DRAFT INSTREAM FLOW RECOMMENDATION

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 instream flow water rights on East Creek, located in Water Division 5.

Location and Land Status. East Creek originates in Unaweep Canyon, approximately 20 miles of Grand Junction. East Creek flows into the Gunnison River at Whitewater. This recommendation covers the stream reach beginning at the confluence with North East Creek and extends downstream to the confluence with the Gunnison River. This stream reach covers a distance of approximately 5.2 miles. BLM manages 4.8 miles of this stream reach, while 0.4 miles are in private ownership.

Biological Summary. East Creek is a cool-water, moderate gradient stream in a narrow canyon confined by bedrock. Some portions of the stream are directly adjacent to a major state highway, but most parts of the stream typically have good bank stability and good vegetative cover. Most portions of the stream have recovered from historic overgrazing, and typically have good mix of riffle and run habitat with large substrate. In areas that have not fully recovered from historic overgrazing, the stream is wider, has less cover, and less bank stability.

Fishery surveys indicate that East Creek supports a self-sustaining population of speckled dace in the upper parts of this reach, and a spawning population of flannelmouth sucker, bluehead sucker, and white sucker in the lower parts of the reach. BLM believes that the stream provides an important spawning area for sensitive native fishes that reside in the Gunnison River. The creek also supports a population of northern leopard frog, which is found on BLM's sensitive species list.

The riparian community along East Creek is robust, providing cover and shading for the stream. The riparian community is comprised mainly of narrowleaf cottonwood, Rio Grande cottonwood, Lanced Leaf Cottonwood and various species of willow.

R2Cross Analysis. BLM collected the following R2Cross data from East Creek 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)
05/15/2012 #1	0.94 cfs	16.9 feet	1.97 cfs	Out of range
05/15/2012 #2	0.78 cfs	12.5 feet	1.49 cfs	1.65 cfs

Averages:	1.73 cfs	1.65 cfs

BLM's analysis of this data, coordinated with Colorado Parks and Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

> 1.65 cubic feet per second is recommended for the snowmelt runoff period from from March 1 through June 30. This recommendation is driven by the average criteria. The goal of this recommendation is to provide as much spawning habitat as possible during snowmelt runoff, and meeting the depth criteria ensures that a sufficient amount of usable habitat is available.

Water Availability. BLM is not aware of any stream gage data for this creek. Gages from elsewhere on the Uncompahgre Plateau are not usable for comparison purposes because those gages are seriously affected by irrigation diversion or return flows and do not reflect natural hydrology. Similarly, the StreamStats package developed jointly between the U.S. Geological Survey and the CWCB has limited applicability on this creek because of the losing nature of the stream. During low flow periods, the flow in the creek is almost entirely dependent upon inflow from North East Creek, a major tributary.

Given the lack of reliable gage data, BLM recommends examining the diversion record for East Creek Ditch, which is located near the end of the recommended reach. The 1975 through 2011 diversion records demonstrate that, on average water is available in the creek from the start of snowmelt runoff through the end of June. East Creek Ditch is the only known diversion within the recommended instream flow reach.

BLM is aware of multiple ditches located upstream from the proposed instream flow reach. The following ditches are located on the main stem of East Creek:

Anderson Ditch – 0.72 cfs, 1887 priority
Unaweep Ditch – 1.3 cfs, 1888 and 1912 priorities
Charles Ditch – 0.12 cfs, 1914 priority
Lurvey Ditch 1 – 1.51 cfs, 1908 priority
Lurvey Ditch 2 – 0.47 cfs, 1914 priority

The following ditches are located upstream on North East Creek:

Bradbury Ditch – 0.91 cfs, 1914 priority
Johnson Creek Ditch – 6.8 cfs, 1950 priority
Lane Ditch – 1.95 cfs, 1923 priority
Mirror Ditches 1 and 2 – 1.0 cfs, 1934 and 1944 priorities

Finally, it is important to note that Colorado Water Conservation Board appropriated an instream flow water right on North East Creek in 2004.

Relationship to Land Management Plans. Common goals, objectives, and management actions focused on management of water resource values identified in the Grand Junction Field Office draft Resource Management Plan include:

1. Protection, preservation, and enhancement of watershed functions in the capture, retention, and release of water in quantity, quality, and time to meet ecosystem and human needs. (Goal)
2. Provide sufficient water quantity on BLM lands for multiple use management and functioning, healthy riparian, wetland, aquatic, and upland systems. (objective)
3. Ensure streams on BLM lands are in geomorphic balance (e.g. stream channel size, sinuosity, slope, and substrate are appropriate for its landscape setting and geology) with the water and sediment being supplied by the watershed (e.g., no accelerated erosion, deposition, or head-cutting) and ensure that the land used does not impeded the natural hydrograph(e.g., allows timing, magnitude and duration of peak, high and low flow events by minimizing surface disturbance, erosion, and sedimentation of streams). (objective)
4. Make recommendations to the Colorado Water Conservation Board for protection and/or enlargement of in-stream flows on appropriate stream segments that cross BLM lands. (management action).

In addition to the biological values noted above, East Creek is also heavily used for recreation purposes because it is adjacent to a major state highway and provides water-oriented recreation in an arid environment. Appropriation of an instream flow water right would assist BLM in long-term management of important riparian and fishery values.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2013. 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,

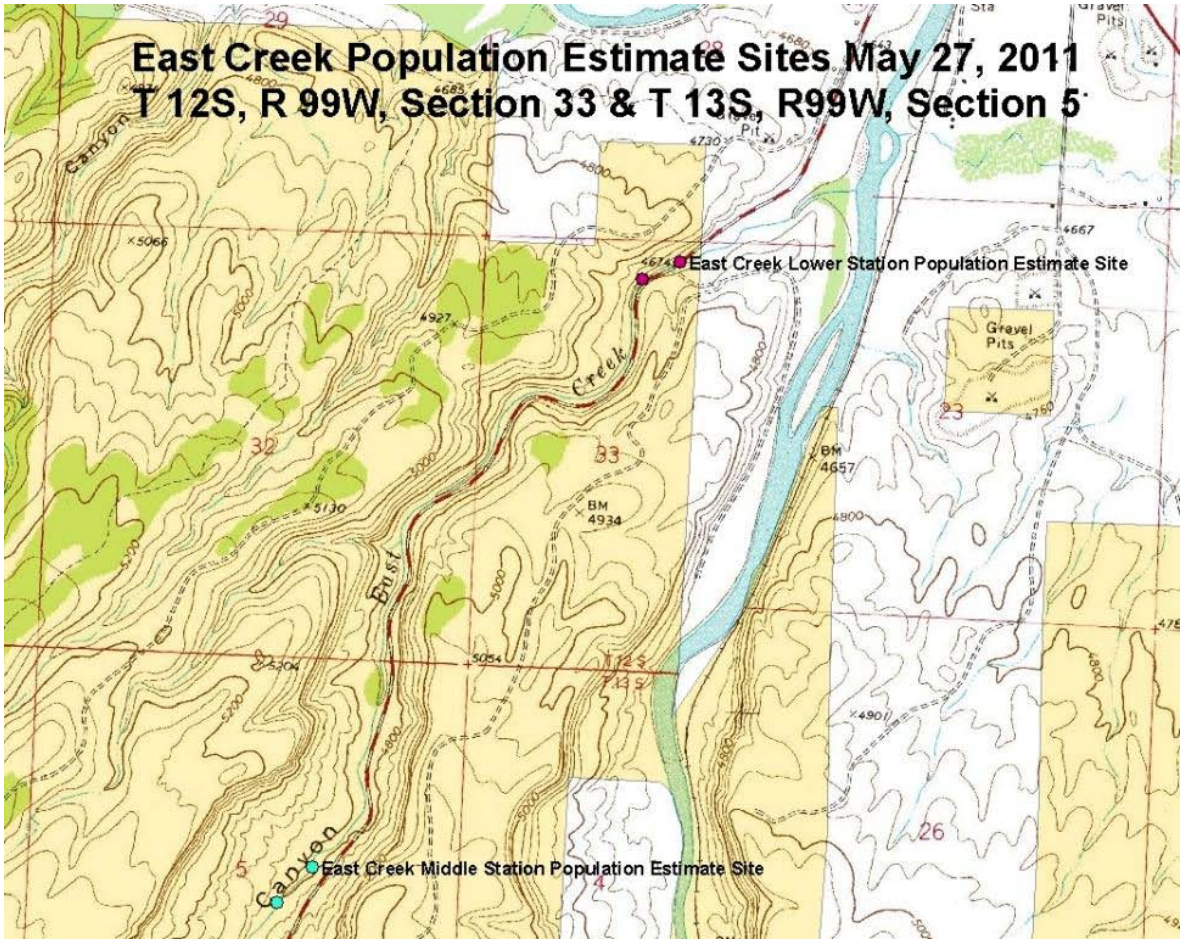
Leigh Espy
Deputy State Director
Resources and Fire

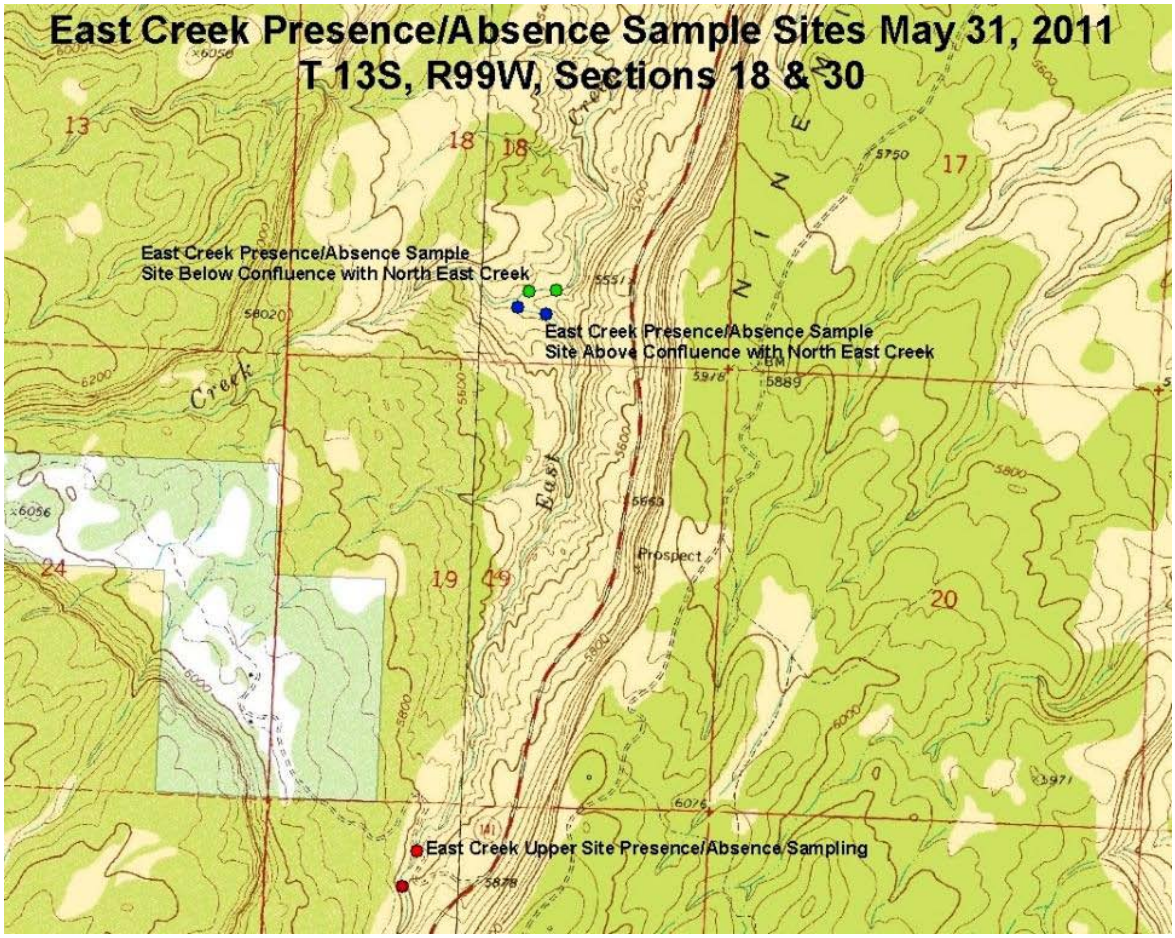
Cc: Catherine Robertson, Grand Junction FO
Nate Dieterich, Grand Junction FO

Grand Junction Field Office Stream Surveys
June 2011

East Creek - Water Code #46498

East creek, located southwest of Whitewater, Colorado on lands managed by the BLM's Grand Junction Field Office, was sampled on May 27 and 31, 2011. East Creek is tributary to the Gunnison River. Five reaches of stream were sampled using 2-3 backpack electroshockers working side by side. A two-pass removal population estimate was conducted at the two lowest sites. Presence/absence sampling was conducted at the upper three sites, and each was approximately 300 feet in length. A second pass was not completed at the upper sites because only speckled dace were collected or seen. Sampling was conducted to determine fishery status and to look specifically for spring spawning use of the creek by select native fish (flannelmouth suckers, bluehead suckers, and roundtail chubs). The upper sites were sampled to determine upper distribution of these fish. Flannelmouth suckers, bluehead suckers, speckled dace, and white suckers were collected and observed in the lower and middle stations. Personnel present included Tom Fresques, Gregor Dekleva, BLM, and Jenn Logan, Kevin Thompson, Colorado Division of Wildlife.




East Creek Presence/Absence Sample Sites May 31, 2011
T 13S, R99W, Sections 18 & 30
East Creek Presence/Absence Sample
Site Below Confluence with North East Creek
East Creek Presence/Absence Sample
Site Above Confluence with North East Creek
East Creek Upper Site Presence/Absence Sampling
Prospect
East
Creek
13
18
17
19
20
24

East Creek, Lower Site

East Creek, Middle Site

East Creek, Upper Site

Debris from flooding in East Creek, Upper Site

East Creek, site just below confluence with North East Creek

East Creek, site just above the confluence with North East Creek

Crew sampling East Creek

Bluehead Sucker with spawning coloration

Bluehead Sucker

Speckled Dace with spawning coloration

Discussion:
Five reaches of East Creek were sampled over a two day period to document adult spawning use by select native fish species (roundtail chub, bluehead sucker, and flannelmouth sucker). It was assumed that during spring flows adult fish would move out of the Gunnison River and into East Creek to spawn.

Adult bluehead suckers and flannelmouth suckers were present in the lower two sites. White suckers were also present in lesser amounts. Two pass removal estimates were conducted at these two sites. The majority of fish collected were in spawning condition. Based on sampling it was apparent that bluehead suckers preferred areas of higher water velocity over cobble and gravel substrates.

The upper three sites on East Creek only contained speckled dace, and presence/absence sampling was conducted. Due to the lack of three species fish in these upper reaches it is likely that a barrier is located between the two lower sites and the three upper sites. Several northern leopard frogs were noted and a large population appears to exist within the upper reaches of this stream. Jenn Logan, Colorado Parks and Wildlife, has the raw fish data with length and weights.

Riparian vegetation was dense and lush along the majority of the stream. Riparian plant species noted included several age classes of narrowleaf and Freemont cottonwood trees, at least two different willow species, sedges, rushes, cattails, horsetail, and some non-natives including smooth brome and tamarisk.

During sampling, flows were high and fast and the water was off color as expected. This made sampling difficult and several large fish were missed at the lower and middle stations and were likely bluehead and flannelmouth suckers. The substrate varied along the stream consisting mainly of sand, silt, and cobbles. In the highest reach there were large boulders within the channel, creating large deep pools and pour-overs. The drainage seems prone to flash flooding per evidence of debris higher in the trees along the stream. The majority of the flow in East Creek came from North East Creek and above the confluence the flow was substantially reduced.

Recommendations:

- Determine the upper distribution of three species fish via additional sampling
- Determine if a barrier is present between the middle site and the confluence with North East Creek
- Consider sampling at other times of year to look for young of year and juvenile native fishes.
- Consider treatment of nonnative riparian vegetation
- Determine the extent of the northern leopard frog population

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: East Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 1.25 miles upstream from conf. w/ Gunnison R.						
DATE: 5-15-17	OBSERVERS: R. Smith, N. Dieterich					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 33	TOWNSHIP: 12 N/S	RANGE: 99 E/W	PM: Sixth	
COUNTY: Mesa	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 21369			
MAP(S): USGS:					719352	
USFS:					4316405	

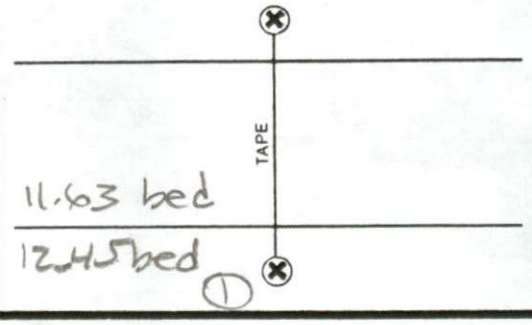
SUPPLEMENTAL DATA

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 1-foot boulders	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	11.89/11.94
② WS Upstream	77.0	11.30
③ WS Downstream	37.0	12.26
SLOPE	0.94/114.0 = .0082	

SKETCH



LEGEND: Stake ⊗ Station ① Photo ◇ 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:

caddisfly, mayfly

COMMENTS

pH = 8.76
Temp = 24.0°C
Cond = 527
Salinity = 0.3

Cottonwood - willow - sumac riparian

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: East Creek | CROSS-SECTION NO: 1 | DATE: 5-15-12 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 3 pm

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	1.0		8.17								
G	5.0		9.53								
	6.0		10.00								
	7.0		10.55								
	8.0		11.15								
W	8.7		11.89								
	9.0		11.95	.05				.35			
	9.3		12	.10				.01			
	9.6		12	.10				.01			
	9.9		12	.10				∅			
	10.2		11.9	∅				∅			
	10.5		12	.10				.65			
	10.8		12	.10				.67			
	11.1		12.05	.15				.72			
	11.4		12.05	.15				.59			
	11.7		11.9	∅				∅			
	12.0		12.05	.15				.65			
	12.3		12	.10				1.21			
	12.6		12.15	.25				1.93			
	12.9		12.10	.20				0.94			
	13.2		12.10	.20				.81			
	13.5		12.15	.25				1.14			
	13.8		12.15	.25				1.20			
	14.1		12.15	.25				0.28			
	14.4		12.15	.25				∅			
	14.7		12.25	.35				.40			
W	15.9		11.94								
	16.5		11.42								
	17.0		11.10								
	18.0		11.08								
	20.0		10.56								
	21.0		10.01								
G	22.0		9.50								
	23.0		8.65								
	24.0		7.87								
	25.0		6.98								
RS	25.7		6.81								
TOTALS:											

Tape	Total Vertical	Water Depth	Water Velocity
15.0	12.25	.35	1.05
15.3	12.20	.30	.93
15.6	12.25	.35	.92
15.8	12.10	.20	.13

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:	East Creek
XS LOCATION:	1.25 miles upstream from Gunnison R.
XS NUMBER:	1
DATE:	15-May-12
OBSERVERS:	R. Smith, N. Dieterich
1/4 SEC:	NE
SECTION:	33
TWP:	12S
RANGE:	99W
PM:	Sixth
COUNTY:	Mesa
WATERSHED:	Gunnison River
DIVISION:	4
DOW CODE:	21369
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:	0.0082

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

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

STREAM NAME: East Creek
XS LOCATION: 1.25 miles upstream from Gunnison R.
XS NUMBER: 1

DATA POINTS= 41

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	1.00	8.17			0.00		0.00	0.00	0.0%
1 G	5.00	9.53			0.00		0.00	0.00	0.0%
	6.00	10.00			0.00		0.00	0.00	0.0%
	7.00	10.55			0.00		0.00	0.00	0.0%
	8.00	11.15			0.00		0.00	0.00	0.0%
W	8.70	11.89	0.00	0.00	0.00		0.00	0.00	0.0%
	9.00	11.95	0.05	0.35	0.31	0.05	0.02	0.01	0.6%
	9.30	12.00	0.10	0.01	0.30	0.10	0.03	0.00	0.0%
	9.60	12.00	0.10	0.01	0.30	0.10	0.03	0.00	0.0%
	9.90	12.00	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
	10.20	11.90	0.00	0.00	0.32		0.00	0.00	0.0%
	10.50	12.00	0.10	0.65	0.32	0.10	0.03	0.02	2.1%
	10.80	12.00	0.10	0.67	0.30	0.10	0.03	0.02	2.1%
	11.10	12.05	0.15	0.72	0.30	0.15	0.05	0.03	3.5%
	11.40	12.05	0.15	0.59	0.30	0.15	0.05	0.03	2.8%
	11.70	11.90	0.00	0.00	0.34		0.00	0.00	0.0%
	12.00	12.05	0.15	0.65	0.34	0.15	0.05	0.03	3.1%
	12.30	12.00	0.10	1.21	0.30	0.10	0.03	0.04	3.9%
	12.60	12.15	0.25	1.93	0.34	0.25	0.08	0.14	15.5%
	12.90	12.10	0.20	0.94	0.30	0.20	0.06	0.06	6.0%
	13.20	12.10	0.20	0.81	0.30	0.20	0.06	0.05	5.2%
	13.50	12.15	0.25	1.14	0.30	0.25	0.08	0.09	9.1%
	13.80	12.15	0.25	1.20	0.30	0.25	0.08	0.09	9.6%
	14.10	12.15	0.25	0.28	0.30	0.25	0.08	0.02	2.2%
	14.40	12.15	0.25	0.00	0.30	0.25	0.08	0.00	0.0%
	14.70	12.25	0.35	0.40	0.32	0.35	0.11	0.04	4.5%
	15.00	12.25	0.35	1.05	0.30	0.35	0.11	0.11	11.8%
	15.30	12.20	0.30	0.93	0.30	0.30	0.09	0.08	8.9%
	15.60	12.25	0.35	0.92	0.30	0.35	0.09	0.08	8.6%
	15.80	12.10	0.20	0.13	0.25	0.20	0.03	0.00	0.4%
W	15.90	11.94	0.00	0.00	0.19		0.00	0.00	0.0%
	16.50	11.42			0.00		0.00	0.00	0.0%
	17.00	11.10			0.00		0.00	0.00	0.0%
	18.00	11.08			0.00		0.00	0.00	0.0%
	20.00	10.56			0.00		0.00	0.00	0.0%
	21.00	10.01			0.00		0.00	0.00	0.0%
1 G	22.00	9.50			0.00		0.00	0.00	0.0%
	23.00	8.65			0.00		0.00	0.00	0.0%
	24.00	7.87			0.00		0.00	0.00	0.0%
	25.00	6.98			0.00		0.00	0.00	0.0%
RS	25.70	6.81			0.00		0.00	0.00	0.0%
TOTALS ----------					7.53	0.35	1.24	0.94	100.0%
						(Max.)			

Manning's n = 0.0537
Hydraulic Radius= 0.16503948

STREAM NAME: East Creek
XS LOCATION: 1.25 miles upstream from Gunnison R.
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.24	1.10	-11.2%
11.67	1.24	2.96	138.5%
11.69	1.24	2.81	126.2%
11.71	1.24	2.66	113.8%
11.73	1.24	2.50	101.6%
11.75	1.24	2.35	89.4%
11.77	1.24	2.20	77.3%
11.79	1.24	2.05	65.2%
11.81	1.24	1.90	53.2%
11.83	1.24	1.76	41.3%
11.85	1.24	1.61	29.5%
11.87	1.24	1.46	17.7%
11.88	1.24	1.39	11.8%
11.89	1.24	1.32	6.0%
11.90	1.24	1.24	0.1%
11.91	1.24	1.17	-5.6%
11.92	1.24	1.10	-11.2%
11.93	1.24	1.04	-16.7%
11.94	1.24	0.97	-22.0%
11.95	1.24	0.90	-27.2%
11.96	1.24	0.84	-32.3%
11.97	1.24	0.78	-37.2%
11.99	1.24	0.66	-46.7%
12.01	1.24	0.56	-54.9%
12.03	1.24	0.47	-61.8%
12.05	1.24	0.40	-68.1%
12.07	1.24	0.33	-73.6%
12.09	1.24	0.26	-79.0%
12.11	1.24	0.20	-84.0%
12.13	1.24	0.14	-88.4%
12.15	1.24	0.10	-92.2%
12.17	1.24	0.07	-94.3%

WATERLINE AT ZERO
AREA ERROR = 11.900

STREAM NAME: East Creek
XS LOCATION: 1.25 miles upstream from Gunnison R.
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	9.53	16.94	1.73	2.72	29.28	18.61	100.0%	1.57	99.21	3.39
	10.90	11.11	0.88	1.35	9.83	12.13	65.2%	0.81	21.39	2.18
	10.95	10.83	0.86	1.30	9.28	11.84	63.6%	0.78	19.76	2.13
	11.00	10.56	0.83	1.25	8.74	11.54	62.0%	0.76	18.20	2.08
	11.05	10.28	0.80	1.20	8.22	11.25	60.4%	0.73	16.72	2.03
	11.10	9.08	0.85	1.15	7.72	10.03	53.9%	0.77	16.26	2.10
	11.15	8.92	0.82	1.10	7.27	9.84	52.9%	0.74	14.90	2.05
	11.20	8.80	0.78	1.05	6.83	9.68	52.0%	0.71	13.57	1.99
	11.25	8.67	0.74	1.00	6.40	9.52	51.1%	0.67	12.29	1.92
	11.30	8.55	0.70	0.95	5.96	9.36	50.3%	0.64	11.07	1.86
	11.35	8.42	0.66	0.90	5.54	9.19	49.4%	0.60	9.90	1.79
	11.40	8.29	0.62	0.85	5.12	9.03	48.5%	0.57	8.79	1.72
	11.45	8.18	0.58	0.80	4.71	8.88	47.7%	0.53	7.73	1.64
	11.50	8.08	0.53	0.75	4.30	8.74	46.9%	0.49	6.73	1.56
	11.55	7.97	0.49	0.70	3.90	8.59	46.2%	0.45	5.78	1.48
	11.60	7.87	0.45	0.65	3.51	8.45	45.4%	0.42	4.89	1.39
	11.65	7.76	0.40	0.60	3.12	8.30	44.6%	0.38	4.06	1.30
	11.70	7.66	0.36	0.55	2.73	8.16	43.8%	0.33	3.30	1.21
	11.75	7.55	0.31	0.50	2.35	8.01	43.0%	0.29	2.60	1.11
	11.80	7.45	0.27	0.45	1.98	7.87	42.3%	0.25	1.97	1.00
	11.85	7.34	0.22	0.40	1.61	7.72	41.5%	0.21	1.41	0.88
WL	11.90	7.19	0.17	0.35	1.24	7.53	40.5%	0.16	0.94	0.75
	11.95	6.39	0.14	0.30	0.90	6.67	35.8%	0.14	0.60	0.66
	12.00	4.66	0.13	0.25	0.60	4.86	26.1%	0.12	0.38	0.62
	12.05	3.43	0.12	0.20	0.39	3.56	19.2%	0.11	0.23	0.58
	12.10	3.00	0.08	0.15	0.23	3.09	16.6%	0.07	0.10	0.44
	12.15	1.33	0.07	0.10	0.10	1.39	7.5%	0.07	0.04	0.42
	12.20	1.11	0.03	0.05	0.04	1.15	6.2%	0.03	0.01	0.25

STREAM NAME: East Creek
XS LOCATION: 1.25 miles upstream from Gunnison R.
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.94	cfs
CALCULATED FLOW (Qc)=	0.94	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	11.92	ft
CALCULATED WATERLINE (WLc)=	11.90	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	0.1	%
MEAN VELOCITY=	0.75	ft/sec
MANNING'S N=	0.054	
SLOPE=	0.0082	ft/ft
.4 * Qm =	0.4	cfs
2.5 * Qm=	2.3	cfs

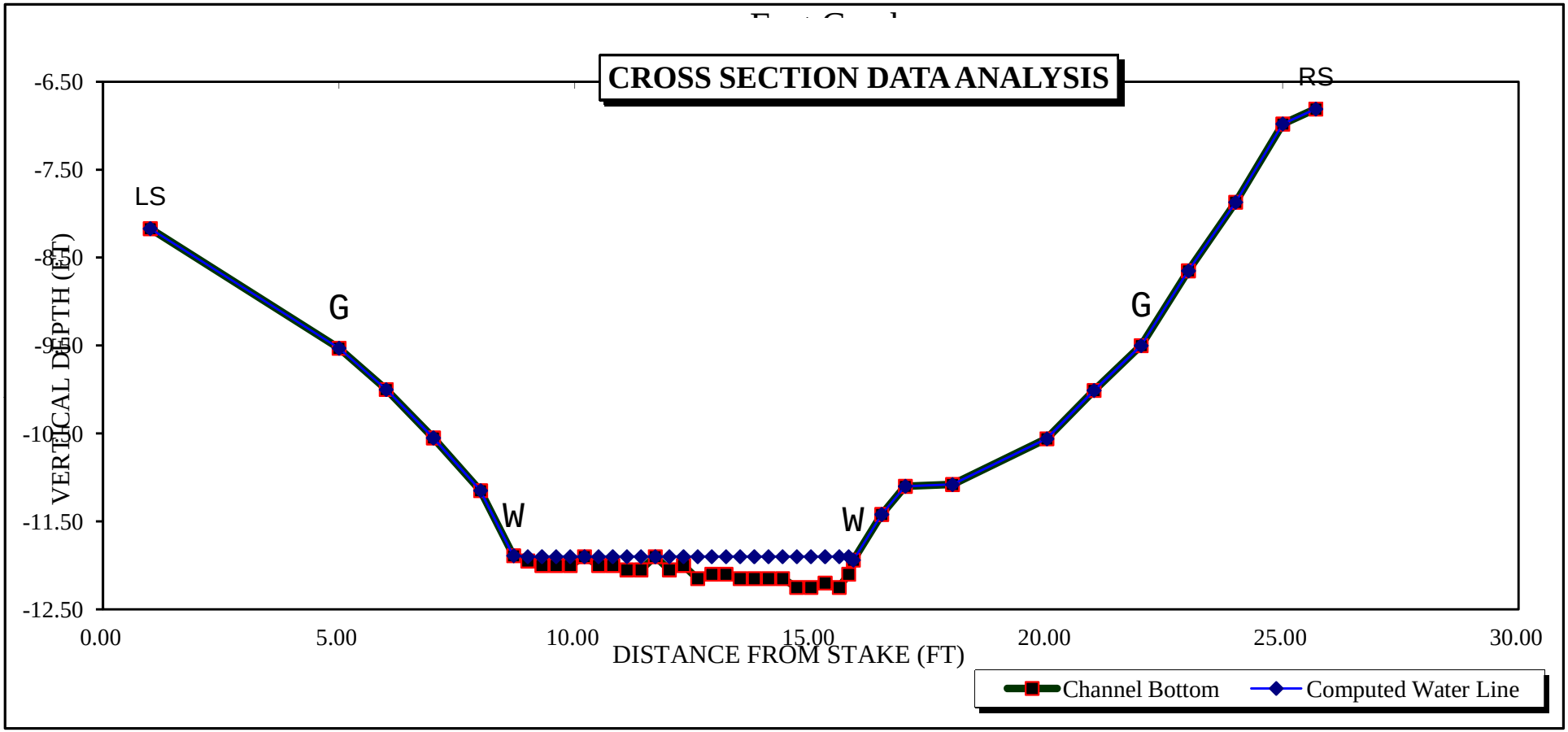
RECOMMENDED INSTREAM FLOW:
=============================

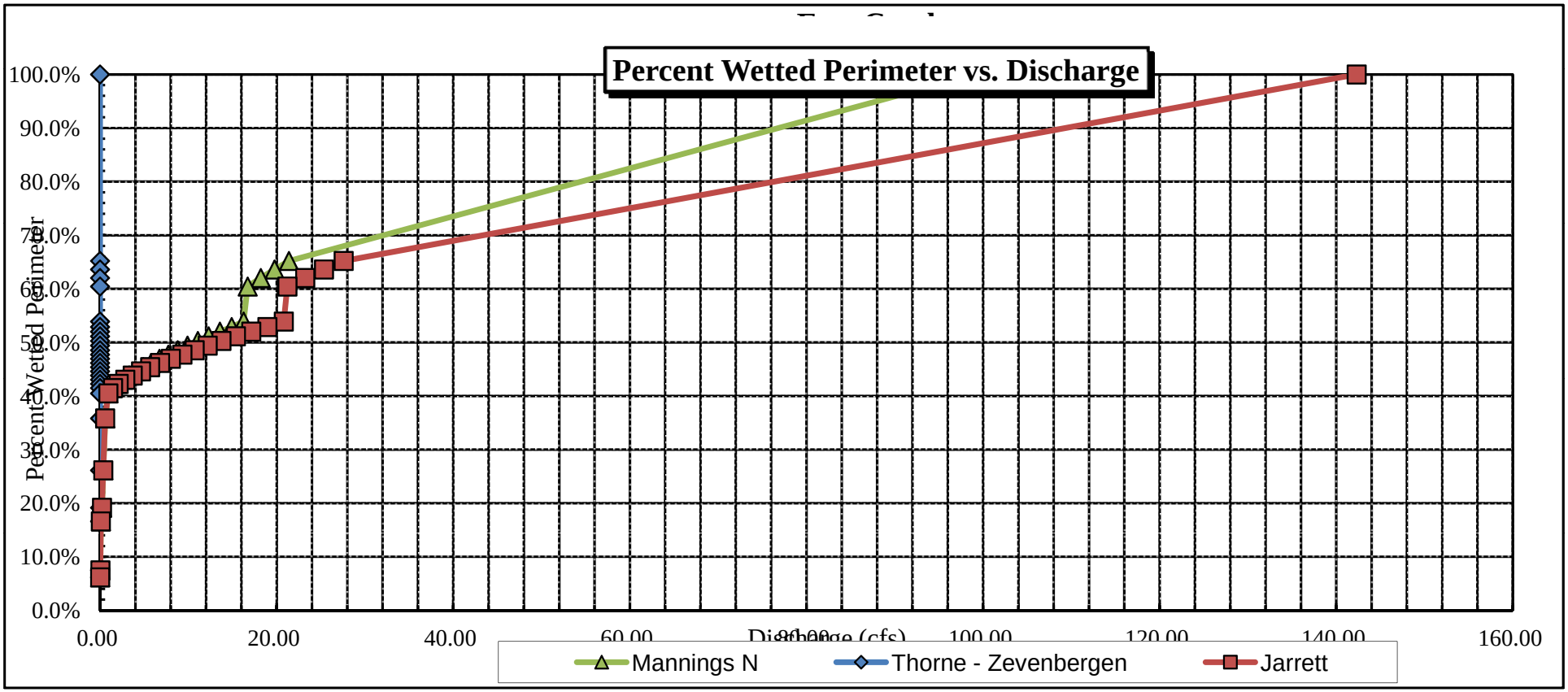
FLOW (CFS)	PERIOD
___________	________
___________	________
___________	________
___________	________

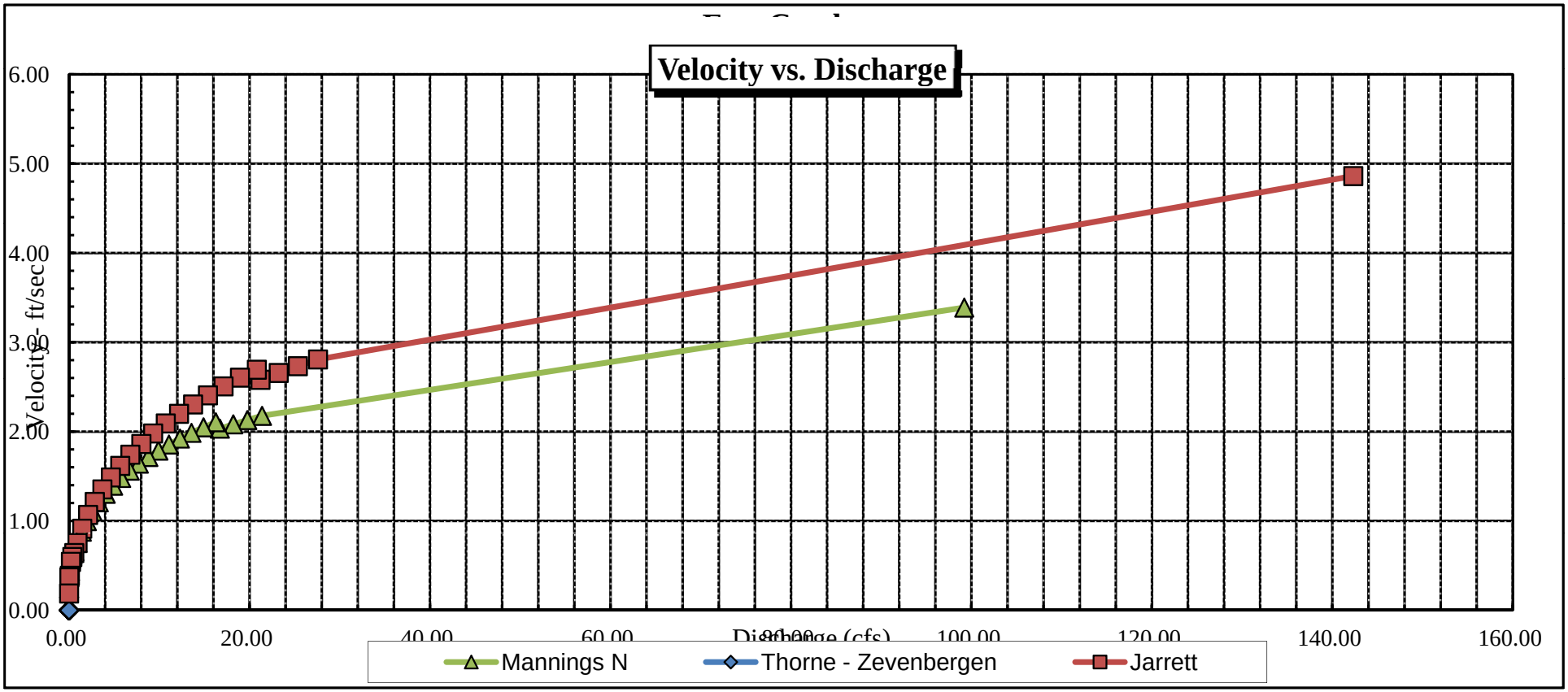
RATIONALE FOR RECOMMENDATION:
=============================

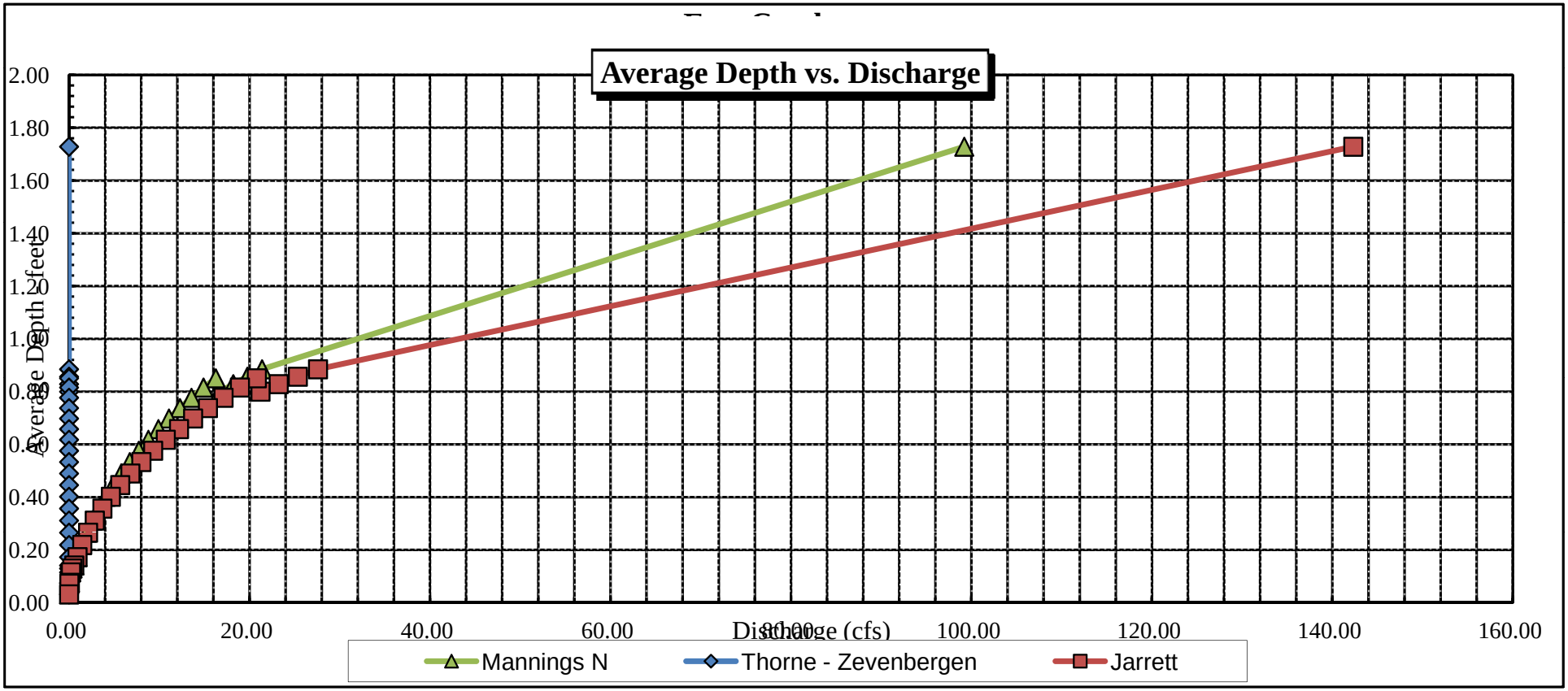
RECOMMENDATION BY: .... AGENCY.. DATE:..................................

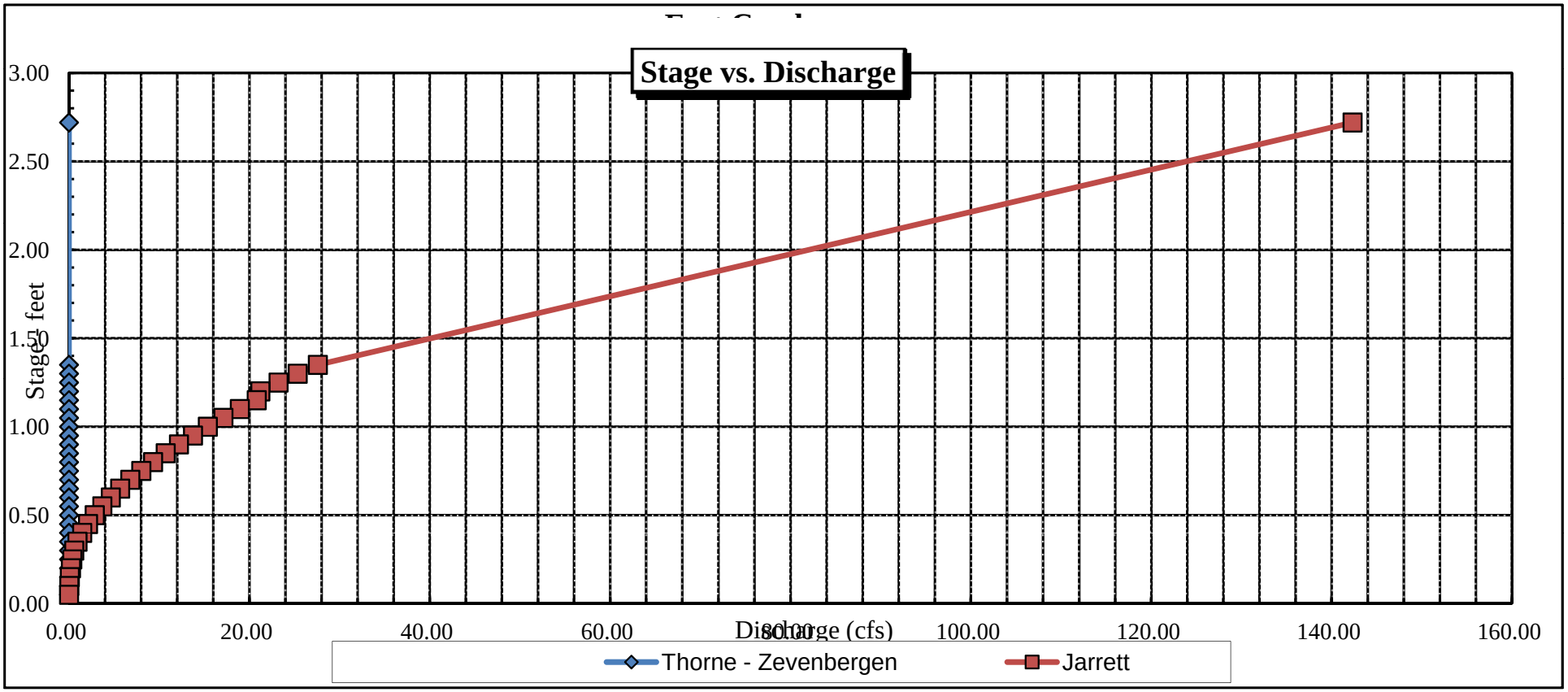
CWCB REVIEW BY: .... DATE:..................................


CROSS SECTION DATA ANALYSIS
-6.50
-7.50
-8.50
-9.50
-10.50
-11.50
-12.50
VERTICAL DEPTH (FT)
LS
G
W
W
G
RS
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
20.00
40.00
60.00
Discharge (cfs)
100.00
120.00
140.00
160.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Mannings N
Thorne - Zevenbergen
Jarrett


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
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.00
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
140.00
160.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: East Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 1.25 miles upstream from conf. w/ Gunnison River						
DATE: 5-15-12	OBSERVERS: R. Smith, N. Dieterich					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 33	TOWNSHIP: 12 N/S	RANGE: 99 E/W	PM: 6th	
COUNTY: Mesa	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 21369			
MAP(S): USGS:	GPS Zone 12 719498					
USFS:	4316367					

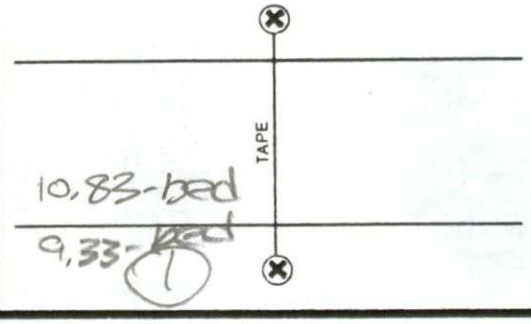
SUPPLEMENTAL DATA

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: 4" cobbles to 1-foot boulders	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	9.45/9.45
② WS Upstream	84.0	10.19
③ WS Downstream	60.0	8.92
SLOPE	1.27 / 144.0 = .0088	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇→
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:

caddisfly, mayfly

COMMENTS

pH = 8.76
Temp = 24.0 °C
Cond = 527
Salinity = 0.3

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: East Creek	CROSS-SECTION NO.: 2	DATE: 5-15-12	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 3:30 pm

Features: Stake (S), Grassline (G), Waterline (W), Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		6.65								
	1.0		6.66								
G	2.5		7.41								
	3.0		7.92								
	4.0		9.09								
W	4.6		9.45								
	4.9		9.5	.05				Ø			
	5.2		9.5	.05				Ø			
	5.5		9.5	.05				Ø			
	5.8		9.5	.05				.34			
	6.1		9.5	.05				.42			
	6.4		9.5	.05				.59			
	6.7		9.65	.20				.43			
	7.0		9.70	.25				.99			
	7.3		9.70	.25				.84			
	7.6		9.75	.30				.44			
	7.9		9.75	.30				.91			
	8.2		9.70	.25				.99			
	8.5		9.55	.10				.58			
	8.8		9.45	Ø				Ø			
	9.1		9.55	.10				.82			
	9.4		9.65	.20				.52			
	9.7		9.60	.15				1.67			
	10.0		9.75	.30				1.43			
	10.3		9.65	.20				1.02			
	10.6		9.55	.10				0.52			
	10.9		9.60	.15				0.06			
	11.2		9.45	Ø				Ø			
	11.5		9.55	.10				1.09			
	11.8		9.50	.05				.51			
W	12.2		9.45								
	13.8		8.34								
G	15.0		7.40								
RS	17.1		6.16								
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:	East Creek
XS LOCATION:	Approx. 1.25 upstream fr Gunnison R.
XS NUMBER:	2
DATE:	15-May-12
OBSERVERS:	R. Smith, N. Dieterich
1/4 SEC:	NE
SECTION:	33
TWP:	12S
RANGE:	99W
PM:	Sixth
COUNTY:	Mesa
WATERSHED:	Gunnison River
DIVISION:	4
DOW CODE:	21369
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:	0.0088

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

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

STREAM NAME: East Creek
XS LOCATION: Approx. 1.25 upstream fr Gunnison R.
XS NUMBER: 2

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
	LS	0.00	6.65			0.00		0.00	0.00	0.0%
		1.00	6.66			0.00		0.00	0.00	0.0%
1	G	2.50	7.41			0.00		0.00	0.00	0.0%
		3.00	7.92			0.00		0.00	0.00	0.0%
		4.00	9.09			0.00		0.00	0.00	0.0%
	W	4.60	9.45	0.00	0.00	0.00		0.00	0.00	0.0%
		4.90	9.50	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		5.20	9.50	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		5.50	9.50	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		5.80	9.50	0.05	0.34	0.30	0.05	0.02	0.01	0.7%
		6.10	9.50	0.05	0.42	0.30	0.05	0.02	0.01	0.8%
		6.40	9.50	0.05	0.59	0.30	0.05	0.02	0.01	1.1%
		6.70	9.65	0.20	0.43	0.34	0.20	0.06	0.03	3.3%
		7.00	9.70	0.25	0.99	0.30	0.25	0.08	0.07	9.6%
		7.30	9.70	0.25	0.84	0.30	0.25	0.08	0.06	8.1%
		7.60	9.75	0.30	0.44	0.30	0.30	0.09	0.04	5.1%
		7.90	9.75	0.30	0.91	0.30	0.30	0.09	0.08	10.6%
		8.20	9.70	0.25	0.97	0.30	0.25	0.08	0.07	9.4%
		8.50	9.55	0.10	0.58	0.34	0.10	0.03	0.02	2.2%
		8.80	9.45	0.00	0.00	0.32		0.00	0.00	0.0%
		9.10	9.55	0.10	0.82	0.32	0.10	0.03	0.02	3.2%
		9.40	9.65	0.20	0.52	0.32	0.20	0.06	0.03	4.0%
		9.70	9.60	0.15	1.67	0.30	0.15	0.05	0.08	9.7%
		10.00	9.75	0.30	1.43	0.34	0.30	0.09	0.13	16.6%
		10.30	9.65	0.20	1.02	0.32	0.20	0.06	0.06	7.9%
		10.60	9.55	0.10	0.52	0.32	0.10	0.03	0.02	2.0%
		10.90	9.60	0.15	0.06	0.30	0.15	0.05	0.00	0.3%
		11.20	9.45	0.00	0.00	0.34		0.00	0.00	0.0%
		11.50	9.55	0.10	1.09	0.32	0.10	0.03	0.03	4.2%
		11.80	9.50	0.05	0.51	0.30	0.05	0.02	0.01	1.2%
	W	12.20	9.45	0.00	0.00	0.40		0.00	0.00	0.0%
		13.80	8.34			0.00		0.00	0.00	0.0%
1	G	15.00	7.40			0.00		0.00	0.00	0.0%
	RS	17.10	6.16			0.00		0.00	0.00	0.0%
	TOTALS ----------					7.87	0.3 (Max.)	0.99	0.78	100.0%

Manning's n = 0.0448
Hydraulic Radius= 0.1260944

STREAM NAME: East Creek
XS LOCATION: Approx. 1.25 upstream fr Gunnison R.
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.99	0.99	0.0%
9.20	0.99	2.99	201.2%
9.22	0.99	2.82	184.4%
9.24	0.99	2.66	167.7%
9.26	0.99	2.49	151.1%
9.28	0.99	2.33	134.7%
9.30	0.99	2.17	118.4%
9.32	0.99	2.01	102.2%
9.34	0.99	1.85	86.1%
9.36	0.99	1.69	70.2%
9.38	0.99	1.53	54.4%
9.40	0.99	1.38	38.7%
9.41	0.99	1.30	30.9%
9.42	0.99	1.22	23.1%
9.43	0.99	1.15	15.4%
9.44	0.99	1.07	7.7%
9.45	0.99	0.99	0.0%
9.46	0.99	0.92	-7.5%
9.47	0.99	0.85	-14.8%
9.48	0.99	0.78	-21.8%
9.49	0.99	0.71	-28.6%
9.50	0.99	0.64	-35.1%
9.52	0.99	0.55	-44.5%
9.54	0.99	0.46	-53.2%
9.56	0.99	0.39	-61.0%
9.58	0.99	0.32	-68.2%
9.60	0.99	0.25	-74.6%
9.62	0.99	0.20	-80.2%
9.64	0.99	0.15	-85.2%
9.66	0.99	0.10	-89.5%
9.68	0.99	0.07	-93.2%
9.70	0.99	0.04	-96.3%

WATERLINE AT ZERO
AREA ERROR = 9.450

STREAM NAME: East Creek
XS LOCATION: Approx. 1.25 upstream fr Gunnison R.
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	7.41	12.49	1.74	2.34	21.76	14.28	100.0%	1.52	89.59	4.12
	8.45	10.19	0.98	1.30	9.98	11.17	78.2%	0.89	28.78	2.88
	8.50	10.07	0.94	1.25	9.47	11.01	77.1%	0.86	26.64	2.81
	8.55	9.96	0.90	1.20	8.97	10.86	76.1%	0.83	24.56	2.74
	8.60	9.84	0.86	1.15	8.48	10.71	75.0%	0.79	22.56	2.66
	8.65	9.73	0.82	1.10	7.99	10.55	73.9%	0.76	20.63	2.58
	8.70	9.61	0.78	1.05	7.50	10.40	72.8%	0.72	18.77	2.50
	8.75	9.50	0.74	1.00	7.03	10.25	71.8%	0.69	16.99	2.42
	8.80	9.38	0.70	0.95	6.55	10.09	70.7%	0.65	15.28	2.33
	8.85	9.27	0.66	0.90	6.09	9.94	69.6%	0.61	13.65	2.24
	8.90	9.16	0.61	0.85	5.63	9.79	68.5%	0.58	12.10	2.15
	8.95	9.04	0.57	0.80	5.17	9.63	67.5%	0.54	10.62	2.05
	9.00	8.93	0.53	0.75	4.72	9.48	66.4%	0.50	9.23	1.95
	9.05	8.81	0.49	0.70	4.28	9.33	65.3%	0.46	7.92	1.85
	9.10	8.69	0.44	0.65	3.84	9.17	64.2%	0.42	6.69	1.74
	9.15	8.53	0.40	0.60	3.41	8.98	62.9%	0.38	5.56	1.63
	9.20	8.38	0.36	0.55	2.99	8.80	61.6%	0.34	4.53	1.51
	9.25	8.22	0.31	0.50	2.57	8.61	60.3%	0.30	3.58	1.39
	9.30	8.07	0.27	0.45	2.17	8.43	59.0%	0.26	2.73	1.26
	9.35	7.91	0.22	0.40	1.77	8.24	57.7%	0.21	1.97	1.11
	9.40	7.76	0.18	0.35	1.38	8.06	56.4%	0.17	1.32	0.96
WL	9.45	7.60	0.13	0.30	0.99	7.87	55.1%	0.13	0.78	0.78
	9.50	4.85	0.13	0.25	0.64	5.08	35.6%	0.13	0.50	0.78
	9.55	3.90	0.11	0.20	0.43	4.08	28.5%	0.10	0.29	0.69
	9.60	3.00	0.08	0.15	0.25	3.12	21.8%	0.08	0.15	0.58
	9.65	2.10	0.06	0.10	0.13	2.16	15.2%	0.06	0.06	0.46
	9.70	1.15	0.03	0.05	0.04	1.18	8.3%	0.03	0.01	0.31
	9.75	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: East Creek
XS LOCATION: Approx. 1.25 upstream fr Gunnison R.
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.78	cfs
CALCULATED FLOW (Qc)=	0.78	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	9.45	ft
CALCULATED WATERLINE (WLc)=	9.45	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.30	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.78	ft/sec
MANNING'S N=	0.045	
SLOPE=	0.0088	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	1.9	cfs

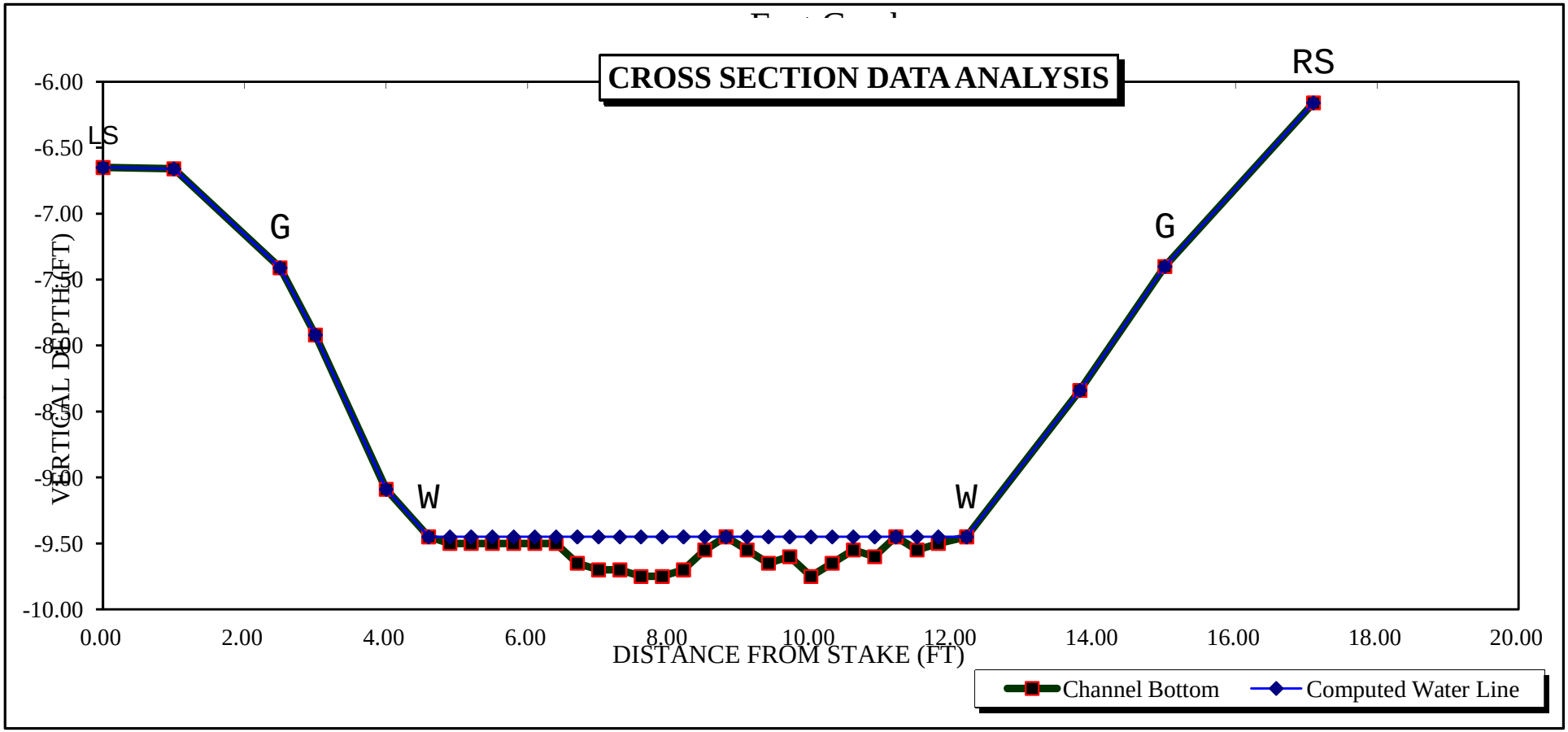
RECOMMENDED INSTREAM FLOW:
============================

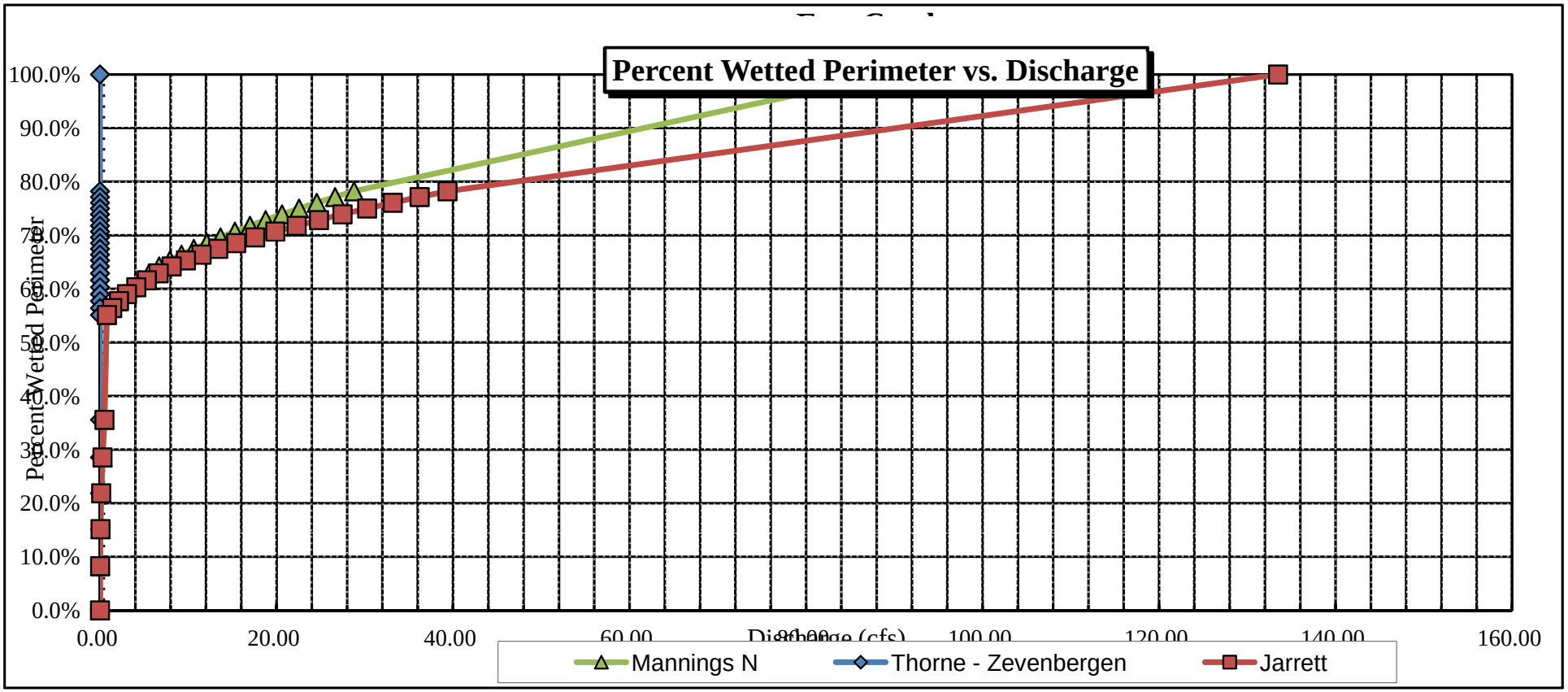
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

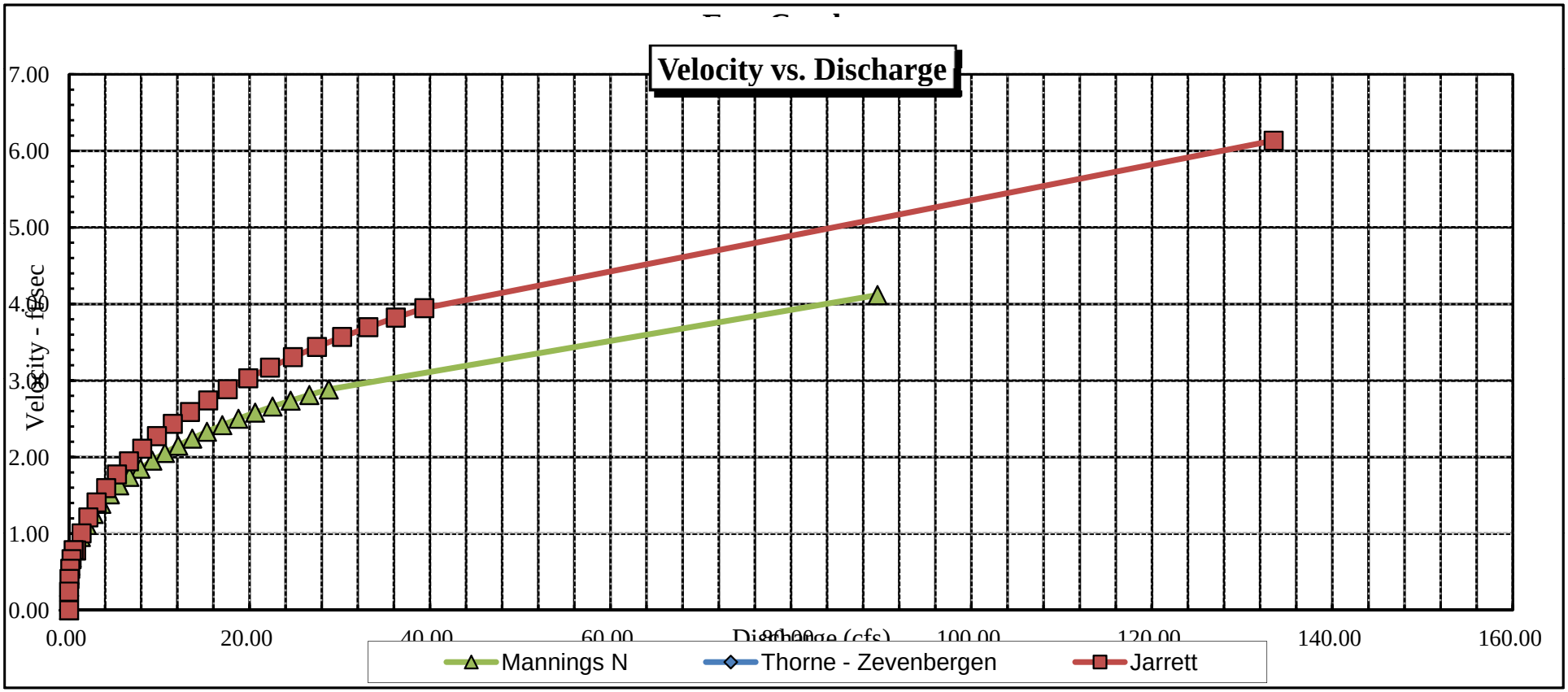
RATIONALE FOR RECOMMENDATION:
============================

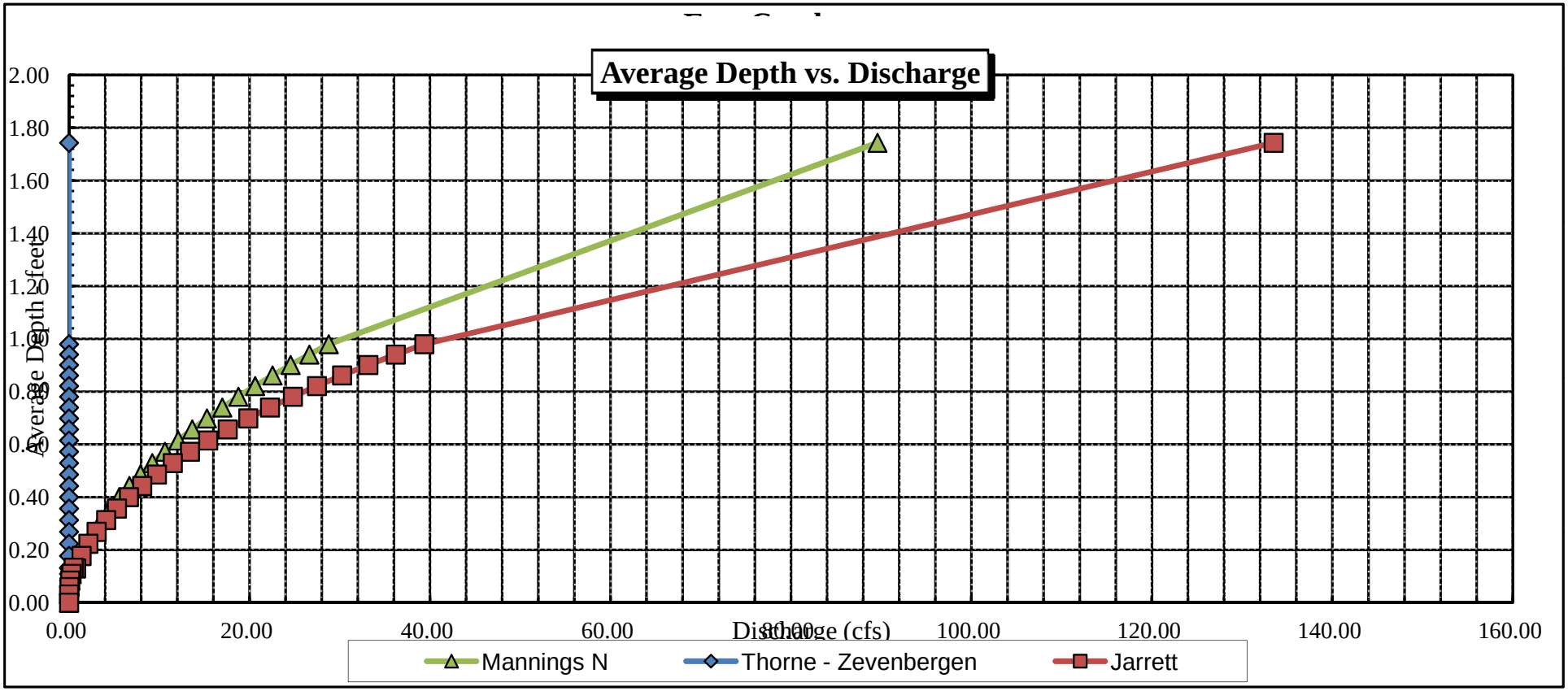
RECOMMENDATION BY: ……………………...………..…….............................. AGENCY...…………………….......……...…....…….…..... DATE:......…...…......……………

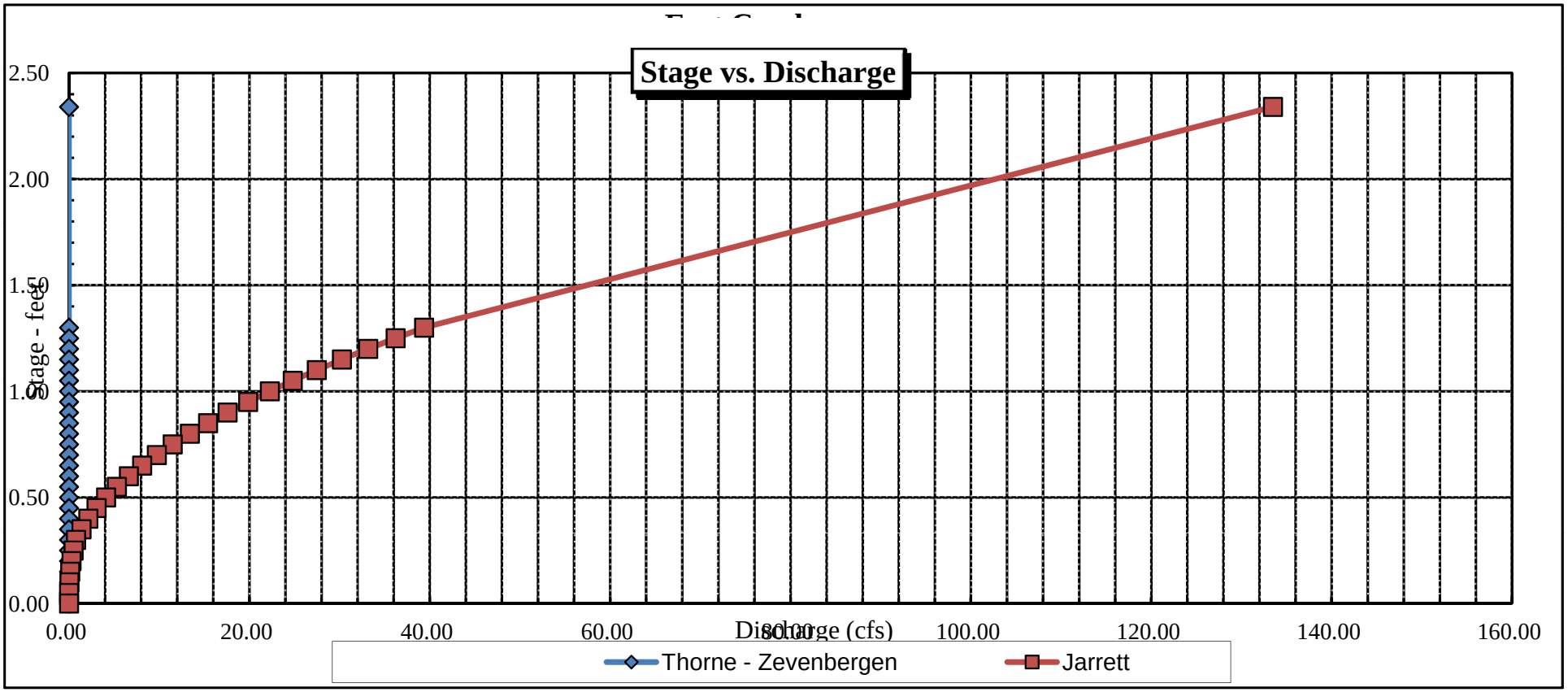
CWCB REVIEW BY: ..………………………......……………………………………………………...…............ DATE:.................…………….....…


CROSS SECTION DATA ANALYSIS
RS
LS
G
G
W
W
-6.00
-6.50
-7.00
-9.50
-10.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
VERTICAL DEPTH (FT)
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
20.00
40.00
60.00
Discharge (cfs)
100.00
120.00
140.00
160.00
Mannings N
Thorne - Zevenbergen
Jarrett


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
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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
140.00
160.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett