.6	0.500	0.6	0.200	1.8120	1.00	1.8120	0.150	0.2717	16.7
10	*13:28*	*5.60*	*0.6*	*0.550*	*0.6*	*0.220*	*1.5705*	*1.00*	*1.5705*	*0.165*	*0.2590*	*15.9*
11	13:29	5.90	0.6	0.600	0.6	0.240	1.3366	1.00	1.3366	0.180	0.2405	14.8
12	13:30	6.20	0.6	0.690	0.6	0.276	0.6749	1.00	0.6749	0.207	0.1396	8.6
13	13:31	6.50	0.6	0.520	0.6	0.208	0.2172	1.00	0.2172	0.208	0.0453	2.8
14	13:31	7.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

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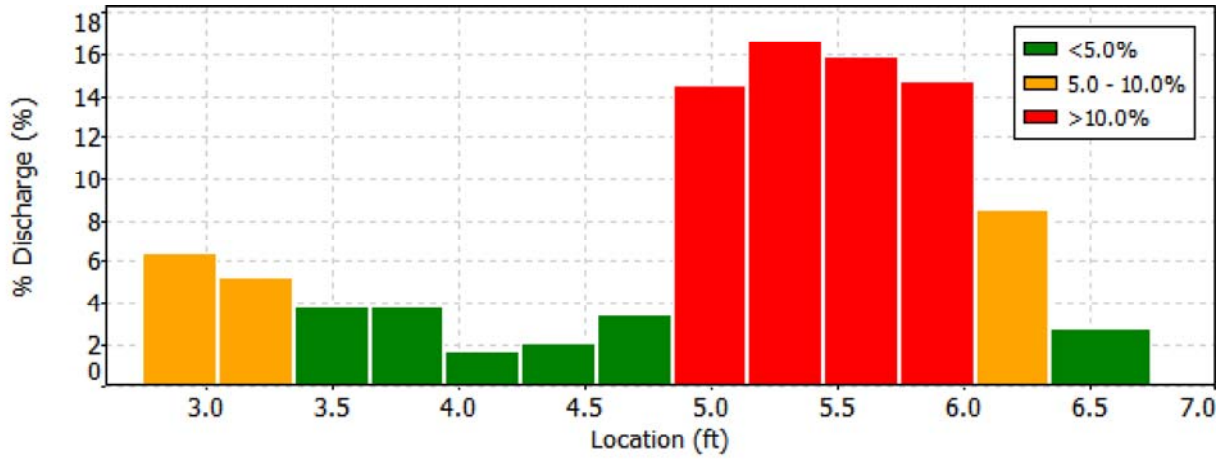
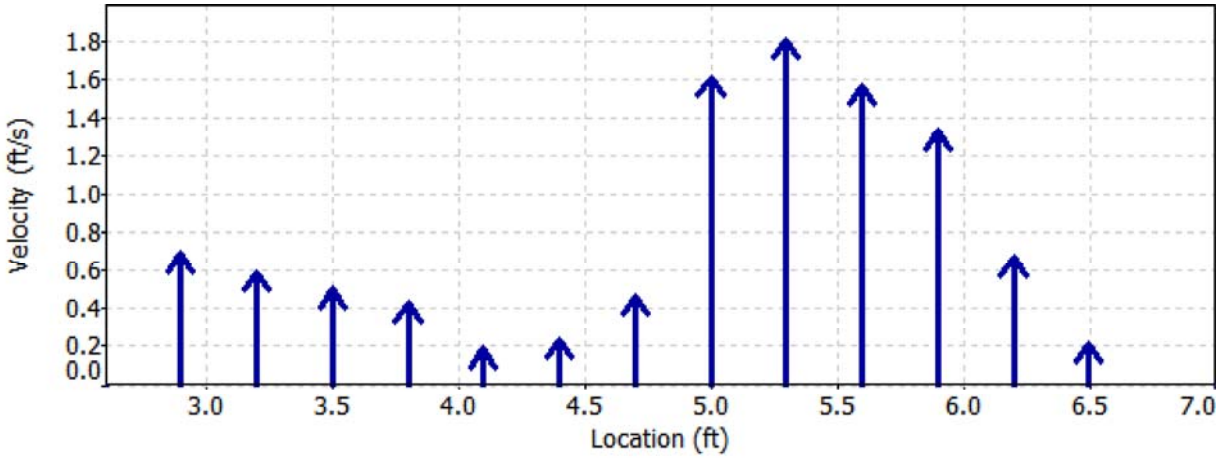
Colorado Water Conservation Board
Department of Natural Resources

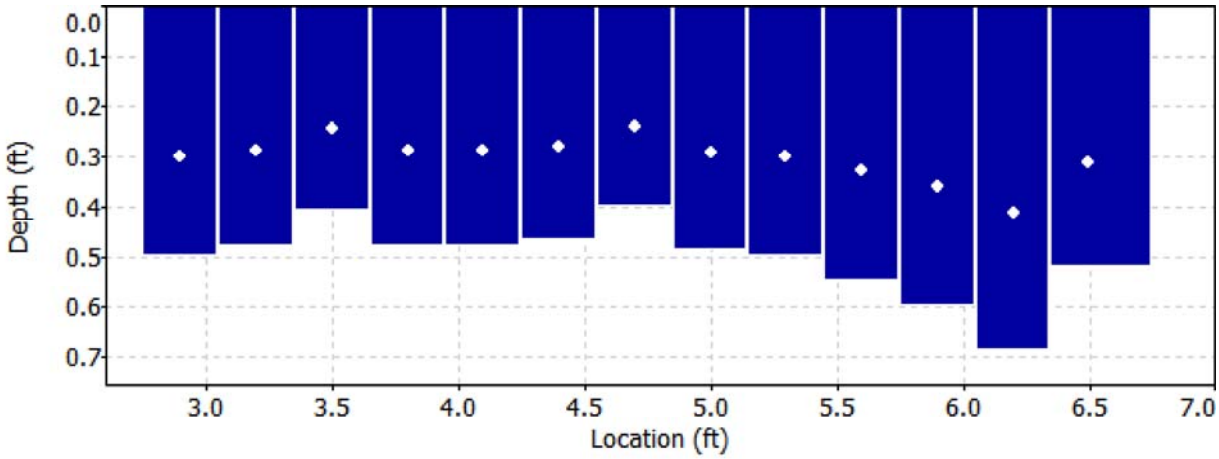
Discharge Measurement Summary

Date Generated: Fri Nov 21 2014

File Information		Site Details	
File Name	BKRCRLTQ.001.WAD	Site Name	BAKER CR NR PROP LT
Start Date and Time	2014/08/07 13:16:48	Operator(s)	BJE







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Discharge Measurement Summary

Date Generated: Fri Nov 21 2014

File Information

File Name	BKRCRLTQ.001.WAD
Start Date and Time	2014/08/07 13:16:48

Site Details

Site Name	BAKER CR NR PROP LT
Operator(s)	BJE

Quality Control

St	Loc	%Dep	Message
5	4.10	0.6	High angle: 27
6	4.40	0.6	High angle: 26
7	4.70	0.6	High angle: 21
10	5.60	0.6	High standard error: 0.081

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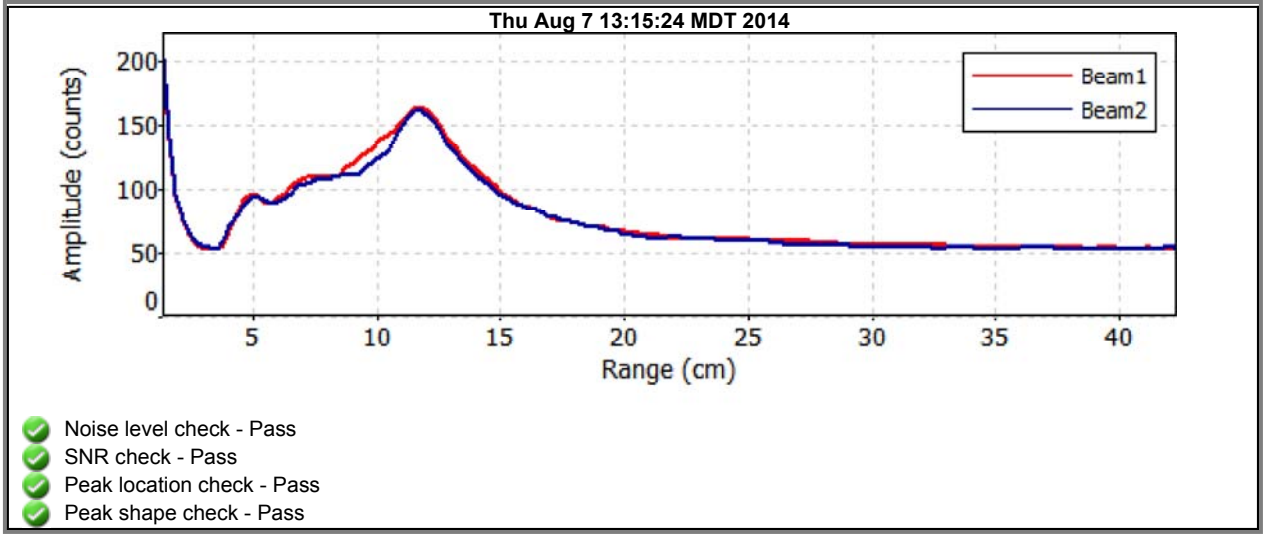
Colorado Water Conservation Board
Department of Natural Resources

Discharge Measurement Summary

Date Generated: Fri Nov 21 2014

File Information		Site Details	
File Name	BKRCRLTQ.001.WAD	Site Name	BAKER CR NR PROP LT
Start Date and Time	2014/08/07 13:16:48	Operator(s)	BJE

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

Discharge Measurement Summary

File Information

File name	BAKERD2_20181029-133649.ft
Start date and time	10/29/2018 1:11 PM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	10/29/2018 1:13:33 PM		End time	10/29/2018 1:31:34 PM	
# Stations	13		Avg interval	40	
Mean depth	0.367	ft			
Mean velocity	0.2086	ft/s	Total width	4.200	ft
Mean SNR	44	dB	Total area	1.5400	ft²
Mean temp	39.119	°F	Total discharge	0.3212	ft³/s

System Information

Sensor type	Top Setting
Handheld serial number	FT2H1747037
Probe serial number	FT2P1747048
Probe firmware	1.23
Handheld software	1.4

Site Details

Site name	BAKER D2
Site number	1029
Operator(s)	JEL
Comment	

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	1.1%	17.2%
Velocity	3.5%	38.7%
Width	0.4%	0.4%
Method	5.7%	
# Stations	3.9%	
Overall	7.9%	42.4%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings

Station discharge caution	5.00	%
Station discharge warning	10.00	%
Maximum depth change	50.00	%
Maximum spacing change	100.00	%

Summary overview

No changes were made to this file
Quality control warnings

Data Collection Settings

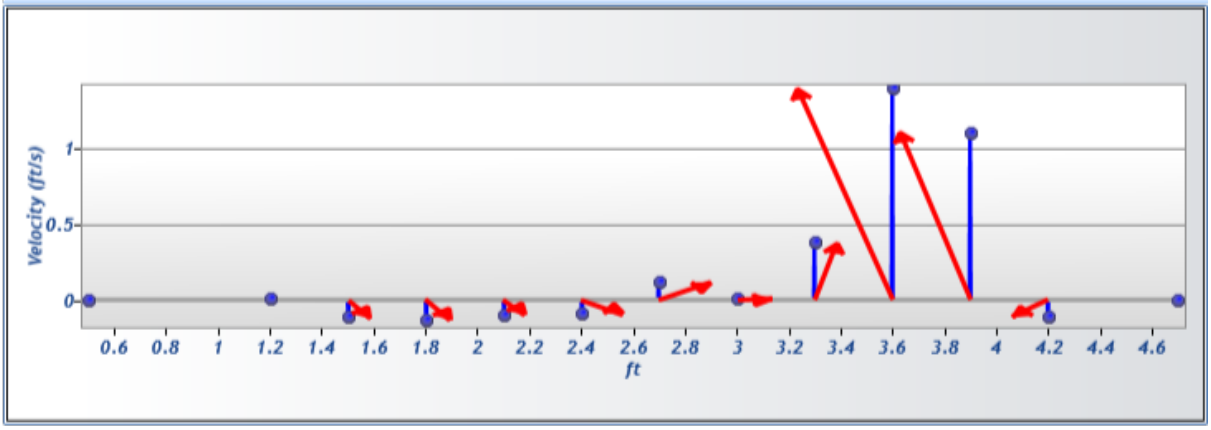
Salinity	0.000	PSS-78
Temperature		°F
Sound speed		ft/s
Mounting correction	0.00	%

Quality Control Settings

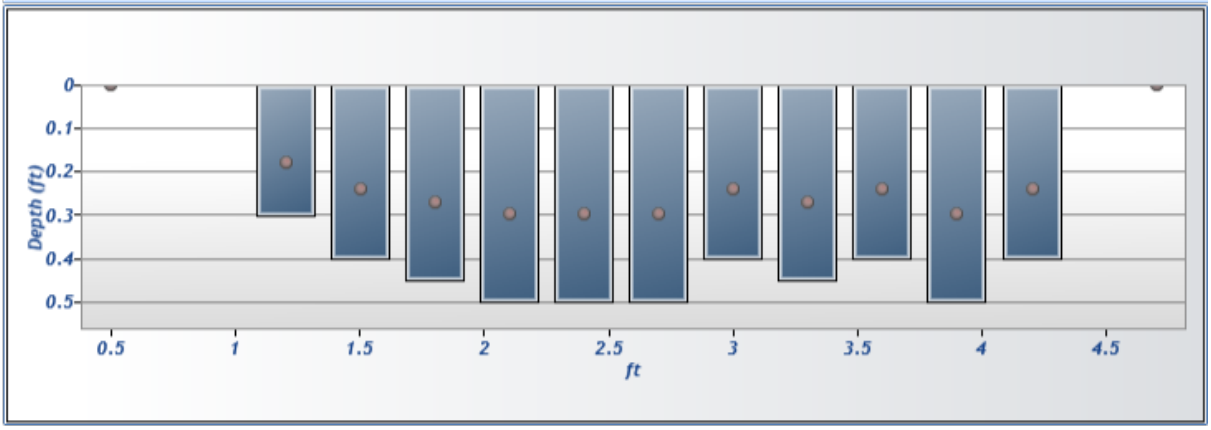
SNR threshold	10	dB
Standard error threshold	0.0328	ft/s
Spike threshold	10.00	%
Maximum velocity angle	20.0	deg
Maximum tilt angle	5.0	deg

Discharge chart

Velocity chart



Depth chart



Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q		
0	1:13 PM	0.500	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.0003	0.0000	0.0000	0.00	✓	
1	1:14 PM	1.200	0.6	0.300	0.6000	0.180	80	0.0003	1.0000	0.0003	0.1500	0.0001	0.02	✓	
2	1:15 PM	1.500	0.6	0.400	0.6000	0.240	80	-0.1200	1.0000	-0.1200	0.1200	-0.0144	-4.48	✓	
3	1:18 PM	1.800	0.6	0.450	0.6000	0.270	80	-0.1394	1.0000	-0.1394	0.1350	-0.0188	-5.86	✓	
4	1:19 PM	2.100	0.6	0.500	0.6000	0.300	80	-0.1012	1.0000	-0.1012	0.1500	-0.0152	-4.73	✓	
5	1:21 PM	2.400	0.6	0.500	0.6000	0.300	80	-0.0976	1.0000	-0.0976	0.1500	-0.0146	-4.56	✓	
6	1:22 PM	2.700	0.6	0.500	0.6000	0.300	80	0.1177	1.0000	0.1177	0.1500	0.0177	5.50	✓	
7	1:24 PM	3.000	0.6	0.400	0.6000	0.240	80	0.0083	1.0000	0.0083	0.1200	0.0010	0.31	✓	
8	1:25 PM	3.300	0.6	0.450	0.6000	0.270	80	0.3734	1.0000	0.3734	0.1350	0.0504	15.70	✓	
9	1:27 PM	3.600	0.6	0.400	0.6000	0.240	80	1.3952	1.0000	1.3952	0.1200	0.1674	52.13	✓	
10	1:28 PM	3.900	0.6	0.500	0.6000	0.300	80	1.1053	1.0000	1.1053	0.1500	0.1658	51.62	✓	
11	1:30 PM	4.200	0.6	0.400	0.6000	0.240	80	-0.1133	1.0000	-0.1133	0.1600	-0.0181	-5.64	✓	
12	1:31 PM	4.700	None	0.000	0.0000	0.000	0	0.0000	1.0000	-0.1133	0.0000	0.0000	0.00	✓	

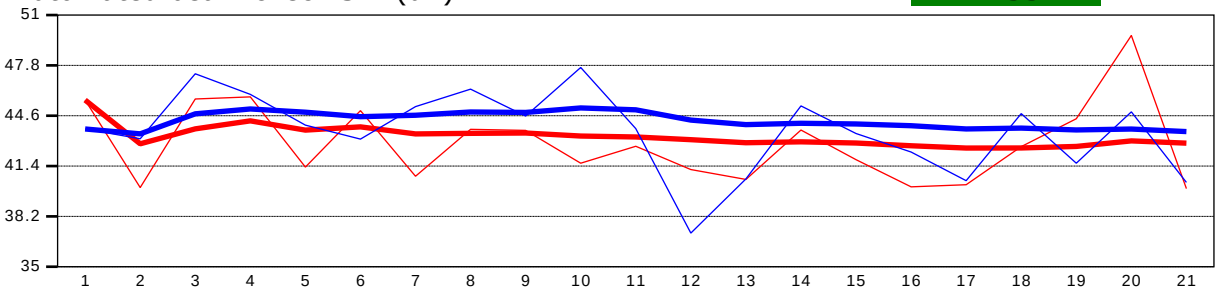
Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings	
1	1:14 PM	1.200	0.6	0.300	0.6000	0.180	SNR Threshold Variation	
2	1:15 PM	1.500	0.6	0.400	0.6000	0.240	Boundary Interference,Velocity Angle > QC	
3	1:18 PM	1.800	0.6	0.450	0.6000	0.270	Boundary Interference,Velocity Angle > QC	
4	1:19 PM	2.100	0.6	0.500	0.6000	0.300	Velocity Angle > QC	
5	1:21 PM	2.400	0.6	0.500	0.6000	0.300	Velocity Angle > QC	
6	1:22 PM	2.700	0.6	0.500	0.6000	0.300	Velocity Angle > QC	
8	1:25 PM	3.300	0.6	0.450	0.6000	0.270	High Stn % Discharge	
9	1:27 PM	3.600	0.6	0.400	0.6000	0.240	Standard Error > QC,High Stn % Discharge	
10	1:28 PM	3.900	0.6	0.500	0.6000	0.300	Standard Error > QC,High Stn % Discharge	
11	1:30 PM	4.200	0.6	0.400	0.6000	0.240	Velocity Angle > QC	

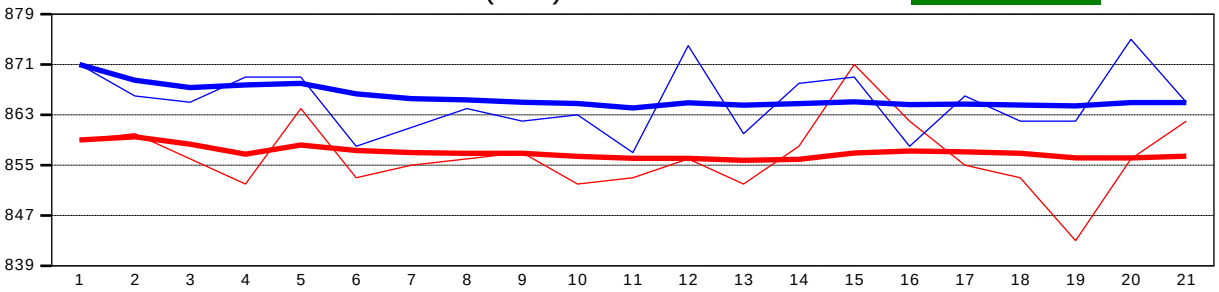
1/17/2019 12:50:31 PM

Automated beam check Start time 10/29/2018 1:12:58 PM

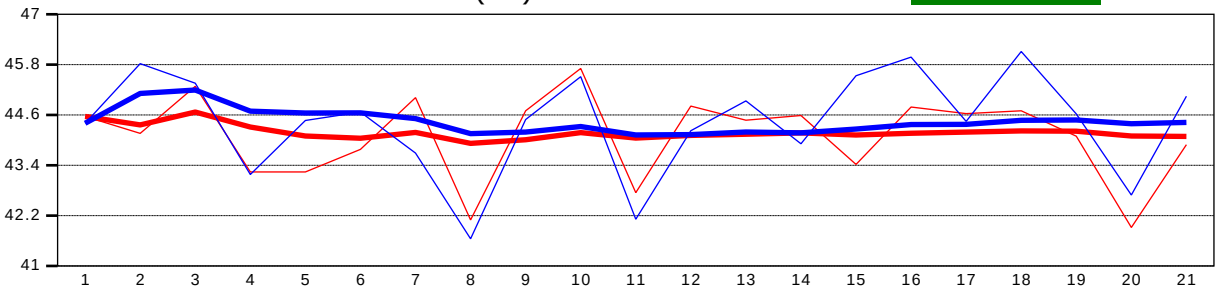
Automated beam check SNR(dB) PASS



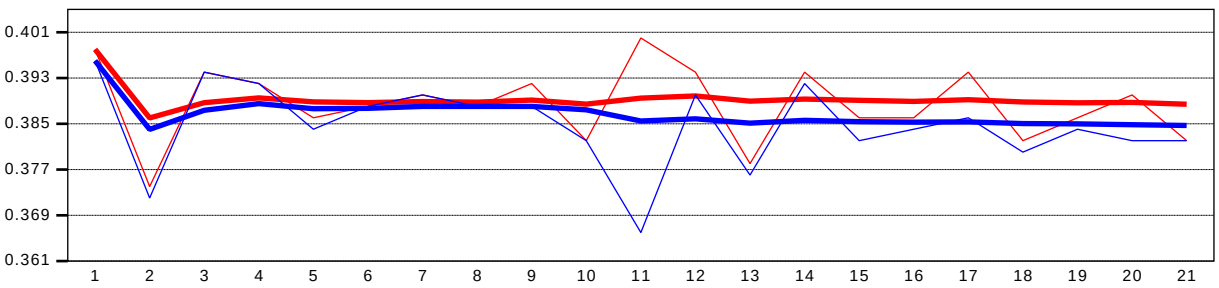
Automated beam check Noise level(cnts) PASS



Automated beam check Peak level(dB) PASS

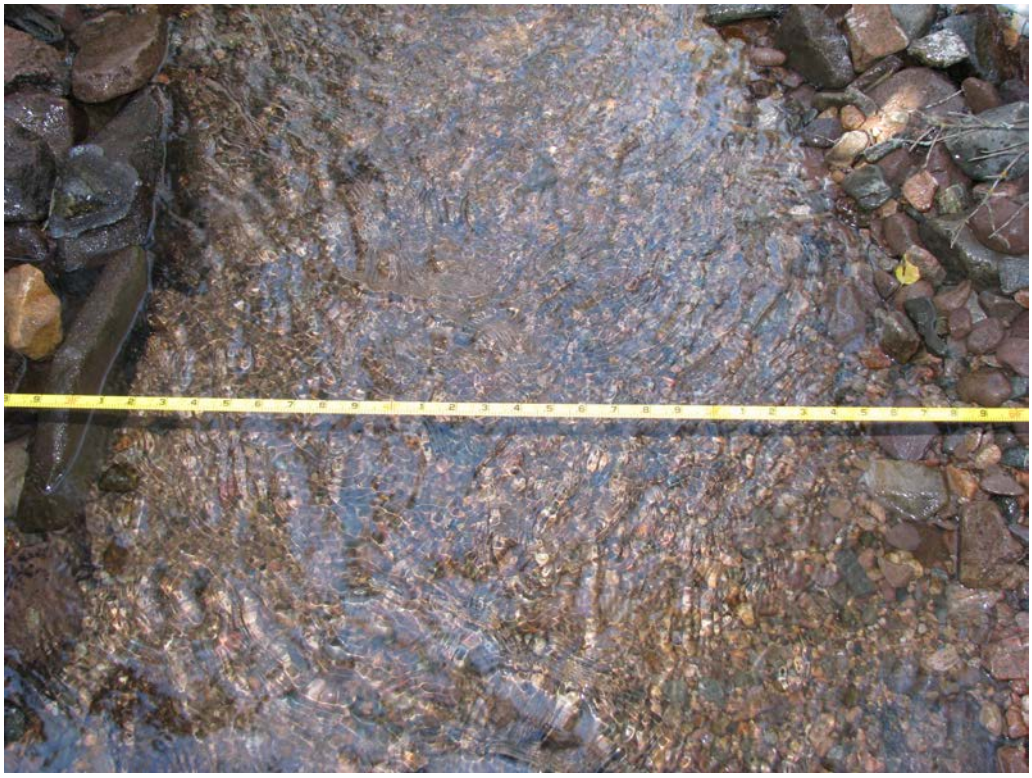


Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings



Baker Creek

At Ski Area