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 an instream water right on Wheeler Creek, located in Water Division 6.

Location and Land Status. Wheeler Creek is tributary to South Fork Big Creek near the community of Pearl in North Park. This recommendation covers the stream reach from the headwaters on Independence Mountain to the confluence with South Fork Big Creek. Approximately 50% of the stream segment is located on lands managed by BLM, while the remaining 50% is located on privately owned lands.

Biological Summary. Wheeler Creek is a moderate gradient stream with small to moderate substrate. The upper part of the creek flows through gently sloping forested areas, and the lower portions of the creek flow through meadow habitat. The riparian community is composed of alder and multiple species of willow. The stream provides a good mixture of undercut banks, run, and riffles for fish habitat. Fishery surveys indicate that the stream supports a self-sustaining population of brook and brown trout. The fish survey yielded a variety of age classes, with individual specimens up to 11 inches in length.

R2Cross Analysis. BLM collected the following R2Cross data from the creek:

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	08/28/2008	0.75	0.3-1.9	0.47	0.45
BLM	08/28/2008	0.73	0.3-1.8	1.18	0.34

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

> 0.8 cfs is recommended for high temperature period, from May 1 through October 31. This recommendation is driven by the wetted perimeter criteria. BLM believes that providing this flow will insure enough physical habitat availability in the creek for reproduction.
>
> 0.4 cfs is recommended for the remainder of the year, from November 1 through April 30. This recommendation is driven by the average depth criteria. This flow rate should provide sufficient water circulation to prevent total icing in pools that are critical for overwintering.

Water Availability. BLM is aware of two water rights that appear to divert from Wheeler Creek:

Akers Ditch – 1897 priority – 6 cfs
Wheeler Ditch – 1887 priority – 6 cfs

The official water rights tabulation notes that these diversions are located within the Wheeler Creek system, but the legal descriptions provided for the water rights place them significantly away from the creek. Further investigation is needed as to the exact location and status of these water rights.

There are no historic gage records available for Wheeler Creek, or for the larger South Fork Big Creek watershed in which Wheeler Creek is located. BLM recommends a two-step approach to analyze water availability. First, a paired analysis should be conducted, using the USGS Roaring Fork Gage near Walden, CO (06612500). This watershed is located close to Wheeler Creek and the lower part of the watershed has similar elevations to the Wheeler Creek watershed. The headwaters of the Roaring Fork are 1500 to 2000 higher in elevation than Wheeler Creek, but the Wheeler Creek watershed faces due north, so the additional shading of the Wheeler Creek watershed may offset the slightly lower elevation, in terms of water yield.

Second, the gage analysis should be compared to pressure transducer data currently being collected on South Fork Big Creek. If that instrument produces useful data, it may be possible to conduct a basin apportionment analysis on the transducer data.

Relationship to Management Plans. BLM is very interested in instream flow protection for Wheeler Creek, because it is one of the very few fisheries managed by BLM in North Park. Under the current resource management plan, the Wheeler Creek watershed is being managed for silvicultural practices that reduce the risk of catastrophic fire, that address pine beetle infestation issues, and that improve overall forest health. Any silvicultural practices are carefully managed to avoid erosion and impacts in the riparian corridor. BLM will continue to avoid road construction in the creek corridor, and the corridor will continue to be managed for dispersed recreational uses such as hunting and fishing.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2009. We thank both the Division of Wildlife and the 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,

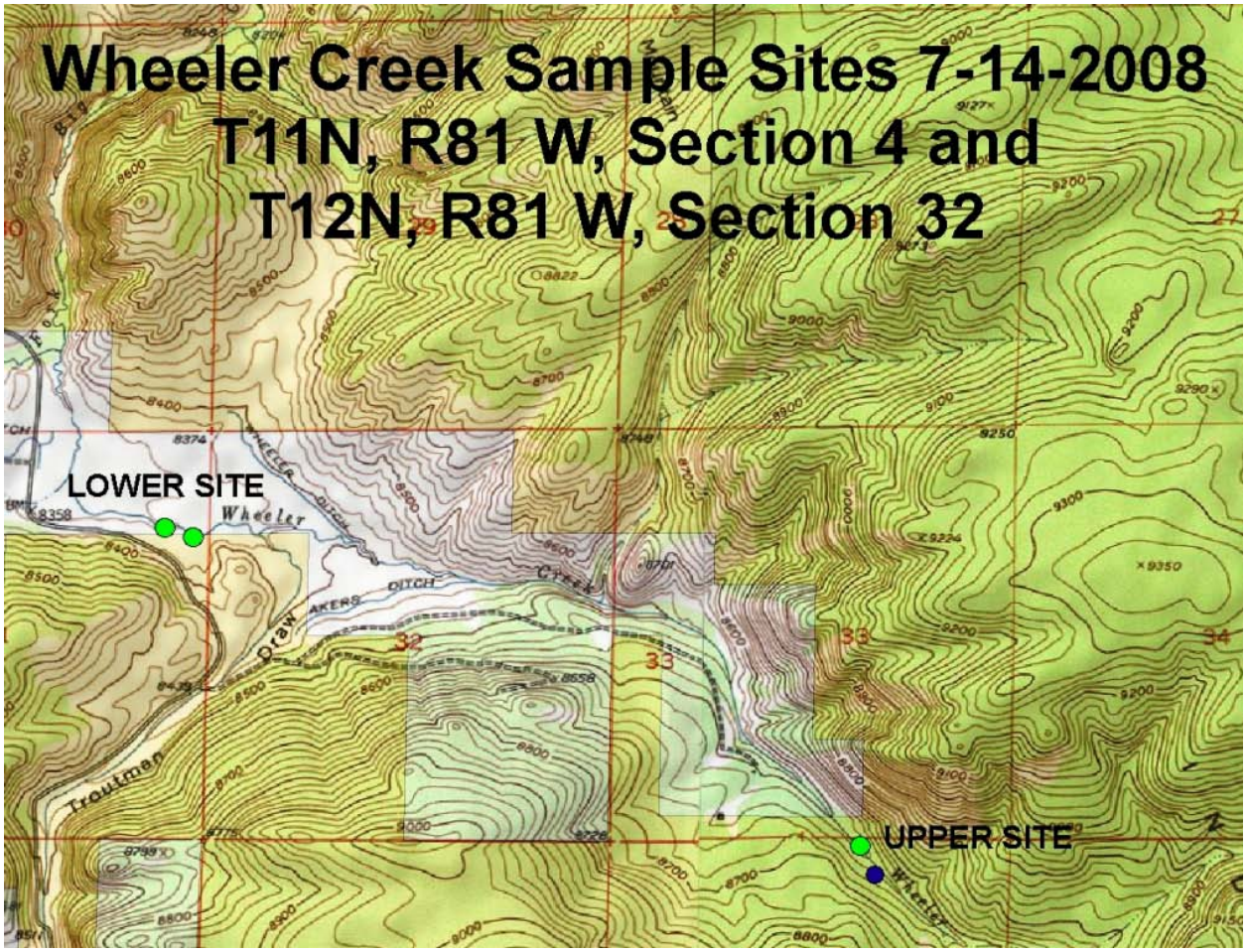
Linda Anania
Deputy State Director
Resources and Fire

cc: Paula Belcher, Kremmling Field Office
Megan McGuire, Kremmling Field Office
David Stout, Kremmling Field Office

Kremmling Field Office Stream Surveys
July 2008

Wheeler Creek - Water Code #12562

Wheeler Creek, located north of Walden, CO near Pearl on BLM lands managed by the Kremmling Field Office was sampled on July 14, 2008. Wheeler Creek is tributary to South Fork Big Creek, and then the North Platte River. Two sites were sampled and a two-pass removal population estimate was conducted on the lower reach and attempted at the upper reach (fish escaped from the first pass and an estimate was not completed). See data sheets below for specifics. All work was done in support of the Colorado BLM in-stream flow program. Sampling was conducted via backpack electro-shocker and approximately 300 feet of stream was sampled at the upper site and 450 feet at the lower site. Personnel present were Todd Allai, KRFO, Hydrologist Technician, Gregor Dekleva, Biological Technician, GSFO, and Alex Griffith, Biological Technician, GSFO.



Lower Wheeler Creek

Brook Trout

YOY Brook Trout

STREAM SURVEY FISH SAMPLING FORM

WATER Wheeler Creek (Lower) H2O CODE 12562 DATE 7/14/08

GEAR BPE EFFORT 300 ft. STATION #_____ PASS # 1&2

CREW Dekleva, Griffith, Allai DRAINAGE North Platte LOCATION GPS

Pass	species	length	weight		species	length	weight	Pass
1	BRK	210			BRK	255		2
1	BRK	275			BRK	233		2
1	BRK	207			BRK	175		2
1	BRK	149			BRK	239		2
1	BRK	154			BRK	171		2
1	BRK	51			BRK	49		2
1	BRK	51			BRK	46		2
1	BRK	41						
1	BRK	27						
1	BRK	37						
1	BRK	42						
1	LOC	127						
1	LOC	204						

GPS Location: See Map

Notes: Stream Width 1-6 ft. Sample Reach 300 ft.
Conductivity: Electroshocker settings

Discussion:
The stream is small and narrow with some good undercut banks which provide cover and refuge from flow velocity. Riparian vegetation varied from fair to good with willows, sedges, and rushes present. Brook trout were the dominant species with a couple of brown trout also captured. All fish collected appeared healthy and robust. Aquatic insect productivity appears to be good with a diversity of caddis, mayflies, and aquatic and terrestrial fly species present.

This reach was also sampled back on 6-10-08 and no fish were collected. This was due to very low conductivities that made shocking difficult/impossible at that time.

Recommendations:

- Pursue instream flow recommendation for this stream reach

Upper Wheeler Creek

Upper Wheeler Creek

STREAM SURVEY FISH SAMPLING FORM

WATER Wheeler Creek (Upper) H2O CODE 12562 DATE 7/14/08

GEAR BPE EFFORT 450 ft. STATION #_____ PASS # 1&2

CREW Dekleva, Griffith, Allai DRAINAGE North Platte LOCATION GPS

Pass	species	length	weight		species	length	weight	Pass
1	BRK	88			BRK	146		2
1	BRK	182			BRK	85		2
1	BRK	124			BRK	36		2
1	BRK	215			BRK	136		2
1	BRK	71			BRK	escaped		2
1	BRK	36			BRK	escaped		2
1	BRK	escaped						
1	BRK	escaped						
1	BRK	escaped						
1	BRK	escaped						

1	BRK	escaped						
1	BRK	escaped						
1	BRK	escaped						

GPS Location: See Map

Notes: Stream Width__2-4_____ft. Sample Reach__450_____ft.
Conductivity: Electroshocker settings

Discussion:

A two-pass removal estimate was attempted, but first pass fish escaped back into the stream and due to time constraints repeat sampling was not performed. Riparian habitat was in good condition with a diversity of vegetation including willows, sedges, aspen, reed grass, and alder. Pools and runs were abundant providing good habitat complexity and diversity. Brook trout were the only species found in the upper reach. All fish collected were healthy and robust and several age classes were present. Aquatic insects present were mayflies, caddis, and stone flies.

This reach was also sampled back on 6-10-08 and no fish were collected. This was due to very low conductivities that made shocking difficult/impossible at that time.

Recommendations:

- Pursue instream flow recommendation for the creek

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Wheeler Creek						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: 0.5 mile upstream from confluence w/ S. Fk. Big Creek							
DATE: 8-28-08	OBSERVERS: R. Smith, P. Belcher						
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 31	TOWNSHIP: 12 (N)/S	RANGE: 81 E (W)	PM: Sixth		
COUNTY: Jackson	WATERSHED: N. Platte	WATER DIVISION: 6	DOW WATER CODE: 12562				
MAP(S): USGS: Pearl, CO 7.5'	GPS:						
USFS:							

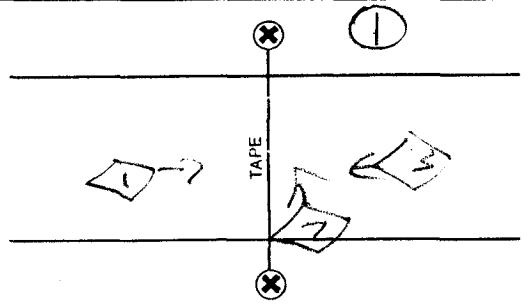
SUPPLEMENTAL DATA

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: sand to gravel	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	6.38 / 6.35
② WS Upstream	6.0	6.28
③ WS Downstream	6.5	6.43
SLOPE	0.15/12.5 = 0.012	

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:
mayfly, caddisfly

COMMENTS

Ph= 8.9
TDS= 120
Temp= 11.0

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Wheeler Creek | CROSS-SECTION NO.: 1 | DATE: 8-28-08 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 11:20 am

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser-vation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		4.91								
G	1.7		5.10								
W	1.9		6.35								
	2.2		6.55	.2				0			
	2.5		6.60	.25				1.45			
	2.8		6.60	.25				1.32			
	3.1		6.60	.25				1.24			
	3.4		6.60	.25				1.43			
	3.7		6.55	.20				1.50			
	4.0		6.50	.15				1.45			
	4.3		6.55	.20				1.60			
	4.6		6.50	.15				1.27			
	4.9		6.45	.10				0.47			
	5.2		6.45	.10				0.56			
W	5.5		6.38								
G	6.2		5.06								
LS	8.7		4.91								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

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

CROSS-SECTION LOCATION: 0.5 mile upstream from confluence w/ South Fork Big Creek

DATE: 5-28-08 | OBSERVERS: R. Smith, PD Belcher

LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP:	RANGE:	PM:
	NE	31	12 (N) S	81 (E) W	Sixth

COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:
Jackson	N. Platte	6	12562

MAP(S): USGS: Pearl 7.5' | GPS 0377787 4536819 NAD 27

USFS:

SUPPLEMENTAL DATA

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

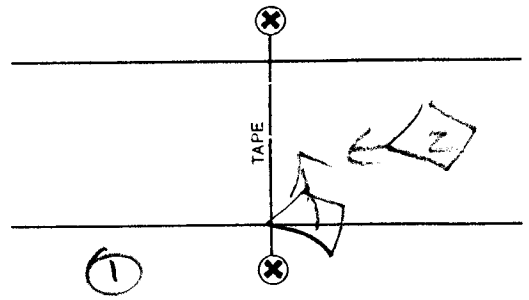
METER NUMBER: | DATE RATED: | CALIB/SPIN: ____ sec | TAPE WEIGHT: surveyed lbs/100' | TAPE TENSION: surveyed lbs

CHANNEL BED MATERIAL SIZE RANGE: sand to gravel | PHOTOGRAPHS TAKEN: (YES) NO | NUMBER OF PHOTOGRAPHS: 2

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed 3.8 ft
① WS @ Tape LB/RB	0.0	6.38 / 6.58
② WS Upstream	9.0	6.50
③ WS Downstream	15.0	6.77
SLOPE	0.27 / 24.0 = 0.011	

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:

mayfly, caddisfly

COMMENTS

Ph: 8.9
Temp: 12°C
TDS: 110

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Wheeler Creek	CROSS-SECTION NO.: 2	DATE: 8-28-08	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 11:45 am

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)
RS	0.0		5.22								
G	0.9		5.61								
W	1.6		6.58								
	1.9		6.80	.25				1.28			
	2.2		6.85	.25				1.52			
	2.5		6.85	.25				1.43			
	2.8		6.90	.30				1.24			
	3.1		6.90	.30				1.10			
	3.4		6.95	.35				1.43			
	3.7		6.90	.30				0.86			
W	3.8		6.58								
	4.0		6.24								
G	5.2		5.62								
LS	6.8		5.0								
TOTALS:											

End of Measurement	Time	Gage Readi... _____ 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:	Wheeler Creek
XS LOCATION:	0.5 mile upstream from confluence with Big Creek
XS NUMBER:	1
DATE:	28-Aug-08
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NE
SECTION:	31
TWP:	12N
RANGE:	81W
PM:	Sixth
COUNTY:	Jackson
WATERSHED:	North Platte
DIVISION:	6
DOW CODE:	12562
USGS MAP:	Pearl, CO 7.5'
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:	0.012

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
XS NUMBER: 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
	RS	0.00	4.94			0.00		0.00	0.00	0.0%
1	G	1.70	5.10			0.00		0.00	0.00	0.0%
	W	1.90	6.35			0.00		0.00	0.00	0.0%
		2.20	6.55	0.20	0.00	0.36	0.20	0.06	0.00	0.0%
		2.50	6.60	0.25	1.45	0.30	0.25	0.08	0.11	14.6%
		2.80	6.60	0.25	1.32	0.30	0.25	0.08	0.10	13.2%
		3.10	6.60	0.25	1.24	0.30	0.25	0.08	0.09	12.4%
		3.40	6.60	0.25	1.43	0.30	0.25	0.08	0.11	14.4%
		3.70	6.55	0.20	1.50	0.30	0.20	0.06	0.09	12.0%
		4.00	6.50	0.15	1.45	0.30	0.15	0.05	0.07	8.7%
		4.30	6.55	0.20	1.60	0.30	0.20	0.06	0.10	12.8%
		4.60	6.50	0.15	1.27	0.30	0.15	0.05	0.06	7.6%
		4.90	6.45	0.10	0.47	0.30	0.10	0.03	0.01	1.9%
		5.20	6.45	0.10	0.56	0.30	0.10	0.03	0.02	2.2%
	W	5.50	6.38			0.31		0.00	0.00	0.0%
1	G	6.20	5.06			0.00		0.00	0.00	0.0%
	LS	8.70	4.91			0.00		0.00	0.00	0.0%
	TOTALS ----------					3.69	0.25 (Max.)	0.63	0.75	100.0%

Manning's n = 0.0422
Hydraulic Radius= 0.17057258

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.63	0.58	-7.8%
6.12	0.63	1.50	138.7%
6.14	0.63	1.43	126.7%
6.16	0.63	1.35	114.8%
6.18	0.63	1.28	102.9%
6.20	0.63	1.20	91.0%
6.22	0.63	1.13	79.2%
6.24	0.63	1.06	67.5%
6.26	0.63	0.98	55.8%
6.28	0.63	0.91	44.1%
6.30	0.63	0.83	32.5%
6.32	0.63	0.76	20.9%
6.33	0.63	0.73	15.1%
6.34	0.63	0.69	9.4%
6.35	0.63	0.65	3.6%
6.36	0.63	0.62	-2.1%
6.37	0.63	0.58	-7.8%
6.38	0.63	0.54	-13.5%
6.39	0.63	0.51	-19.1%
6.40	0.63	0.47	-24.7%
6.41	0.63	0.44	-30.1%
6.42	0.63	0.41	-35.5%
6.44	0.63	0.34	-46.0%
6.46	0.63	0.28	-55.8%
6.48	0.63	0.22	-64.5%
6.50	0.63	0.17	-72.7%
6.52	0.63	0.12	-80.2%
6.54	0.63	0.08	-86.6%
6.56	0.63	0.05	-91.6%
6.58	0.63	0.03	-95.8%
6.60	0.63	0.00	-99.3%
6.62	0.63	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 6.351

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
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	5.10	4.48	1.27	1.50	5.69	6.41	100.0%	0.89	20.30	3.56
	5.35	4.31	1.07	1.25	4.59	5.87	91.6%	0.78	15.03	3.27
	5.40	4.27	1.02	1.20	4.38	5.76	89.9%	0.76	14.05	3.21
	5.45	4.24	0.98	1.15	4.16	5.65	88.2%	0.74	13.09	3.14
	5.50	4.20	0.94	1.10	3.95	5.55	86.6%	0.71	12.16	3.08
	5.55	4.17	0.90	1.05	3.74	5.44	84.9%	0.69	11.25	3.01
	5.60	4.13	0.86	1.00	3.54	5.33	83.2%	0.66	10.37	2.93
	5.65	4.10	0.81	0.95	3.33	5.23	81.5%	0.64	9.51	2.86
	5.70	4.06	0.77	0.90	3.13	5.12	79.9%	0.61	8.68	2.78
	5.75	4.03	0.73	0.85	2.92	5.01	78.2%	0.58	7.87	2.69
	5.80	3.99	0.68	0.80	2.72	4.90	76.5%	0.56	7.09	2.61
	5.85	3.96	0.64	0.75	2.52	4.80	74.9%	0.53	6.34	2.51
	5.90	3.93	0.59	0.70	2.33	4.69	73.2%	0.50	5.62	2.42
	5.95	3.89	0.55	0.65	2.13	4.58	71.5%	0.47	4.93	2.32
	6.00	3.86	0.50	0.60	1.94	4.48	69.8%	0.43	4.28	2.21
	6.05	3.82	0.46	0.55	1.75	4.37	68.2%	0.40	3.65	2.09
	6.10	3.79	0.41	0.50	1.56	4.26	66.5%	0.37	3.06	1.97
	6.15	3.75	0.36	0.45	1.37	4.15	64.8%	0.33	2.51	1.84
	6.20	3.72	0.32	0.40	1.18	4.05	63.1%	0.29	2.00	1.70
	6.25	3.68	0.27	0.35	0.99	3.94	61.5%	0.25	1.53	1.54
	6.30	3.65	0.22	0.30	0.81	3.83	59.8%	0.21	1.11	1.37
WL	6.35	3.61	0.17	0.25	0.63	3.72	58.1%	0.17	0.74	1.18
	6.40	3.43	0.13	0.20	0.45	3.51	54.7%	0.13	0.45	0.99
	6.45	2.84	0.10	0.15	0.29	2.89	45.2%	0.10	0.24	0.83
	6.50	2.45	0.06	0.10	0.16	2.48	38.8%	0.06	0.10	0.61
	6.55	1.48	0.04	0.05	0.06	1.49	23.3%	0.04	0.03	0.44

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.75	cfs
CALCULATED FLOW (Qc)=	0.74	cfs
(Qm-Qc)/Qm * 100 =	0.5	%
MEASURED WATERLINE (WLm)=	6.37	ft
CALCULATED WATERLINE (WLc)=	6.35	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.25	ft
MAX CALCULATED DEPTH (Dc)=	0.25	ft
(Dm-Dc)/Dm * 100	0.5	%
MEAN VELOCITY=	1.18	ft/sec
MANNING'S N=	0.042	
SLOPE=	0.012	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	1.9	cfs

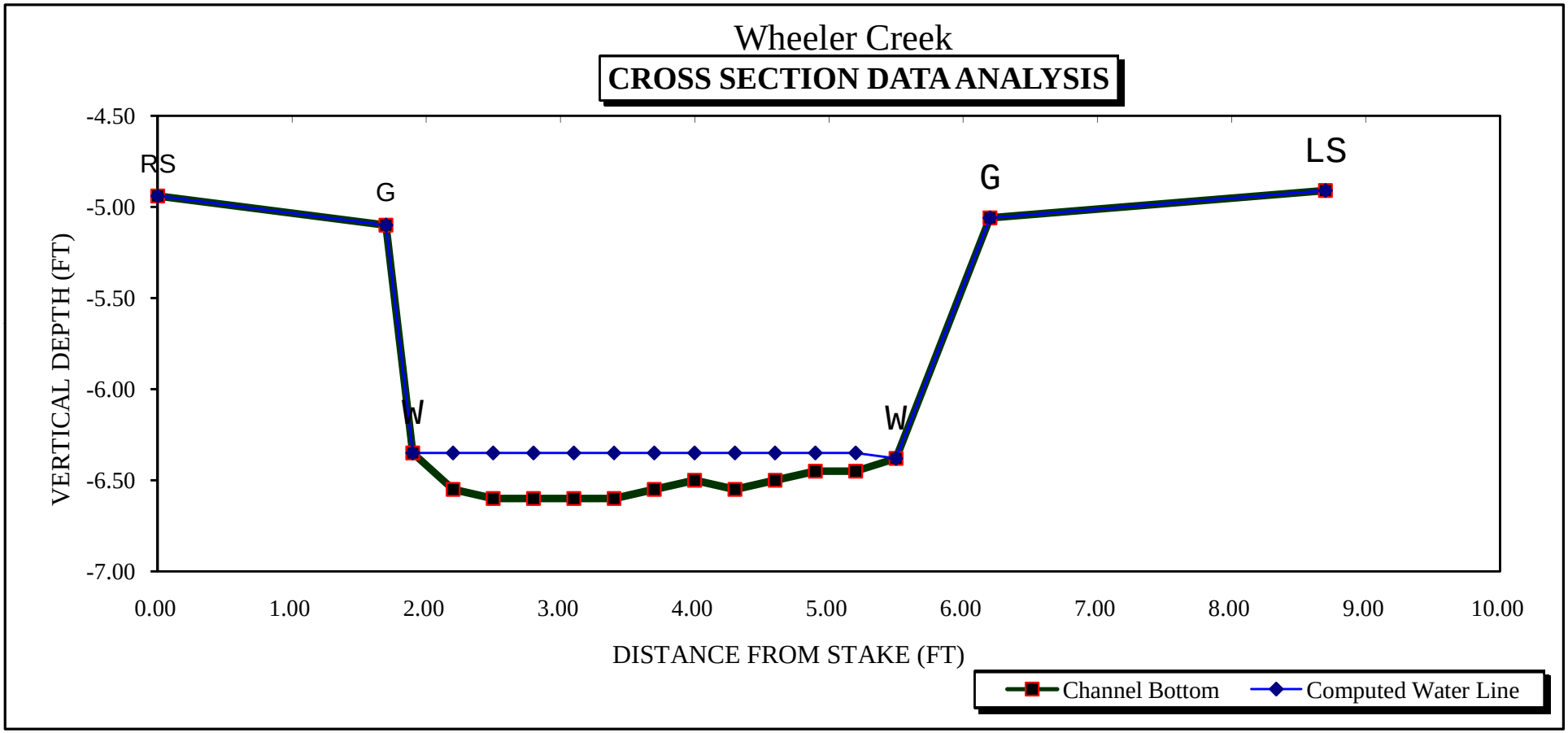
RECOMMENDED INSTREAM FLOW:
=============================

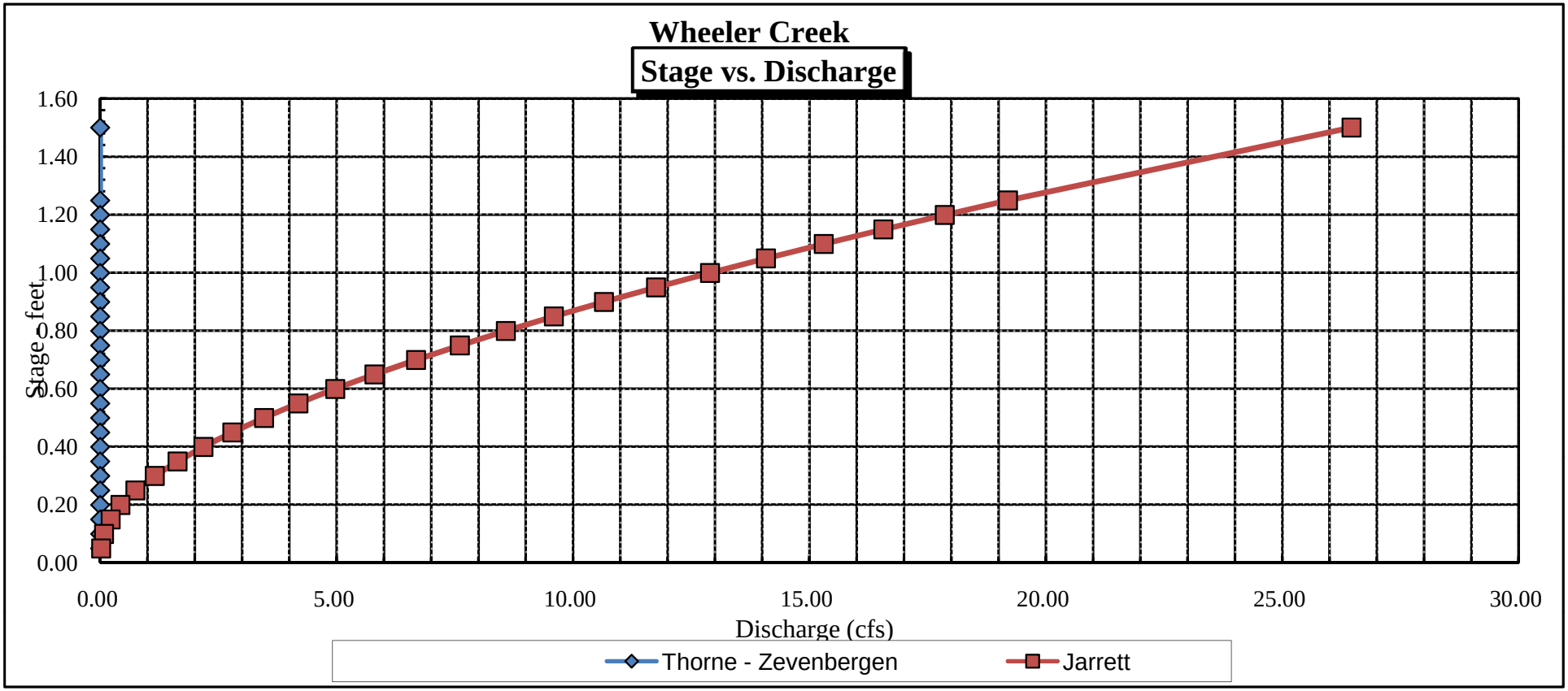
FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

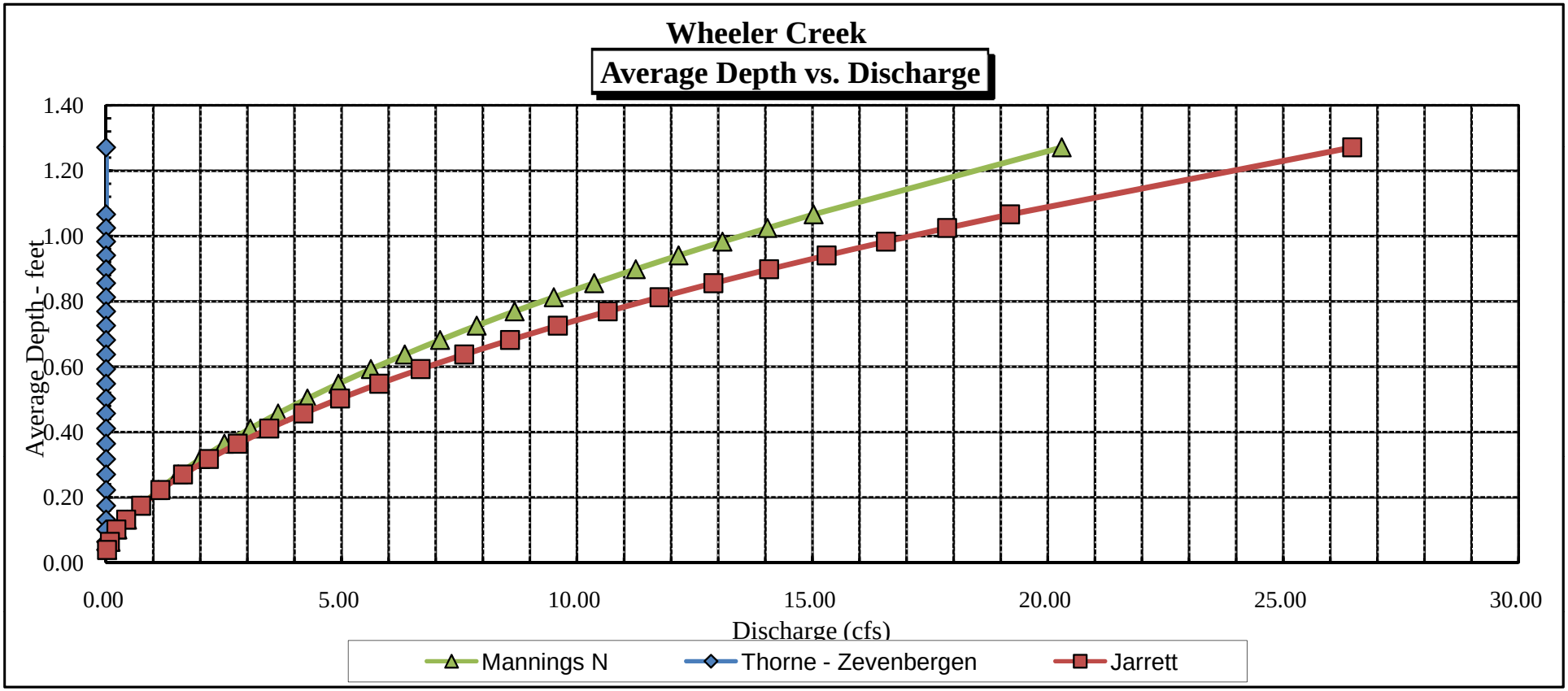
RATIONALE FOR RECOMMENDATION:
=============================

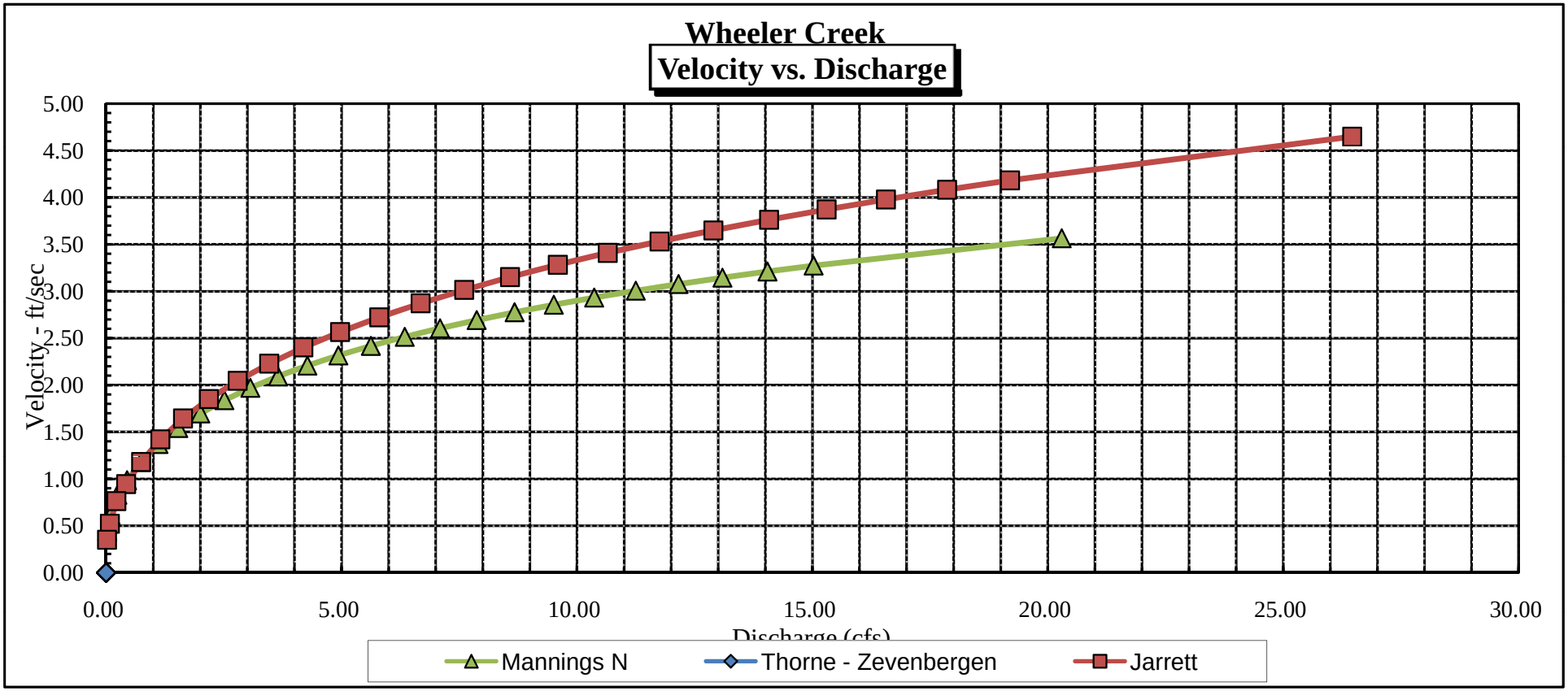
RECOMMENDATION BY: ……………………..……….………................................ AGENCY..………………………....……...…...…….…...... DATE:......…..…......……………

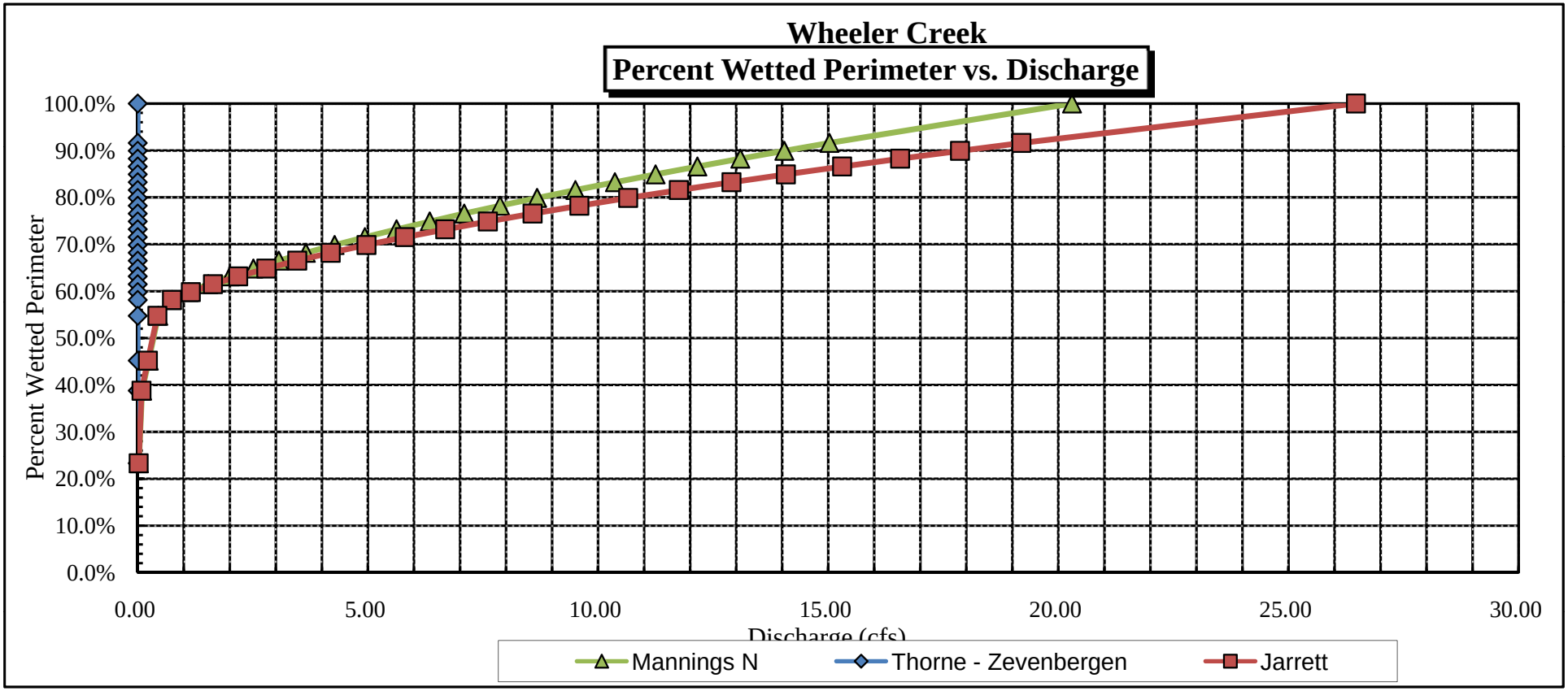
CWCB REVIEW BY: ..……………………………...………………………………………………………...…............. DATE:.................…………….....


Wheeler Creek
CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
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)
Channel Bottom
Computed Water Line


Wheeler Creek
Stage vs. Discharge
Stage - 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
Discharge (cfs)
Thorne - Zevenbergen
Jarrett


Wheeler Creek
Average Depth vs. Discharge
Average Depth - feet
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Wheeler Creek
Velocity vs. Discharge
Velocity - ft/sec
5.00
4.50
4.00
3.50
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Wheeler 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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Wheeler Creek
XS LOCATION:	0.5 mile upstream from confluence with Big Creek
XS NUMBER:	2
DATE:	28-Aug-08
OBSERVERS:	P. Belcher, R. Smith
1/4 SEC:	NE
SECTION:	31
TWP:	12N
RANGE:	81W
PM:	Sixth
COUNTY:	Jackson
WATERSHED:	North Platte
DIVISION:	6
DOW CODE:	12562
USGS MAP:	Pearl, CO 7.5'
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:	0.011

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

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

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
XS NUMBER: 2

DATA POINTS= 14

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	5.22			0.00		0.00	0.00	0.0%
1	G	0.90	5.61			0.00		0.00	0.00	0.0%
	W	1.60	6.58			0.00		0.00	0.00	0.0%
		1.90	6.80	0.25	1.28	0.37	0.25	0.08	0.10	13.2%
		2.20	6.85	0.25	1.52	0.30	0.25	0.08	0.11	15.6%
		2.50	6.85	0.25	1.43	0.30	0.25	0.08	0.11	14.7%
		2.80	6.90	0.30	1.24	0.30	0.30	0.09	0.11	15.3%
		3.10	6.90	0.30	1.10	0.30	0.30	0.09	0.10	13.6%
		3.40	6.95	0.35	1.43	0.30	0.35	0.11	0.15	20.6%
		3.70	6.90	0.30	0.86	0.30	0.30	0.06	0.05	7.1%
	W	3.80	6.58			0.34		0.00	0.00	0.0%
		4.00	6.24			0.00		0.00	0.00	0.0%
1	G	5.20	5.62			0.00		0.00	0.00	0.0%
	LS	6.80	5.00			0.00		0.00	0.00	0.0%
	TOTALS ----------					2.52	0.35 (Max.)	0.57	0.73	100.0%

Manning's n = 0.0452
Hydraulic Radius= 0.22584677

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.57	0.60	4.4%
6.33	0.57	1.19	108.1%
6.35	0.57	1.14	99.2%
6.37	0.57	1.09	90.5%
6.39	0.57	1.04	81.9%
6.41	0.57	0.99	73.3%
6.43	0.57	0.94	64.9%
6.45	0.57	0.89	56.5%
6.47	0.57	0.84	48.2%
6.49	0.57	0.80	40.1%
6.51	0.57	0.75	32.0%
6.53	0.57	0.71	24.0%
6.54	0.57	0.68	20.0%
6.55	0.57	0.66	16.1%
6.56	0.57	0.64	12.2%
6.57	0.57	0.62	8.3%
6.58	0.57	0.60	4.4%
6.59	0.57	0.57	0.5%
6.60	0.57	0.55	-3.3%
6.61	0.57	0.53	-7.1%
6.62	0.57	0.51	-10.8%
6.63	0.57	0.49	-14.5%
6.65	0.57	0.45	-21.9%
6.67	0.57	0.40	-29.2%
6.69	0.57	0.36	-36.3%
6.71	0.57	0.32	-43.3%
6.73	0.57	0.28	-50.2%
6.75	0.57	0.25	-57.0%
6.77	0.57	0.21	-63.6%
6.79	0.57	0.17	-70.2%
6.81	0.57	0.13	-76.6%
6.83	0.57	0.10	-82.5%

WATERLINE AT ZERO
AREA ERROR = 6.591

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
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	5.62	4.29	0.83	1.33	3.57	5.45	100.0%	0.65	9.29	2.60
	5.64	4.24	0.82	1.31	3.48	5.38	98.7%	0.65	8.98	2.58
	5.69	4.10	0.80	1.26	3.27	5.21	95.5%	0.63	8.27	2.53
	5.74	3.97	0.77	1.21	3.07	5.04	92.4%	0.61	7.61	2.48
	5.79	3.84	0.75	1.16	2.87	4.87	89.3%	0.59	6.98	2.43
	5.84	3.70	0.72	1.11	2.68	4.70	86.1%	0.57	6.38	2.38
	5.89	3.57	0.70	1.06	2.50	4.53	83.0%	0.55	5.82	2.32
	5.94	3.44	0.68	1.01	2.33	4.36	79.9%	0.53	5.29	2.27
	5.99	3.31	0.65	0.96	2.16	4.19	76.8%	0.52	4.79	2.22
	6.04	3.17	0.63	0.91	2.00	4.02	73.6%	0.50	4.32	2.17
	6.09	3.04	0.61	0.86	1.84	3.84	70.5%	0.48	3.89	2.11
	6.14	2.91	0.58	0.81	1.69	3.67	67.4%	0.46	3.48	2.06
	6.19	2.77	0.56	0.76	1.55	3.50	64.2%	0.44	3.11	2.00
	6.24	2.64	0.54	0.71	1.41	3.33	61.1%	0.42	2.76	1.95
	6.29	2.58	0.50	0.66	1.28	3.21	59.0%	0.40	2.40	1.87
	6.34	2.51	0.46	0.61	1.16	3.09	56.8%	0.37	2.07	1.79
	6.39	2.45	0.42	0.56	1.03	2.98	54.6%	0.35	1.76	1.71
	6.44	2.38	0.38	0.51	0.91	2.86	52.4%	0.32	1.47	1.61
	6.49	2.32	0.34	0.46	0.80	2.74	50.2%	0.29	1.20	1.51
	6.54	2.25	0.30	0.41	0.68	2.62	48.0%	0.26	0.96	1.41
WL	6.59	2.18	0.26	0.36	0.57	2.49	45.7%	0.23	0.74	1.29
	6.64	2.10	0.22	0.31	0.46	2.36	43.2%	0.20	0.54	1.17
	6.69	2.01	0.18	0.26	0.36	2.22	40.7%	0.16	0.37	1.03
	6.74	1.93	0.14	0.21	0.26	2.08	38.2%	0.13	0.23	0.87
	6.79	1.85	0.09	0.16	0.17	1.94	35.7%	0.09	0.11	0.67
	6.84	1.57	0.05	0.11	0.08	1.63	29.8%	0.05	0.04	0.47
	6.89	0.95	0.02	0.06	0.02	0.97	17.8%	0.02	0.01	0.28
	6.94	0.10	0.00	0.01	0.00	0.10	1.9%	0.00	0.00	0.09

STREAM NAME: Wheeler Creek
XS LOCATION: 0.5 mile upstream from confluence with Big Creek
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.73	cfs
CALCULATED FLOW (Qc)=	0.74	cfs
(Qm-Qc)/Qm * 100 =	-0.8	%
MEASURED WATERLINE (WLm)=	6.58	ft
CALCULATED WATERLINE (WLc)=	6.59	ft
(WLm-WLc)/WLm * 100 =	-0.2	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.36	ft
(Dm-Dc)/Dm * 100	-2.5	%
MEAN VELOCITY=	1.29	ft/sec
MANNING'S N=	0.045	
SLOPE=	0.011	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	1.8	cfs

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

FLOW (CFS)	PERIOD
___________________	___________________
___________________	___________________
___________________	___________________
___________________	___________________

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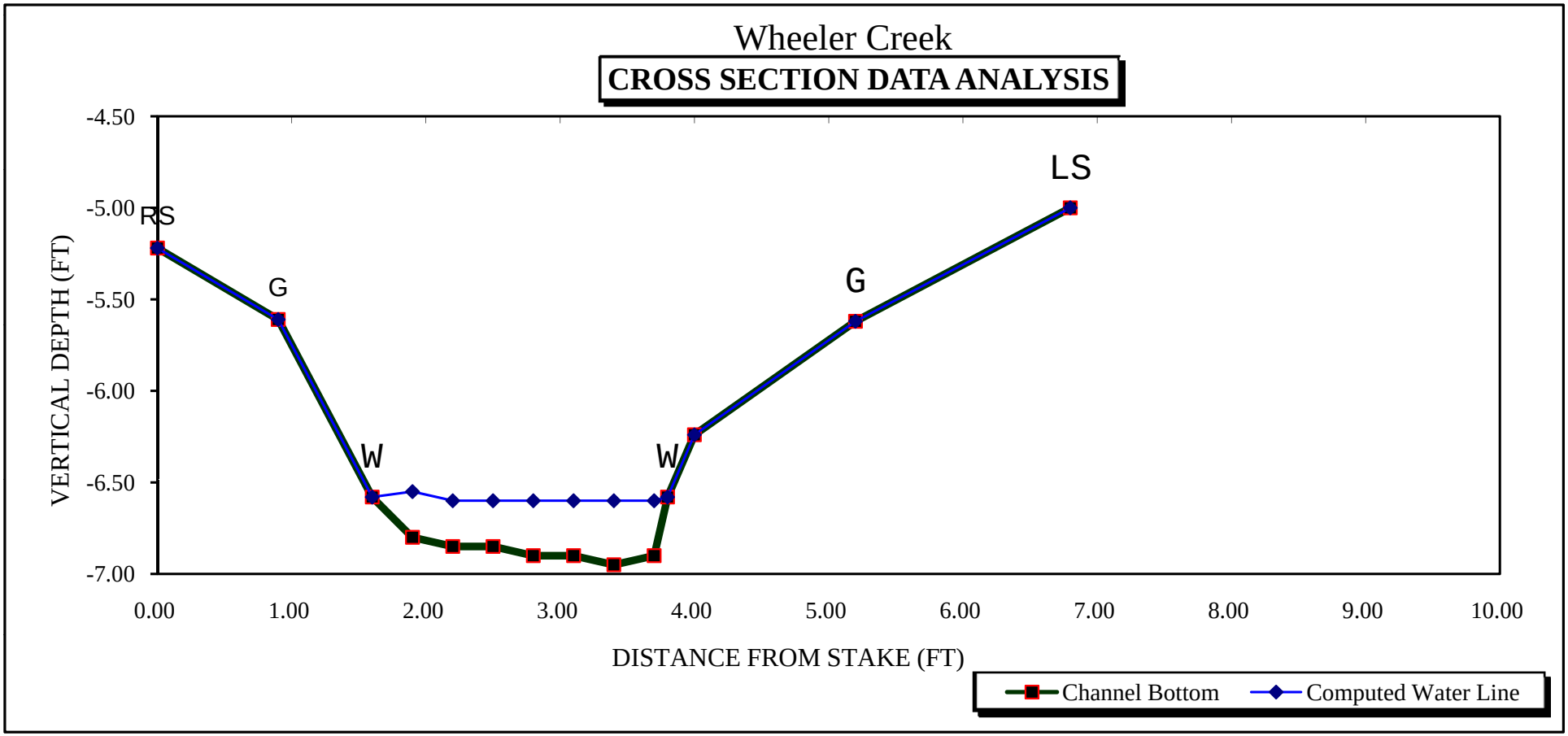
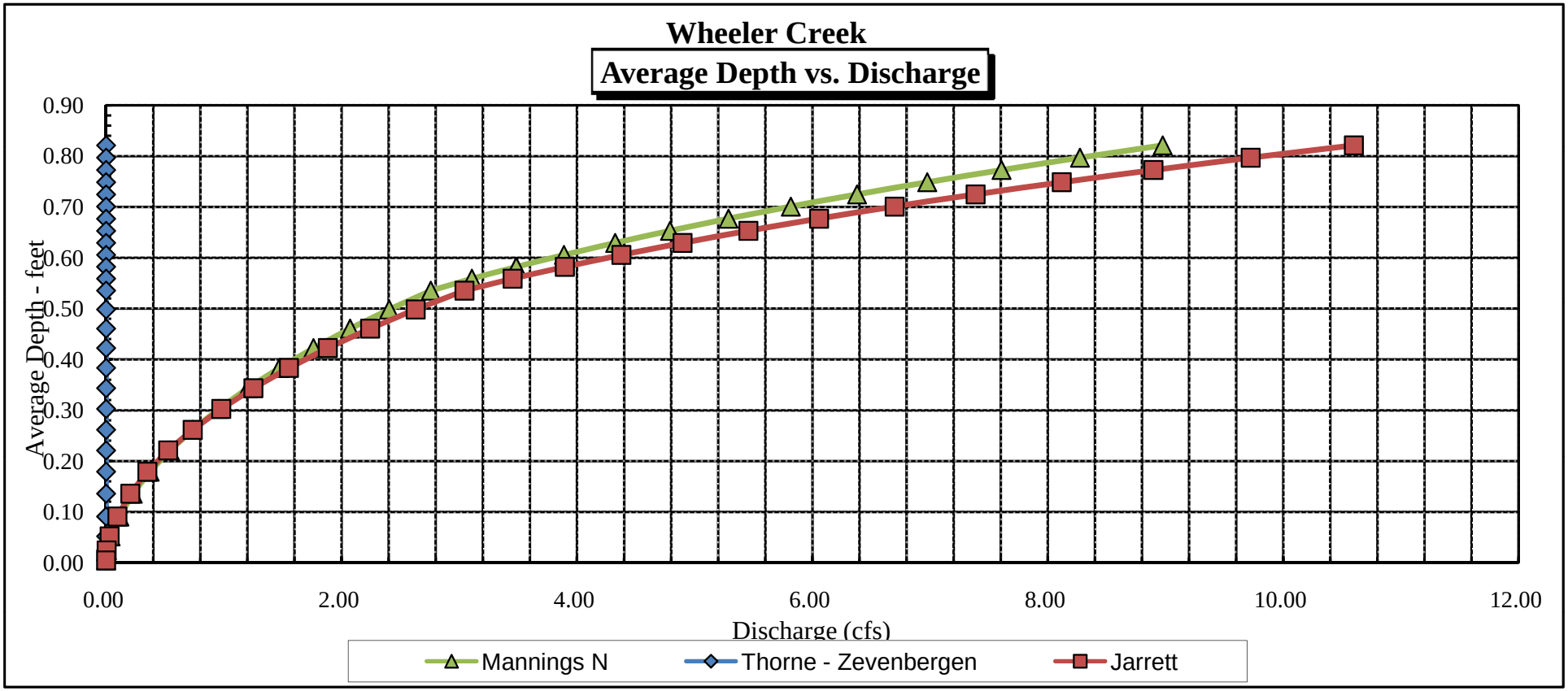
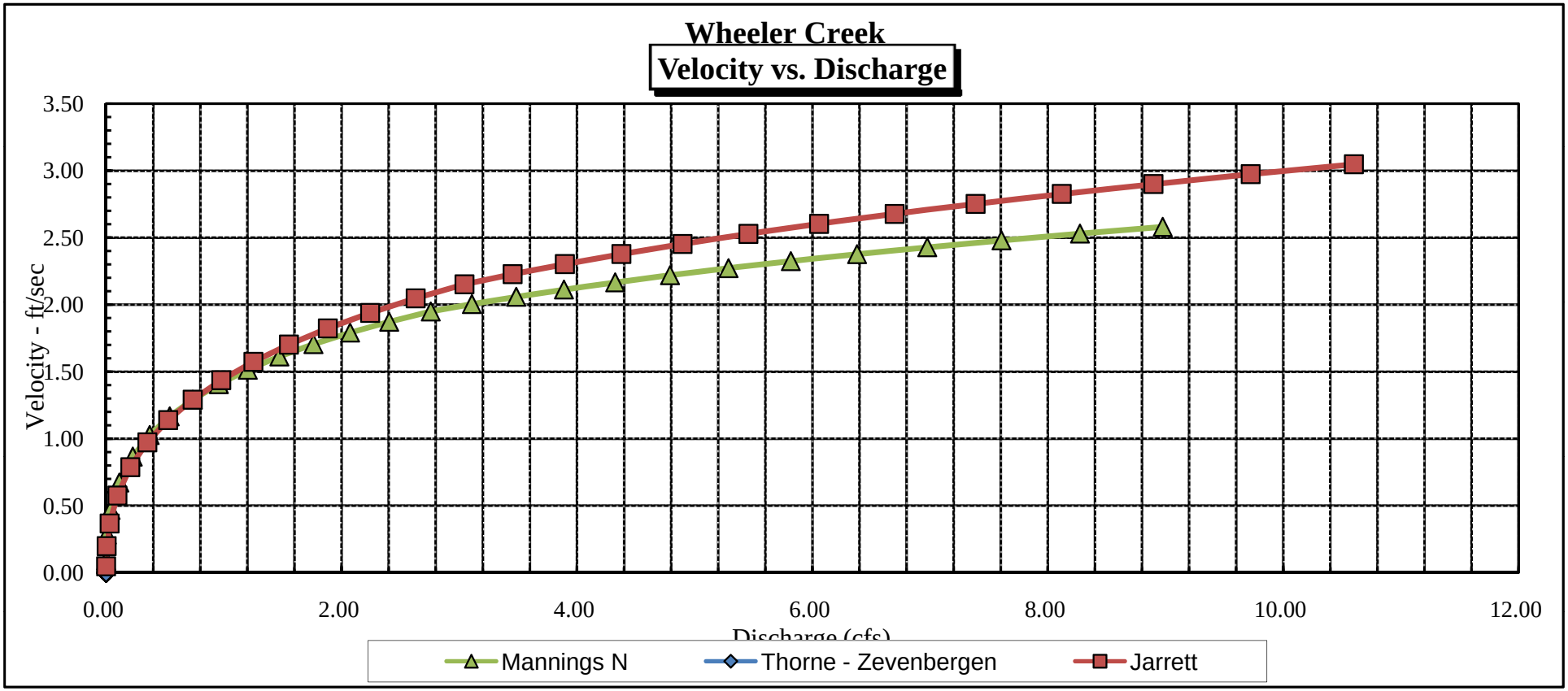
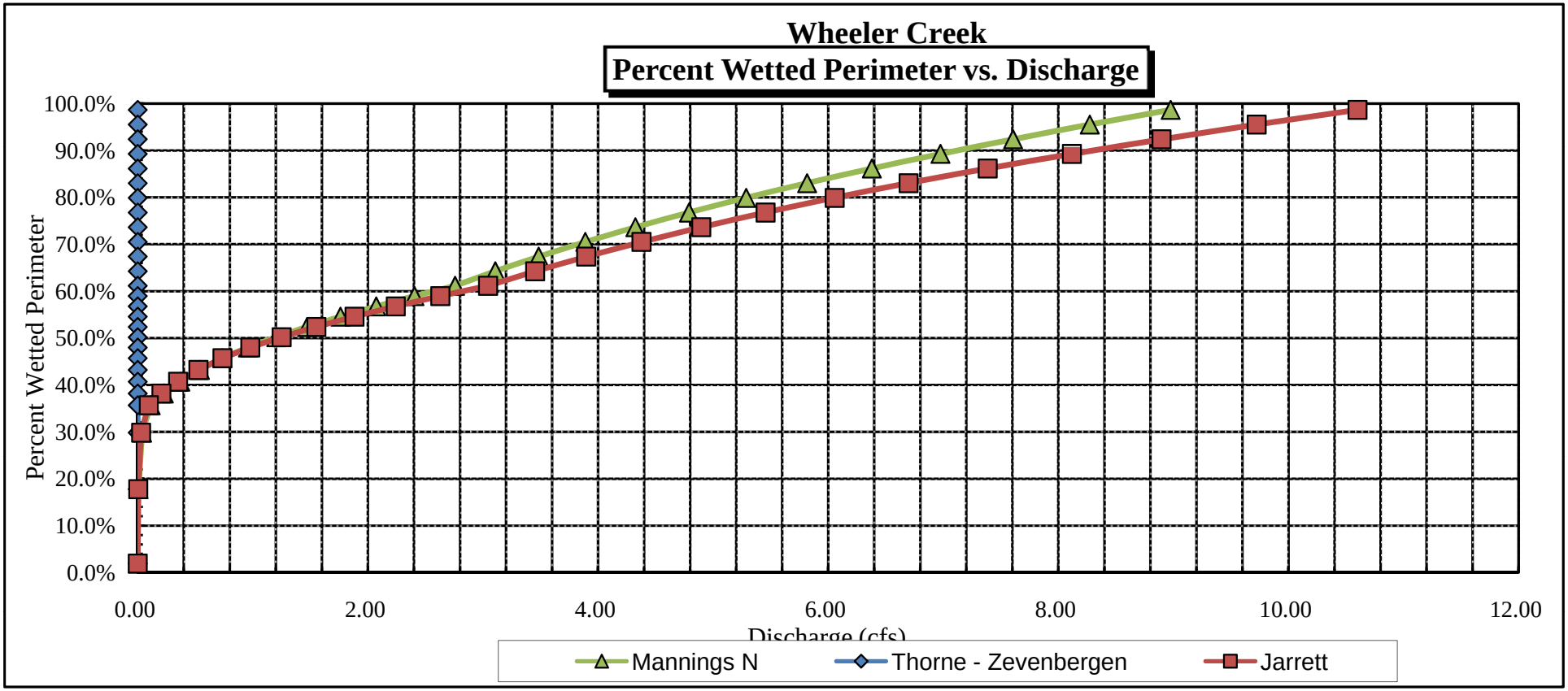
RECOMMENDATION BY: ………………...………..…................................ AGENCY..……………………......……....…....…....... DATE:.......…...…......……………

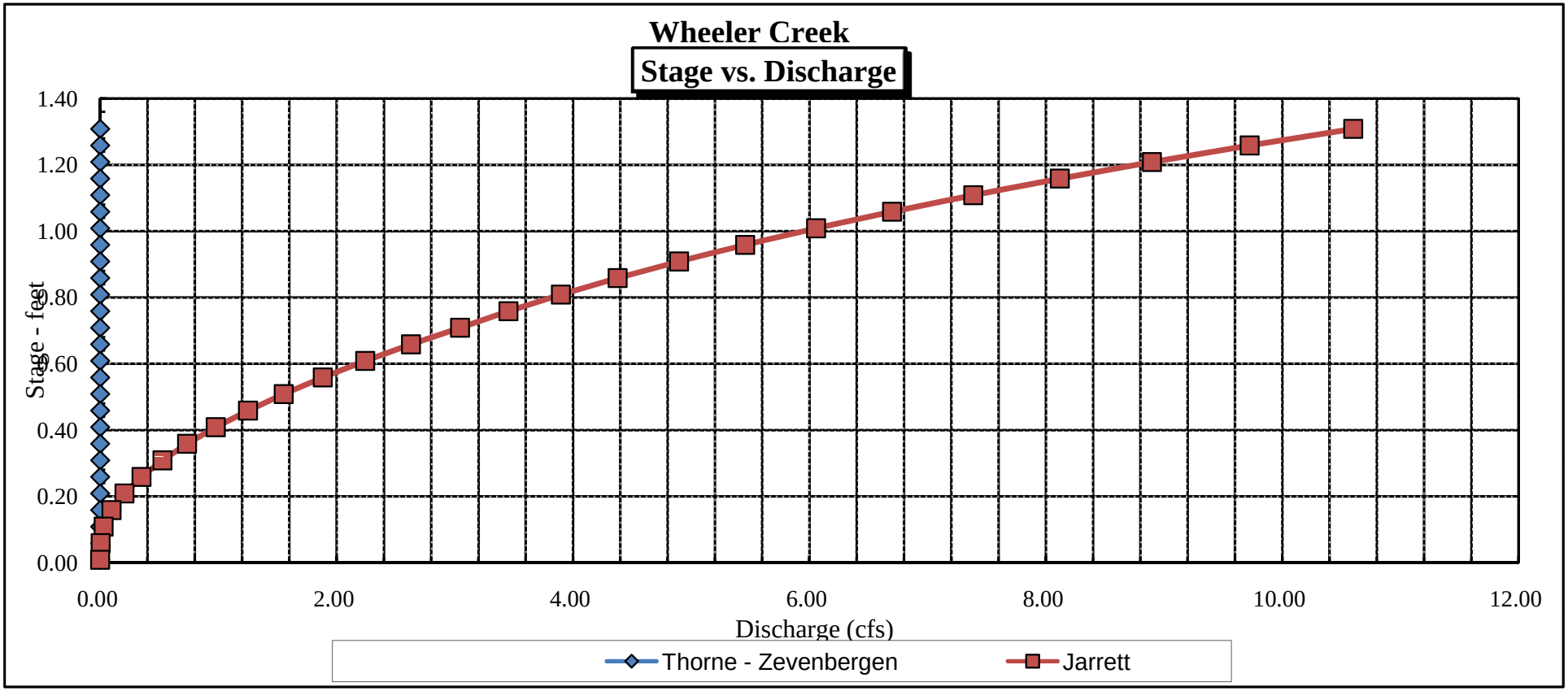
CWCB REVIEW BY: ..……………………….....………………………………………………...…............. DATE:.................…………….....


Wheeler Creek
CROSS SECTION DATA ANALYSIS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
RS
G
W
W
G
LS
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)
Channel Bottom
Computed Water Line


Wheeler Creek
Average Depth vs. Discharge
Average Depth - feet
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
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Wheeler Creek
Velocity vs. Discharge
Velocity - ft/sec
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Wheeler 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
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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