DRAFT RECOMMENDATION – SUBJECT TO CHANGE

Ms. Linda Bassi
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an increase to the instream flow water right on Watson Creek, located in Water Division 6.

Location and Land Status. Watson Creek originates at Heart Lake on the east side of the Flattops Mountains, approximately 7.0 miles southwest of the community of Yampa. Watson Creek flows into the Yampa River approximately two miles downstream from Yampa. This recommendation addresses the portion of Watson Creek that starts at the confluence with Moody Creek and extends downstream to the headgate of the Hardscrabble Ditch, a distance of approximately 6.5 miles. The BLM manages 0.3 miles of this reach, while approximately 5.2 miles are in private ownership.

Biological Summary. Watson Creek is a cool water, low to moderate gradient stream. The reach that is the subject of this recommendation flows through shallow valley that ranges from ¼ to ½ mile in width. The reach flows through agricultural lands primarily used for livestock grazing. Substrate is generally from small to medium in size, ranging from sands and gravels to 4 inch cobbles. Water quality is acceptable for supporting cool water fish species, but the creek does appear to be affected by nutrient loading.

Fish surveys have documented self-supporting populations of longnose suckers, whitehead suckers, and creek chub. Spot surveys have indicated populations of mayfly, caddisfly, and other macroinvertebrate species that tolerate cool to warm water habitats.

The creek supports a riparian community of willow, sedges, and rush species, which are more abundant in areas that are fenced off from grazing. Bank stability appears to be good, except in areas of high livestock usage.

R2Cross Analysis. The BLM collected the following R2Cross data from Watson Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
08/2/2017 #1	2.52 cfs	12.77 feet	1.10 cfs	2.27 cfs
08/2/2017 #2	2.57 cfs	10.19 feet	1.01 cfs	1.57 cfs
		Averages:	1.05 cfs	1.92 cfs

BLM's analysis of this data, coordinated with Colorado Parks and Wildlife, indicates that the

following flows are needed to protect the natural environment to a reasonable degree.

> 1.90 cubic feet per second is recommended during the warm weather period, from April 1 to October 31. This recommendation is driven by the average depth criteria and wetted perimeter criteria. During the irrigation season, maintaining this flow rate in the creek would provide adequate habitat for maintaining fish species while irrigation diversions occur. This flow rate will maintain sufficient physical habitat in the creek for the fish population to complete important parts of their life cycle before cold temperatures reduce fish activity for the winter.
>
> 1.05 cubic feet per second is recommended during cold weather period, from November 1 through March 31. This recommendation is driven by the average velocity criteria. This flow rate should prevent complete icing of the numerous pools in this reach, allowing the fish population to overwinter.

Water Availability. The BLM recommends using a variety of data sources to confirm water availability, because BLM is not aware of any historical gage data on this creek. Use of Streamstats can provide an estimate of natural hydrology, but this estimate may have to be modified by adjusting for irrigation diversions and return flows. One nearby gages may provide an estimate of natural hydrology, because it is located on a watershed with similar characteristics. USGS Gage 09238000, on Oak Creek near the community of Oak Creek, is located on a smaller watershed, but appears to be relatively unaffected by diversion and storage operations. Diversion records would also assist in analyzing the impact of diversions on stream flows, while recognizing that return flows from irrigation accrue to the channel quickly because of the narrow width of the stream valley.

The BLM is aware of the following water rights within the proposed instream flow reach:

Powell Ditch 1 – 1.0 cfs
Powell Ditch 2 – 2.0 cfs
Laramore Ditch – 5.0 cfs
Ferguson Ditch – 15.0 cfs

The BLM is aware of the following water upstream from the recommended reach:

Moody Ditch – 5.0 cfs
Bijou Ditch – 5.0 cfs
Mohr Ditch – 0.66 cfs
Hill Ditch – 4.52 cfs
Homer Buttricks Ditch – 3.0 cfs
Patton Ditch – 4.0 cfs
Heart Lake Reservoir – 283 acre feet

Relationship to Land Management Plans. The BLM's management plan calls for improvement and recovery of current and historic fisheries as a means of increasing native fish populations. In addition, the BLM plan calls for making instream flow recommendations to the

Colorado Water Conservation Board to meet minimum instream flow requirements to maintain native fisheries. Finally, the plan calls for maintaining and improving the function of riparian areas to achieve advanced ecological stage for the riparian community, and it also calls for protecting riparian and wetland systems from further sources of degradation. Establishing an instream flow water right would assist in meeting these objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2018. We thank both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Brian St. George
Deputy State Director
Resources and Fire

Cc: Bruce Sillitoe, Little Snake FO
Eric Scherff, Little Snake FO
Andrew Archuleta, Northwest District Manager

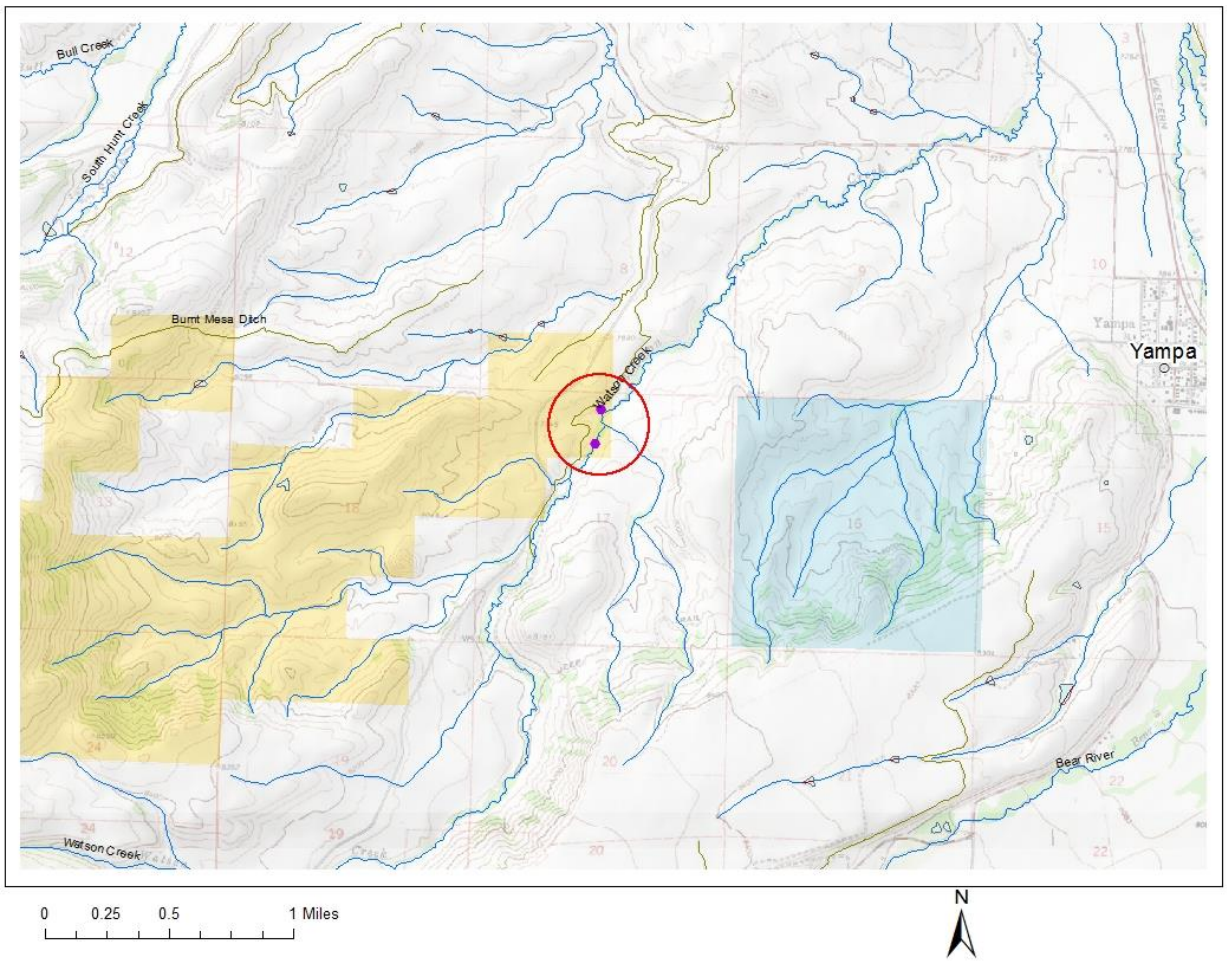
Little Snake Field Office

Stream Sampling July 2016

Watson Creek - Water Code: 22676

Introduction:

Watson Creek, located west of Yampa, Colorado on BLM lands managed by the Little Snake Field Office, was sampled on July 18, 2016. Watson Creek is tributary to the Yampa River. Sampling was conducted to obtain baseline information on fishery status and species composition. One backpack electrofisher was used to sample limited flowing stream habitat in approximately 125 feet of stream. This stream was primarily a series of beaver dams and ponds with some small reaches of slow moving water with deep pools and a lot of silt, which made sampling difficult. Capture efficiency was poor. Fish species collected included: White Suckers, Longnose Sucker, and Creek Chub. Personnel present were Tom Fresques, Nate Higginson, and Kristen Doyle, BLM.



White Sucker

Longnose Sucker

Creek Chub

Representative habitat

Representative habitat

Discussion:

Watson Creek is a small stream that appears to be used extensively for irrigation purposes. A total of 6 fish were collected including four white suckers, one longnose sucker, and one creek chub. Additional fish were seen but were not collected due to poor sampling efficiency. Some very small larval fish were also noted but not collected. Sampling was difficult as the stream is a series of beaver ponds with low gradient, deep runs and pools between. Riffle habitat was very limited.

Riparian habitat is comprised primarily of sedges, rushes, riparian grasses, and a few willows. Stream shading is limited. Stream habitats are comprised primarily of beaver ponds with deep slow runs and pools and limited riffle habitat outside of beaver pond areas. Many pools were >3 feet in depth. Substrate was comprised primarily of fine sediments - silt / clay with limited gravels.

Recommendations:

- Consider other sampling techniques, such as seining

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Watson Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: At BLM - private boundary						
DATE: 8-2-17	OBSERVERS: R. Smith, E. Scharff					
LEGAL DESCRIPTION	¼ SECTION: NE NW	SECTION: 17	TOWNSHIP: 20 N/S	RANGE: 85 E/W	PM: 6th	
COUNTY: Routt	WATERSHED: Yampa R.	WATER DIVISION:	DOW WATER CODE: 22676			
MAP(S): USGS:	Zone 13 333772 4446171					
USFS:						

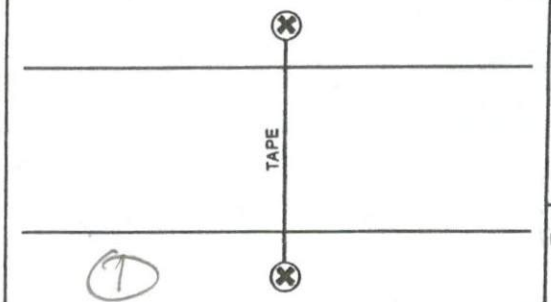
SUPPLEMENTAL DATA

GAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M				
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs	
CHANNEL BED MATERIAL SIZE RANGE: gravels to 4" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3			

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	7.75 / 7.75
② WS Upstream	13.0	7.60
③ WS Downstream	8.8	7.78
SLOPE	0.18 / 21.8 = .008	

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

Willow - sedge - rush riparian.

Ph =
Temp =
Cond =

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Watson Creek | CROSS-SECTION NO.: 1 | DATE: 8-2-17 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: _____ ft | TIME: 10:00 am

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 (ft^2)	Discharge (cfs)
LS	2.0		5.19								
G	3.0		5.95								
	4.3		7.52								
	6.0		7.78								
	8.2		7.72								
LW	9.7		7.75								
	10.0		7.85	0.10				Ø			
	10.3		7.95	0.20				Ø			
	10.6		8.05	0.30				0.45			
	10.9		8.05	0.30				0.96			
	11.2		8.05	0.30				1.30			
	11.5		8.05	0.30				1.37			
	11.7		8.10	0.35				1.26			
	11.9		8.10	0.35				1.80			
	12.1		8.10	0.35				1.89			
	12.3		8.15	0.40				2.09			
	12.5		8.20	0.45				2.08			
	12.7		8.25	0.50				2.46			
	12.9		8.25	0.50				2.28			
	13.1		8.25	0.50				2.31			
	13.3		8.30	0.55				1.98			
	13.5		8.25	0.50				1.49			
	13.7		8.25	0.50				1.10			
	13.9		8.20	0.45				0.90			
	14.1		8.15	0.4				0.62			
	14.3		8.15	0.4				0.54			
	14.5		8.15	0.4				0.59			
	14.7		8.15	0.4				0.53			
	14.9		8.05	0.3				0.39			
	15.1		7.85	0.1				0.09			
RW	15.3		7.75								
G	15.8		5.85								
RS	16.3		4.60								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Watson Creek
XS LOCATION:	At BLM-Private Boundary
XS NUMBER:	1
DATE:	2-Aug-17
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE NW
SECTION:	17
TWP:	2N
RANGE:	85W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	22676
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

TAPE WT:	0.0106
TENSION:	99999

CHANNEL PROFILE DATA

SLOPE:	0.008

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

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

STREAM NAME: Watson Creek
XS LOCATION: At BLM-Private Boundary
XS NUMBER: 1

DATA POINTS= 33

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	2.00	5.19			0.00		0.00	0.00	0.0%
1	G	3.00	5.95			0.00		0.00	0.00	0.0%
		4.30	7.52			0.00		0.00	0.00	0.0%
		6.00	7.78			0.00		0.00	0.00	0.0%
		8.20	7.72			0.00		0.00	0.00	0.0%
	LW	9.70	7.75	0.00	0.00	0.00		0.00	0.00	0.0%
		10.00	7.85	0.10	0.00	0.32	0.10	0.03	0.00	0.0%
		10.30	7.95	0.20	0.00	0.32	0.20	0.06	0.00	0.0%
		10.60	8.05	0.30	0.45	0.32	0.30	0.09	0.04	1.6%
		10.90	8.05	0.30	0.96	0.30	0.30	0.09	0.09	3.4%
		11.20	8.05	0.30	1.30	0.30	0.30	0.09	0.12	4.6%
		11.50	8.05	0.30	1.37	0.30	0.30	0.08	0.10	4.1%
		11.70	8.10	0.35	1.26	0.21	0.35	0.07	0.09	3.5%
		11.90	8.10	0.35	1.80	0.20	0.35	0.07	0.13	5.0%
		12.10	8.10	0.35	1.89	0.20	0.35	0.07	0.13	5.3%
		12.30	8.15	0.40	2.09	0.21	0.40	0.08	0.17	6.6%
		12.50	8.20	0.45	2.08	0.21	0.45	0.09	0.19	7.4%
		12.70	8.25	0.50	2.46	0.21	0.50	0.10	0.25	9.8%
		12.90	8.25	0.50	2.28	0.20	0.50	0.10	0.23	9.1%
		13.10	8.25	0.50	2.31	0.20	0.50	0.10	0.23	9.2%
		13.30	8.30	0.55	1.98	0.21	0.55	0.11	0.22	8.6%
		13.50	8.25	0.50	1.49	0.21	0.50	0.10	0.15	5.9%
		13.70	8.25	0.50	1.10	0.20	0.50	0.10	0.11	4.4%
		13.90	8.20	0.45	0.90	0.21	0.45	0.09	0.08	3.2%
		14.10	8.15	0.40	0.62	0.21	0.40	0.08	0.05	2.0%
		14.30	8.15	0.40	0.54	0.20	0.40	0.08	0.04	1.7%
		14.50	8.15	0.40	0.59	0.20	0.40	0.08	0.05	1.9%
		14.70	8.15	0.40	0.53	0.20	0.40	0.08	0.04	1.7%
		14.90	8.05	0.30	0.39	0.22	0.30	0.06	0.02	0.9%
		15.10	7.85	0.10	0.09	0.28	0.10	0.02	0.00	0.1%
	RW	15.30	7.75	0.00	0.00	0.22		0.00	0.00	0.0%
1	G	15.80	5.85			0.00		0.00	0.00	0.0%
	RS	16.30	4.60			0.00		0.00	0.00	0.0%
	TOTALS ----------					5.83	0.55 (Max.)	1.92	2.52	100.0%

Manning's n = 0.0481
Hydraulic Radius= 0.32858716

STREAM NAME: Watson Creek
XS LOCATION: At BLM-Private Boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.92	1.93	1.0%
7.50	1.92	4.48	134.0%
7.52	1.92	4.26	122.4%
7.54	1.92	4.04	110.9%
7.56	1.92	3.82	99.6%
7.58	1.92	3.61	88.4%
7.60	1.92	3.40	77.4%
7.62	1.92	3.19	66.4%
7.64	1.92	2.98	55.7%
7.66	1.92	2.78	45.0%
7.68	1.92	2.58	34.6%
7.70	1.92	2.38	24.2%
7.71	1.92	2.28	19.1%
7.72	1.92	2.18	14.0%
7.73	1.92	2.09	9.2%
7.74	1.92	2.01	4.9%
7.75	1.92	1.93	1.0%
7.76	1.92	1.87	-2.5%
7.77	1.92	1.81	-5.7%
7.78	1.92	1.75	-8.7%
7.79	1.92	1.70	-11.5%
7.80	1.92	1.64	-14.3%
7.82	1.92	1.54	-19.8%
7.84	1.92	1.43	-25.3%
7.86	1.92	1.33	-30.6%
7.88	1.92	1.23	-35.8%
7.90	1.92	1.13	-41.0%
7.92	1.92	1.03	-46.1%
7.94	1.92	0.94	-51.1%
7.96	1.92	0.84	-56.0%
7.98	1.92	0.75	-60.8%
8.00	1.92	0.66	-65.5%

WATERLINE AT ZERO
AREA ERROR = 7.753

STREAM NAME: Watson Creek
XS LOCATION: At BLM-Private Boundary
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	5.95	12.77	1.80	2.35	22.97	15.15	100.0%	1.52	83.71	3.64
	6.75	11.90	1.10	1.55	13.06	13.28	87.6%	0.98	35.69	2.73
	6.80	11.84	1.05	1.50	12.47	13.16	86.9%	0.95	33.23	2.66
	6.85	11.79	1.01	1.45	11.88	13.04	86.1%	0.91	30.83	2.59
	6.90	11.73	0.96	1.40	11.29	12.93	85.3%	0.87	28.50	2.52
	6.95	11.68	0.92	1.35	10.71	12.81	84.6%	0.84	26.24	2.45
	7.00	11.62	0.87	1.30	10.12	12.69	83.8%	0.80	24.05	2.38
	7.05	11.57	0.82	1.25	9.54	12.58	83.0%	0.76	21.93	2.30
	7.10	11.52	0.78	1.20	8.97	12.46	82.2%	0.72	19.89	2.22
	7.15	11.46	0.73	1.15	8.39	12.34	81.5%	0.68	17.92	2.14
	7.20	11.41	0.69	1.10	7.82	12.23	80.7%	0.64	16.03	2.05
	7.25	11.35	0.64	1.05	7.25	12.11	79.9%	0.60	14.23	1.96
	7.30	11.30	0.59	1.00	6.69	11.99	79.2%	0.56	12.51	1.87
	7.35	11.24	0.54	0.95	6.12	11.88	78.4%	0.52	10.87	1.78
	7.40	11.19	0.50	0.90	5.56	11.76	77.6%	0.47	9.32	1.68
	7.45	11.13	0.45	0.85	5.00	11.64	76.9%	0.43	7.87	1.57
	7.50	11.08	0.40	0.80	4.45	11.53	76.1%	0.39	6.51	1.46
	7.55	10.84	0.36	0.75	3.90	11.23	74.2%	0.35	5.32	1.36
	7.60	10.50	0.32	0.70	3.37	10.85	71.6%	0.31	4.26	1.27
	7.65	10.16	0.28	0.65	2.85	10.47	69.1%	0.27	3.30	1.16
	7.70	9.82	0.24	0.60	2.35	10.09	66.6%	0.23	2.46	1.05
WL	7.75	6.76	0.28	0.55	1.91	6.98	46.1%	0.27	2.23	1.17
	7.80	5.34	0.30	0.50	1.63	5.54	36.6%	0.29	1.98	1.22
	7.85	5.09	0.27	0.45	1.37	5.27	34.8%	0.26	1.53	1.12
	7.90	4.89	0.23	0.40	1.12	5.05	33.3%	0.22	1.13	1.01
	7.95	4.69	0.19	0.35	0.88	4.82	31.8%	0.18	0.78	0.89
	8.00	4.49	0.14	0.30	0.65	4.59	30.3%	0.14	0.48	0.75
	8.05	3.38	0.13	0.25	0.43	3.45	22.8%	0.12	0.30	0.69
	8.10	2.68	0.10	0.20	0.27	2.74	18.1%	0.10	0.16	0.59
	8.15	1.78	0.08	0.15	0.14	1.81	12.0%	0.08	0.07	0.51
	8.20	1.38	0.05	0.10	0.07	1.40	9.2%	0.05	0.02	0.36
	8.25	0.38	0.02	0.05	0.01	0.39	2.6%	0.02	0.00	0.22

STREAM NAME: Watson Creek
XS LOCATION: At BLM-Private Boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.52	cfs
CALCULATED FLOW (Qc)=	2.23	cfs
(Qm-Qc)/Qm * 100 =	11.4	%
MEASURED WATERLINE (WLm)=	7.75	ft
CALCULATED WATERLINE (WLc)=	7.75	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.55	ft
MAX CALCULATED DEPTH (Dc)=	0.55	ft
(Dm-Dc)/Dm * 100	0.5	%
MEAN VELOCITY=	1.17	ft/sec
MANNING'S N=	0.048	
SLOPE=	0.008	ft/ft
.4 * Qm =	1.0	cfs
2.5 * Qm=	6.3	cfs

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

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

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

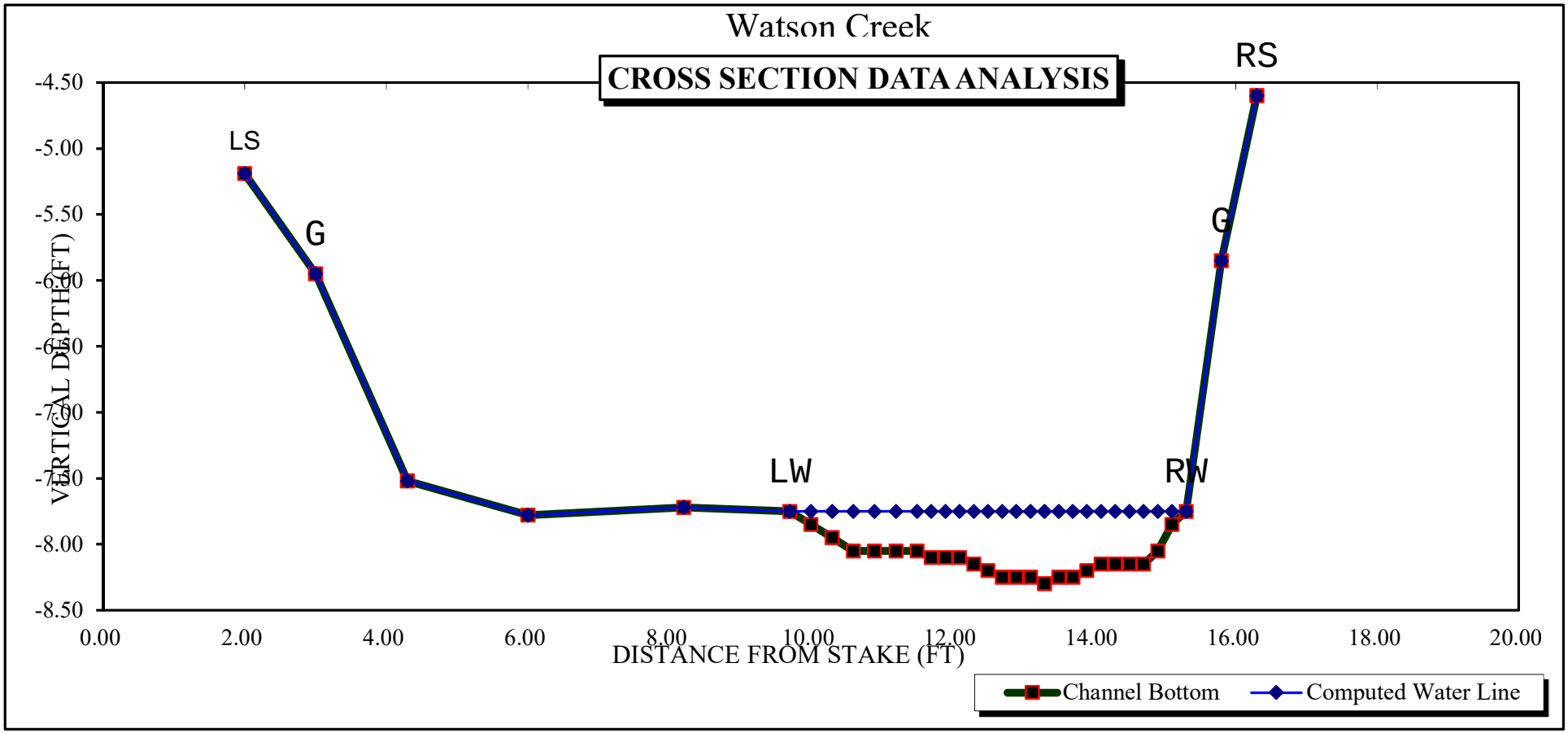
RECOMMENDATION BY: …….. AGENCY…….. DATE:……

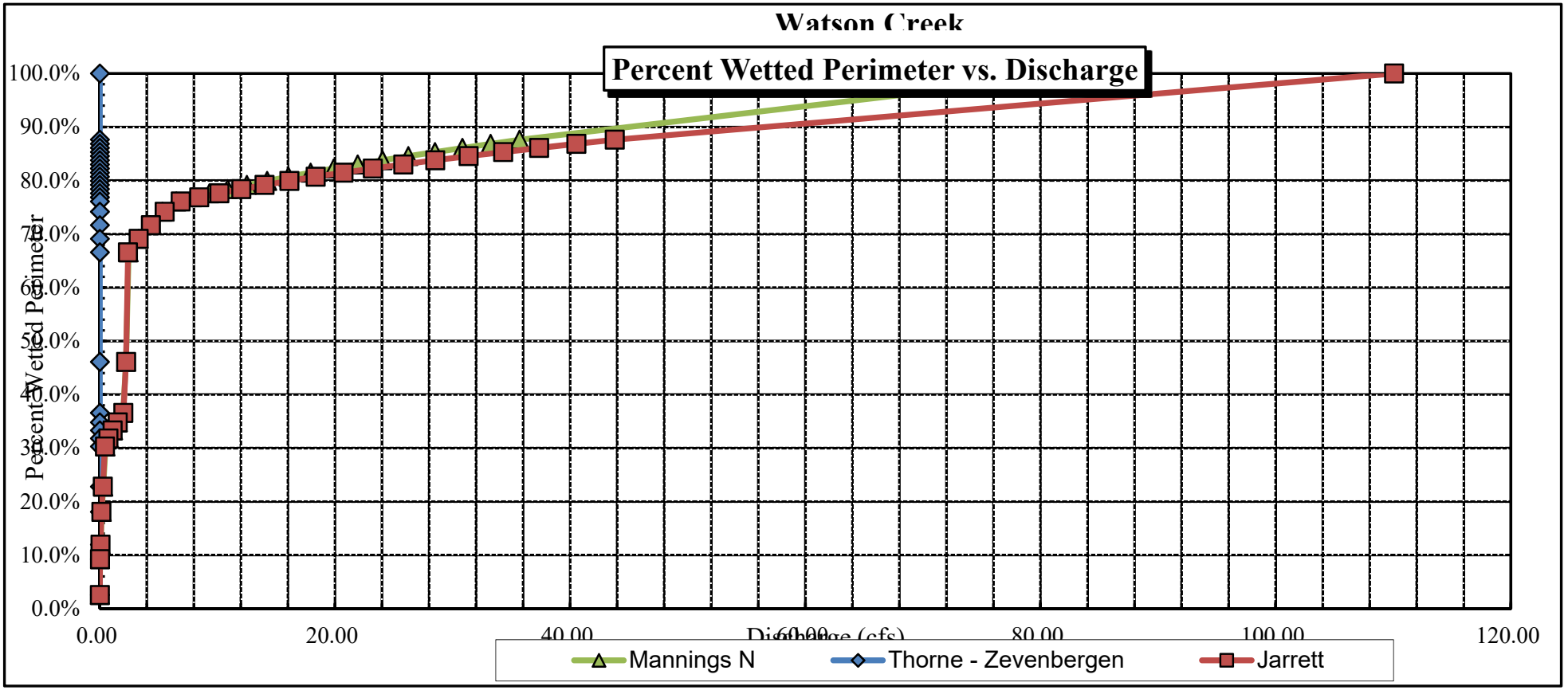
CWCB REVIEW BY: …….. DATE:……

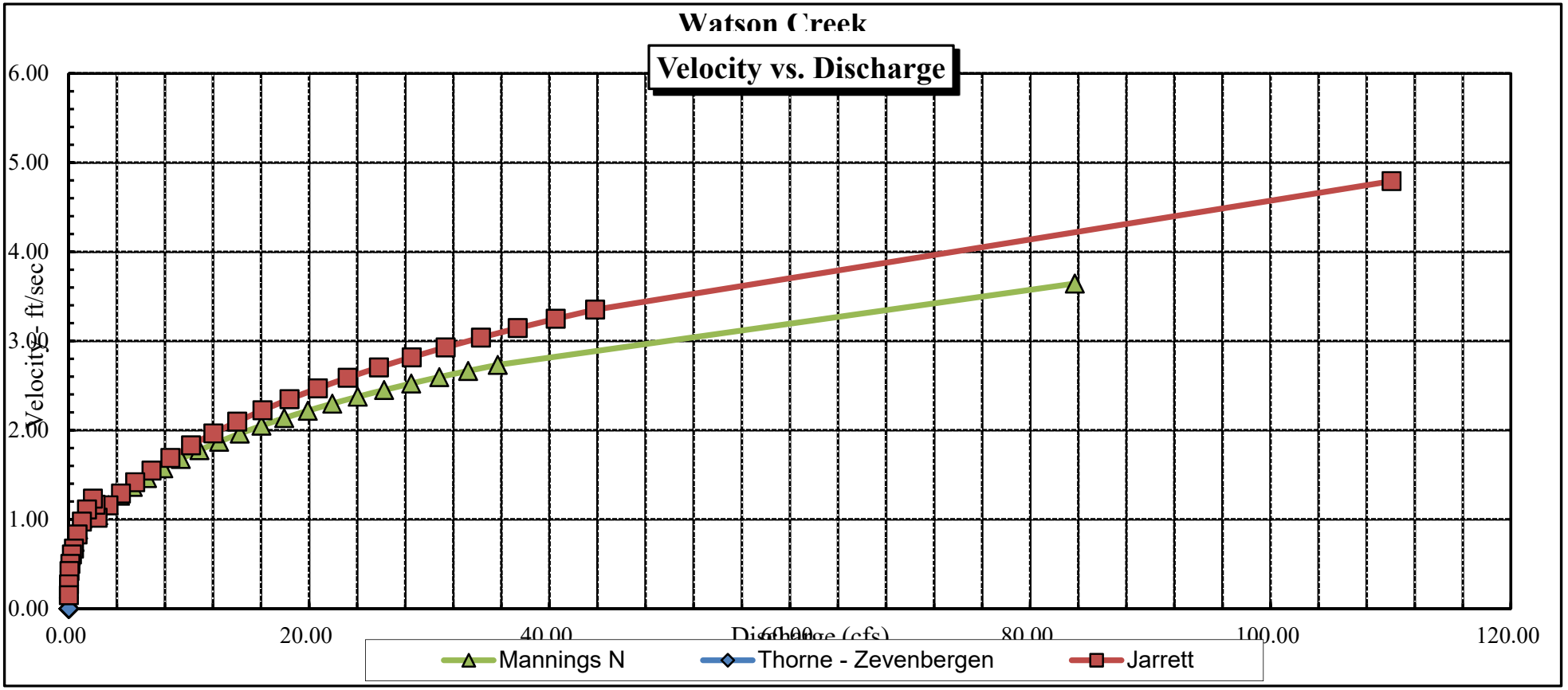
STREAM NAME: Watson Creek
XS LOCATION: At BLM-Private Boundary
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

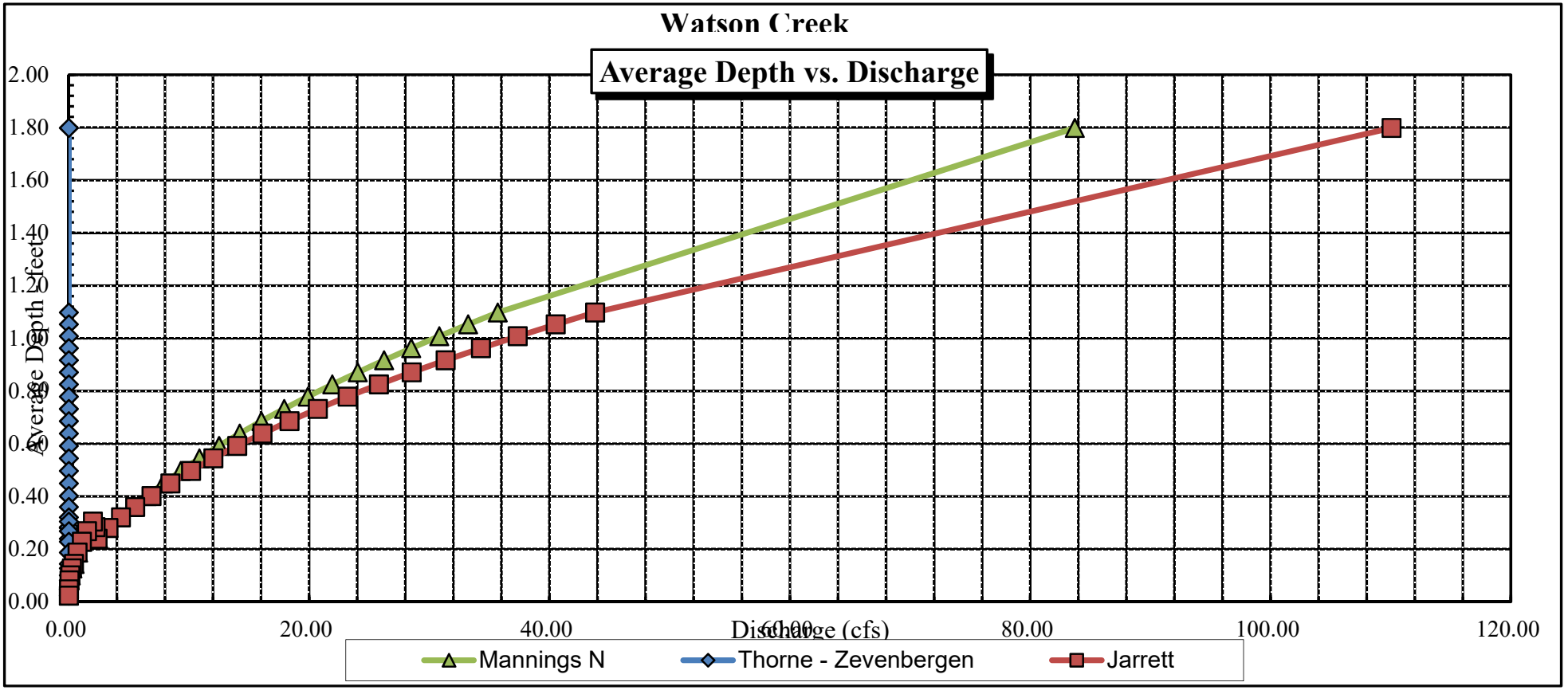
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

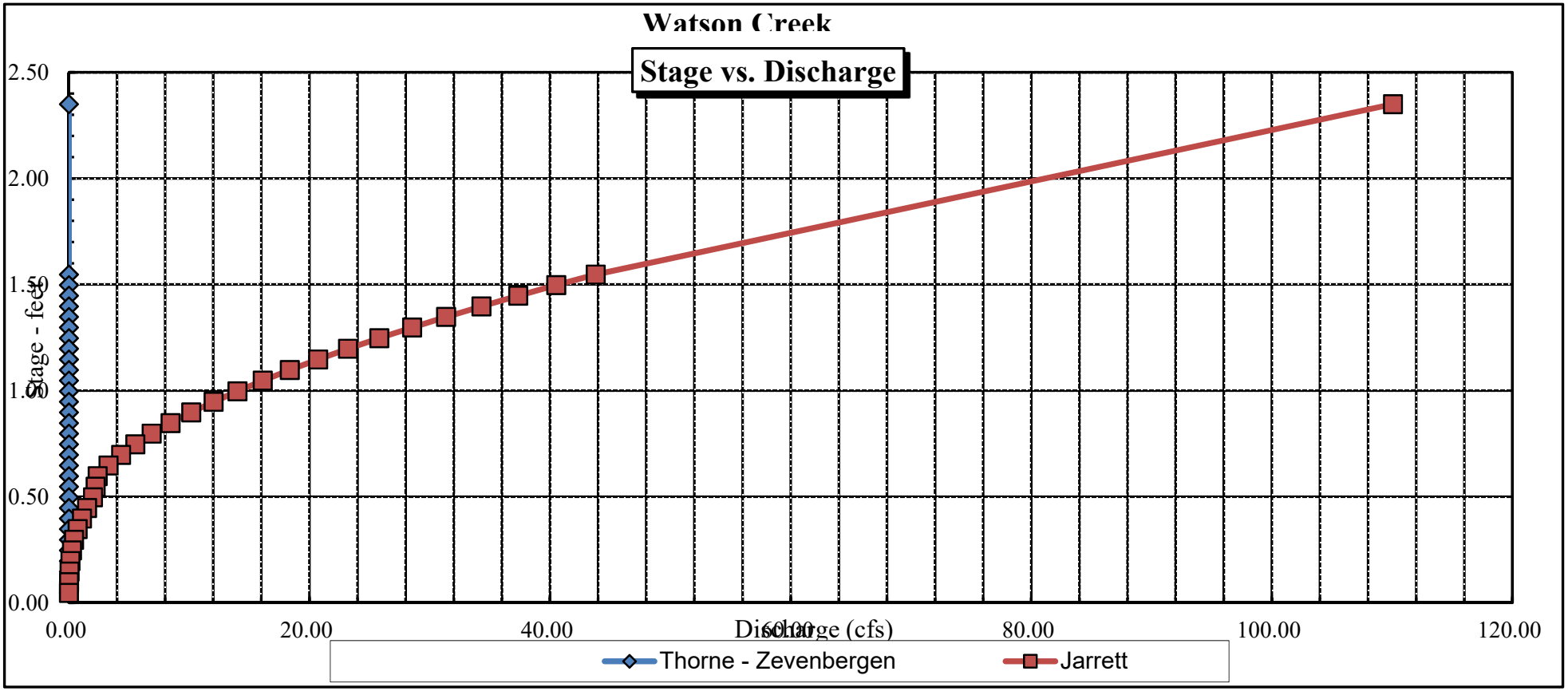
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.95	12.77	1.80	2.35	22.97	15.15	100.0%	1.52	110.07	4.79
	6.75	11.90	1.10	1.55	13.06	13.28	87.6%	0.98	43.79	3.35
	6.80	11.84	1.05	1.50	12.47	13.16	86.9%	0.95	40.52	3.25
	6.85	11.79	1.01	1.45	11.88	13.04	86.1%	0.91	37.36	3.14
	6.90	11.73	0.96	1.40	11.29	12.93	85.3%	0.87	34.30	3.04
	6.95	11.68	0.92	1.35	10.71	12.81	84.6%	0.84	31.36	2.93
	7.00	11.62	0.87	1.30	10.12	12.69	83.8%	0.80	28.53	2.82
	7.05	11.57	0.82	1.25	9.54	12.58	83.0%	0.76	25.81	2.70
	7.10	11.52	0.78	1.20	8.97	12.46	82.2%	0.72	23.21	2.59
	7.15	11.46	0.73	1.15	8.39	12.34	81.5%	0.68	20.73	2.47
	7.20	11.41	0.69	1.10	7.82	12.23	80.7%	0.64	18.36	2.35
	7.25	11.35	0.64	1.05	7.25	12.11	79.9%	0.60	16.12	2.22
	7.30	11.30	0.59	1.00	6.69	11.99	79.2%	0.56	14.01	2.10
	7.35	11.24	0.54	0.95	6.12	11.88	78.4%	0.52	12.03	1.96
	7.40	11.19	0.50	0.90	5.56	11.76	77.6%	0.47	10.17	1.83
	7.45	11.13	0.45	0.85	5.00	11.64	76.9%	0.43	8.46	1.69
	7.50	11.08	0.40	0.80	4.45	11.53	76.1%	0.39	6.88	1.55
	7.55	10.84	0.36	0.75	3.90	11.23	74.2%	0.35	5.52	1.42
	7.60	10.50	0.32	0.70	3.37	10.85	71.6%	0.31	4.34	1.29
	7.65	10.16	0.28	0.65	2.85	10.47	69.1%	0.27	3.30	1.16
	7.70	9.82	0.24	0.60	2.35	10.09	66.6%	0.23	2.39	1.02
WL	7.75	6.76	0.28	0.55	1.91	6.98	46.1%	0.27	2.23	1.17
	7.80	5.34	0.30	0.50	1.63	5.54	36.6%	0.29	2.00	1.23
	7.85	5.09	0.27	0.45	1.37	5.27	34.8%	0.26	1.52	1.11
	7.90	4.89	0.23	0.40	1.12	5.05	33.3%	0.22	1.09	0.98
	7.95	4.69	0.19	0.35	0.88	4.82	31.8%	0.18	0.73	0.83
	8.00	4.49	0.14	0.30	0.65	4.59	30.3%	0.14	0.44	0.67
	8.05	3.38	0.13	0.25	0.43	3.45	22.8%	0.12	0.26	0.61
	8.10	2.68	0.10	0.20	0.27	2.74	18.1%	0.10	0.13	0.50
	8.15	1.78	0.08	0.15	0.14	1.81	12.0%	0.08	0.06	0.42
	8.20	1.38	0.05	0.10	0.07	1.40	9.2%	0.05	0.02	0.27
	8.25	0.38	0.02	0.05	0.01	0.39	2.6%	0.02	0.00	0.15


Watson Creek
CROSS SECTION DATA ANALYSIS
LS
G
LW
RW
G
RS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
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


Watson 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
20.00
40.00
80.00
100.00
120.00
Mannings N
Thorne - Zevenbergen
Jarrett


Watson Creek
Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity- ft/sec
0.00
20.00
40.00
80.00
100.00
120.00
Mannings N
Thorne - Zevenbergen
Jarrett


Watson Creek
Average Depth vs. Discharge
Average Depth (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
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Watson Creek
Stage vs. Discharge
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Watson Creek
XS LOCATION:	At BLM-Private Boundary
XS NUMBER:	1
DATE:	8/2/2017
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE NW
SECTION:	17
TWP:	2N
RANGE:	85W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	22676
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.008 ft / ft

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

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 33					
	LS	2.00	5.19			0.00	0.00	0.00
1	G	3.00	5.95			0.00	0.00	0.00
		4.30	7.52			0.00	0.00	0.00
		6.00	7.78			0.00	0.00	0.00
		8.20	7.72			0.00	0.00	0.00
	LW	9.70	7.75	0.00	0.00	0.00	0.00	0.00
		10.00	7.85	0.10	0.00	0.03	0.00	7.75
		10.30	7.95	0.20	0.00	0.06	0.00	7.75
		10.60	8.05	0.30	0.45	0.09	0.04	7.75
		10.90	8.05	0.30	0.96	0.09	0.09	7.75
		11.20	8.05	0.30	1.30	0.09	0.12	7.75
		11.50	8.05	0.30	1.37	0.08	0.10	7.75
		11.70	8.10	0.35	1.26	0.07	0.09	7.75
		11.90	8.10	0.35	1.80	0.07	0.13	7.75
		12.10	8.10	0.35	1.89	0.07	0.13	7.75
		12.30	8.15	0.40	2.09	0.08	0.17	7.75
		12.50	8.20	0.45	2.08	0.09	0.19	7.75
		12.70	8.25	0.50	2.46	0.10	0.25	7.75
		12.90	8.25	0.50	2.28	0.10	0.23	7.75
		13.10	8.25	0.50	2.31	0.10	0.23	7.75
		13.30	8.30	0.55	1.98	0.11	0.22	7.75
		13.50	8.25	0.50	1.49	0.10	0.15	7.75
		13.70	8.25	0.50	1.10	0.10	0.11	7.75
		13.90	8.20	0.45	0.90	0.09	0.08	7.75
		14.10	8.15	0.40	0.62	0.08	0.05	7.75
		14.30	8.15	0.40	0.54	0.08	0.04	7.75
		14.50	8.15	0.40	0.59	0.08	0.05	7.75
		14.70	8.15	0.40	0.53	0.08	0.04	7.75
		14.90	8.05	0.30	0.39	0.06	0.02	7.75
		15.10	7.85	0.10	0.09	0.02	0.00	7.75
	RW	15.30	7.75	0.00	0.00	0.00	0.00	0.00
1	G	15.80	5.85			0.00	0.00	0.00
	RS	16.30	4.60			0.00	0.00	0.00
					Totals	1.92	2.52	

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Watson Creek | CROSS-SECTION NO.: 2

CROSS-SECTION LOCATION: At BLM - Private boundary

DATE: 8-2-17 | OBSERVERS: R. Smith, E. Scherff

LEGAL DESCRIPTION | ¼ SECTION: NE NW | SECTION: 17 | TOWNSHIP: 2 N/S | RANGE: 85 E/W | PM: 6th

COUNTY: Routt | WATERSHED: Yampa R. | WATER DIVISION: 6 | DOW WATER CODE: 22676

MAP(S): USGS: | USFS:

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO | METER TYPE: M-M

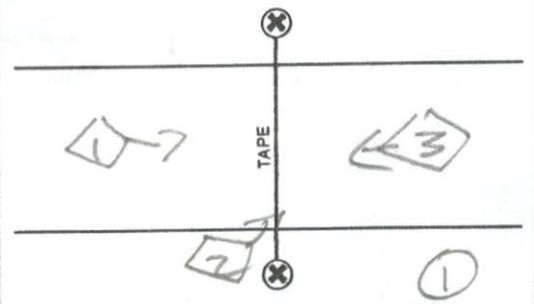
METER NUMBER: | DATE RATED: | CALIB/SPIN: ____ sec | TAPE WEIGHT: surveyed ____ lbs/foot | TAPE TENSION: surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: gravel to 4" cobbles | PHOTOGRAPHS TAKEN: YES/NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	7.90/7.90
② WS Upstream	11.0	7.77
③ WS Downstream	6.0	7.95
SLOPE	0.18/17.0 = .01	

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
caddisflies, amelids, mayflies,																	

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

COMMENTS

pH 7.69

Temp Water 14.7 °C

SC 228 µS/cm

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Watson Creek	CROSS-SECTION NO: 2	DATE: 8-2-17	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 10:40 am

Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft^2)	Discharge (cfs)
								At Point	Mean in Vertical		
RS	2.3		4.70								
G	3.8		6.26								
	5.3		6.62								
	6.0		6.95								
RW	6.9		7.90								
	7.2		8.0	0.10				0.04			
	7.5		8.05	0.15				0.37			
	7.8		8.1	0.20				0.56			
	8.1		8.1	0.20				0.74			
	8.4		8.1	0.20				0.89			
	8.7		8.1	0.20				1.26			
	9.0		8.15	0.25				1.44			
	9.2		8.2	0.30				1.64			
	9.4		8.2	0.30				1.76			
	9.6		8.25	0.35				2.05			
	9.8		8.25	0.35				2.18			
	10.0		8.25	0.35				2.20			
	10.2		8.25	0.35				1.89			
	10.4		8.3	0.40				1.93			
	10.6		8.3	0.40				2.12			
	10.8		8.25	0.35				2.23			
	11.0		8.2	0.30				2.29			
	11.2		8.2	0.30				2.22			
	11.4		8.2	0.30				2.17			
	11.6		8.2	0.30				1.86			
	11.8		8.2	0.30				1.53			
	12.0		8.2	0.30				1.15			
	12.2		8.2	0.30				0.66			
	12.4		8.2	0.30				0.60			
	12.6		8.2	0.30				0.70			
	12.8		8.2	0.30				0.84			
	13.1		8.25	0.35				0.72			
	13.4		8.2	0.30				0.63			
	13.7		7.95	0.05				0.07			
RW	13.8		7.90								
G	14.0		6.20								
	14.4		5.36								
RS	15.7		4.96								
TOTALS:											

End of Measurement	Time: 10:53	Gage Reading: _____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

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

LOCATION INFORMATION

STREAM NAME:	Watson Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	2
DATE:	2-Aug-17
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE NW
SECTION:	17
TWP:	2N
RANGE:	85W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	22676
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:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.01

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

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

STREAM NAME: Watson Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

DATA POINTS= 38

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
RS	2.30	4.70			0.00		0.00	0.00	0.0%
1 G	3.80	6.26			0.00		0.00	0.00	0.0%
	5.30	6.62			0.00		0.00	0.00	0.0%
	6.00	6.95			0.00		0.00	0.00	0.0%
RW	6.90	7.90	0.00	0.00	0.00		0.00	0.00	0.0%
	7.20	8.00	0.10	0.04	0.32	0.10	0.03	0.00	0.0%
	7.50	8.05	0.15	0.37	0.30	0.15	0.05	0.02	0.6%
	7.80	8.10	0.20	0.56	0.30	0.20	0.06	0.03	1.3%
	8.10	8.10	0.20	0.74	0.30	0.20	0.06	0.04	1.7%
	8.40	8.10	0.20	0.89	0.30	0.20	0.06	0.05	2.1%
	8.70	8.10	0.20	1.26	0.30	0.20	0.06	0.08	2.9%
	9.00	8.15	0.25	1.44	0.30	0.25	0.06	0.09	3.5%
	9.20	8.20	0.30	1.64	0.21	0.30	0.06	0.10	3.8%
	9.40	8.20	0.30	1.76	0.20	0.30	0.06	0.11	4.1%
	9.60	8.25	0.35	2.05	0.21	0.35	0.07	0.14	5.6%
	9.80	8.25	0.35	2.18	0.20	0.35	0.07	0.15	5.9%
	10.00	8.25	0.35	2.20	0.20	0.35	0.07	0.15	6.0%
	10.20	8.25	0.35	1.89	0.20	0.35	0.07	0.13	5.2%
	10.40	8.30	0.40	1.93	0.21	0.40	0.08	0.15	6.0%
	10.60	8.30	0.40	2.12	0.20	0.40	0.08	0.17	6.6%
	10.80	8.25	0.35	2.23	0.21	0.35	0.07	0.16	6.1%
	11.00	8.20	0.30	2.29	0.21	0.30	0.06	0.14	5.4%
	11.20	8.20	0.30	2.22	0.20	0.30	0.06	0.13	5.2%
	11.40	8.20	0.30	2.17	0.20	0.30	0.06	0.13	5.1%
	11.60	8.20	0.30	1.86	0.20	0.30	0.06	0.11	4.3%
	11.80	8.20	0.30	1.53	0.20	0.30	0.06	0.09	3.6%
	12.00	8.20	0.30	1.15	0.20	0.30	0.06	0.07	2.7%
	12.20	8.20	0.30	0.66	0.20	0.30	0.06	0.04	1.5%
	12.40	8.20	0.30	0.60	0.20	0.30	0.06	0.04	1.4%
	12.60	8.20	0.30	0.70	0.20	0.30	0.06	0.04	1.6%
	12.80	8.20	0.30	0.84	0.20	0.30	0.08	0.06	2.5%
	13.10	8.25	0.35	0.72	0.30	0.35	0.11	0.08	2.9%
	13.40	8.20	0.30	0.63	0.30	0.30	0.09	0.06	2.2%
	13.70	7.95	0.05	0.07	0.39	0.05	0.01	0.00	0.0%
LW	13.80	7.90	0.00	0.00	0.11		0.00	0.00	0.0%
1 G	14.00	6.20			0.00		0.00	0.00	0.0%
	14.40	5.36			0.00		0.00	0.00	0.0%
LS	15.70	4.96			0.00		0.00	0.00	0.0%
TOTALS ----------					7.07	0.4 (Max.)	1.83	2.57	100.0%

Manning's n = 0.0429
Hydraulic Radius= 0.25848617

STREAM NAME: Watson Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.83	1.83	0.0%
7.65	1.83	3.59	96.2%
7.67	1.83	3.44	88.4%
7.69	1.83	3.30	80.6%
7.71	1.83	3.16	72.8%
7.73	1.83	3.02	65.0%
7.75	1.83	2.87	57.3%
7.77	1.83	2.73	49.6%
7.79	1.83	2.59	41.9%
7.81	1.83	2.45	34.2%
7.83	1.83	2.31	26.6%
7.85	1.83	2.17	19.0%
7.86	1.83	2.10	15.1%
7.87	1.83	2.03	11.4%
7.88	1.83	1.97	7.6%
7.89	1.83	1.90	3.8%
7.90	1.83	1.83	0.0%
7.91	1.83	1.76	-3.8%
7.92	1.83	1.69	-7.5%
7.93	1.83	1.62	-11.2%
7.94	1.83	1.56	-14.9%
7.95	1.83	1.49	-18.5%
7.97	1.83	1.36	-25.8%
7.99	1.83	1.23	-32.9%
8.01	1.83	1.10	-39.9%
8.03	1.83	0.97	-46.8%
8.05	1.83	0.85	-53.6%
8.07	1.83	0.73	-60.1%
8.09	1.83	0.61	-66.6%
8.11	1.83	0.51	-72.3%
8.13	1.83	0.41	-77.4%
8.15	1.83	0.32	-82.4%

WATERLINE AT ZERO
AREA ERROR = 7.900

STREAM NAME: Watson Creek
XS LOCATION: At BLM-private boundary
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	6.26	10.19	1.47	2.04	14.99	12.35	100.0%	1.21	59.07	3.94
	6.90	8.02	1.15	1.40	9.26	9.50	77.0%	0.97	31.53	3.40
	6.95	7.91	1.12	1.35	8.86	9.34	75.6%	0.95	29.65	3.35
	7.00	7.86	1.08	1.30	8.47	9.22	74.6%	0.92	27.72	3.27
	7.05	7.81	1.03	1.25	8.08	9.10	73.7%	0.89	25.84	3.20
	7.10	7.75	0.99	1.20	7.69	8.98	72.7%	0.86	24.01	3.12
	7.15	7.70	0.95	1.15	7.30	8.86	71.7%	0.82	22.23	3.04
	7.20	7.65	0.90	1.10	6.92	8.74	70.8%	0.79	20.50	2.96
	7.25	7.59	0.86	1.05	6.54	8.62	69.8%	0.76	18.83	2.88
	7.30	7.54	0.82	1.00	6.16	8.50	68.9%	0.72	17.21	2.79
	7.35	7.49	0.77	0.95	5.78	8.38	67.9%	0.69	15.64	2.70
	7.40	7.43	0.73	0.90	5.41	8.26	66.9%	0.65	14.13	2.61
	7.45	7.38	0.68	0.85	5.04	8.14	66.0%	0.62	12.68	2.52
	7.50	7.33	0.64	0.80	4.67	8.02	65.0%	0.58	11.29	2.42
	7.55	7.27	0.59	0.75	4.31	7.90	64.0%	0.54	9.95	2.31
	7.60	7.22	0.55	0.70	3.95	7.79	63.1%	0.51	8.69	2.20
	7.65	7.17	0.50	0.65	3.59	7.67	62.1%	0.47	7.48	2.09
	7.70	7.11	0.45	0.60	3.23	7.55	61.1%	0.43	6.35	1.97
	7.75	7.06	0.41	0.55	2.87	7.43	60.2%	0.39	5.29	1.84
	7.80	7.01	0.36	0.50	2.52	7.31	59.2%	0.35	4.30	1.70
	7.85	6.95	0.31	0.45	2.17	7.19	58.2%	0.30	3.39	1.56
WL	7.90	6.90	0.26	0.40	1.83	7.07	57.3%	0.26	2.57	1.41
	7.95	6.65	0.22	0.35	1.49	6.80	55.1%	0.22	1.87	1.26
	8.00	6.44	0.18	0.30	1.16	6.56	53.2%	0.18	1.27	1.09
	8.05	6.08	0.14	0.25	0.85	6.18	50.1%	0.14	0.78	0.92
	8.10	4.82	0.11	0.20	0.55	4.90	39.7%	0.11	0.45	0.81
	8.15	4.46	0.07	0.15	0.32	4.52	36.6%	0.07	0.19	0.59
	8.20	2.20	0.05	0.10	0.11	2.23	18.1%	0.05	0.05	0.45
	8.25	0.60	0.03	0.05	0.02	0.61	5.0%	0.03	0.01	0.35
	8.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Watson Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.57	cfs
CALCULATED FLOW (Qc)=	2.57	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.90	ft
CALCULATED WATERLINE (WLc)=	7.90	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.41	ft/sec
MANNING'S N=	0.043	
SLOPE=	0.01	ft/ft
.4 * Qm =	1.0	cfs
2.5 * Qm=	6.4	cfs

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

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

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

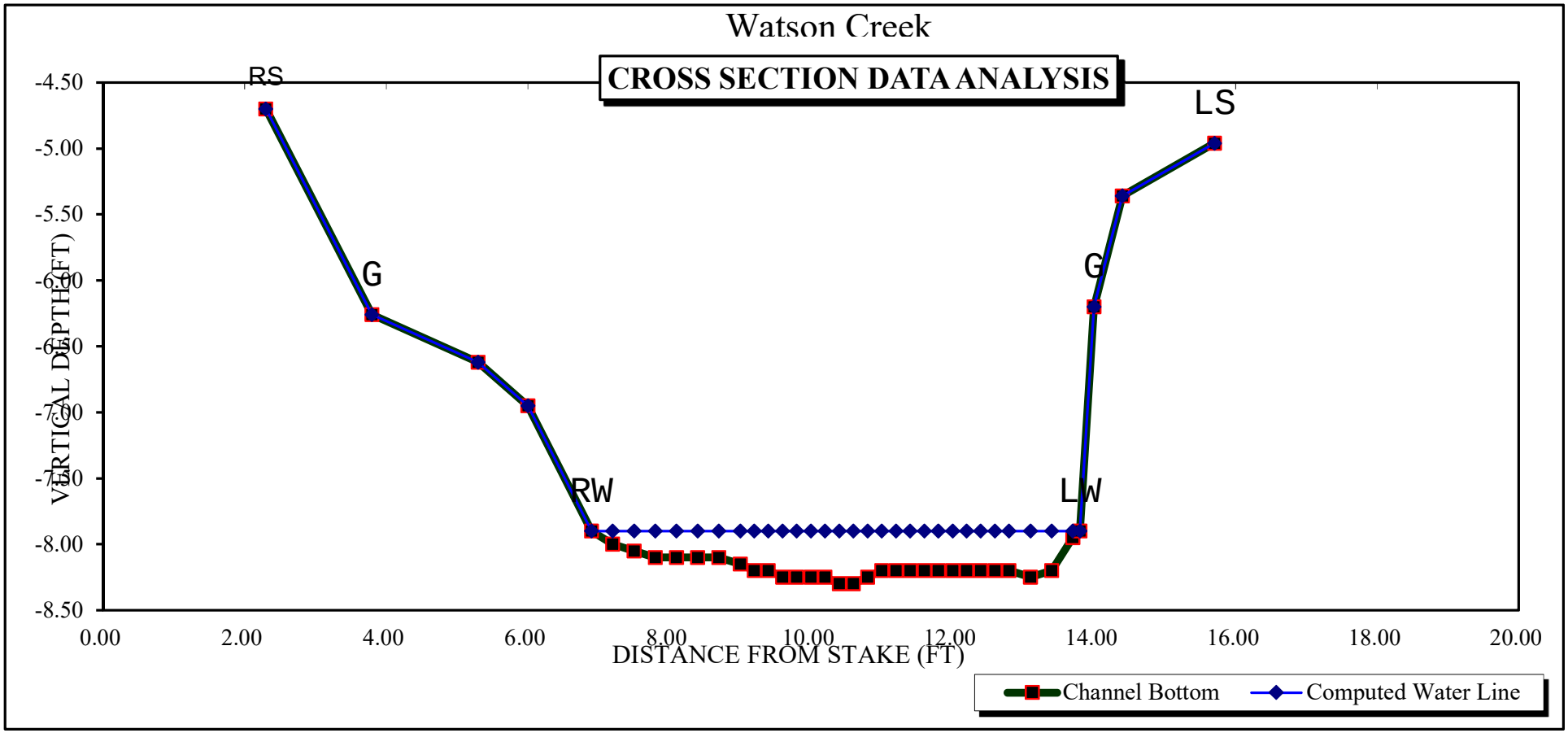
RECOMMENDATION BY: …… AGENCY…… DATE:……

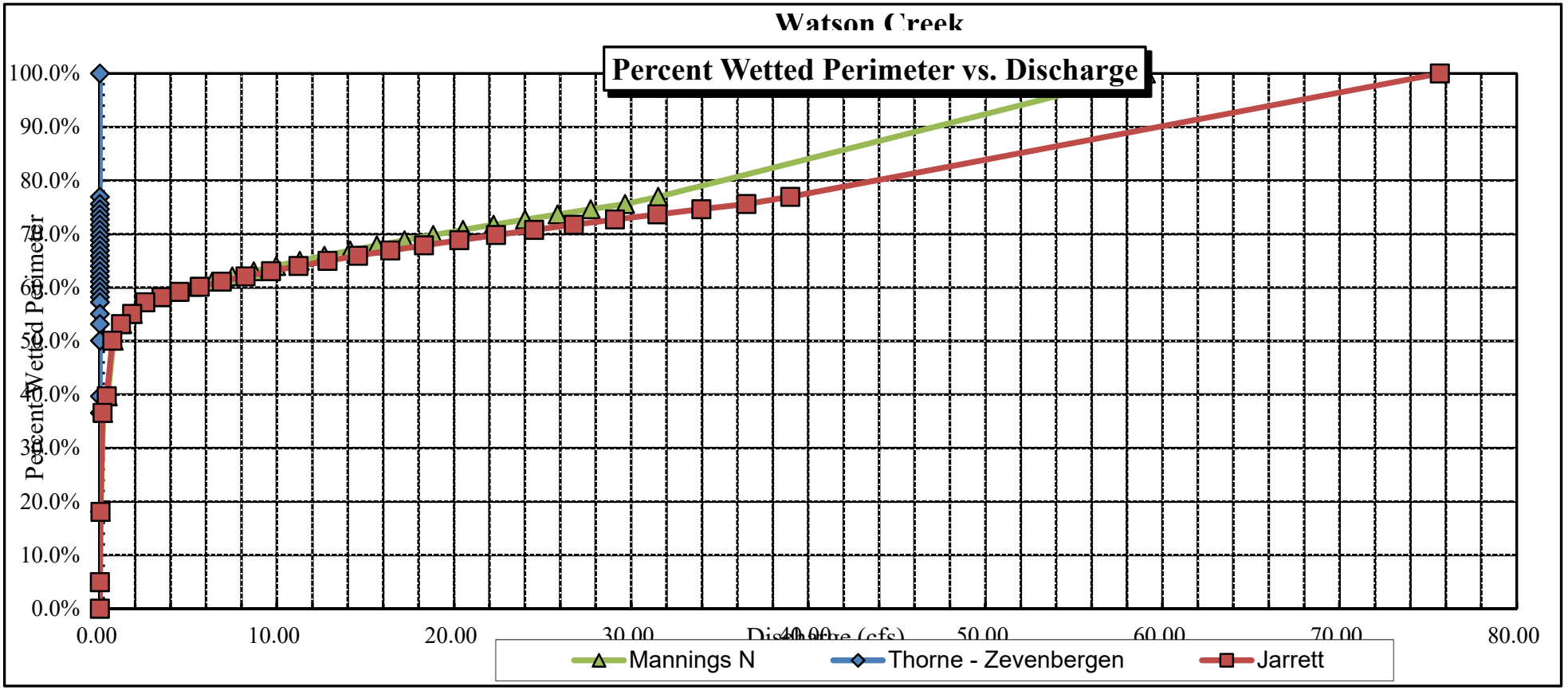
CWCB REVIEW BY: …… DATE:……

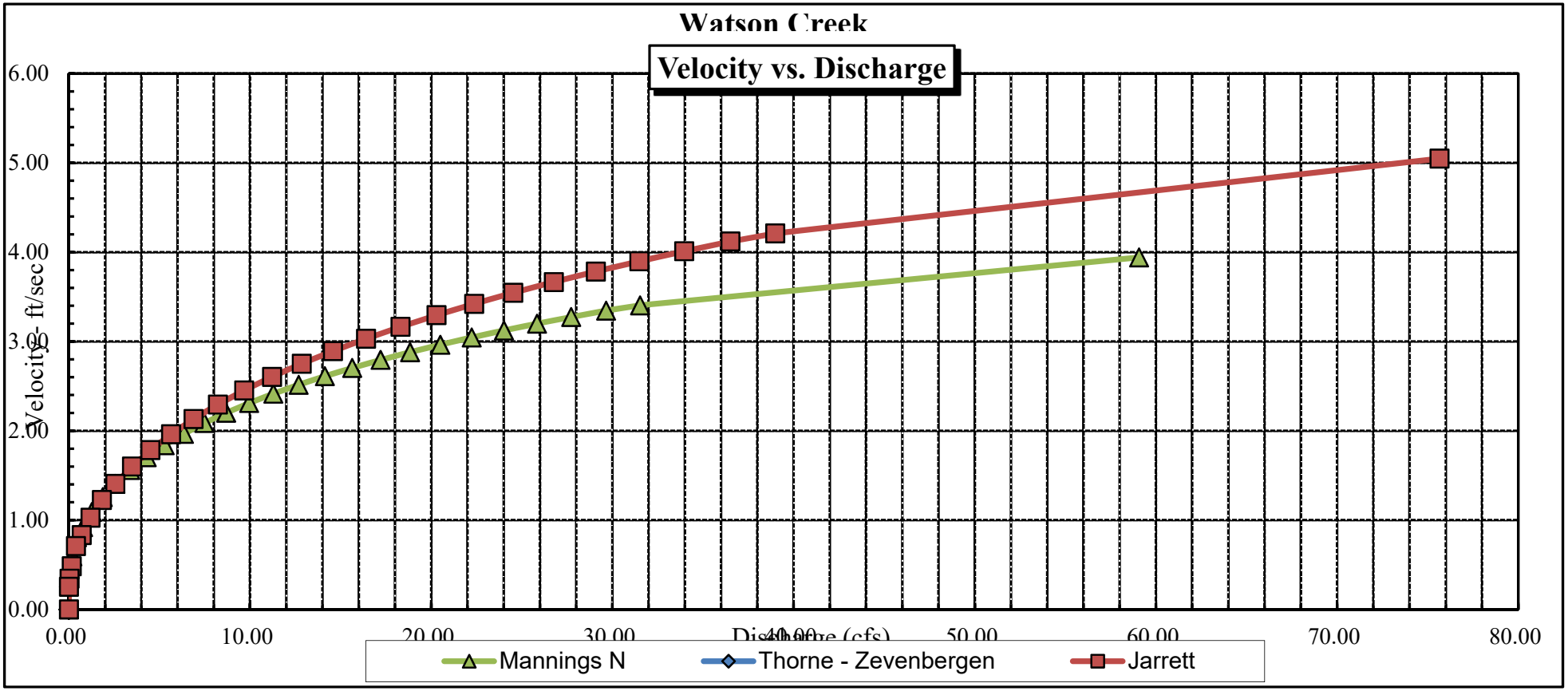
STREAM NAME: Watson Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

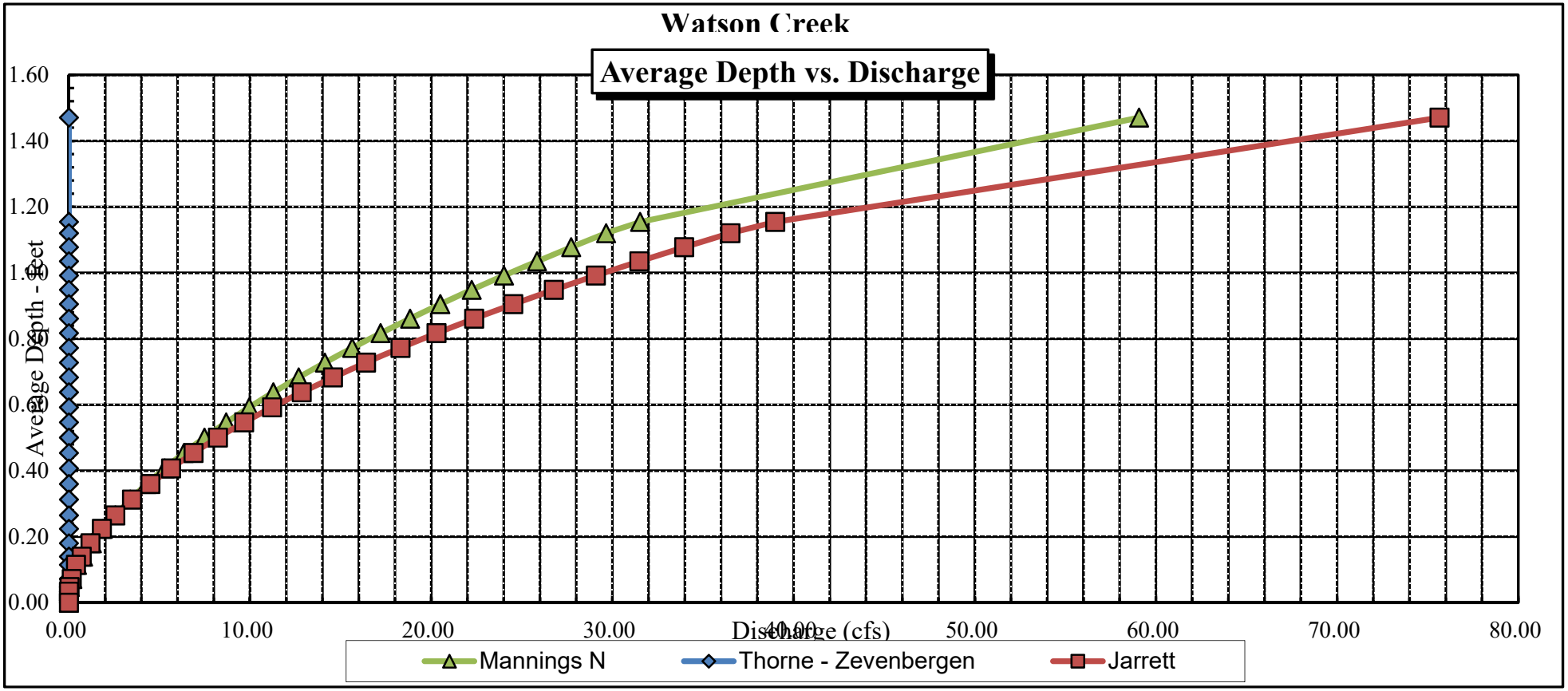
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

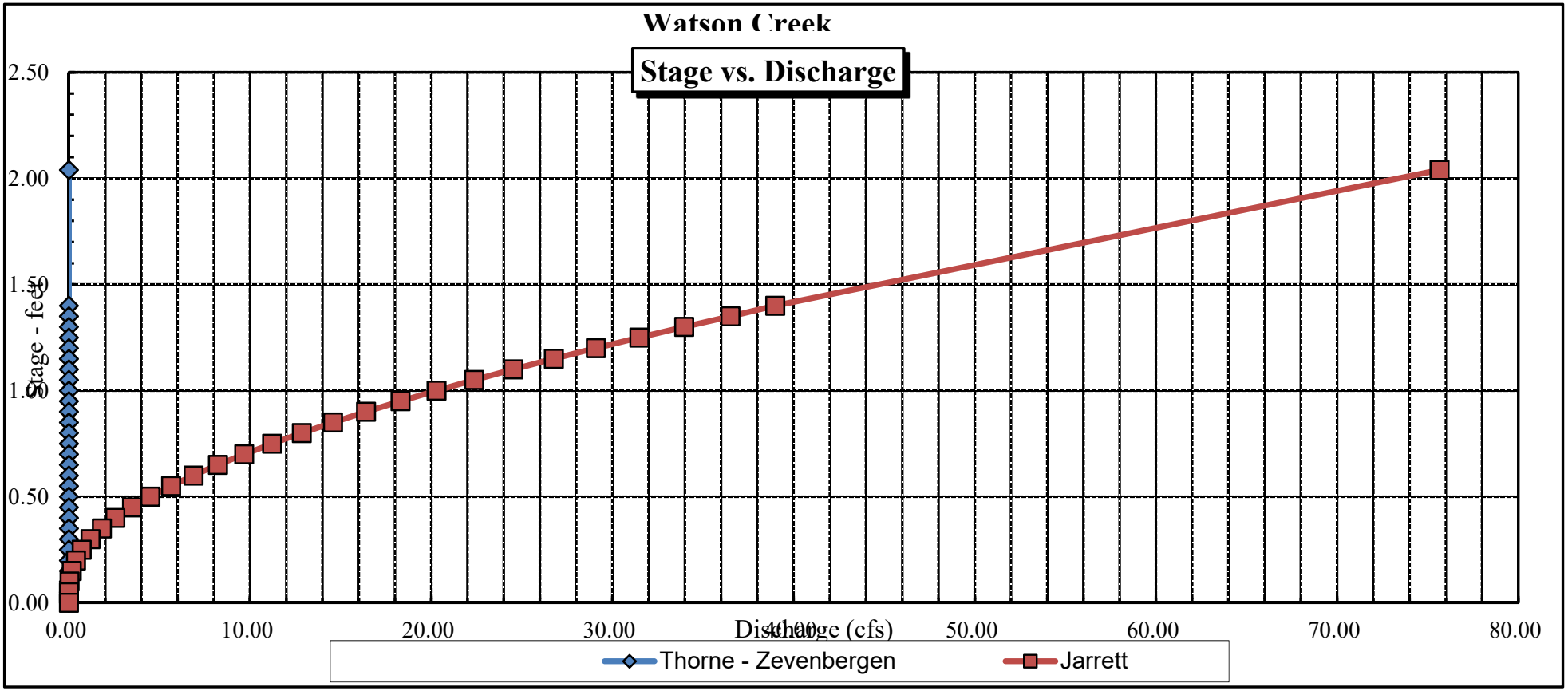
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.26	10.19	1.47	2.04	14.99	12.35	100.0%	1.21	75.66	5.05
	6.90	8.02	1.15	1.40	9.26	9.50	77.0%	0.97	38.99	4.21
	6.95	7.91	1.12	1.35	8.86	9.34	75.6%	0.95	36.51	4.12
	7.00	7.86	1.08	1.30	8.47	9.22	74.6%	0.92	33.96	4.01
	7.05	7.81	1.03	1.25	8.08	9.10	73.7%	0.89	31.48	3.90
	7.10	7.75	0.99	1.20	7.69	8.98	72.7%	0.86	29.09	3.78
	7.15	7.70	0.95	1.15	7.30	8.86	71.7%	0.82	26.77	3.67
	7.20	7.65	0.90	1.10	6.92	8.74	70.8%	0.79	24.53	3.55
	7.25	7.59	0.86	1.05	6.54	8.62	69.8%	0.76	22.37	3.42
	7.30	7.54	0.82	1.00	6.16	8.50	68.9%	0.72	20.29	3.29
	7.35	7.49	0.77	0.95	5.78	8.38	67.9%	0.69	18.30	3.16
	7.40	7.43	0.73	0.90	5.41	8.26	66.9%	0.65	16.40	3.03
	7.45	7.38	0.68	0.85	5.04	8.14	66.0%	0.62	14.58	2.89
	7.50	7.33	0.64	0.80	4.67	8.02	65.0%	0.58	12.85	2.75
	7.55	7.27	0.59	0.75	4.31	7.90	64.0%	0.54	11.22	2.60
	7.60	7.22	0.55	0.70	3.95	7.79	63.1%	0.51	9.67	2.45
	7.65	7.17	0.50	0.65	3.59	7.67	62.1%	0.47	8.23	2.29
	7.70	7.11	0.45	0.60	3.23	7.55	61.1%	0.43	6.88	2.13
	7.75	7.06	0.41	0.55	2.87	7.43	60.2%	0.39	5.64	1.96
	7.80	7.01	0.36	0.50	2.52	7.31	59.2%	0.35	4.50	1.78
	7.85	6.95	0.31	0.45	2.17	7.19	58.2%	0.30	3.48	1.60
WL	7.90	6.90	0.26	0.40	1.83	7.07	57.3%	0.26	2.57	1.41
	7.95	6.65	0.22	0.35	1.49	6.80	55.1%	0.22	1.82	1.22
	8.00	6.44	0.18	0.30	1.16	6.56	53.2%	0.18	1.19	1.03
	8.05	6.08	0.14	0.25	0.85	6.18	50.1%	0.14	0.71	0.83
	8.10	4.82	0.11	0.20	0.55	4.90	39.7%	0.11	0.39	0.71
	8.15	4.46	0.07	0.15	0.32	4.52	36.6%	0.07	0.16	0.48
	8.20	2.20	0.05	0.10	0.11	2.23	18.1%	0.05	0.04	0.34
	8.25	0.60	0.03	0.05	0.02	0.61	5.0%	0.03	0.01	0.25
	8.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


Watson Creek
CROSS SECTION DATA ANALYSIS
RS
G
RW
LW
G
LS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
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


Watson 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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Mannings N
Thorne - Zevenbergen
Jarrett


Watson Creek
Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Watson 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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Watson Creek
Stage vs. Discharge
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Watson Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	2
DATE:	8/2/2017
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE NW
SECTION:	17
TWP:	2N
RANGE:	85W
PM:	Sixth
COUNTY:	Routt
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	22676
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.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 38					
	RS	2.30	4.70			0.00	0.00	0.00
1	G	3.80	6.26			0.00	0.00	0.00
		5.30	6.62			0.00	0.00	0.00
		6.00	6.95			0.00	0.00	0.00
	RW	6.90	7.90	0.00	0.00	0.00	0.00	0.00
		7.20	8.00	0.10	0.04	0.03	0.00	7.90
		7.50	8.05	0.15	0.37	0.05	0.02	7.90
		7.80	8.10	0.20	0.56	0.06	0.03	7.90
		8.10	8.10	0.20	0.74	0.06	0.04	7.90
		8.40	8.10	0.20	0.89	0.06	0.05	7.90
		8.70	8.10	0.20	1.26	0.06	0.08	7.90
		9.00	8.15	0.25	1.44	0.06	0.09	7.90
		9.20	8.20	0.30	1.64	0.06	0.10	7.90
		9.40	8.20	0.30	1.76	0.06	0.11	7.90
		9.60	8.25	0.35	2.05	0.07	0.14	7.90
		9.80	8.25	0.35	2.18	0.07	0.15	7.90
		10.00	8.25	0.35	2.20	0.07	0.15	7.90
		10.20	8.25	0.35	1.89	0.07	0.13	7.90
		10.40	8.30	0.40	1.93	0.08	0.15	7.90
		10.60	8.30	0.40	2.12	0.08	0.17	7.90
		10.80	8.25	0.35	2.23	0.07	0.16	7.90
		11.00	8.20	0.30	2.29	0.06	0.14	7.90
		11.20	8.20	0.30	2.22	0.06	0.13	7.90
		11.40	8.20	0.30	2.17	0.06	0.13	7.90
		11.60	8.20	0.30	1.86	0.06	0.11	7.90
		11.80	8.20	0.30	1.53	0.06	0.09	7.90
		12.00	8.20	0.30	1.15	0.06	0.07	7.90
		12.20	8.20	0.30	0.66	0.06	0.04	7.90
		12.40	8.20	0.30	0.60	0.06	0.04	7.90
		12.60	8.20	0.30	0.70	0.06	0.04	7.90
		12.80	8.20	0.30	0.84	0.08	0.06	7.90
		13.10	8.25	0.35	0.72	0.11	0.08	7.90
		13.40	8.20	0.30	0.63	0.09	0.06	7.90
		13.70	7.95	0.05	0.07	0.01	0.00	7.90
	LW	13.80	7.90	0.00	0.00	0.00	0.00	0.00
1	G	14.00	6.20			0.00	0.00	0.00
		14.40	5.36			0.00	0.00	0.00
	LS	15.70	4.96			0.00	0.00	0.00
					Totals	1.83	2.57