COLORADO
Parks and Wildlife
Department of Natural Resources

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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 3, Saguache County; Miners Creek and Prong 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 Miners Creek and Prong Creek in Water Division 3. 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 in 1993 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 Miners Creek and Prong 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, Miners Creek and Prong 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, up until very recently, thought to be habitat for conservation populations of Rio Grande cutthroat trout. Recent genetic testing of the fish in both of these creeks has resulted in a down-listing of these populations due to a slight introgression of Yellowstone cutthroat trout. This relatively recent development has resulted in Miners and Prong Creek's removal from the "Conservation Population" list of streams and lakes in the Rio Grande basin (Conservation Agreement and Strategy, 2013). 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). So, while it is true that the Miners Creek and Prong Creek fisheries are no longer critical to the overall range-wide Rio Grande cutthroat trout conservation effort, these fisheries are still important to CPW and are still worthy of protection via an instream flow water right.

Attached you will find summary information on the Miners Creek and Prong Creek fish population. This data was collected by CPW biologists utilizing standard electrofishing techniques. The data shows multiple age classes of both brook trout and Rio Grande cutthroat trout; this population structure is indicative of natural reproduction of both species. 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 1993 and 2017, CPW personnel collected stream cross section data to be used as input into the R2CROSS model. Three cross section data sets were collected on each of the creeks. The field data sheets and R2CROSS runs are attached. The results of the R2CROSS analysis for each of the two creeks are summarized on the attached FACT SHEETS. For Miners Creek, the R2CROSS generated flow recommendations are 1.0 cfs Summer (5/1 – 8/31) and 0.56 cfs Winter (9/1 – 4/30). For Prong Creek, the R2CROSS generated flow recommendations are 4.2

cfs Summer (5/1 - 8/31) and 0.4 cfs Winter (9/1 - 4/30). There is not any current or historic stream flow records for either creek, so seasons were determined using the USGS StreamStats output. StreamStats also confirms that water appears to be available for an ISF appropriation on both Miners Creek and Prong Creek. Final water availability analyses will be performed 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 following 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

Prong Creek

Water Division 3, Saguache County

Upper Terminus: The headwaters at a point approximately located at 37 degrees 55' 37.42" N, 106 degrees 32' 20.60" W

Lower Terminus: The confluence with the South Fork of Carnero Creek at approximately 37 degrees 57' 23.9" N, 106 degrees 29' 35.47" W

Approximate Length: 2.9 miles

Natural Environment:

Prong Creek has a natural environment consisting of self-sustaining populations of Rio Grande cutthroat trout and brook trout. 2006 and 2012 electrofishing data shows multiple age classes of both species and a wide range of sizes from 3 inch fish to individuals in excess of 9 inches. Genetic testing of the Rio Grande cutthroats in Prong Creek show approximately 5 -10% introgression with Yellowstone cutthroat trout. Prong Creek was originally identified in the Rio Grande Cutthroat Trout Conservation Plan as a conservation stream but the Yellowstone introgression has resulted in a downgrading of this stream's overall cutthroat importance. Prong Creek's natural environment also has a diverse macroinvertebrate community and numerous beaver dam complexes.

R2CROSS Results:

In 1993 and 2017, CPW and CWCB personnel collected R2CROSS data at 3 sites within the proposed ISF segment. The 1993 data set was used for the winter flow recommendation and the 2017 data sets were used for the summer flow recommendation by averaging the two values. The results of the R2CROSS modeling are summarized in the following table:

Date	Q Measured	250% - 40%	Flow meeting two criteria	Flow meeting three criteria
9/22/1993	0.61 cfs	0.2 – 1.5 cfs	0.37 cfs	*
9/27/2017	3.44 cfs	1.4 – 8.6 cfs	*	4.86 cfs
9/27/2017	3.44 cfs	1.4 – 8.6 cfs	*	3.54 cfs

"*" = Modeled flow out of range with respect to estimate of Manning's "n"; highlighted values used for ISF recommendation.

CPW recommends an instream flow to protect the Prong Creek natural environment to a reasonable degree of 4.2 cfs (5/1 to 8/31) and 0.4 cfs (9/1 to 4/30).

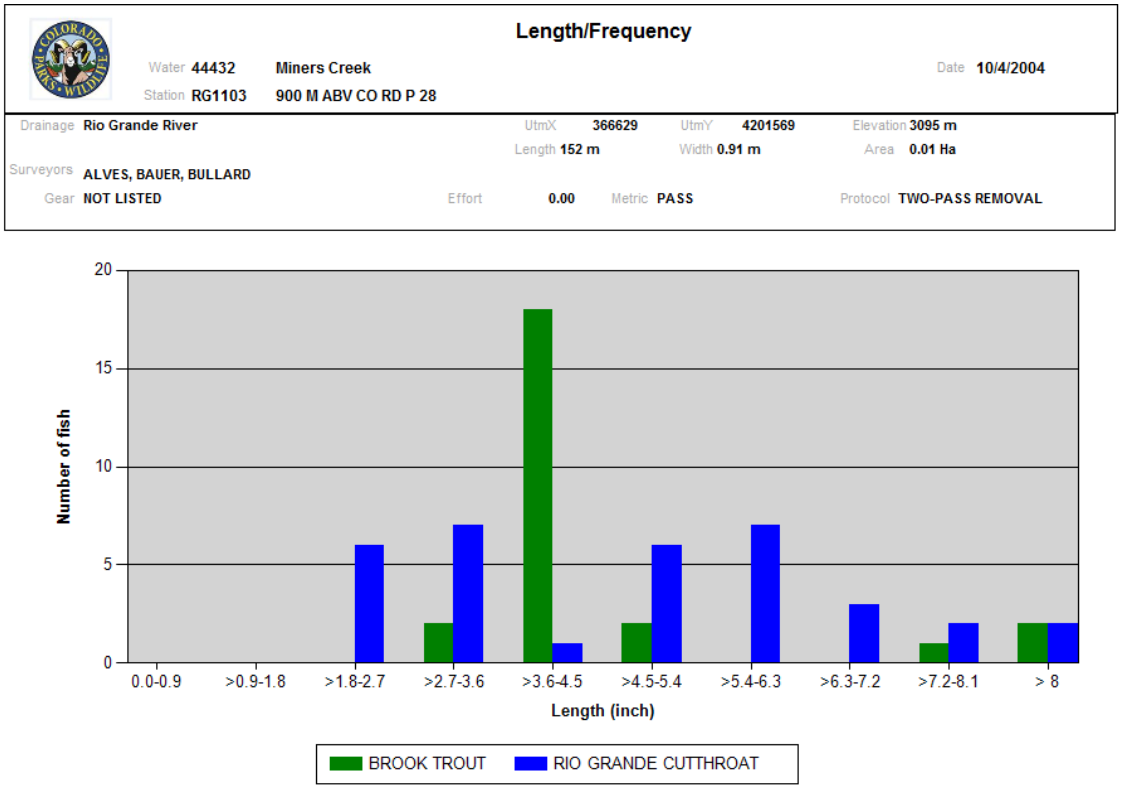
Miners and Prong Creek Sampling Summary

Both Miners and Prong Creeks, Rio Grande Cutthroat Trout populations are introgressed with 5-10% Yellowstone cutthroat trout and are **not** considered core conservation populations.

Miners Creek (44432)

Miners creek was sampled at one site (RG1103) in 1977 and 1998. No fish we sampled in 1977 and only 17 Rio Grande cutthroat were sampled in 1998.

The last sampling at Miners Creek occurred in October of 2004 when the historical site RG1103, and a new site RG1104 were both sampled. At the new site RG1104 only 6 brook trout and no cutthroat were sampled. At RG1103, 34 cutthroat and 25 brook trout were sampled. The length frequency plot of the data is shown here:



Prong Creek (38271)

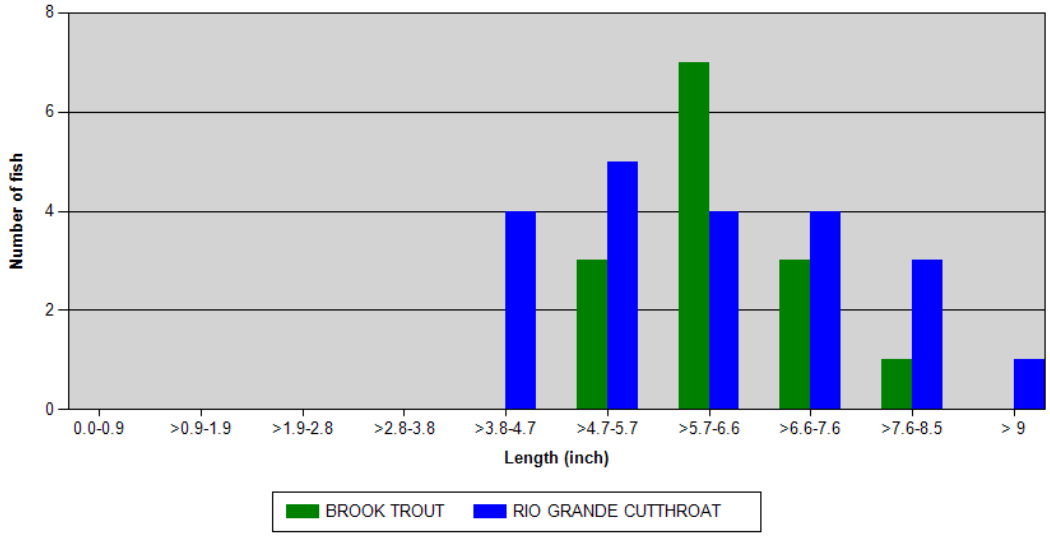
Prong Creek has one main sampling site (RG0547), located below the confluence with Miners Creek. This site was sampled in 1977, 2006 and most recently in 2012. In 1977 at this site, 8 cutthroat and 3 brook trout were sampled. Also in 1977 a site (RG1729) upstream from the Miners creek confluence was also sampled. At RG1729, on this date only two brook trout were sampled, and this is the only record I have of the upper site being sampled.

RG0547 was next sampled in 2006 and 21 cutthroat and 14 brook trout were sampled at this time. In 2012 the site was sampled but during high flows and turbidity which may have reduced efficiency of

electrofishing. In 2012, only 2 cutthroat and 12 brook trout were sampled. Because of the low catch in 2012 I have included the length frequency plots for the sampling dates in 2006 and 2012 respectively.

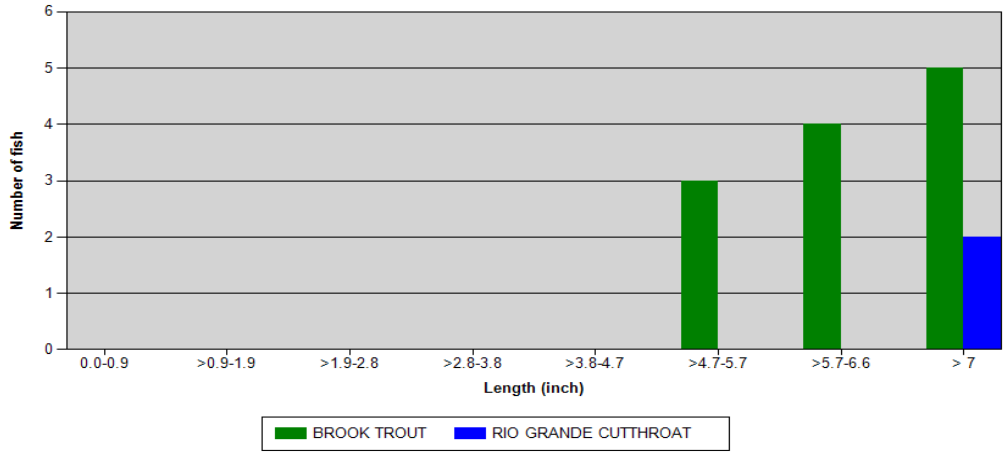
2006

Water 38271 Prong Creek Date 7/5/2006
Station RG0547 400 M BLW Miners Creek
Drainage Rio Grande River UtmX 367657 UtmY 4201603 Elevation 3018 m
Length 122 m Width 1.83 m Area 0.02 Ha
Surveyors ALVES
Gear NOT LISTED Effort 0.00 Metric PASS Protocol TWO-PASS REMOVAL



2012

Water 38271 Prong Creek Date 9/13/2012
Station RG0547 400 M BLW Miners Creek
Drainage Rio Grande River UtmX 368185 UtmY 4202135 Elevation 3018 m
Length 47 m Width 1.22 m Area 0.01 Ha
Surveyors A. Todd
Gear BPEF Effort Metric PASS Protocol PRESENCE/ABSENCE



Data Input & Proofing

STREAM NAME:	Prong Creek
XS LOCATION:	250 ft u/s of Miners Creek confl
XS NUMBER:	(93) 1
DATE:	9/22/1993
OBSERVERS:	Skinner Navo Carlson
1/4 SEC:	
SECTION:	
TWP:	
RANGE:	
PM:	
COUNTY:	
WATERSHED:	
DIVISION:	
DOW CODE:	
USGS MAP:	
USFS MAP:	
TAPE WT:	0.0106 lbs / ft
TENSION:	11 lbs
SLOPE:	0.048 ft / ft

Sag Tape

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

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
		Total Data Points = 17						
	s	0.00	0.75			0.00	0.00	0.00
		1.30	1.30			0.00	0.00	0.00
1	gl	2.10	1.50			0.00	0.00	0.00
	wl	2.60	1.90	0.00	0.00	0.00	0.00	0.00
		2.65	1.95	0.05	0.00	0.01	0.00	1.91
		3.00	2.05	0.20	0.26	0.07	0.02	1.86
		3.30	2.00	0.25	1.60	0.08	0.12	1.76
		3.60	2.05	0.25	0.76	0.08	0.06	1.81
		3.90	2.05	0.25	1.48	0.08	0.11	1.81
		4.20	2.25	0.40	0.52	0.12	0.06	1.86
		4.50	2.20	0.35	0.46	0.11	0.05	1.86
		4.80	2.15	0.30	0.40	0.09	0.04	1.86
		5.10	2.20	0.35	1.24	0.13	0.16	1.86
		5.55	1.90	0.25	0.00	0.06	0.00	1.65
	wl	5.60	1.80	0.00	0.00	0.00	0.00	0.00
1	gl	6.50	1.15			0.00	0.00	0.00
	s	7.25	0.70			0.00	0.00	0.00
					Totals	0.81	0.61	

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

LOCATION INFORMATION

STREAM NAME:	Prong Creek
XS LOCATION:	250 ft u/s of Miners Creek confl
XS NUMBER:	(93) 1
DATE:	22-Sep-93
OBSERVERS:	Skinner Navo Carlson
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	0
WATERSHED:	0
DIVISION:	0
DOW CODE:	0
USGS MAP:	0
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:	11	

CHANNEL PROFILE DATA

SLOPE:	0.048

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

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

STREAM NAME: Prong Creek
XS LOCATION: 250 ft u/s of Miners Creek confl
XS NUMBER: (93) 1

DATA POINTS= 17

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	s	0.00	0.75			0.00		0.00	0.00	0.0%
		1.30	1.30			0.00		0.00	0.00	0.0%
1	gl	2.10	1.50			0.00		0.00	0.00	0.0%
	wl	2.60	1.90	0.00	0.00	0.00		0.00	0.00	0.0%
		2.65	1.95	0.05	0.00	0.07	0.05	0.01	0.00	0.0%
		3.00	2.05	0.20	0.26	0.36	0.20	0.07	0.02	2.8%
		3.30	2.00	0.25	1.60	0.30	0.25	0.08	0.12	19.5%
		3.60	2.05	0.25	0.76	0.30	0.25	0.08	0.06	9.3%
		3.90	2.05	0.25	1.48	0.30	0.25	0.08	0.11	18.1%
		4.20	2.25	0.40	0.52	0.36	0.40	0.12	0.06	10.2%
		4.50	2.20	0.35	0.46	0.30	0.35	0.11	0.05	7.9%
		4.80	2.15	0.30	0.40	0.30	0.30	0.09	0.04	5.9%
		5.10	2.20	0.35	1.24	0.30	0.35	0.13	0.16	26.5%
		5.55	1.90	0.25	0.00	0.54	0.25	0.06	0.00	0.0%
	wl	5.60	1.80	0.00	0.00	0.11		0.00	0.00	0.0%
1	gl	6.50	1.15			0.00		0.00	0.00	0.0%
	s	7.25	0.70			0.00		0.00	0.00	0.0%
	TOTALS ----------					3.27	0.4 (Max.)	0.81	0.61	100.0%

Manning's n = 0.1689
Hydraulic Radius= 0.24743024

STREAM NAME: Prong Creek
XS LOCATION: 250 ft u/s of Miners Creek confl
XS NUMBER: (93) 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.81	0.71	-11.8%
1.61	0.81	1.54	91.0%
1.63	0.81	1.47	82.0%
1.65	0.81	1.40	73.2%
1.67	0.81	1.33	64.5%
1.69	0.81	1.26	55.9%
1.71	0.81	1.19	47.5%
1.73	0.81	1.13	39.2%
1.75	0.81	1.06	31.0%
1.77	0.81	0.99	22.9%
1.79	0.81	0.93	15.0%
1.81	0.81	0.87	7.2%
1.82	0.81	0.84	3.4%
1.83	0.81	0.81	-0.5%
1.84	0.81	0.77	-4.3%
1.85	0.81	0.74	-8.1%
1.86	0.81	0.71	-11.8%
1.87	0.81	0.68	-15.6%
1.88	0.81	0.65	-19.3%
1.89	0.81	0.62	-23.0%
1.90	0.81	0.59	-26.7%
1.91	0.81	0.56	-30.3%
1.93	0.81	0.50	-37.6%
1.95	0.81	0.45	-44.7%
1.97	0.81	0.39	-51.6%
1.99	0.81	0.34	-58.4%
2.01	0.81	0.28	-64.9%
2.03	0.81	0.24	-70.9%
2.05	0.81	0.19	-76.0%
2.07	0.81	0.16	-80.1%
2.09	0.81	0.13	-83.5%
2.11	0.81	0.11	-86.7%

WATERLINE AT ZERO
AREA ERROR = 1.824

STREAM NAME: Prong Creek
XS LOCATION: 250 ft u/s of Miners Creek confl
XS NUMBER: (93) 1

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	1.51	3.91	0.49	0.75	1.92	4.42	100.0%	0.43	2.13	1.11
	1.52	3.86	0.48	0.73	1.85	4.36	98.6%	0.42	2.01	1.09
	1.57	3.73	0.44	0.68	1.66	4.19	94.9%	0.40	1.72	1.04
	1.62	3.60	0.41	0.63	1.48	4.03	91.1%	0.37	1.46	0.99
	1.67	3.47	0.37	0.58	1.30	3.86	87.4%	0.34	1.21	0.93
	1.72	3.34	0.34	0.53	1.13	3.70	83.7%	0.31	0.99	0.87
	1.77	3.21	0.30	0.48	0.97	3.53	79.9%	0.27	0.78	0.81
WL	1.82	3.09	0.26	0.43	0.81	3.38	76.4%	0.24	0.60	0.74
	1.87	3.01	0.22	0.38	0.66	3.24	73.4%	0.20	0.44	0.66
	1.92	2.90	0.18	0.33	0.51	3.10	70.1%	0.16	0.29	0.58
	1.97	2.73	0.13	0.28	0.37	2.90	65.5%	0.13	0.18	0.49
	2.02	2.27	0.10	0.23	0.24	2.41	54.5%	0.10	0.10	0.41
	2.07	1.37	0.11	0.18	0.15	1.48	33.4%	0.10	0.06	0.42
	2.12	1.22	0.07	0.13	0.08	1.30	29.4%	0.06	0.03	0.31
	2.17	0.85	0.03	0.08	0.03	0.89	20.2%	0.03	0.01	0.20
	2.22	0.24	0.02	0.03	0.00	0.25	5.7%	0.02	0.00	0.12

STREAM NAME: Prong Creek
XS LOCATION: 250 ft u/s of Miners Creek confl
XS NUMBER: (93) 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.61	cfs
CALCULATED FLOW (Qc)=	0.60	cfs
(Qm-Qc)/Qm * 100 =	2.2	%
MEASURED WATERLINE (WLm)=	1.86	ft
CALCULATED WATERLINE (WLc)=	1.82	ft
(WLm-WLc)/WLm * 100 =	1.7	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.43	ft
(Dm-Dc)/Dm * 100	-8.1	%
MEAN VELOCITY=	0.74	ft/sec
MANNING'S N=	0.169	
SLOPE=	0.048	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.5	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

RATIONALE FOR RECOMMENDATION:
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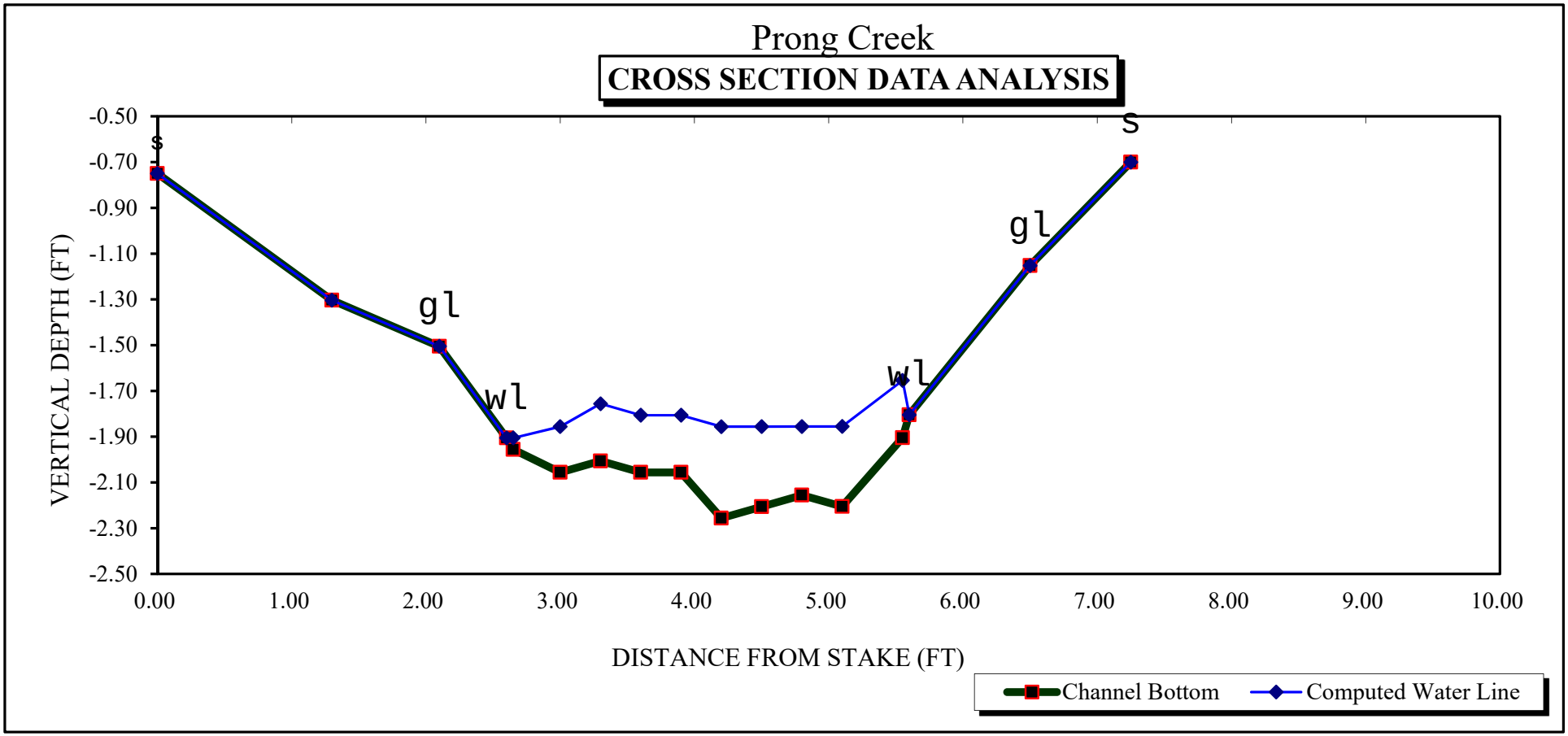
RECOMMENDATION BY: ………………...………..……............................... AGENCY..………………………......……......…...……....... DATE:.......…...…......……………

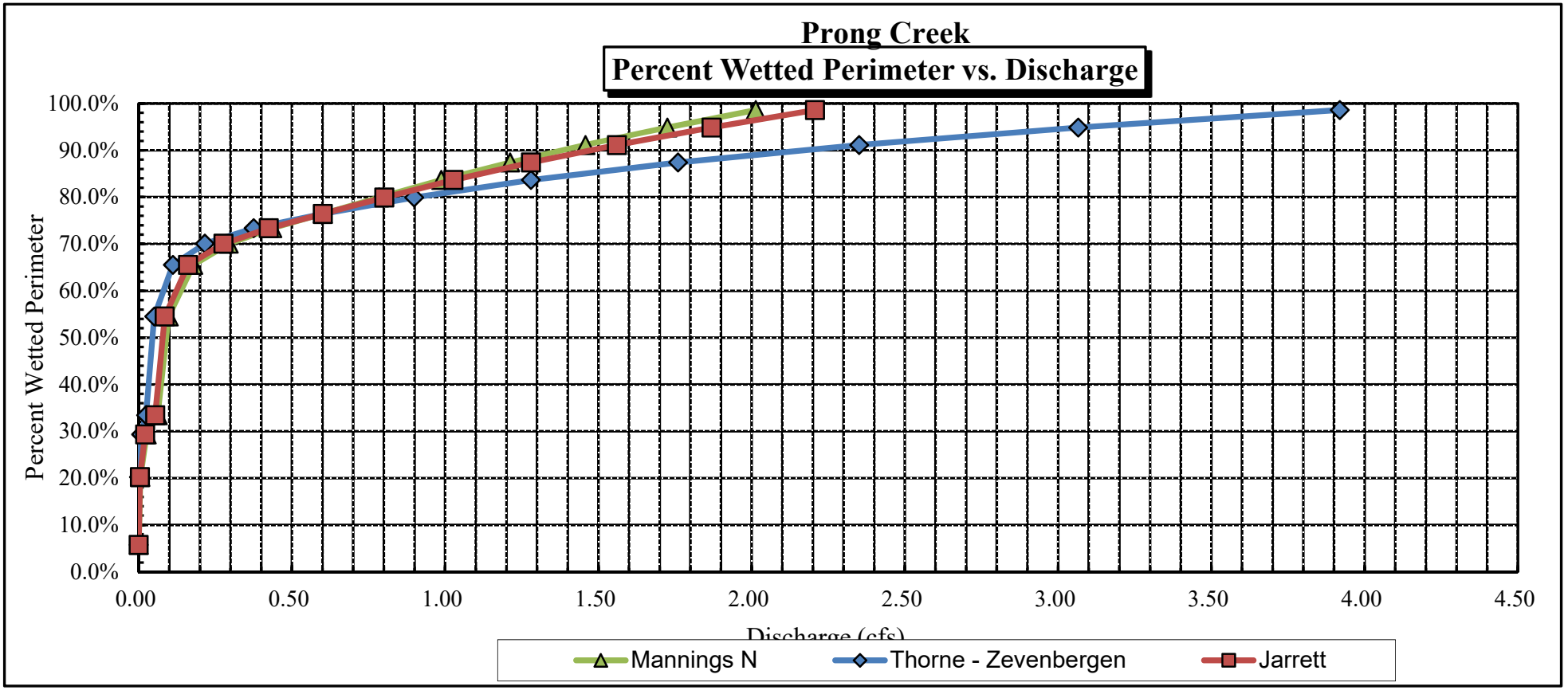
CWCB REVIEW BY: ..…………………………....……………………………………………………..…............... DATE:.................……………...…

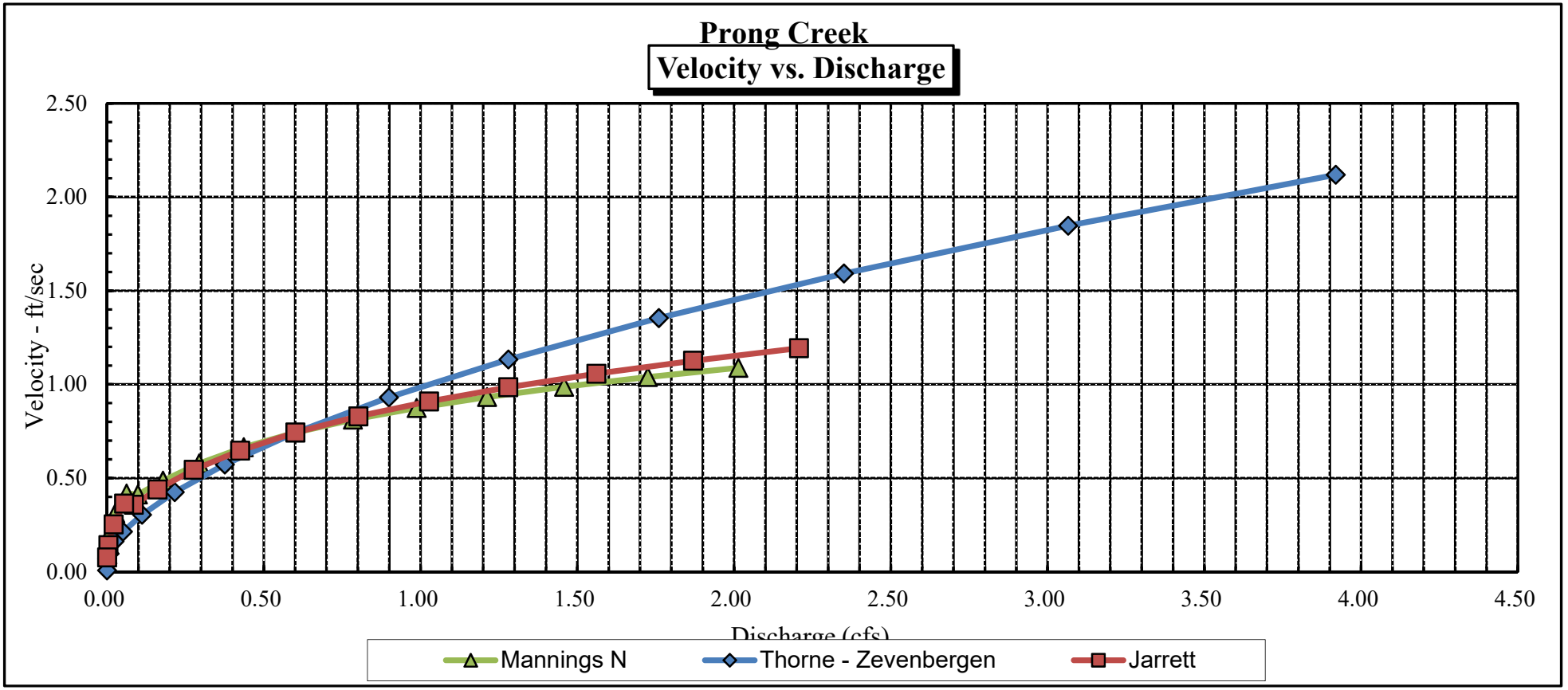
STREAM NAME: Prong Creek
XS LOCATION: 250 ft u/s of Miners Creek confl
XS NUMBER: (93) 1 Jarrett Variable Manning's n Correction Applied

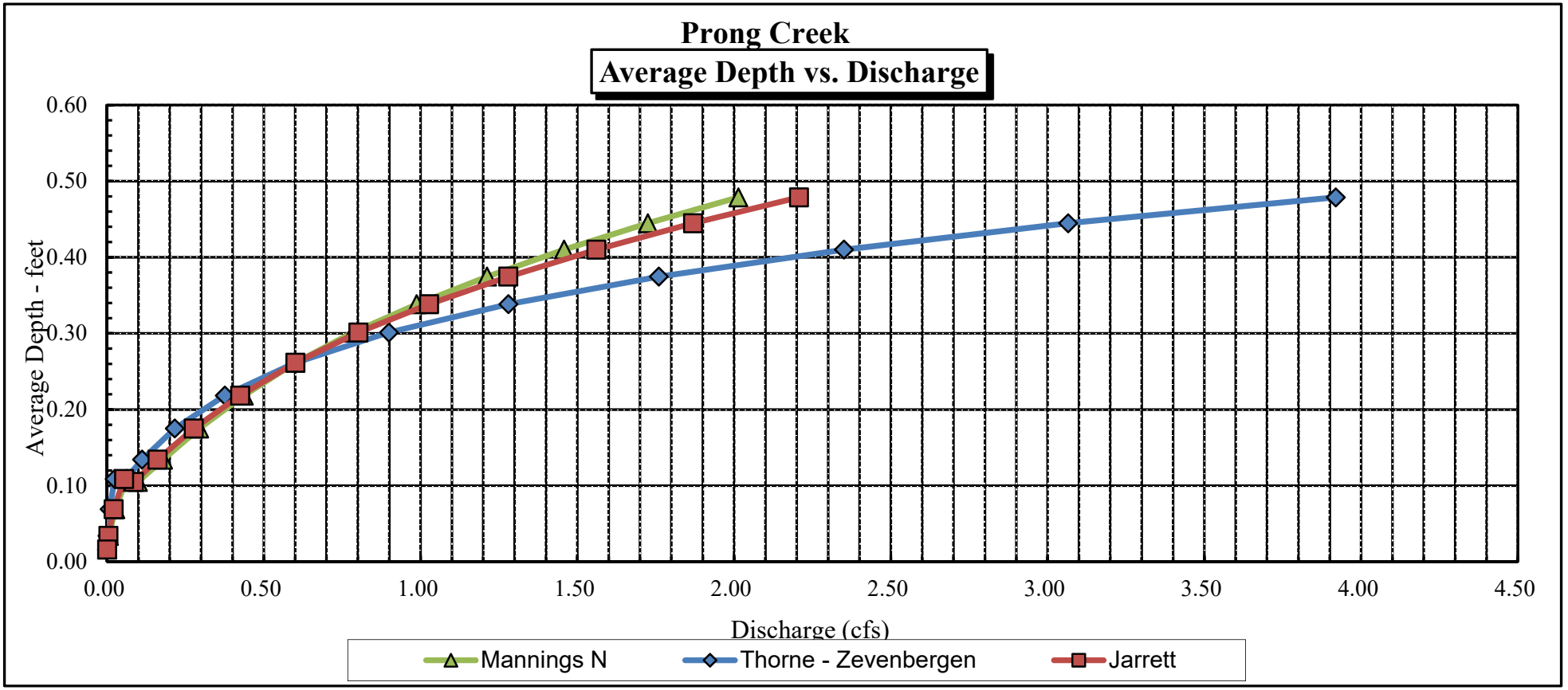
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

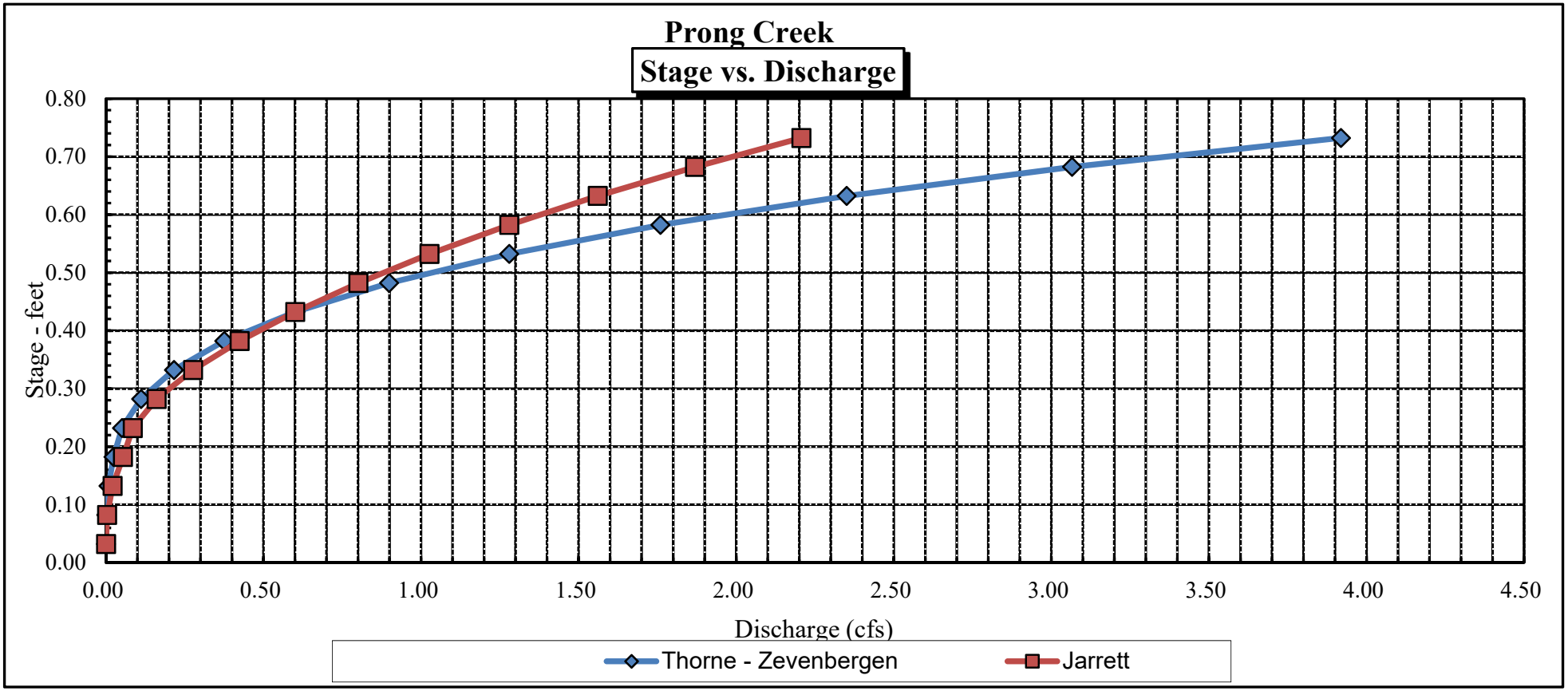
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	1.51	3.91	0.49	0.75	1.92	4.42	100.0%	0.43	2.34	1.22
	1.52	3.86	0.48	0.73	1.85	4.36	98.6%	0.42	2.21	1.19
	1.57	3.73	0.44	0.68	1.66	4.19	94.9%	0.40	1.87	1.13
	1.62	3.60	0.41	0.63	1.48	4.03	91.1%	0.37	1.56	1.06
	1.67	3.47	0.37	0.58	1.30	3.86	87.4%	0.34	1.28	0.98
	1.72	3.34	0.34	0.53	1.13	3.70	83.7%	0.31	1.03	0.91
	1.77	3.21	0.30	0.48	0.97	3.53	79.9%	0.27	0.80	0.83
WL	1.82	3.09	0.26	0.43	0.81	3.38	76.4%	0.24	0.60	0.74
	1.87	3.01	0.22	0.38	0.66	3.24	73.4%	0.20	0.42	0.65
	1.92	2.90	0.18	0.33	0.51	3.10	70.1%	0.16	0.28	0.54
	1.97	2.73	0.13	0.28	0.37	2.90	65.5%	0.13	0.16	0.44
	2.02	2.27	0.10	0.23	0.24	2.41	54.5%	0.10	0.09	0.36
	2.07	1.37	0.11	0.18	0.15	1.48	33.4%	0.10	0.05	0.36
	2.12	1.22	0.07	0.13	0.08	1.30	29.4%	0.06	0.02	0.25
	2.17	0.85	0.03	0.08	0.03	0.89	20.2%	0.03	0.00	0.14
	2.22	0.24	0.02	0.03	0.00	0.25	5.7%	0.02	0.00	0.08


Prong Creek
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-0.50
-0.70
-0.90
-1.10
-1.30
-1.50
-1.70
-1.90
-2.10
-2.30
-2.50
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
DISTANCE FROM STAKE (FT)
s
gl
wl
wl
gl
s
Channel Bottom
Computed Water Line


Prong Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Velocity vs. Discharge
Velocity - ft/sec
2.50
2.00
1.50
1.00
0.50
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Average Depth vs. Discharge
Average Depth - feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Stage vs. Discharge
Stage - feet
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Prong Creek
XS LOCATION:	13S 368088 4202076
XS NUMBER:	1
DATE:	9/27/2017
OBSERVERS:	J. Skinner, J. Baessler, J. Landers
1/4 SEC:	SE
SECTION:	23
TWP:	43N
RANGE:	4E
PM:	6th
COUNTY:	Saguache
WATERSHED:	Rio Grande
DIVISION:	3
DOW CODE:	
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.01 ft / ft

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

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

Total Data Points = 34

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	S	0.00	4.96			0.00	0.00	0.00
1	GL	2.20	5.25			0.00	0.00	0.00
		2.30	5.80			0.00	0.00	0.00
		2.50	6.15			0.00	0.00	0.00
	W	2.80	6.55	0.00	0.00	0.00	0.00	0.00
		3.20	6.80	0.25	0.00	0.10	0.00	6.55
	R	3.60	6.70	0.20	0.04	0.08	0.00	6.50
	R	4.00	6.80	0.30	0.78	0.12	0.09	6.50
		4.40	6.80	0.30	0.76	0.12	0.09	6.50
		4.80	6.95	0.45	0.62	0.18	0.11	6.50
		5.20	6.85	0.35	0.67	0.14	0.09	6.50
	R	5.60	6.60	0.10	0.74	0.04	0.03	6.50
		6.00	6.85	0.35	1.05	0.14	0.15	6.50
		6.40	6.85	0.35	0.93	0.14	0.13	6.50
		6.80	6.80	0.30	1.14	0.12	0.14	6.50
		7.20	6.85	0.35	1.15	0.14	0.16	6.50
		7.60	6.85	0.40	1.15	0.16	0.18	6.45
		8.00	6.90	0.40	1.07	0.16	0.17	6.50
		8.40	6.90	0.40	1.20	0.16	0.19	6.50
		8.80	6.90	0.40	1.42	0.16	0.23	6.50
		9.20	6.95	0.45	1.73	0.18	0.31	6.50
		9.60	7.05	0.55	1.38	0.22	0.30	6.50
		10.00	6.75	0.30	1.42	0.12	0.17	6.45
		10.40	7.15	0.60	1.26	0.24	0.30	6.55
		10.80	6.95	0.50	1.04	0.20	0.21	6.45
		11.20	7.05	0.60	0.60	0.24	0.14	6.45
		11.60	7.05	0.50	0.42	0.20	0.08	6.55
		12.00	7.10	0.60	0.34	0.24	0.08	6.50
		12.40	7.05	0.50	0.30	0.20	0.06	6.55
	W	12.80	6.46	0.00	0.00	0.00	0.00	0.00
		13.60	6.45			0.00	0.00	0.00
		13.90	5.80			0.00	0.00	0.00
		14.80	5.40			0.00	0.00	0.00
1	S/GL	15.50	5.20			0.00	0.00	0.00
					Totals	3.80	3.44	

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

LOCATION INFORMATION

STREAM NAME:	Prong Creek
XS LOCATION:	13S 368088 4202076
XS NUMBER:	1
DATE:	27-Sep-17
OBSERVERS:	J. Skinner, J. Baessler, J. Landers
1/4 SEC:	SE
SECTION:	23
TWP:	43N
RANGE:	4E
PM:	6th
COUNTY:	Saguache
WATERSHED:	Rio Grande
DIVISION:	3
DOW CODE:	0
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:	0.01

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

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

STREAM NAME: Prong Creek
XS LOCATION: 13S 368088 4202076
XS NUMBER: 1

DATA POINTS= 34

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.00	4.96			0.00		0.00	0.00	0.0%
1 GL	2.20	5.25			0.00		0.00	0.00	0.0%
	2.30	5.80			0.00		0.00	0.00	0.0%
	2.50	6.15			0.00		0.00	0.00	0.0%
W	2.80	6.55	0.00	0.00	0.00		0.00	0.00	0.0%
	3.20	6.80	0.25	0.00	0.47	0.25	0.10	0.00	0.0%
R	3.60	6.70	0.20	0.04	0.41	0.20	0.08	0.00	0.1%
R	4.00	6.80	0.30	0.78	0.41	0.30	0.12	0.09	2.7%
	4.40	6.80	0.30	0.76	0.40	0.30	0.12	0.09	2.7%
	4.80	6.95	0.45	0.62	0.43	0.45	0.18	0.11	3.2%
	5.20	6.85	0.35	0.67	0.41	0.35	0.14	0.09	2.7%
R	5.60	6.60	0.10	0.74	0.47	0.10	0.04	0.03	0.9%
	6.00	6.85	0.35	1.05	0.47	0.35	0.14	0.15	4.3%
	6.40	6.85	0.35	0.93	0.40	0.35	0.14	0.13	3.8%
	6.80	6.80	0.30	1.14	0.40	0.30	0.12	0.14	4.0%
	7.20	6.85	0.35	1.15	0.40	0.35	0.14	0.16	4.7%
	7.60	6.85	0.40	1.15	0.40	0.40	0.16	0.18	5.4%
	8.00	6.90	0.40	1.07	0.40	0.40	0.16	0.17	5.0%
	8.40	6.90	0.40	1.20	0.40	0.40	0.16	0.19	5.6%
	8.80	6.90	0.40	1.42	0.40	0.40	0.16	0.23	6.6%
	9.20	6.95	0.45	1.73	0.40	0.45	0.18	0.31	9.1%
	9.60	7.05	0.55	1.38	0.41	0.55	0.22	0.30	8.8%
	10.00	6.75	0.30	1.42	0.50	0.30	0.12	0.17	5.0%
	10.40	7.15	0.60	1.26	0.57	0.60	0.24	0.30	8.8%
	10.80	6.95	0.50	1.04	0.45	0.50	0.20	0.21	6.1%
	11.20	7.05	0.60	0.60	0.41	0.60	0.24	0.14	4.2%
	11.60	7.05	0.50	0.42	0.40	0.50	0.20	0.08	2.4%
	12.00	7.10	0.60	0.34	0.40	0.60	0.24	0.08	2.4%
	12.40	7.05	0.50	0.30	0.40	0.50	0.20	0.06	1.7%
W	12.80	6.46	0.00	0.00	0.71		0.00	0.00	0.0%
	13.60	6.45			0.00		0.00	0.00	0.0%
	13.90	5.80			0.00		0.00	0.00	0.0%
	14.80	5.40			0.00		0.00	0.00	0.0%
1 S/GL	15.50	5.20			0.00		0.00	0.00	0.0%
TOTALS ----------					10.95	0.6 (Max.)	3.80	3.44	100.0%

Manning's n = 0.0811
Hydraulic Radius= 0.34708782

STREAM NAME: Prong Creek
XS LOCATION: 13S 368088 4202076
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.80	3.75	-1.2%
6.26	3.80	6.45	69.8%
6.28	3.80	6.23	64.0%
6.30	3.80	6.01	58.2%
6.32	3.80	5.79	52.3%
6.34	3.80	5.57	46.5%
6.36	3.80	5.35	40.7%
6.38	3.80	5.13	35.0%
6.40	3.80	4.91	29.2%
6.42	3.80	4.69	23.5%
6.44	3.80	4.47	17.7%
6.46	3.80	4.26	12.0%
6.47	3.80	4.15	9.3%
6.48	3.80	4.05	6.7%
6.49	3.80	3.95	4.0%
6.50	3.80	3.85	1.4%
6.51	3.80	3.75	-1.2%
6.52	3.80	3.65	-3.9%
6.53	3.80	3.55	-6.5%
6.54	3.80	3.45	-9.1%
6.55	3.80	3.35	-11.7%
6.56	3.80	3.26	-14.3%
6.58	3.80	3.06	-19.6%
6.60	3.80	2.86	-24.7%
6.62	3.80	2.66	-29.9%
6.64	3.80	2.47	-35.0%
6.66	3.80	2.28	-40.0%
6.68	3.80	2.09	-45.0%
6.70	3.80	1.90	-49.9%
6.72	3.80	1.72	-54.8%
6.74	3.80	1.54	-59.5%
6.76	3.80	1.37	-64.1%

WATERLINE AT ZERO
AREA ERROR = 6.500

STREAM NAME: Prong Creek
XS LOCATION: 13S 368088 4202076
XS NUMBER: 1

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	5.25	13.12	1.40	1.90	18.39	15.46	100.0%	1.19	37.81	2.06
	5.50	12.33	1.23	1.65	15.21	14.41	93.2%	1.06	28.88	1.90
	5.55	12.21	1.20	1.60	14.60	14.24	92.1%	1.03	27.18	1.86
	5.60	12.09	1.16	1.55	13.99	14.06	91.0%	0.99	25.53	1.83
	5.65	11.96	1.12	1.50	13.39	13.89	89.8%	0.96	23.93	1.79
	5.70	11.84	1.08	1.45	12.79	13.71	88.7%	0.93	22.37	1.75
	5.75	11.72	1.04	1.40	12.20	13.54	87.6%	0.90	20.86	1.71
	5.80	11.60	1.00	1.35	11.62	13.37	86.5%	0.87	19.39	1.67
	5.85	11.55	0.96	1.30	11.04	13.25	85.7%	0.83	17.91	1.62
	5.90	11.50	0.91	1.25	10.46	13.14	85.0%	0.80	16.47	1.57
	5.95	11.44	0.86	1.20	9.89	13.03	84.3%	0.76	15.08	1.52
	6.00	11.39	0.82	1.15	9.32	12.92	83.6%	0.72	13.74	1.47
	6.05	11.34	0.77	1.10	8.75	12.80	82.8%	0.68	12.44	1.42
	6.10	11.29	0.73	1.05	8.19	12.69	82.1%	0.65	11.19	1.37
	6.15	11.24	0.68	1.00	7.62	12.58	81.4%	0.61	10.00	1.31
	6.20	11.18	0.63	0.95	7.06	12.46	80.6%	0.57	8.86	1.25
	6.25	11.12	0.59	0.90	6.51	12.34	79.9%	0.53	7.77	1.20
	6.30	11.06	0.54	0.85	5.95	12.23	79.1%	0.49	6.75	1.13
	6.35	11.00	0.49	0.80	5.40	12.11	78.3%	0.45	5.77	1.07
	6.40	10.94	0.44	0.75	4.85	11.99	77.6%	0.40	4.86	1.00
	6.45	10.85	0.40	0.70	4.31	11.84	76.6%	0.36	4.02	0.93
WL	6.50	10.01	0.38	0.65	3.80	10.96	70.9%	0.35	3.43	0.90
	6.55	9.94	0.33	0.60	3.30	10.84	70.1%	0.30	2.74	0.83
	6.60	9.82	0.29	0.55	2.81	10.68	69.1%	0.26	2.11	0.75
	6.65	9.55	0.24	0.50	2.32	10.34	66.9%	0.22	1.57	0.68
	6.70	9.27	0.20	0.45	1.85	9.99	64.6%	0.19	1.10	0.60
	6.75	8.60	0.16	0.40	1.41	9.24	59.8%	0.15	0.73	0.52
	6.80	7.40	0.13	0.35	1.00	7.92	51.3%	0.13	0.46	0.46
	6.85	5.36	0.12	0.30	0.66	5.77	37.4%	0.11	0.28	0.43
	6.90	3.68	0.11	0.25	0.41	4.01	25.9%	0.10	0.16	0.40
	6.95	2.80	0.09	0.20	0.25	3.04	19.7%	0.08	0.09	0.35
	7.00	2.15	0.06	0.15	0.13	2.30	14.9%	0.05	0.03	0.26
	7.05	1.09	0.03	0.10	0.03	1.16	7.5%	0.03	0.01	0.18
	7.10	0.15	0.02	0.05	0.00	0.18	1.2%	0.02	0.00	0.14

STREAM NAME: Prong Creek
XS LOCATION: 13S 368088 4202076
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.44	cfs
CALCULATED FLOW (Qc)=	3.43	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	6.51	ft
CALCULATED WATERLINE (WLc)=	6.50	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.60	ft
MAX CALCULATED DEPTH (Dc)=	0.65	ft
(Dm-Dc)/Dm * 100	-8.3	%
MEAN VELOCITY=	0.90	ft/sec
MANNING'S N=	0.081	
SLOPE=	0.01	ft/ft
.4 * Qm =	1.4	cfs
2.5 * Qm=	8.6	cfs

RECOMMENDED INSTREAM FLOW:
============================

FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

RATIONALE FOR RECOMMENDATION:
============================

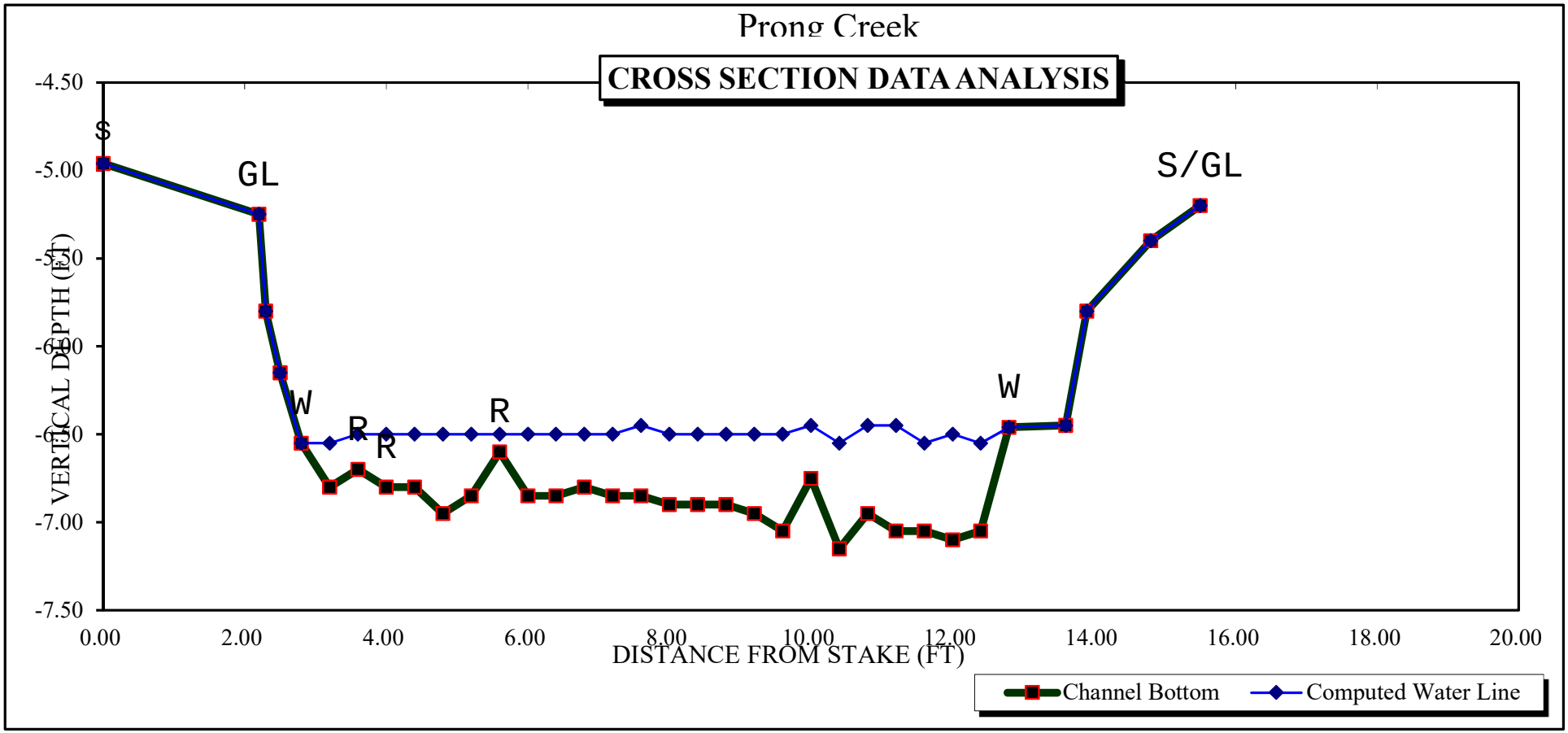
RECOMMENDATION BY: ……………….………..…….............................. AGENCY..……………………......……....…...……...... DATE:.......…...…......……………

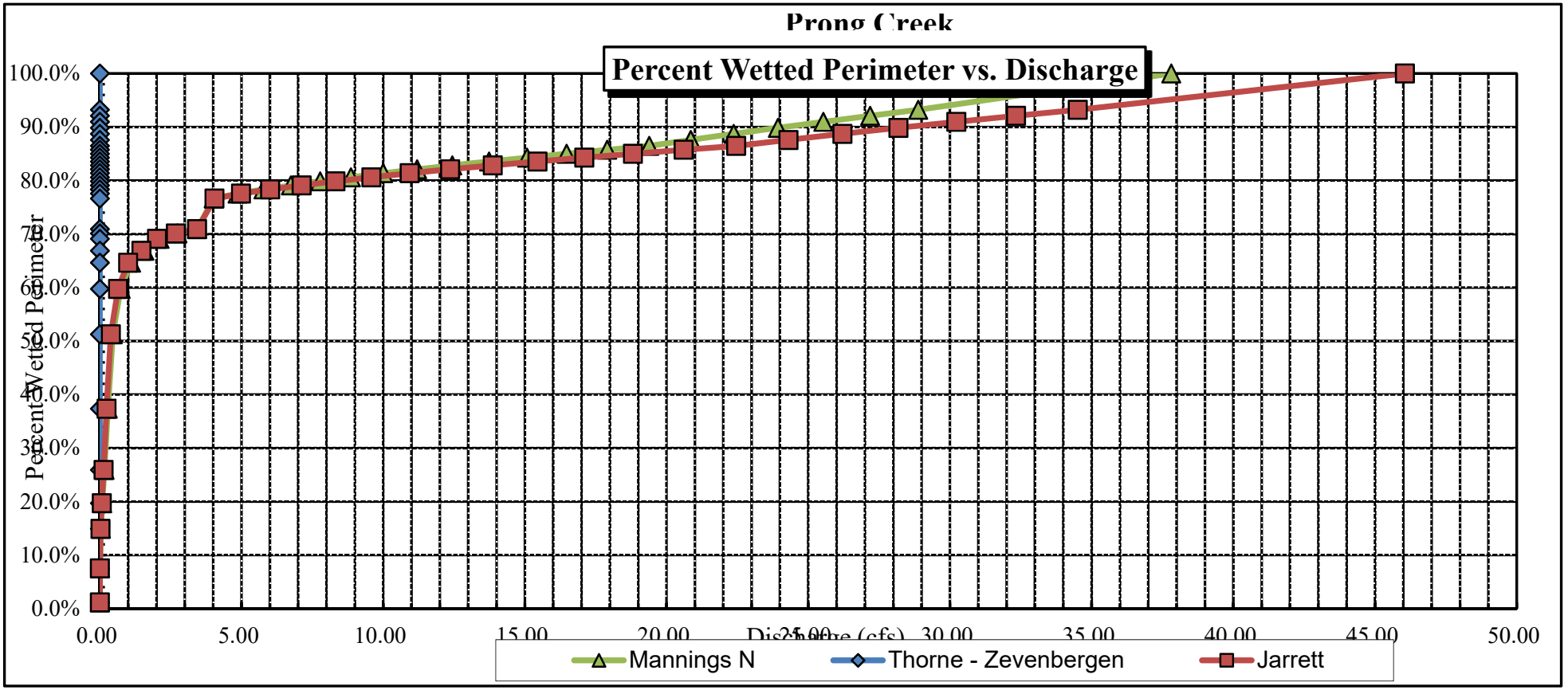
CWCB REVIEW BY: ..…………………………....………………………………………………...…............. DATE:.................……………...…

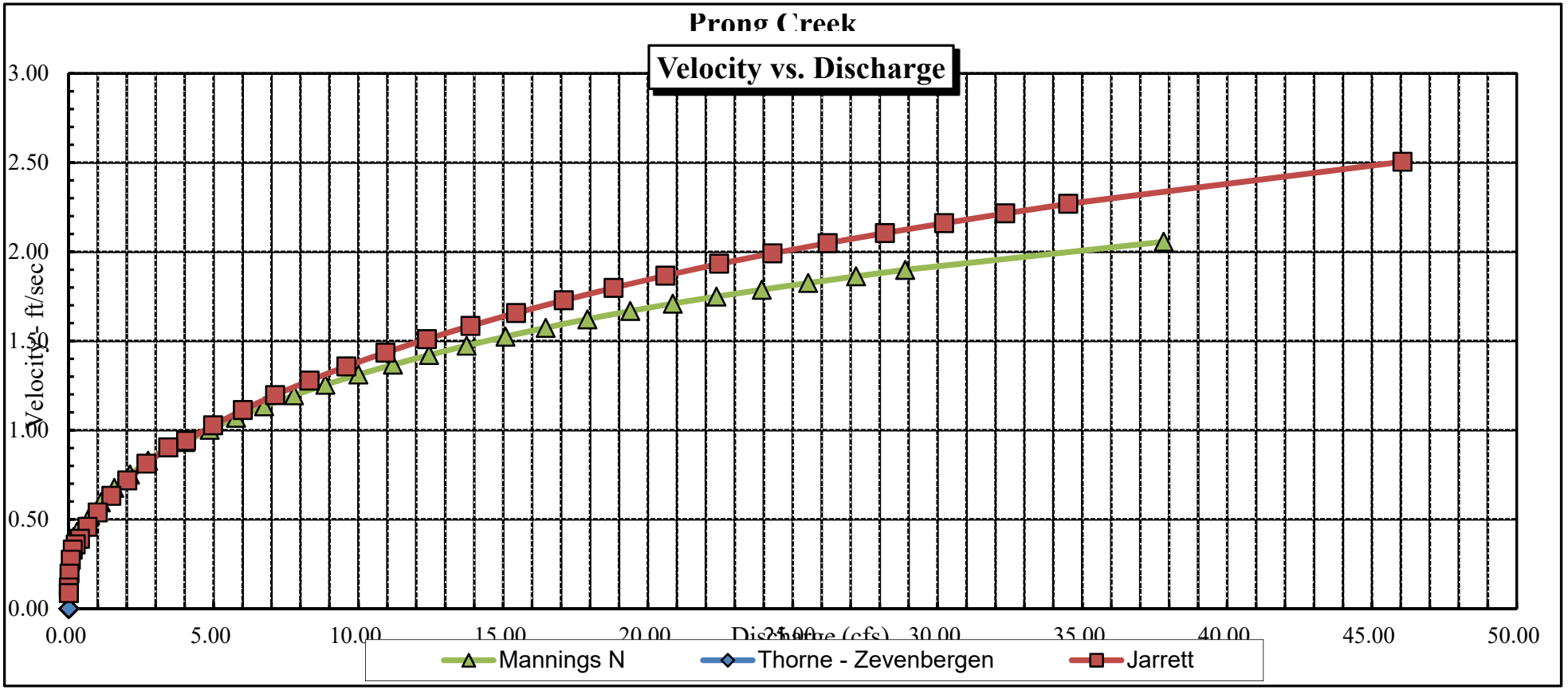
STREAM NAME: Prong Creek
XS LOCATION: 13S 368088 4202076
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

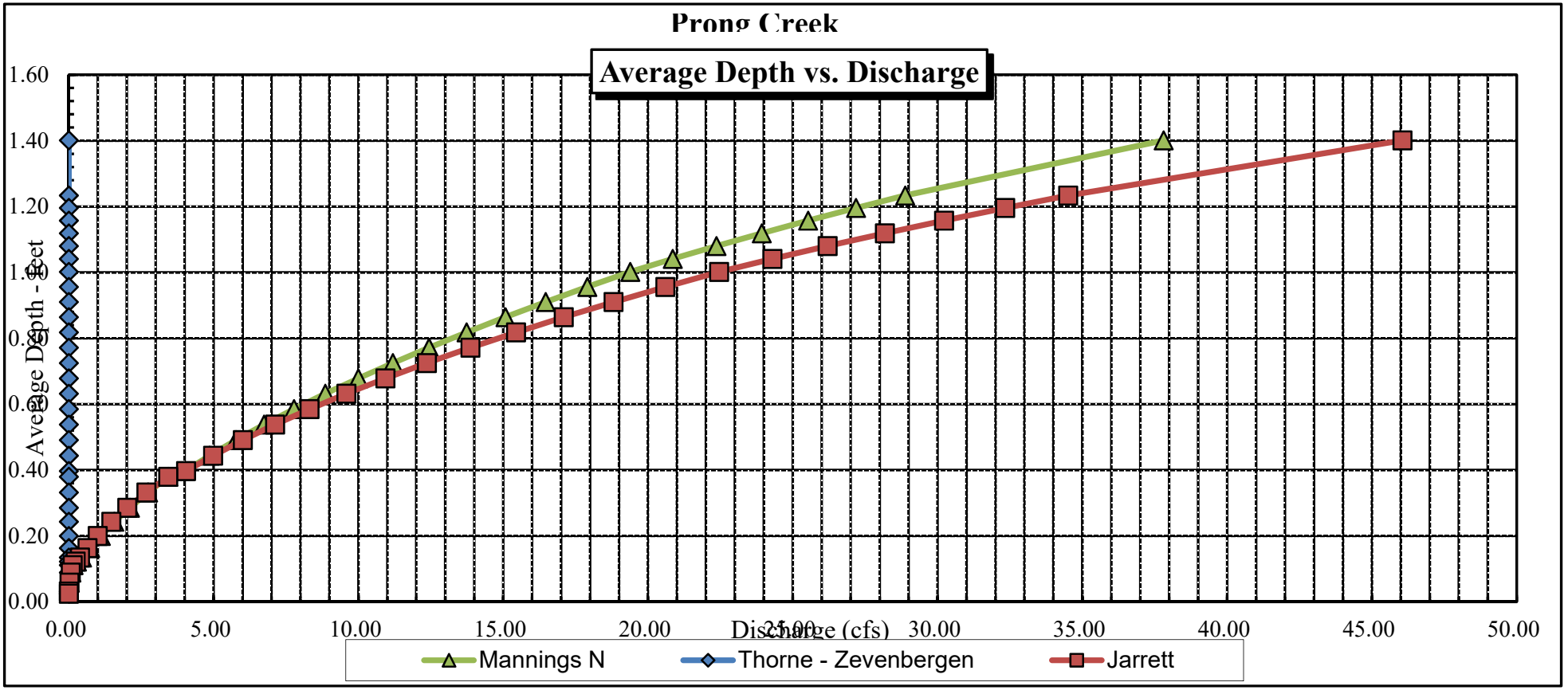
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

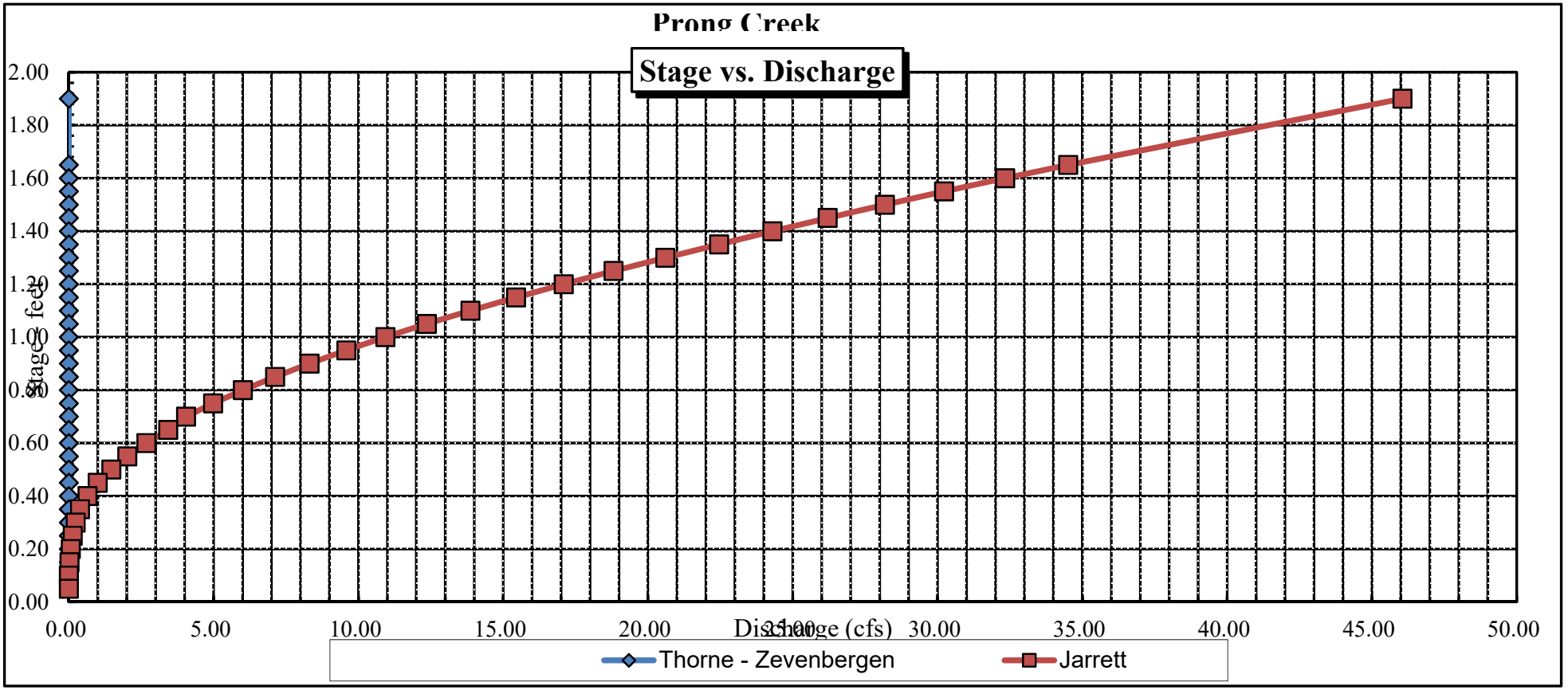
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.25	13.12	1.40	1.90	18.39	15.46	100.0%	1.19	46.05	2.50
	5.50	12.33	1.23	1.65	15.21	14.41	93.2%	1.06	34.51	2.27
	5.55	12.21	1.20	1.60	14.60	14.24	92.1%	1.03	32.33	2.22
	5.60	12.09	1.16	1.55	13.99	14.06	91.0%	0.99	30.22	2.16
	5.65	11.96	1.12	1.50	13.39	13.89	89.8%	0.96	28.18	2.11
	5.70	11.84	1.08	1.45	12.79	13.71	88.7%	0.93	26.21	2.05
	5.75	11.72	1.04	1.40	12.20	13.54	87.6%	0.90	24.30	1.99
	5.80	11.60	1.00	1.35	11.62	13.37	86.5%	0.87	22.46	1.93
	5.85	11.55	0.96	1.30	11.04	13.25	85.7%	0.83	20.60	1.87
	5.90	11.50	0.91	1.25	10.46	13.14	85.0%	0.80	18.81	1.80
	5.95	11.44	0.86	1.20	9.89	13.03	84.3%	0.76	17.09	1.73
	6.00	11.39	0.82	1.15	9.32	12.92	83.6%	0.72	15.44	1.66
	6.05	11.34	0.77	1.10	8.75	12.80	82.8%	0.68	13.87	1.58
	6.10	11.29	0.73	1.05	8.19	12.69	82.1%	0.65	12.36	1.51
	6.15	11.24	0.68	1.00	7.62	12.58	81.4%	0.61	10.93	1.43
	6.20	11.18	0.63	0.95	7.06	12.46	80.6%	0.57	9.59	1.36
	6.25	11.12	0.59	0.90	6.51	12.34	79.9%	0.53	8.31	1.28
	6.30	11.06	0.54	0.85	5.95	12.23	79.1%	0.49	7.12	1.20
	6.35	11.00	0.49	0.80	5.40	12.11	78.3%	0.45	6.01	1.11
	6.40	10.94	0.44	0.75	4.85	11.99	77.6%	0.40	4.98	1.03
	6.45	10.85	0.40	0.70	4.31	11.84	76.6%	0.36	4.05	0.94
WL	6.50	10.01	0.38	0.65	3.80	10.96	70.9%	0.35	3.43	0.90
	6.55	9.94	0.33	0.60	3.30	10.84	70.1%	0.30	2.68	0.81
	6.60	9.82	0.29	0.55	2.81	10.68	69.1%	0.26	2.02	0.72
	6.65	9.55	0.24	0.50	2.32	10.34	66.9%	0.22	1.47	0.63
	6.70	9.27	0.20	0.45	1.85	9.99	64.6%	0.19	1.00	0.54
	6.75	8.60	0.16	0.40	1.41	9.24	59.8%	0.15	0.64	0.46
	6.80	7.40	0.13	0.35	1.00	7.92	51.3%	0.13	0.39	0.39
	6.85	5.36	0.12	0.30	0.66	5.77	37.4%	0.11	0.24	0.36
	6.90	3.68	0.11	0.25	0.41	4.01	25.9%	0.10	0.14	0.33
	6.95	2.80	0.09	0.20	0.25	3.04	19.7%	0.08	0.07	0.27
	7.00	2.15	0.06	0.15	0.13	2.30	14.9%	0.05	0.02	0.20
	7.05	1.09	0.03	0.10	0.03	1.16	7.5%	0.03	0.00	0.12
	7.10	0.15	0.02	0.05	0.00	0.18	1.2%	0.02	0.00	0.09


Prong Creek
CROSS SECTION DATA ANALYSIS
-4.50
-5.00
-7.00
-7.50
VERTICAL DEPTH (FT)
S
GL
W
R
R
R
W
S/GL
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


Prong Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Velocity vs. Discharge
Velocity - ft/sec
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Average Depth vs. Discharge
Average Depth - Feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Stage vs. Discharge
Stage, feet
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Prong Creek
XS LOCATION:	13S 368067 4202068
XS NUMBER:	2
DATE:	9/27/2017
OBSERVERS:	J. Skinner, J. Baessler, J. Landers
1/4 SEC:	SE
SECTION:	23
TWP:	43N
RANGE:	4E
PM:	6th
COUNTY:	Saguache
WATERSHED:	Rio Grande
DIVISION:	3
DOW CODE:	
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.069 ft / ft

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

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

Total Data Points = 25

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	S	0.00	5.20			0.00	0.00	0.00
		2.00	5.30			0.00	0.00	0.00
1	GL	3.00	5.55			0.00	0.00	0.00
		3.40	5.65			0.00	0.00	0.00
	W	3.70	5.98	0.00		0.00	0.00	0.00
		4.00	6.20	0.10	0.97	0.04	0.04	6.10
		4.50	6.55	0.55	0.97	0.28	0.27	6.00
		5.00	6.40	0.40	0.97	0.20	0.19	6.00
		5.50	6.45	0.30	0.97	0.15	0.15	6.15
		6.00	6.60	0.40	0.97	0.20	0.19	6.20
		6.50	6.20	0.10	0.97	0.05	0.05	6.10
		7.00	6.55	0.30	0.97	0.15	0.15	6.25
		7.50	6.80	0.55	0.97	0.28	0.27	6.25
		8.00	6.50	0.30	0.97	0.15	0.15	6.20
		8.50	6.95	0.60	0.97	0.30	0.29	6.35
		9.00	6.75	0.60	0.97	0.30	0.29	6.15
		9.50	6.85	0.80	0.97	0.40	0.39	6.05
		10.00	6.60	0.70	0.97	0.35	0.34	5.90
		10.50	6.90	1.00	0.97	0.50	0.49	5.90
		11.00	6.40	0.45	0.97	0.20	0.20	5.95
	W	11.40	5.97	0.00		0.00	0.00	0.00
1	GL	11.80	5.60			0.00	0.00	0.00
		12.00	5.05			0.00	0.00	0.00
		13.00	4.65			0.00	0.00	0.00
	S	15.40	4.55			0.00	0.00	0.00
					Totals	3.54	3.44	

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

LOCATION INFORMATION

STREAM NAME:	Prong Creek
XS LOCATION:	13S 368067 4202068
XS NUMBER:	2
DATE:	27-Sep-17
OBSERVERS:	J. Skinner, J. Baessler, J. Landers
1/4 SEC:	SE
SECTION:	23
TWP:	43N
RANGE:	4E
PM:	6th
COUNTY:	Saguache
WATERSHED:	Rio Grande
DIVISION:	3
DOW CODE:	0
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:	0.069

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

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

STREAM NAME: Prong Creek
XS LOCATION: 13S 368067 4202068
XS NUMBER: 2

DATA POINTS= 25

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.00	5.20			0.00		0.00	0.00	0.0%
	2.00	5.30			0.00		0.00	0.00	0.0%
1 GL	3.00	5.55			0.00		0.00	0.00	0.0%
	3.40	5.65			0.00		0.00	0.00	0.0%
W	3.70	5.98	0.00		0.00		0.00	0.00	0.0%
	4.00	6.20	0.10	0.97	0.37	0.10	0.04	0.04	1.1%
	4.50	6.55	0.55	0.97	0.61	0.55	0.28	0.27	7.8%
	5.00	6.40	0.40	0.97	0.52	0.40	0.20	0.19	5.6%
	5.50	6.45	0.30	0.97	0.50	0.30	0.15	0.15	4.2%
	6.00	6.60	0.40	0.97	0.52	0.40	0.20	0.19	5.6%
	6.50	6.20	0.10	0.97	0.64	0.10	0.05	0.05	1.4%
	7.00	6.55	0.30	0.97	0.61	0.30	0.15	0.15	4.2%
	7.50	6.80	0.55	0.97	0.56	0.55	0.28	0.27	7.8%
	8.00	6.50	0.30	0.97	0.58	0.30	0.15	0.15	4.2%
	8.50	6.95	0.60	0.97	0.67	0.60	0.30	0.29	8.5%
	9.00	6.75	0.60	0.97	0.54	0.60	0.30	0.29	8.5%
	9.50	6.85	0.80	0.97	0.51	0.80	0.40	0.39	11.3%
	10.00	6.60	0.70	0.97	0.56	0.70	0.35	0.34	9.9%
	10.50	6.90	1.00	0.97	0.58	1.00	0.50	0.49	14.1%
	11.00	6.40	0.45	0.97	0.71	0.45	0.20	0.20	5.7%
W	11.40	5.97	0.00		0.59		0.00	0.00	0.0%
1 GL	11.80	5.60			0.00		0.00	0.00	0.0%
	12.00	5.05			0.00		0.00	0.00	0.0%
	13.00	4.65			0.00		0.00	0.00	0.0%
S	15.40	4.55			0.00		0.00	0.00	0.0%
TOTALS ----------					9.08	1 (Max.)	3.54	3.44	100.0%

Manning's n = 0.2149
Hydraulic Radius= 0.39017641

STREAM NAME: Prong Creek
XS LOCATION: 13S 368067 4202068
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.54	4.49	26.8%
5.73	3.54	6.48	82.9%
5.75	3.54	6.32	78.3%
5.77	3.54	6.15	73.7%
5.79	3.54	5.99	69.2%
5.81	3.54	5.83	64.6%
5.83	3.54	5.67	60.1%
5.85	3.54	5.51	55.6%
5.87	3.54	5.35	51.1%
5.89	3.54	5.19	46.6%
5.91	3.54	5.04	42.2%
5.93	3.54	4.88	37.8%
5.94	3.54	4.80	35.6%
5.95	3.54	4.73	33.4%
5.96	3.54	4.65	31.2%
5.97	3.54	4.57	29.0%
5.98	3.54	4.49	26.8%
5.99	3.54	4.42	24.7%
6.00	3.54	4.34	22.5%
6.01	3.54	4.26	20.4%
6.02	3.54	4.19	18.2%
6.03	3.54	4.11	16.1%
6.05	3.54	3.96	11.8%
6.07	3.54	3.81	7.5%
6.09	3.54	3.66	3.3%
6.11	3.54	3.51	-0.9%
6.13	3.54	3.36	-5.0%
6.15	3.54	3.22	-9.2%
6.17	3.54	3.07	-13.3%
6.19	3.54	2.93	-17.4%
6.21	3.54	2.78	-21.4%
6.23	3.54	2.64	-25.5%

WATERLINE AT ZERO
AREA ERROR = 6.101

STREAM NAME: Prong Creek
XS LOCATION: 13S 368067 4202068
XS NUMBER: 2

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	5.60	8.60	0.87	1.35	7.52	10.28	100.0%	0.73	11.10	1.48
	5.60	8.60	0.87	1.35	7.52	10.27	100.0%	0.73	11.09	1.48
	5.65	8.34	0.85	1.30	7.09	9.99	97.3%	0.71	10.25	1.45
	5.70	8.24	0.81	1.25	6.68	9.85	95.9%	0.68	9.36	1.40
	5.75	8.15	0.77	1.20	6.27	9.71	94.5%	0.65	8.51	1.36
	5.80	8.05	0.73	1.15	5.86	9.57	93.1%	0.61	7.69	1.31
	5.85	7.95	0.69	1.10	5.46	9.43	91.8%	0.58	6.90	1.26
	5.90	7.85	0.65	1.05	5.07	9.29	90.4%	0.55	6.15	1.21
	5.95	7.75	0.60	1.00	4.68	9.15	89.0%	0.51	5.44	1.16
	6.00	7.64	0.56	0.95	4.30	9.00	87.6%	0.48	4.76	1.11
	6.05	7.53	0.52	0.90	3.92	8.85	86.1%	0.44	4.13	1.05
WL	6.10	7.41	0.48	0.85	3.54	8.70	84.6%	0.41	3.54	1.00
	6.15	7.30	0.43	0.80	3.17	8.54	83.1%	0.37	2.98	0.94
	6.20	7.18	0.39	0.75	2.81	8.39	81.6%	0.34	2.47	0.88
	6.25	6.93	0.35	0.70	2.46	8.06	78.5%	0.30	2.02	0.82
	6.30	6.68	0.32	0.65	2.12	7.74	75.3%	0.27	1.62	0.77
	6.35	6.43	0.28	0.60	1.79	7.42	72.2%	0.24	1.26	0.70
	6.40	6.16	0.24	0.55	1.48	7.09	68.9%	0.21	0.94	0.64
	6.45	5.25	0.23	0.50	1.19	6.09	59.3%	0.20	0.73	0.61
	6.50	4.66	0.20	0.45	0.94	5.41	52.7%	0.17	0.54	0.57
	6.55	3.93	0.19	0.40	0.73	4.57	44.5%	0.16	0.39	0.53
	6.60	3.41	0.16	0.35	0.55	3.96	38.6%	0.14	0.26	0.48
	6.65	2.94	0.13	0.30	0.39	3.40	33.1%	0.11	0.17	0.43
	6.70	2.47	0.10	0.25	0.25	2.84	27.6%	0.09	0.09	0.36
	6.75	1.99	0.07	0.20	0.14	2.27	22.1%	0.06	0.04	0.28
	6.80	1.15	0.05	0.15	0.06	1.32	12.8%	0.05	0.01	0.24
	6.85	0.49	0.04	0.10	0.02	0.58	5.6%	0.04	0.00	0.20
	6.90	0.18	0.02	0.05	0.00	0.21	2.0%	0.02	0.00	0.14

STREAM NAME: Prong Creek
XS LOCATION: 13S 368067 4202068
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.44	cfs
CALCULATED FLOW (Qc)=	3.54	cfs
(Qm-Qc)/Qm * 100 =	-2.9	%
MEASURED WATERLINE (WLm)=	5.98	ft
CALCULATED WATERLINE (WLc)=	6.10	ft
(WLm-WLc)/WLm * 100 =	-2.1	%
MAX MEASURED DEPTH (Dm)=	1.00	ft
MAX CALCULATED DEPTH (Dc)=	0.85	ft
(Dm-Dc)/Dm * 100	15.1	%
MEAN VELOCITY=	1.00	ft/sec
MANNING'S N=	0.215	
SLOPE=	0.069	ft/ft
.4 * Qm =	1.4	cfs
2.5 * Qm=	8.6	cfs

RECOMMENDED INSTREAM FLOW:
==========

FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

RATIONALE FOR RECOMMENDATION:
==========

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

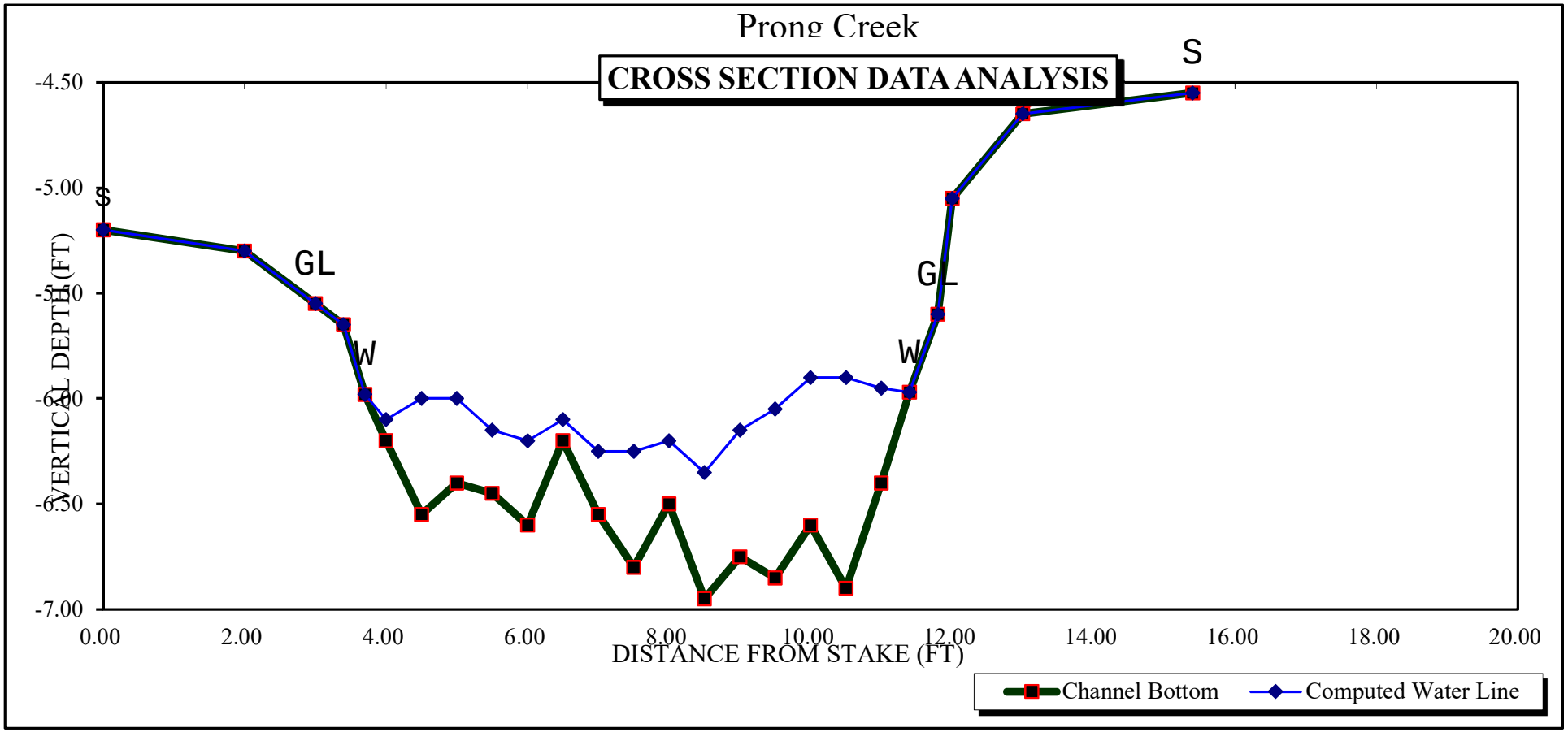
CWCB REVIEW BY: …….. DATE:……

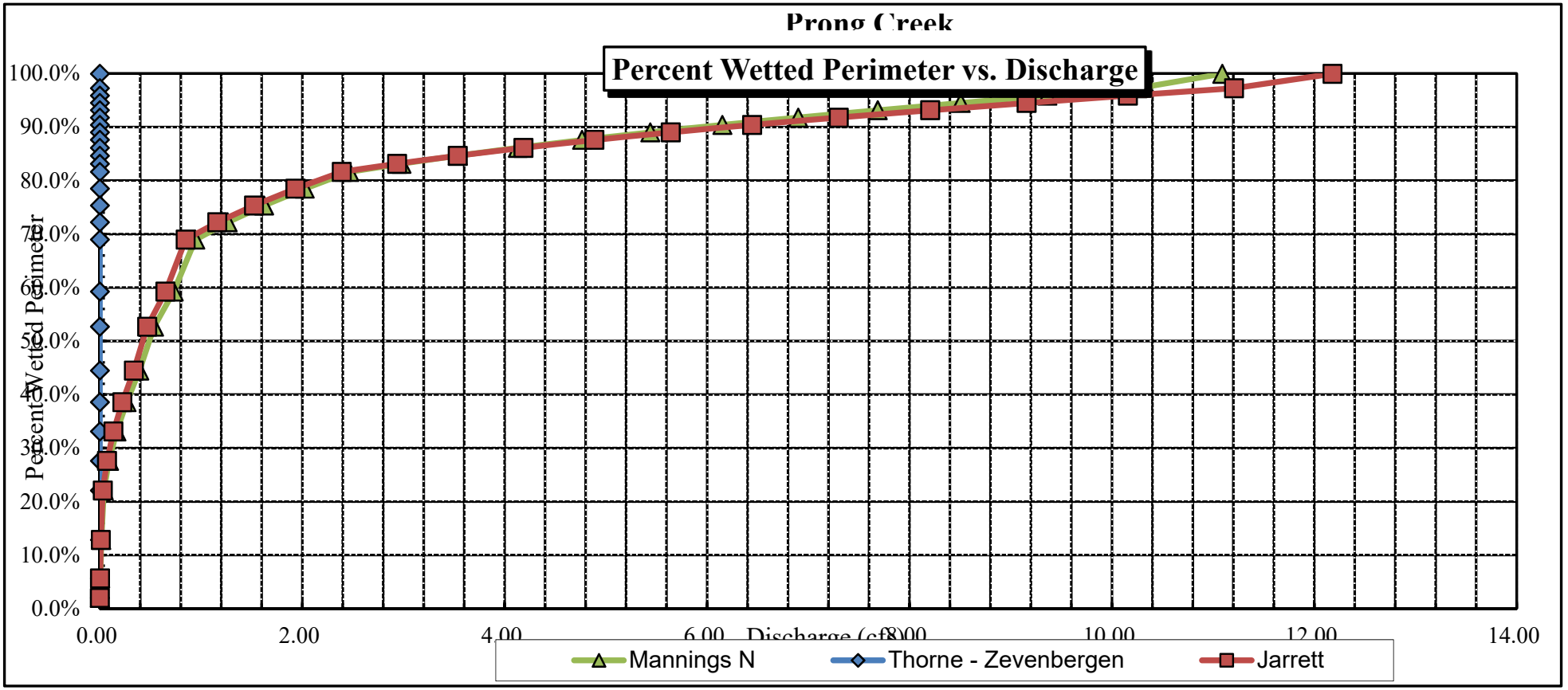
STREAM NAME: Prong Creek
XS LOCATION: 13S 368067 4202068
XS NUMBER: 2

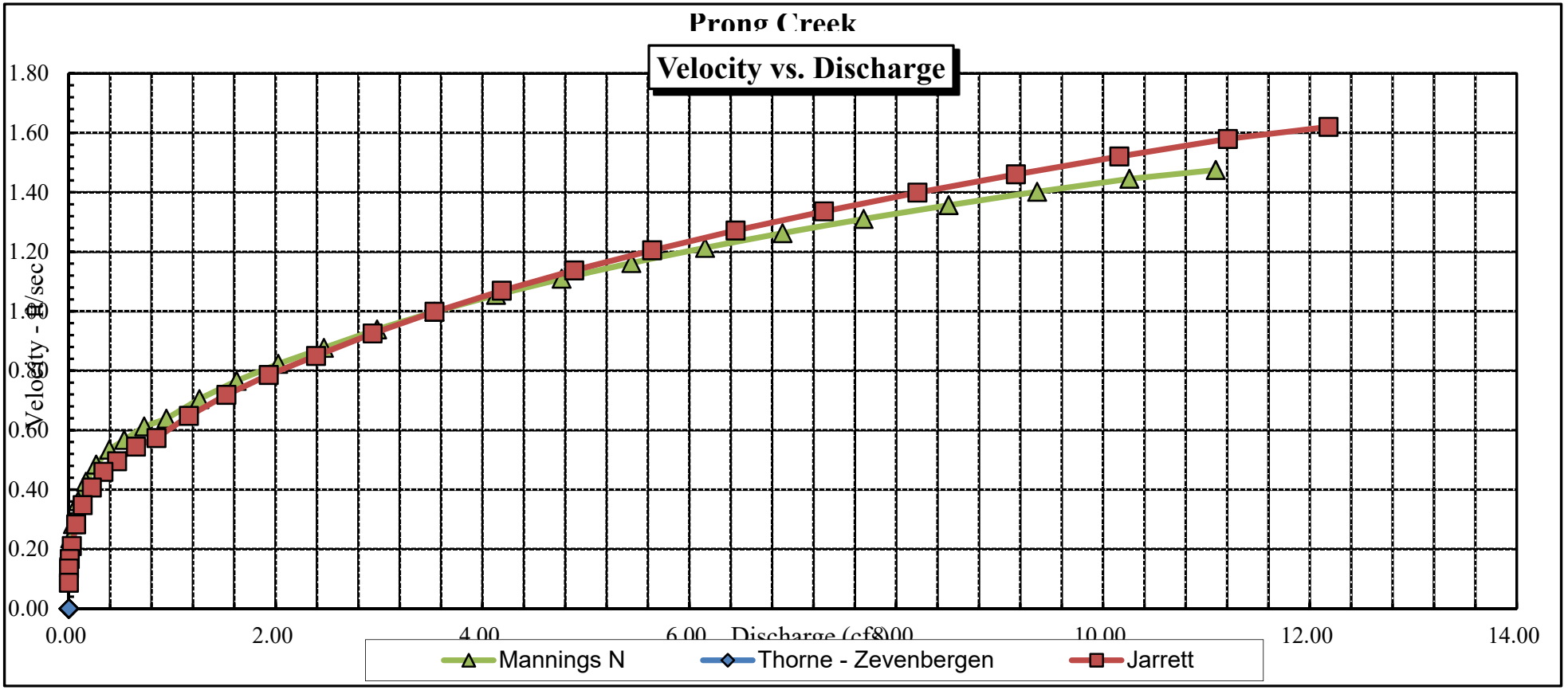
Jarrett Variable Manning's n Correction Applied

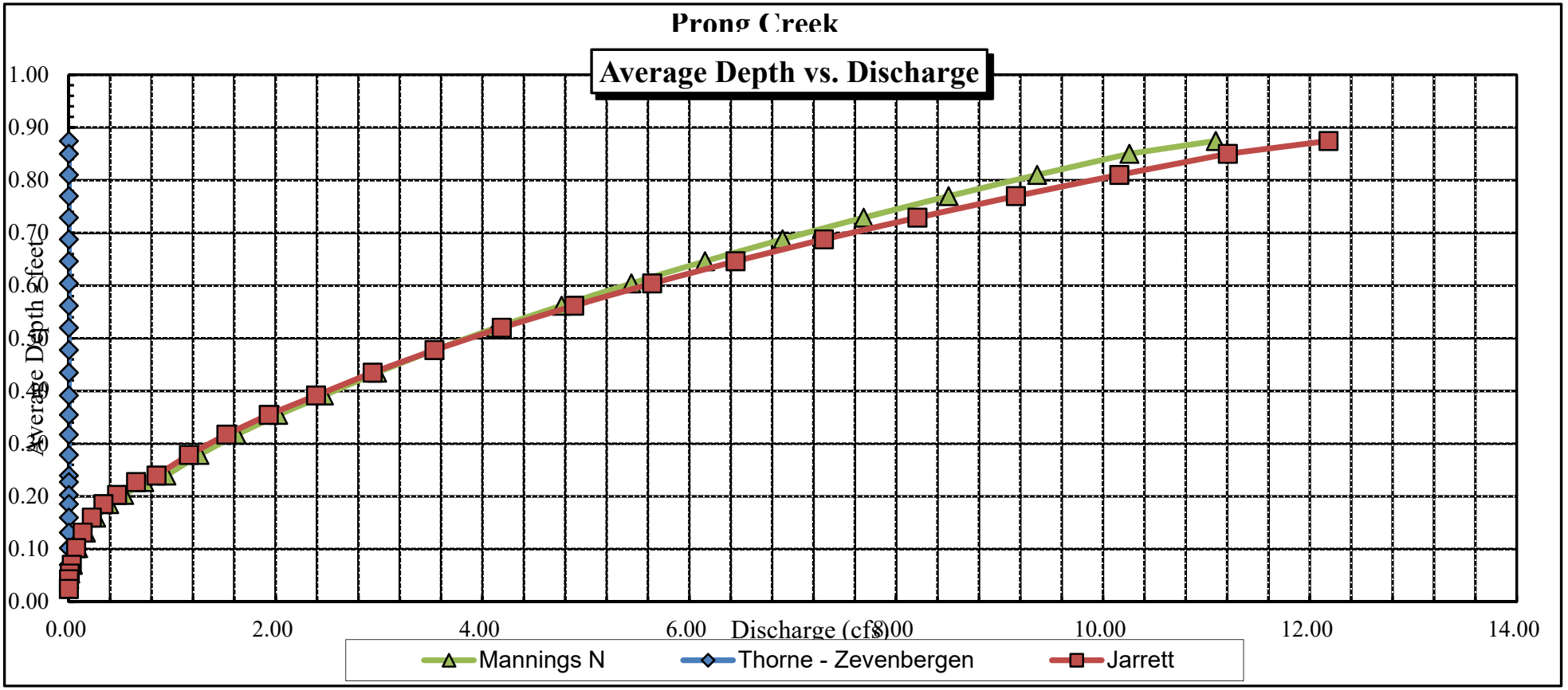
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

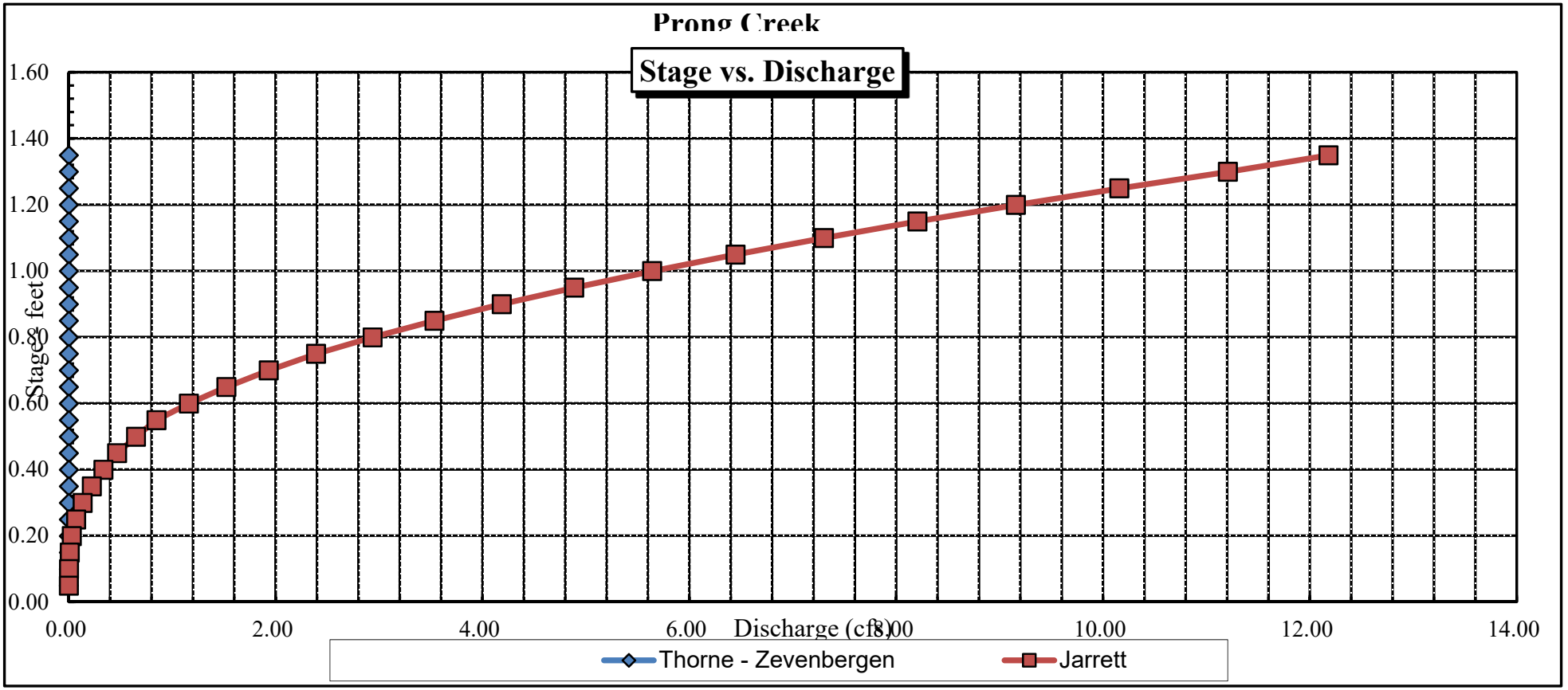
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.60	8.60	0.87	1.35	7.52	10.28	100.0%	0.73	12.20	1.62
	5.60	8.60	0.87	1.35	7.52	10.27	100.0%	0.73	12.18	1.62
	5.65	8.34	0.85	1.30	7.09	9.99	97.3%	0.71	11.21	1.58
	5.70	8.24	0.81	1.25	6.68	9.85	95.9%	0.68	10.16	1.52
	5.75	8.15	0.77	1.20	6.27	9.71	94.5%	0.65	9.16	1.46
	5.80	8.05	0.73	1.15	5.86	9.57	93.1%	0.61	8.21	1.40
	5.85	7.95	0.69	1.10	5.46	9.43	91.8%	0.58	7.30	1.34
	5.90	7.85	0.65	1.05	5.07	9.29	90.4%	0.55	6.45	1.27
	5.95	7.75	0.60	1.00	4.68	9.15	89.0%	0.51	5.64	1.21
	6.00	7.64	0.56	0.95	4.30	9.00	87.6%	0.48	4.89	1.14
	6.05	7.53	0.52	0.90	3.92	8.85	86.1%	0.44	4.19	1.07
WL	6.10	7.41	0.48	0.85	3.54	8.70	84.6%	0.41	3.54	1.00
	6.15	7.30	0.43	0.80	3.17	8.54	83.1%	0.37	2.94	0.93
	6.20	7.18	0.39	0.75	2.81	8.39	81.6%	0.34	2.39	0.85
	6.25	6.93	0.35	0.70	2.46	8.06	78.5%	0.30	1.93	0.79
	6.30	6.68	0.32	0.65	2.12	7.74	75.3%	0.27	1.52	0.72
	6.35	6.43	0.28	0.60	1.79	7.42	72.2%	0.24	1.16	0.65
	6.40	6.16	0.24	0.55	1.48	7.09	68.9%	0.21	0.85	0.57
	6.45	5.25	0.23	0.50	1.19	6.09	59.3%	0.20	0.65	0.54
	6.50	4.66	0.20	0.45	0.94	5.41	52.7%	0.17	0.47	0.50
	6.55	3.93	0.19	0.40	0.73	4.57	44.5%	0.16	0.34	0.46
	6.60	3.41	0.16	0.35	0.55	3.96	38.6%	0.14	0.22	0.41
	6.65	2.94	0.13	0.30	0.39	3.40	33.1%	0.11	0.13	0.35
	6.70	2.47	0.10	0.25	0.25	2.84	27.6%	0.09	0.07	0.28
	6.75	1.99	0.07	0.20	0.14	2.27	22.1%	0.06	0.03	0.21
	6.80	1.15	0.05	0.15	0.06	1.32	12.8%	0.05	0.01	0.17
	6.85	0.49	0.04	0.10	0.02	0.58	5.6%	0.04	0.00	0.13
	6.90	0.18	0.02	0.05	0.00	0.21	2.0%	0.02	0.00	0.09


Prong Creek
CROSS SECTION DATA ANALYSIS
S
S
GL
GL
W
W
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
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


Prong Creek
Percent Wetted Perimeter vs. Discharge
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Percent Wetted Perimeter
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Velocity vs. Discharge
1.80
1.60
1.40
1.20
0.60
0.40
0.20
0.00
0.00
2.00
12.00
14.00
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Average Depth vs. Discharge
Average Depth (feet)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Prong Creek
Stage vs. Discharge
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage, feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett