DRAFT RECOMMMENDATION – 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 instream flow recommendation for Douglas Creek, located in Water Division 6.

Location and Land Status. Douglas Creek is tributary to the White River at the east end of the community of Rangely. This recommendation covers the stream reach beginning at the confluence of East Douglas Creek and West Douglas Creek and extends downstream to the confluence with the White River. Approximately 89 % of the 26.4-mile reach is publically owned, while the remaining 11 % is privately owned. All of the publically-owned lands along the reach are managed by the BLM.

Biological Summary. Douglas Creek is a moderate gradient stream in a canyon with variable widths. In some locations, there is sufficient width in canyon bottom for the stream to meander over time. In other locations, stream movement is confined by bedrock. As such, the stream has a stable channel but has a variable substrate size, ranging from gravels to six-inch cobbles. The stream has abundant run and pool habitat, but very limited riffle habitat. Water quality, water temperatures, and food sources are suitable for native species, but very low flows during certain portions of the year limits fish abundance and doesn't allow for a high diversity of age classes.

Fishery surveys indicate that the creek supports self-sustaining populations of speckled dace. In addition, the creek environment supports occurrences of northern leopard frog, a BLM sensitive species.

The creek supports a riparian community comprised of willows, sedges, and rushes, but the tamarisk population is extensive. The riparian community has been impacted by historic grazing practices but is now on an upward trend.

R2Cross Analysis. BLM collected the following R2Cross data from Douglas 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)
4/23/2015 #1	4.84 cfs	19.13 feet	2.15 cfs	2.80 cfs
4/23/2015 #2	4.00 cfs	14.00 feet	Out of confidence interval	2.16 cfs
6/28/2016 #1	3.41 cfs	14.20 feet	1.43 cfs	2.25 cfs
6/28/2016 #2	3.87 cfs	13.56 feet	Out of confidence interval	3.55 cfs
		Averages:	**1.79 cfs**	**2.69 cfs**

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

> 2.70 cubic feet per second is recommended from March 1 to November 30. In most of the cross sections collected, the recommended flow rates are driven by the average depth and average velocity criteria. Protecting average velocity for spawning habitat is important, because many portions of this reach that are suitable for spawning are low gradient. Some portions of this reach have high width-to-depth ratio, so it is also important to maintain sufficient depth for fish passage. BLM believes that maintaining 2.70 cfs will maintain acceptable physical habitat characteristics over a wide variety of riffle widths.
>
> 1.80 cubic feet per second is recommended from December 1 to February 28. This recommendation is driven by the average velocity criteria. BLM believes that this flow rate will keep pools sufficiently free of ice to allow overwintering of fish.

Water Availability. BLM is not aware any decreed surface diversions within the recommended instream flow reach. However, BLM is aware of the following water rights in locations upstream from the recommended reach:

<u>East Douglas Creek</u>

East Douglas Ditch – 6.0 cfs
Decker Irrigation Ditch – 2.8 cfs
Tipp Ditch – 3.36 cfs conditional
Mitchell Ditch – 2.59 cfs
Lewis Ditch – 1.00 cfs
Lake Creek Pool Ditch – 7.0 cfs
Soldier Creek Ditch – 7.0 cfs
Cathedral Creek Diversion – 2.0 cfs

Gillam Draw Ditch – 2.06 cfs

West Douglas Creek

Red Rock Ditch – 2.0 cfs
Middle Creek Ditch – 3.0 cfs
JP White Ditch – 2.43 cfs
Adams and Owen Ditch – 1.9 cfs
West Creek Canal – 1.5 cfs

BLM recommends using multiple data sources to confirm water availability. The nearest gage with similar watershed characteristics is USGS gage 09306222 (Piceance Creek at White River, CO). This gage has a long period of record. However, this gage record incorporates all the impacts to stream flows associated with upstream ditch diversions and return flows, so its usability during the irrigation season may be limited. If upstream diversions are considered, perhaps the Piceance Creek gage could be considered as a very conservative indication of water availability during the irrigation season. However, during the non-irrigation season, this gage can easily be compared with the Douglas Creek watershed, which has a slightly smaller size.

BLM does not recommend usage of data from USGS gage 09306380 (Douglas Creek at Rangely, CO). Even though this gage is located within the recommended reach, the period of record is very short, with less than five years of data. In addition, the years in which data was collected included a drought period during 1976-77 and an extraordinarily wet yet year during 1995. Inclusion of these extreme years in a short period of record renders mean flow statistics from the gage as not reliable.

Relationship to Management Plans. In the White River Resource Management Plan 2015 Amendment, Douglas Creek is listed as a high-priority stream identified for implementation of measures to maintain aquatic habitat for current fish popuations and macroinvertebrate communities, streamflow, and water quality (Appendix D, Table 2-1). In addition, the plan specifies that BLM will work with the Colorado Water Conservation Board to appropriate instream flow water rights to protect these fisheries.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in January 2017. We thank both Colorado Parks and Wildlife and the CWCB 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

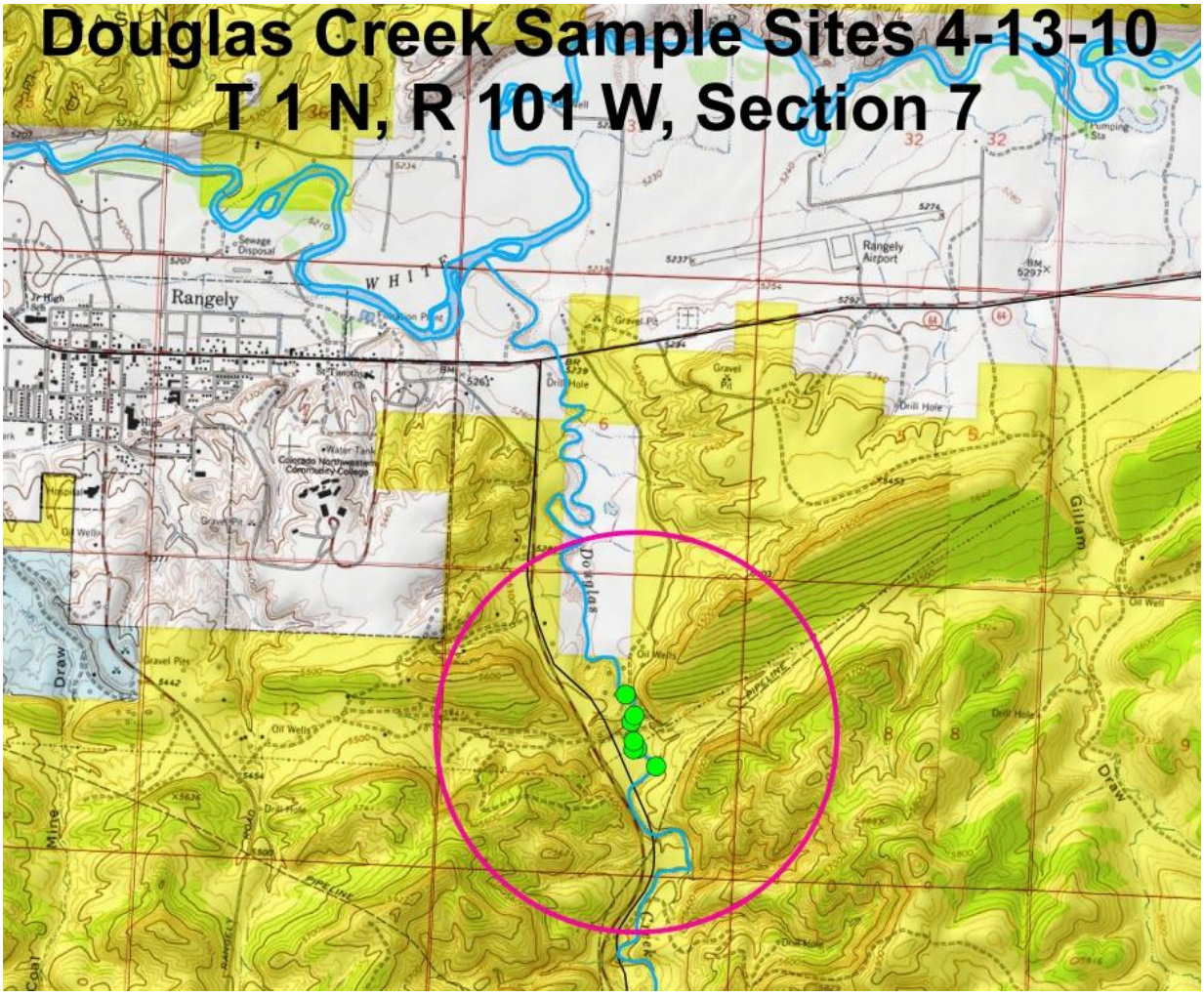
cc: Keith Sauter, White River Field Office
Kent Walter, White River Field

White River Field Office Stream Surveys
April 2010

Douglas Creek - Water Code #25317

On April 13, 2010, Douglas Creek was sampled on BLM lands administered by the White River Field Office approximately 2 miles above the confluence with the White River (See Map). Sampling was conducted to determine fishery status and to look specifically for spring spawning use of the creek by native fish (flannelmouth suckers, bluehead suckers, and roundtail chubs). The site was sampled using a backpack electroshocker, six hoopnets, and two minnow traps. Personnel present were Tom Fresques, BLM, and Jenn Logan, Colorado Division of Wildlife.

Only native speckled dace were collected. A population estimate was not completed.



STREAM SURVEY FISH SAMPLING FORM

Water Douglas Creek **H_2O Code** 25317 **Date** 4/13/2010

Gear BPE **Effort** _____ **Station #** UP **Pass #** 1

Crew Fresques, Logan **Drainage** White River **Location** Above Falls

PASS	SPECIES	LENGTH	WEIGHT		PASS	SPECIES	LENGTH	WEIGHT
1	SPD	66	2		16	SPD	61	2
2	SPD	69	3		17	SPD	59	2
3	SPD	67	3		18	SPD	65	3
4	SPD	65	2		19	SPD	72	4
5	SPD	65	2		20	SPD	63	3
6	SPD	64	2		21	SPD	66	2
7	SPD	63	3		22	SPD	71	3
8	SPD	66	3		23	SPD	42	1
9	SPD	47	1		1	SPD	60	2
10	SPD	64	2		2	SPD	51	1
11	SPD	76	4		3	SPD	74	4
12	SPD	81	6		4	SPD	83	5
13	SPD	72	3		5	SPD	68	3
14	SPD	72	3		6	SPD	65	2
15	SPD	61	2		7	SPD	35	2
					8	SPD	46	1
					9	SPD	32	1
						SPD	COUNT	71

GPS LOCATION:

STREAM WIDTH: _____ ft.

SAMPLE REACH: _____ ft.

CONDUCTIVITY: 1919 @ 25 C

ELECTROSHOCKER SETTINGS :

NOTES: COND. 1355 @ 9.6 C

DO 8126 mg/L

TEMP 9.6 C

STREAM SURVEY FISH SAMPLING FORM

Water Douglas Creek **H_2O Code** 25317 **Date** 4/12/2010

Gear **Hoop Nets** **Effort** _____ **Station #** _____ **Pass #** _____

Crew Fresques, Logan, Elbell **Drainage** White River **Location** ~1 mile above White River confluence

NET	Net Set	Mesh	Hoop Dia.		Net pulled			
1	9:30	1" mesh	1.5' hoop		2:35	no fish		
2	9:10	2" mesh	2' hoop		2:45	no fish		
3	9:15	1" mesh	3' hoop		2:50	no fish		
4	10:03	1" mesh	1.5' hoop		3:00	no fish		
5	10:10	1" mesh	3' hoop		3:00	no fish		
6	10:28	2" mesh	3' hoop		3:05	no fish		
	Upstream minnow trap							
	11:00				3:00			
	SPD	42 cm	1 g					
	SPD	49 cm	2 g					

Large natural barrier 4.5 foot drop

Looking downstream from barrier

Hoop Net Set (one of six)

Discussion:

Douglas Creek was high and muddy and running an estimated 15-20 cfs. The stream was a good mix of pools and riffles. The stream was in good condition with good bank stability and proper width to depth ratios. The stream appeared to be a Rosgen C/B channel type with good sinuosity and relatively moderate gradient with some entrenchement, but largely a wide floodplain. Riparian vegetation consisted of herbaceous species including sedges and rush. Woody species were predominantly salt cedar (tamarisk) with a few willows noted.

Electrofishing was conducted both above and below the natural waterfall barrier. In addition, 3 hoop nets were set above and 3 below the barrier as was 1 minnow trap at each sampling location. The only fish species collected both above and below the barrier were speckled dace. Fish were only collected during electrofishing efforts and in the two small minnow traps. No fish were collected within any of the hoopnets which are designed to capture larger adults. Based on limited sampling, it appears that Douglas Creek may not provide seasonal spawning habitat for target native fishes hypothesized to move out of the White River and into the stream to spawn. No adult fish were seen or collected.

Recommendations:

- Perhaps a more extensive look at this creek is warranted. Consider sampling later in the spring (early to mid May) to attempt to detect adult spawning fish. Consider sampling the small BLM parcel closer to the confluence with the White River

- If possible, look into connectivity to the White River with regard to diversions, additional barriers, etc. below the sample site to the confluence to see if any impediments to seasonal use of the creek by native species residing in the White River exist

- Periodically sample/monitor the creek to assess fishery composition and stream and riparian habitat conditions

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Douglas Creek						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: Approx 1 mile upstream from confluence with Coal Draw							
DATE: 6-28-16	OBSERVERS: R. Smith, K. Sauder						
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 7	TOWNSHIP: 1 N(S)	RANGE: 101 E(W)	PM: 6th		
COUNTY: Rio Blanco	WATERSHED: White River	WATER DIVISION: 6	DOW WATER CODE: 25317				
MAP(S): USGS:							
USFS:							

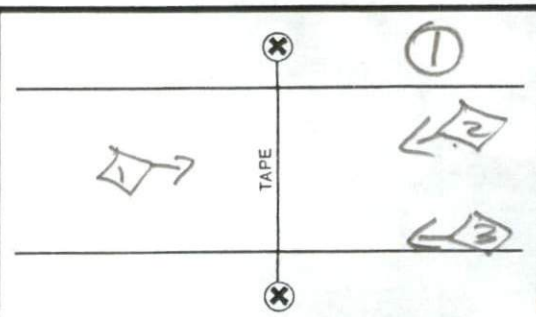
SUPPLEMENTAL DATA

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	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	7.95/7.95
② WS Upstream	1.0	7.94
③ WS Downstream	25.2	8.35
SLOPE	0.41/26.2 = 0.016	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇1→
Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/(NO)	DISTANCE ELECTROFISHED: ____ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/(NO)

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

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

COMMENTS

FORM #USF-ED-1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Douglas Creek | CROSS-SECTION NO.: 2 | DATE: 6-28-16 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: _____ ft | TIME: 3:10 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)
RS	0.0		5.30								
G	3.2		7.45								
W	3.4		7.95								
	4		8.25	0.3				1.29			
	4.5		8.25	0.3				1.22			
	5		8.20	0.25				1.61			
	5.5		8.20	0.25				1.21			
	6		8.15	0.20				1.32			
	6.5		8.15	0.20				1.32			
	7		8.05	0.10				0.45			
	7.5		8.05	0.10				1.17			
	8		8.15	0.20				1.04			
	8.5		8.20	0.25				1.82			
	9		8.15	0.20				1.56			
	9.5		8.25	0.30				1.80			
	10		8.25	0.30				1.50			
	10.5		8.25	0.30				1.57			
	11		8.30	0.35				1.74			
	11.5		8.25	0.30				1.75			
	12		8.25	.3				1.82			
	12.5		8.25	.3				1.69			
	13		8.25	.3				1.47			
	13.5		8.15	.2				1.17			
	14		8.05	.1				0.69			
	14.5		8.05	.1				0.92			
	15		8.05	.1				0.62			
	15.5		8.05	.1				0.38			
	16		8.00	.05				0.04			
W	16.6		7.95								
G	16.8		7.55								
LS	19.7		5.10								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Douglas Creek						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: Downstream from Rio Blanco County Road 138 crossing							
DATE: 6-28-16	OBSERVERS: R. Smith, K. Sauter						
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 18	TOWNSHIP: 1(0) N/S	RANGE: 101 E/(W)	PM: 6th		
COUNTY: Rio Blanco	WATERSHED: White River	WATER DIVISION: 6	DOW WATER CODE: 25317				
MAP(S): USGS:	Zone 12 690421						
USFS:	4436953						

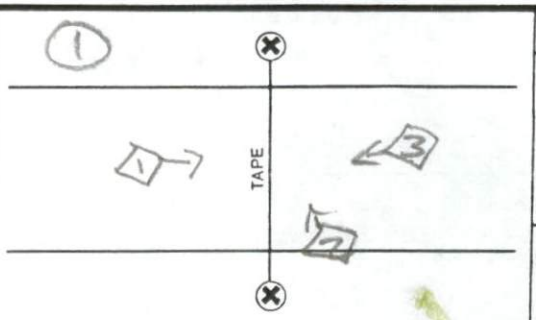
SUPPLEMENTAL DATA

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: gravels to 6" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 4		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	survey
⊗ Tape @ Stake RB	0.0	survey
① WS @ Tape LB/RB	0.0	8.85/8.85
② WS Upstream	22.0	8.60
③ WS Downstream	25.0	9.22
SLOPE	0.62/47.0 = 0.013	

SKETCH



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

pH = 8.24
Temp = 25.3° C
Salinity = 0.7
Cond @ 14%

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Douglas Creek	CROSS-SECTION NO.: 1	DATE: 6-28-16	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 2:15 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)
RS	0.0		5.98								
	1.0		7.39								
G	1.9		8.18								
	2.4		8.48								
W	2.5		8.85								
	2.9		9.05	0.2				0.28			
	3.3		9.05	0.2				0.69			
	3.7		9.15	0.3				0.83			
	4.1		9.10	0.25				1.44			
	4.5		9.05	0.20				1.13			
	4.9		9.15	0.30				1.15			
	5.3		9.15	0.30				1.32			
	5.7		9.15	0.30				1.31			
	6.1		9.25	0.40				1.50			
	6.5		9.25	0.40				1.69			
	6.9		9.15	0.30				1.70			
	7.3		9.10	0.25				1.75			
	7.7		9.20	0.35				1.88			
	8.1		9.15	0.30				1.72			
	8.5		9.25	0.40				1.94			
	8.9		9.25	0.40				1.72			
	9.3		9.15	0.30				1.24			
	9.7		9.15	0.30				1.20			
	10.1		9.20	0.35				1.03			
	10.5		9.15	0.30				0.87			
	10.9		9.05	0.20				0.12			
	11.3		9.00	0.15				0.36			
	11.7		8.95	0.10				0.19			
	12.1		8.95	0.10				0.30			
	12.5		8.95	0.10				0.13			
	12.9		8.90	0.05				0			
	13.3		↓	↓				↓			
	13.7										
W	14.1										
G	14.5										
LS	14.9										
	15.3		↓	↓				↓			
W	15.9		8.85								
G	16.1		8.18								
LS	19.0		6.32								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Douglas Creek						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: Approx. 1 mile upstream from confluence with Coal Draw							
DATE: 4-23-15	OBSERVERS: R. Smith, K. Sauter						
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 7	TOWNSHIP: 1 N/S	RANGE: 101 E/W	PM: 6th		
COUNTY: Rio Blanco	WATERSHED: White River	WATER DIVISION: 6	DOW WATER CODE: 25317				
MAP(S): USGS:	39.98154						
USFS:	108.77706						

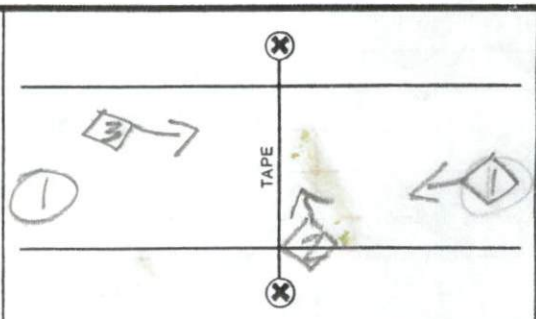
SUPPLEMENTAL DATA

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	4.15 / 4.15
② WS Upstream	8.5	4.10
③ WS Downstream	51.0	4.80
SLOPE	0.7 / 59.5 = .012	

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:

COMMENTS

FORM [illegible]

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Douglas Creek	CROSS-SECTION NO.: 2	DATE: 4-23-15	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 2:20 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)
RS	0.0		0.90								
G	1.2		1.55								
	1.5		3.08								
W	1.6		4.15	←							
	2.0		4.45		.3			0.83			
	2.5		4.65		.5			1.10			
	3.0		4.75		.6			1.40			
	3.5		4.65		.5			.98			
	4.0		4.50		.35			.78			
	4.5		4.35		.20			.60			
	5		4.25		.10			.52			
	5.5		4.25	←	.10			.55			
	6		4.35		.20			1.06			
	6.5		4.25		.10			1.43			
	7		4.25		.10			1.37			
	7.5		4.25		.10			1.31			
	8		4.25		.10			1.32			
	8.5		4.25		.10			1.32			
	9		4.25		.10			1.41			
	9.5		4.25		.10			1.52			
	10		4.35		.20			1.27			
	10.5		4.25		.10			0.81			
	11		4.25		.10			0.79			
	11.5		4.35		.20			0.99			
	12		4.50		.35			1.81			
	12.5		4.55		.40			1.84			
	13		4.60		.45			1.05			
	13.5		4.65		.50			0.74			
	14		4.65		.50			0.98			
	14.5		4.75	←	.60			1.49			
W	15.0		4.15								
G	15.2		1.55								
LS	17.7		0.70								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Douglas Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Downstream from Rio Blanco County Road 138 Crossing						
DATE: 4-23-15	OBSERVERS: R. Smith, K. Sauder					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 18	TOWNSHIP: 1 (N)/S	RANGE: 101 E/(W)	PM: Sixth	
COUNTY: Rio Blanco	WATERSHED: White River	WATER DIVISION: 6	DOW WATER CODE: 25317			
MAP(S): USGS:			40.06138			
USFS:			108.76947			

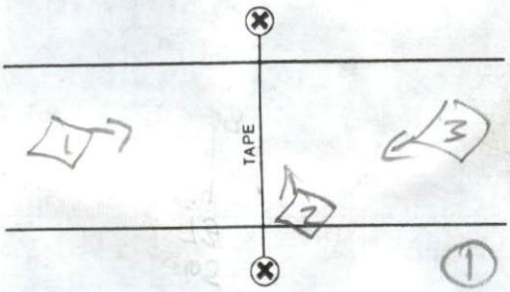
SUPPLEMENTAL DATA

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)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	7.80/7.80
(2) WS Upstream	8.5	7.74
(3) WS Downstream	40.0	8.30
SLOPE	0.50/48.5 = .012	

SKETCH



LEGEND:
- Stake (X)
- 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

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Douglas Creek | CROSS-SECTION NO.: 1 | DATE: 4-23-15 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 1:22 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)
RS	0.0		4.50								
G	1.1		5.40								
	2.0		6.02								
	2.5		6.62								
W	3.2		7.80								
	3.5		8.10	.3				1.09			
	4.0		8.05	.25				1.15			
	4.5		8.00	.20				1.14			
	5.0		8.10	.3				0.69			
	5.5		8.05	.25				0.76			
	6.0		8.00	.2				0.98			
	6.5		8.10	.3				1.65			
	7.0		8.10	.3				1.73			
	7.5		8.00	.2				1.74			
	8.0		8.00	.2				1.34			
	8.5		8.05	.25				1.28			
	9.0		8.10	.3				1.45			
	9.5		8.10	.3				1.46			
	10.0		8.10	.3				1.53			
	10.5		8.10	.3				1.52			
	11.0		8.10	.3				1.55			
	11.5		8.15	.35				1.45			
	12.0		8.15	.35				1.51			
	12.5		8.10	.30				1.59			
	13.0		8.10	.30				1.59			
	13.5		8.10	.30				1.57			
	14.0		8.10	.30				1.51			
	14.5		8.10	.30				1.12			
	15		8.10	.30				1.32			
	15.5		8.15	.35				1.30			
W	16.0		7.80								
	17.5		6.34								
RSTG	20.3		5.45								
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	Douglas Creek
XS LOCATION:	Approx 1 mile upstr from con w Coal Draw
XS NUMBER:	2
DATE:	6/28/2016
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NW
SECTION:	12
TWP:	1S
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	25317
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.016 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 = 30					
	RS	0.00	5.30			0.00	0.00	0.00
1	G	3.20	7.45			0.00	0.00	0.00
	W	3.40	7.95	0.00	0.00	0.00	0.00	0.00
		4.00	8.25	0.30	1.29	0.17	0.21	7.95
		4.50	8.25	0.30	1.22	0.15	0.18	7.95
		5.00	8.20	0.25	1.61	0.13	0.20	7.95
		5.50	8.20	0.25	1.21	0.13	0.15	7.95
		6.00	8.15	0.20	1.32	0.10	0.13	7.95
		6.50	8.15	0.20	1.32	0.10	0.13	7.95
		7.00	8.05	0.10	0.45	0.05	0.02	7.95
		7.50	8.05	0.10	1.12	0.05	0.06	7.95
		8.00	8.15	0.20	1.04	0.10	0.10	7.95
		8.50	8.20	0.25	1.82	0.13	0.23	7.95
		9.00	8.15	0.20	1.56	0.10	0.16	7.95
		9.50	8.25	0.30	1.80	0.15	0.27	7.95
		10.00	8.25	0.30	1.50	0.15	0.23	7.95
		10.50	8.25	0.30	1.57	0.15	0.24	7.95
		11.00	8.30	0.35	1.74	0.18	0.30	7.95
		11.50	8.25	0.30	1.75	0.15	0.26	7.95
		12.00	8.25	0.30	1.82	0.15	0.27	7.95
		12.50	8.25	0.30	1.69	0.15	0.25	7.95
		13.00	8.25	0.30	1.47	0.15	0.22	7.95
		13.50	8.15	0.20	1.12	0.10	0.11	7.95
		14.00	8.05	0.10	0.69	0.05	0.03	7.95
		14.50	8.05	0.10	0.92	0.05	0.05	7.95
		15.00	8.05	0.10	0.62	0.05	0.03	7.95
		15.50	8.05	0.10	0.38	0.05	0.02	7.95
		16.00	8.00	0.05	0.04	0.03	0.00	7.95
	W	16.60	7.95	0.00	0.00	0.00	0.00	0.00
					Totals	2.74	3.87	

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

LOCATION INFORMATION

STREAM NAME:	Douglas Creek
XS LOCATION:	Approx 1 mile upstr from con w Coal Draw
XS NUMBER:	2
DATE:	28-Jun-16
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NW
SECTION:	12
TWP:	1S
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	25317
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.016

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

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

STREAM NAME: Douglas Creek
XS LOCATION: Approx 1 mile upstr from con w Coal Draw
XS NUMBER: 2

DATA POINTS= 30

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	5.30			0.00		0.00	0.00	0.0%
1 G	3.20	7.45			0.00		0.00	0.00	0.0%
W	3.40	7.95	0.00	0.00	0.00		0.00	0.00	0.0%
	4.00	8.25	0.30	1.29	0.67	0.30	0.17	0.21	5.5%
	4.50	8.25	0.30	1.22	0.50	0.30	0.15	0.18	4.7%
	5.00	8.20	0.25	1.61	0.50	0.25	0.13	0.20	5.2%
	5.50	8.20	0.25	1.21	0.50	0.25	0.13	0.15	3.9%
	6.00	8.15	0.20	1.32	0.50	0.20	0.10	0.13	3.4%
	6.50	8.15	0.20	1.32	0.50	0.20	0.10	0.13	3.4%
	7.00	8.05	0.10	0.45	0.51	0.10	0.05	0.02	0.6%
	7.50	8.05	0.10	1.12	0.50	0.10	0.05	0.06	1.4%
	8.00	8.15	0.20	1.04	0.51	0.20	0.10	0.10	2.7%
	8.50	8.20	0.25	1.82	0.50	0.25	0.13	0.23	5.9%
	9.00	8.15	0.20	1.56	0.50	0.20	0.10	0.16	4.0%
	9.50	8.25	0.30	1.80	0.51	0.30	0.15	0.27	7.0%
	10.00	8.25	0.30	1.50	0.50	0.30	0.15	0.23	5.8%
	10.50	8.25	0.30	1.57	0.50	0.30	0.15	0.24	6.1%
	11.00	8.30	0.35	1.74	0.50	0.35	0.18	0.30	7.9%
	11.50	8.25	0.30	1.75	0.50	0.30	0.15	0.26	6.8%
	12.00	8.25	0.30	1.82	0.50	0.30	0.15	0.27	7.1%
	12.50	8.25	0.30	1.69	0.50	0.30	0.15	0.25	6.6%
	13.00	8.25	0.30	1.47	0.50	0.30	0.15	0.22	5.7%
	13.50	8.15	0.20	1.12	0.51	0.20	0.10	0.11	2.9%
	14.00	8.05	0.10	0.69	0.51	0.10	0.05	0.03	0.9%
	14.50	8.05	0.10	0.92	0.50	0.10	0.05	0.05	1.2%
	15.00	8.05	0.10	0.62	0.50	0.10	0.05	0.03	0.8%
	15.50	8.05	0.10	0.38	0.50	0.10	0.05	0.02	0.5%
	16.00	8.00	0.05	0.04	0.50	0.05	0.03	0.00	0.0%
W	16.60	7.95	0.00	0.00	0.60		0.00	0.00	0.0%
1 G	16.80	7.55			0.00		0.00	0.00	0.0%
TOTALS ----------					13.34	0.35 (Max.)	2.74	3.87	100.0%

Manning's n = 0.0464
Hydraulic Radius= 0.20558677

STREAM NAME: Douglas Creek
XS LOCATION: Approx 1 mile upstr from con w Coal Draw
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.74	2.74	0.0%
7.70	2.74	6.07	121.4%
7.72	2.74	5.80	111.6%
7.74	2.74	5.53	101.8%
7.76	2.74	5.27	92.0%
7.78	2.74	5.00	82.3%
7.80	2.74	4.73	72.6%
7.82	2.74	4.47	62.8%
7.84	2.74	4.20	53.1%
7.86	2.74	3.93	43.5%
7.88	2.74	3.67	33.8%
7.90	2.74	3.40	24.1%
7.91	2.74	3.27	19.3%
7.92	2.74	3.14	14.5%
7.93	2.74	3.01	9.6%
7.94	2.74	2.87	4.8%
7.95	2.74	2.74	0.0%
7.96	2.74	2.61	-4.8%
7.97	2.74	2.48	-9.5%
7.98	2.74	2.35	-14.2%
7.99	2.74	2.23	-18.8%
8.00	2.74	2.10	-23.4%
8.02	2.74	1.85	-32.5%
8.04	2.74	1.61	-41.3%
8.06	2.74	1.39	-49.2%
8.08	2.74	1.20	-56.2%
8.10	2.74	1.02	-62.9%
8.12	2.74	0.84	-69.4%
8.14	2.74	0.67	-75.6%
8.16	2.74	0.51	-81.4%
8.18	2.74	0.37	-86.4%
8.20	2.74	0.25	-90.8%

WATERLINE AT ZERO
AREA ERROR = 7.950

STREAM NAME: Douglas Creek
XS LOCATION: Approx 1 mile upstr from con w Coal Draw
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	7.55	13.56	0.60	0.75	8.09	14.22	100.0%	0.57	22.51	2.78
	7.55	13.56	0.60	0.75	8.09	14.22	100.0%	0.57	22.50	2.78
	7.60	13.51	0.55	0.70	7.42	14.11	99.2%	0.53	19.56	2.64
	7.65	13.47	0.50	0.65	6.74	14.00	98.5%	0.48	16.77	2.49
	7.70	13.42	0.45	0.60	6.07	13.89	97.7%	0.44	14.15	2.33
	7.75	13.38	0.40	0.55	5.40	13.78	96.9%	0.39	11.71	2.17
	7.80	13.33	0.35	0.50	4.73	13.67	96.1%	0.35	9.44	2.00
	7.85	13.29	0.31	0.45	4.07	13.56	95.4%	0.30	7.38	1.81
	7.90	13.24	0.26	0.40	3.40	13.45	94.6%	0.25	5.51	1.62
WL	7.95	13.20	0.21	0.35	2.74	13.34	93.8%	0.21	3.87	1.41
	8.00	12.50	0.17	0.30	2.10	12.63	88.8%	0.17	2.57	1.22
	8.05	9.90	0.15	0.25	1.49	10.01	70.4%	0.15	1.69	1.14
	8.10	9.05	0.11	0.20	1.02	9.14	64.3%	0.11	0.95	0.94
	8.15	7.70	0.08	0.15	0.59	7.76	54.6%	0.08	0.42	0.72
	8.20	5.10	0.05	0.10	0.25	5.13	36.1%	0.05	0.14	0.54
	8.25	1.00	0.03	0.05	0.03	1.00	7.1%	0.02	0.01	0.34
	8.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Douglas Creek
XS LOCATION: Approx 1 mile upstr from con w Coal Draw
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.87	cfs
CALCULATED FLOW (Qc)=	3.87	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.95	ft
CALCULATED WATERLINE (WLc)=	7.95	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.41	ft/sec
MANNING'S N=	0.046	
SLOPE=	0.016	ft/ft
.4 * Qm =	1.5	cfs
2.5 * Qm=	9.7	cfs

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

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

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

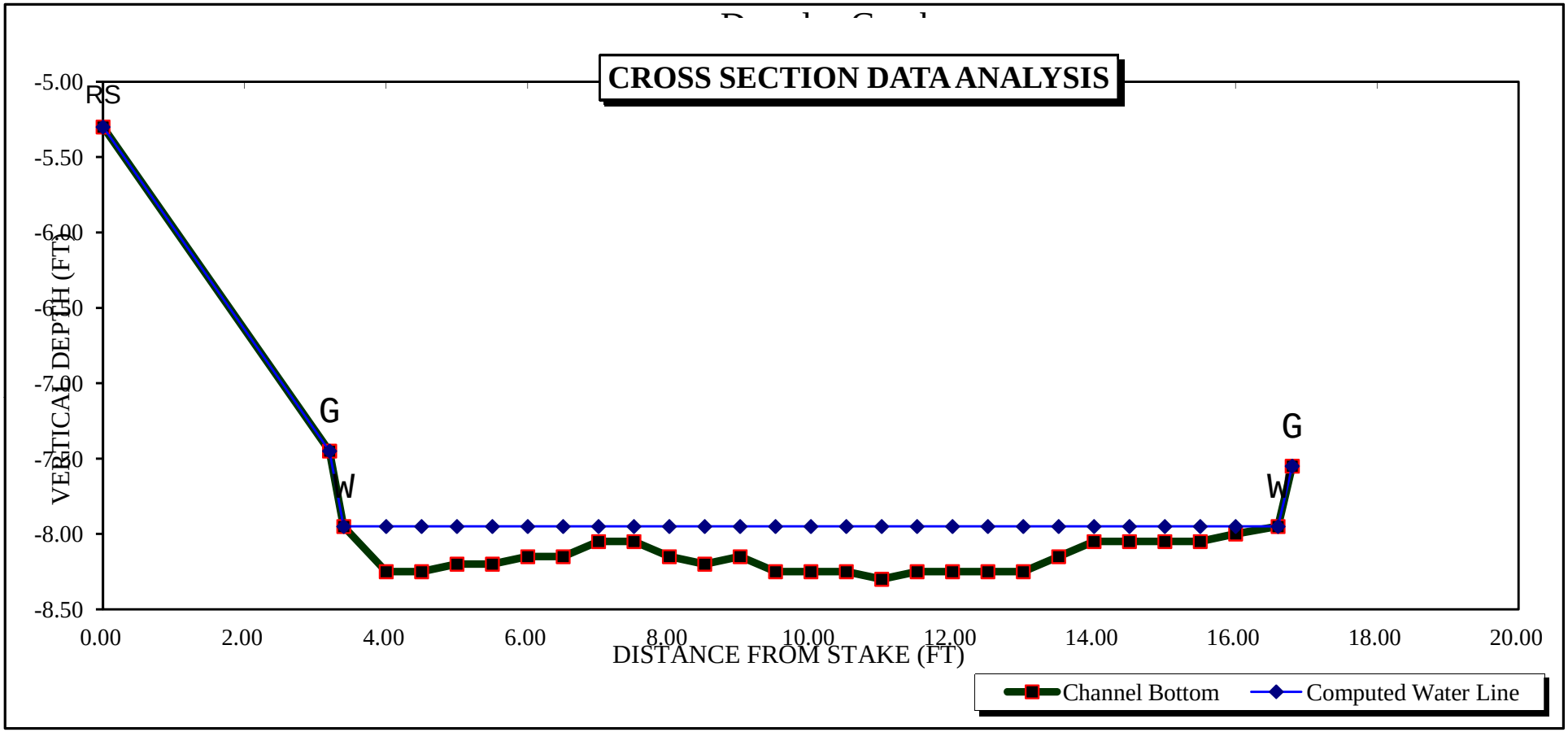
RECOMMENDATION BY: ………………...……..…..…............................ AGENCY..……………………......…....…...…....…...... DATE:.......…...…......……………

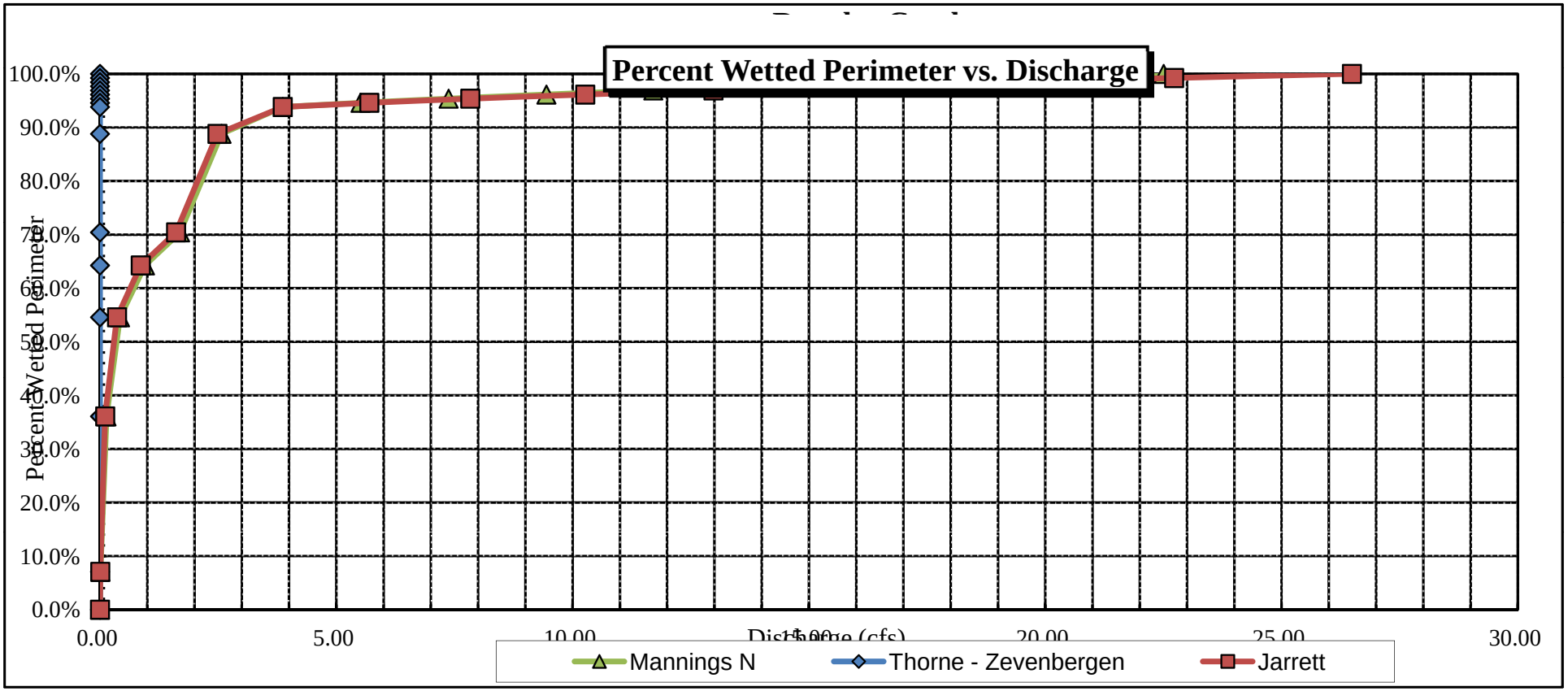
CWCB REVIEW BY: ..……………………….....…………………………………………………….......................................…............. DATE:.................…………….....

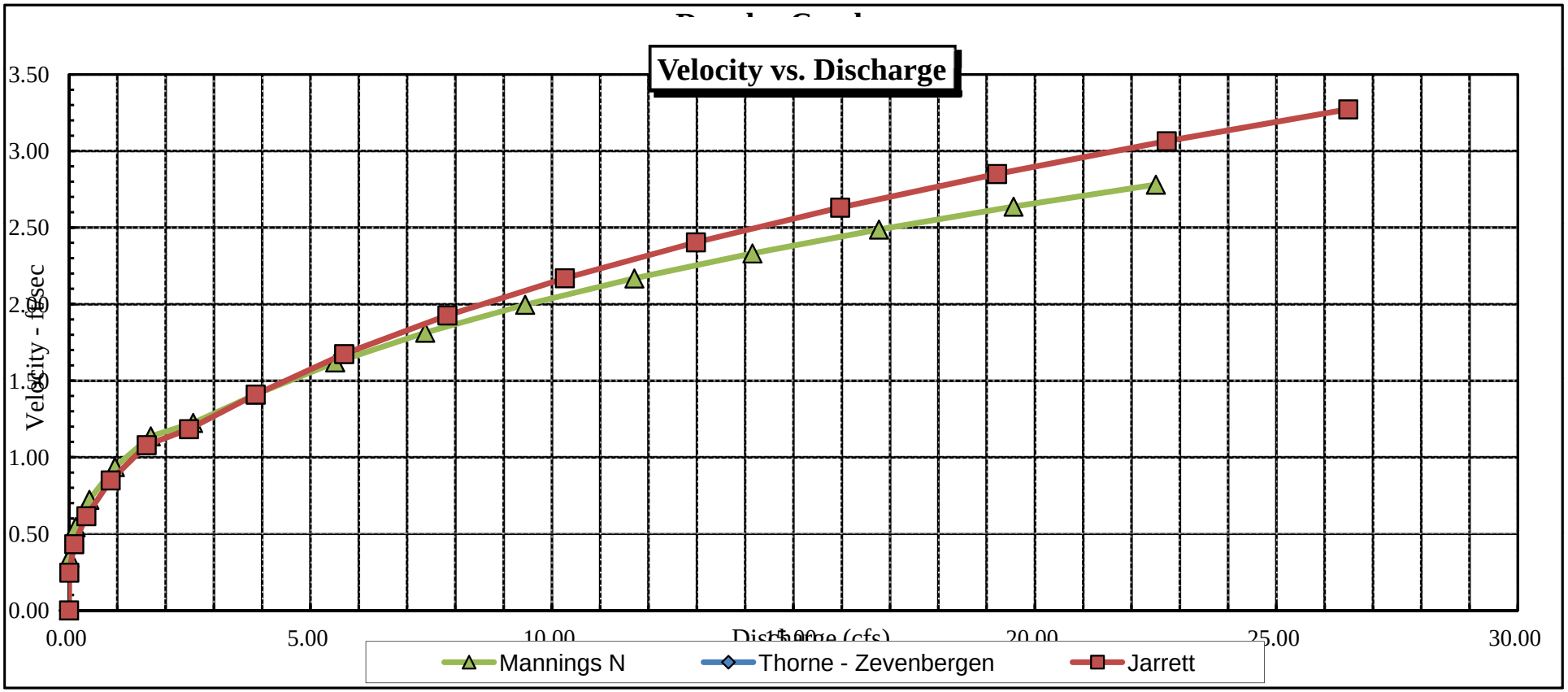
STREAM NAME: Douglas Creek
XS LOCATION: Approx 1 mile upstr from con w Coal Draw
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

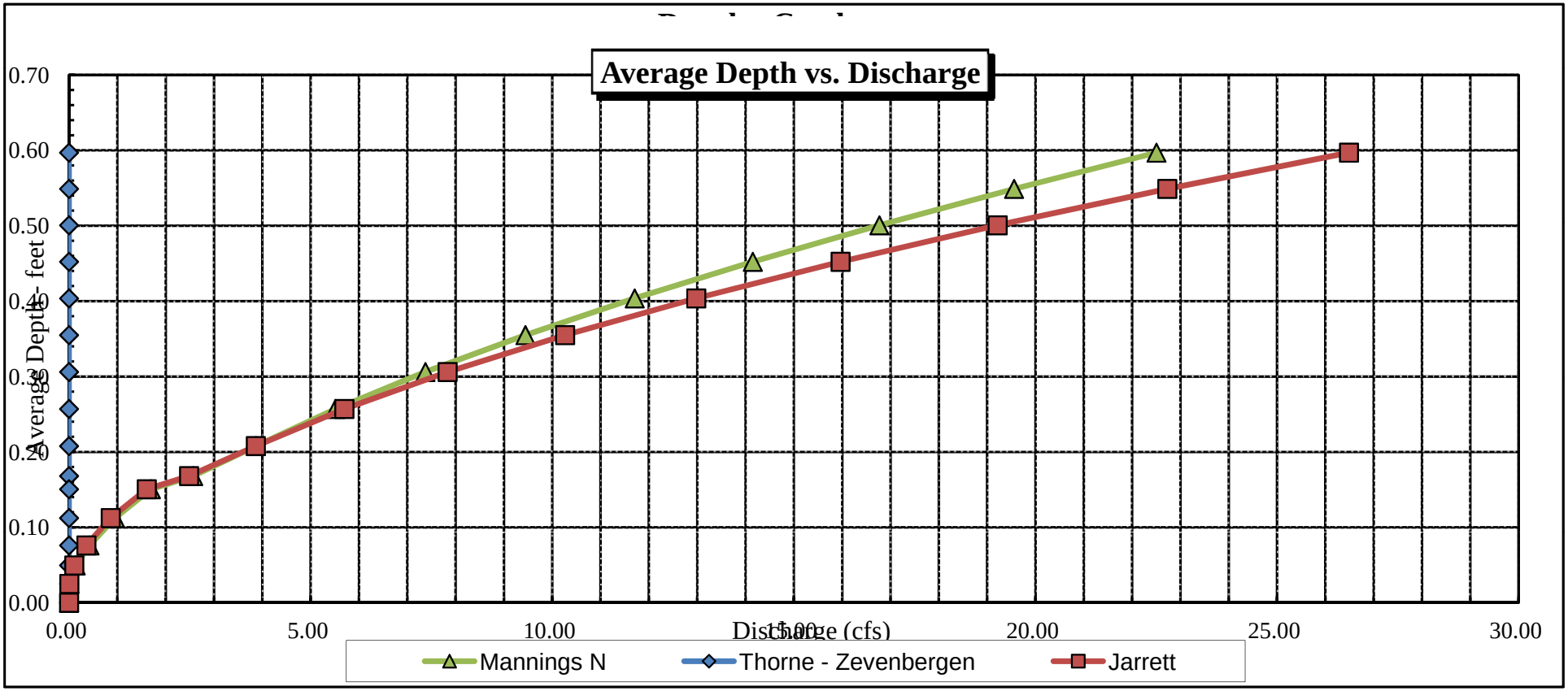
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

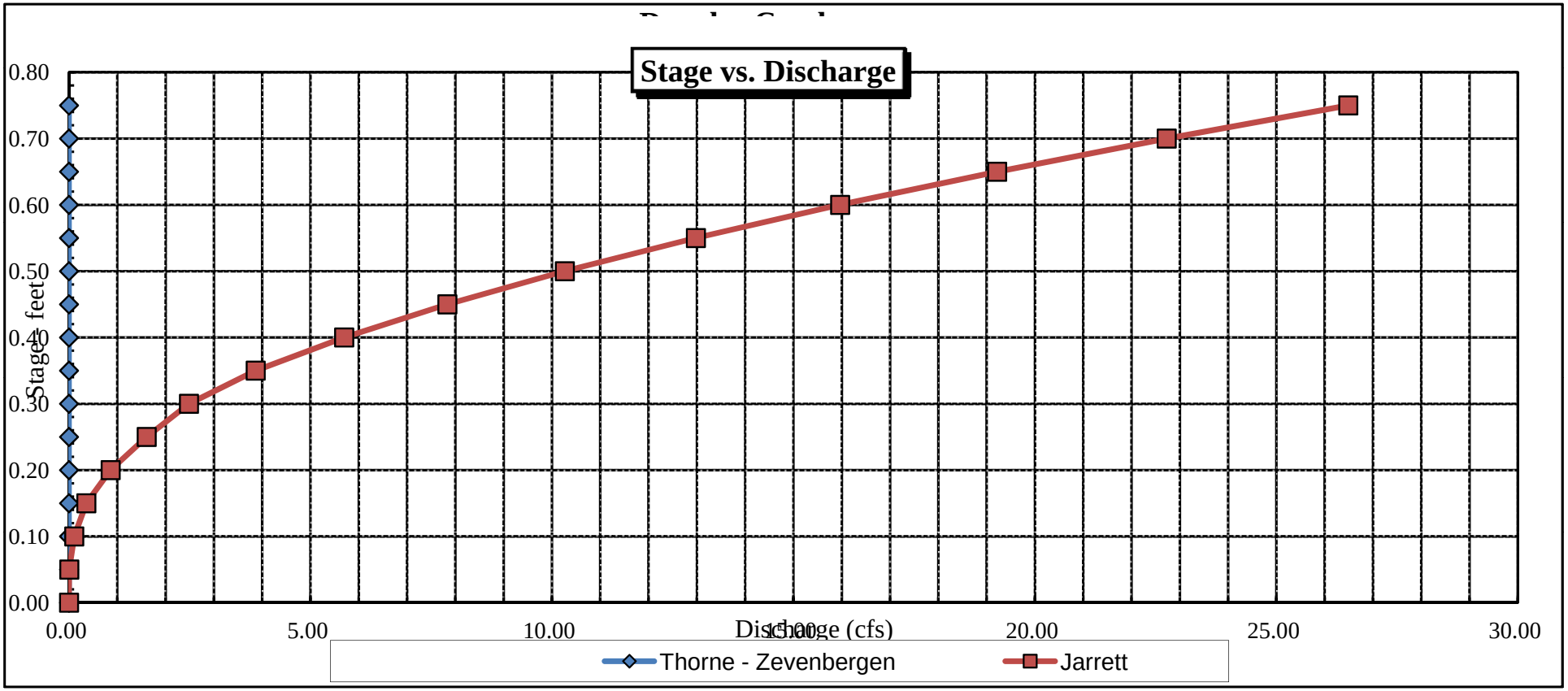
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.55	13.56	0.60	0.75	8.09	14.22	100.0%	0.57	26.49	3.27
	7.55	13.56	0.60	0.75	8.09	14.22	100.0%	0.57	26.49	3.27
	7.60	13.51	0.55	0.70	7.42	14.11	99.2%	0.53	22.73	3.06
	7.65	13.47	0.50	0.65	6.74	14.00	98.5%	0.48	19.22	2.85
	7.70	13.42	0.45	0.60	6.07	13.89	97.7%	0.44	15.97	2.63
	7.75	13.38	0.40	0.55	5.40	13.78	96.9%	0.39	12.98	2.40
	7.80	13.33	0.35	0.50	4.73	13.67	96.1%	0.35	10.27	2.17
	7.85	13.29	0.31	0.45	4.07	13.56	95.4%	0.30	7.84	1.93
	7.90	13.24	0.26	0.40	3.40	13.45	94.6%	0.25	5.70	1.67
WL	7.95	13.20	0.21	0.35	2.74	13.34	93.8%	0.21	3.87	1.41
	8.00	12.50	0.17	0.30	2.10	12.63	88.8%	0.17	2.48	1.18
	8.05	9.90	0.15	0.25	1.49	10.01	70.4%	0.15	1.61	1.08
	8.10	9.05	0.11	0.20	1.02	9.14	64.3%	0.11	0.86	0.85
	8.15	7.70	0.08	0.15	0.59	7.76	54.6%	0.08	0.36	0.62
	8.20	5.10	0.05	0.10	0.25	5.13	36.1%	0.05	0.11	0.43
	8.25	1.00	0.03	0.05	0.03	1.00	7.1%	0.02	0.01	0.25
	8.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
RS
G
W
G
W
-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


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
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
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
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Stage, feet
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Douglas Creek
XS LOCATION:	Dwnstr from Rio Blanco County Rd 138
XS NUMBER:	1
DATE:	6/28/2016
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NE
SECTION:	18
TWP:	1N
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.013 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 = 39						
	RS	0.00	5.98			0.00	0.00	0.00
		1.00	7.39			0.00	0.00	0.00
1	G	1.90	8.18			0.00	0.00	0.00
		2.40	8.48			0.00	0.00	0.00
	W	2.50	8.85	0.00	0.00	0.00	0.00	0.00
		2.90	9.05	0.20	0.28	0.08	0.02	8.85
		3.30	9.05	0.20	0.69	0.08	0.06	8.85
		3.70	9.15	0.30	0.83	0.12	0.10	8.85
		4.10	9.10	0.25	1.44	0.10	0.14	8.85
		4.50	9.05	0.20	1.13	0.08	0.09	8.85
		4.90	9.15	0.30	1.15	0.12	0.14	8.85
		5.30	9.15	0.30	1.32	0.12	0.16	8.85
		5.70	9.15	0.30	1.31	0.12	0.16	8.85
		6.10	9.25	0.40	1.50	0.16	0.24	8.85
		6.50	9.25	0.40	1.69	0.16	0.27	8.85
		6.90	9.15	0.30	1.70	0.12	0.20	8.85
		7.30	9.10	0.25	1.75	0.10	0.18	8.85
		7.70	9.20	0.35	1.88	0.14	0.26	8.85
		8.10	9.15	0.30	1.72	0.12	0.21	8.85
		8.50	9.25	0.40	1.94	0.16	0.31	8.85
		8.90	9.25	0.40	1.72	0.16	0.28	8.85
		9.30	9.15	0.30	1.24	0.12	0.15	8.85
		9.70	9.15	0.30	1.20	0.12	0.14	8.85
		10.10	9.20	0.35	1.03	0.14	0.14	8.85
		10.50	9.15	0.30	0.87	0.12	0.10	8.85
		10.90	9.05	0.20	0.12	0.08	0.01	8.85
		11.30	9.00	0.15	0.36	0.06	0.02	8.85
		11.70	8.95	0.10	0.19	0.04	0.01	8.85
		12.10	8.95	0.10	0.30	0.04	0.01	8.85
		12.50	8.95	0.10	0.13	0.04	0.01	8.85
		12.90	8.90	0.05	0.00	0.02	0.00	8.85
		13.30	8.90	0.05	0.00	0.02	0.00	8.85
		13.70	8.90	0.05	0.00	0.02	0.00	8.85
		14.10	8.90	0.05	0.00	0.02	0.00	8.85
		14.50	8.90	0.05	0.00	0.02	0.00	8.85
		14.90	8.90	0.05	0.00	0.02	0.00	8.85
		15.30	8.90	0.05	0.00	0.03	0.00	8.85
	W	15.90	8.85	0.00	0.00	0.00	0.00	0.00
1	G	16.10	8.18			0.00	0.00	0.00
					Totals	2.85	3.41	

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

LOCATION INFORMATION

STREAM NAME:	Douglas Creek
XS LOCATION:	Dwnstr from Rio Blanco County Rd 138
XS NUMBER:	1
DATE:	28-Jun-16
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NE
SECTION:	18
TWP:	1N
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.013

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

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

STREAM NAME: Douglas Creek
XS LOCATION: Dwnstr from Rio Blanco County Rd 138
XS NUMBER: 1

DATA POINTS= 39

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	5.98			0.00		0.00	0.00	0.0%
	1.00	7.39			0.00		0.00	0.00	0.0%
1 G	1.90	8.18			0.00		0.00	0.00	0.0%
	2.40	8.48			0.00		0.00	0.00	0.0%
W	2.50	8.85	0.00	0.00	0.00		0.00	0.00	0.0%
	2.90	9.05	0.20	0.28	0.45	0.20	0.08	0.02	0.7%
	3.30	9.05	0.20	0.69	0.40	0.20	0.08	0.06	1.6%
	3.70	9.15	0.30	0.83	0.41	0.30	0.12	0.10	2.9%
	4.10	9.10	0.25	1.44	0.40	0.25	0.10	0.14	4.2%
	4.50	9.05	0.20	1.13	0.40	0.20	0.08	0.09	2.7%
	4.90	9.15	0.30	1.15	0.41	0.30	0.12	0.14	4.1%
	5.30	9.15	0.30	1.32	0.40	0.30	0.12	0.16	4.6%
	5.70	9.15	0.30	1.31	0.40	0.30	0.12	0.16	4.6%
	6.10	9.25	0.40	1.50	0.41	0.40	0.16	0.24	7.0%
	6.50	9.25	0.40	1.69	0.40	0.40	0.16	0.27	7.9%
	6.90	9.15	0.30	1.70	0.41	0.30	0.12	0.20	6.0%
	7.30	9.10	0.25	1.75	0.40	0.25	0.10	0.18	5.1%
	7.70	9.20	0.35	1.88	0.41	0.35	0.14	0.26	7.7%
	8.10	9.15	0.30	1.72	0.40	0.30	0.12	0.21	6.1%
	8.50	9.25	0.40	1.94	0.41	0.40	0.16	0.31	9.1%
	8.90	9.25	0.40	1.72	0.40	0.40	0.16	0.28	8.1%
	9.30	9.15	0.30	1.24	0.41	0.30	0.12	0.15	4.4%
	9.70	9.15	0.30	1.20	0.40	0.30	0.12	0.14	4.2%
	10.10	9.20	0.35	1.03	0.40	0.35	0.14	0.14	4.2%
	10.50	9.15	0.30	0.87	0.40	0.30	0.12	0.10	3.1%
	10.90	9.05	0.20	0.12	0.41	0.20	0.08	0.01	0.3%
	11.30	9.00	0.15	0.36	0.40	0.15	0.06	0.02	0.6%
	11.70	8.95	0.10	0.19	0.40	0.10	0.04	0.01	0.2%
	12.10	8.95	0.10	0.30	0.40	0.10	0.04	0.01	0.4%
	12.50	8.95	0.10	0.13	0.40	0.10	0.04	0.01	0.2%
	12.90	8.90	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	13.30	8.90	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	13.70	8.90	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	14.10	8.90	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	14.50	8.90	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	14.90	8.90	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
	15.30	8.90	0.05	0.00	0.40	0.05	0.03	0.00	0.0%
W	15.90	8.85	0.00	0.00	0.60		0.00	0.00	0.0%
1 G	16.10	8.18			0.00		0.00	0.00	0.0%
TOTALS ----------					13.58	0.4 (Max.)	2.85	3.41	100.0%

Manning's n = 0.0499
Hydraulic Radius= 0.20956417

STREAM NAME: Douglas Creek
XS LOCATION: Dwnstr from Rio Blanco County Rd 138
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.85	2.85	0.0%
8.60	2.85	6.21	118.4%
8.62	2.85	5.94	108.9%
8.64	2.85	5.67	99.4%
8.66	2.85	5.40	89.9%
8.68	2.85	5.13	80.4%
8.70	2.85	4.86	70.9%
8.72	2.85	4.59	61.4%
8.74	2.85	4.32	51.9%
8.76	2.85	4.05	42.5%
8.78	2.85	3.78	33.0%
8.80	2.85	3.52	23.6%
8.81	2.85	3.38	18.9%
8.82	2.85	3.25	14.1%
8.83	2.85	3.11	9.4%
8.84	2.85	2.98	4.7%
8.85	2.85	2.85	0.0%
8.86	2.85	2.71	-4.7%
8.87	2.85	2.58	-9.3%
8.88	2.85	2.45	-13.9%
8.89	2.85	2.32	-18.4%
8.90	2.85	2.19	-22.9%
8.92	2.85	1.99	-30.1%
8.94	2.85	1.79	-37.1%
8.96	2.85	1.60	-43.7%
8.98	2.85	1.42	-49.9%
9.00	2.85	1.25	-56.0%
9.02	2.85	1.08	-61.9%
9.04	2.85	0.92	-67.6%
9.06	2.85	0.77	-73.1%
9.08	2.85	0.62	-78.2%
9.10	2.85	0.49	-83.0%

WATERLINE AT ZERO
AREA ERROR = 8.850

STREAM NAME: Douglas Creek
XS LOCATION: Dwnstr from Rio Blanco County Rd 138
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	8.18	14.20	0.85	1.07	12.01	15.24	100.0%	0.79	34.80	2.90
	8.20	14.16	0.83	1.05	11.73	15.18	99.6%	0.77	33.53	2.86
	8.25	14.06	0.78	1.00	11.02	15.03	98.6%	0.73	30.43	2.76
	8.30	13.96	0.74	0.95	10.32	14.88	97.6%	0.69	27.46	2.66
	8.35	13.87	0.69	0.90	9.63	14.73	96.7%	0.65	24.61	2.56
	8.40	13.77	0.65	0.85	8.94	14.58	95.7%	0.61	21.89	2.45
	8.45	13.67	0.60	0.80	8.25	14.43	94.7%	0.57	19.29	2.34
	8.50	13.60	0.56	0.75	7.57	14.30	93.8%	0.53	16.81	2.22
	8.55	13.57	0.51	0.70	6.89	14.20	93.2%	0.49	14.44	2.10
	8.60	13.54	0.46	0.65	6.21	14.10	92.5%	0.44	12.21	1.97
	8.65	13.51	0.41	0.60	5.54	13.99	91.8%	0.40	10.13	1.83
	8.70	13.49	0.36	0.55	4.86	13.89	91.1%	0.35	8.20	1.69
	8.75	13.46	0.31	0.50	4.19	13.78	90.4%	0.30	6.42	1.53
	8.80	13.43	0.26	0.45	3.52	13.68	89.8%	0.26	4.82	1.37
WL	8.85	13.40	0.21	0.40	2.84	13.58	89.1%	0.21	3.41	1.20
	8.90	10.30	0.21	0.35	2.19	10.46	68.6%	0.21	2.63	1.20
	8.95	9.00	0.19	0.30	1.69	9.15	60.0%	0.18	1.86	1.10
	9.00	8.50	0.15	0.25	1.25	8.63	56.6%	0.15	1.17	0.94
	9.05	7.60	0.11	0.20	0.84	7.72	50.6%	0.11	0.65	0.77
	9.10	6.60	0.07	0.15	0.49	6.70	43.9%	0.07	0.29	0.59
	9.15	3.80	0.05	0.10	0.20	3.86	25.4%	0.05	0.09	0.46
	9.20	1.60	0.04	0.05	0.06	1.62	10.7%	0.04	0.02	0.38
	9.25	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Douglas Creek
XS LOCATION: Dwnstr from Rio Blanco County Rd 138
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.41	cfs
CALCULATED FLOW (Qc)=	3.41	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	8.85	ft
CALCULATED WATERLINE (WLc)=	8.85	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=	1.20	ft/sec
MANNING'S N=	0.050	
SLOPE=	0.013	ft/ft
.4 * Qm =	1.4	cfs
2.5 * Qm=	8.5	cfs

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

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

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

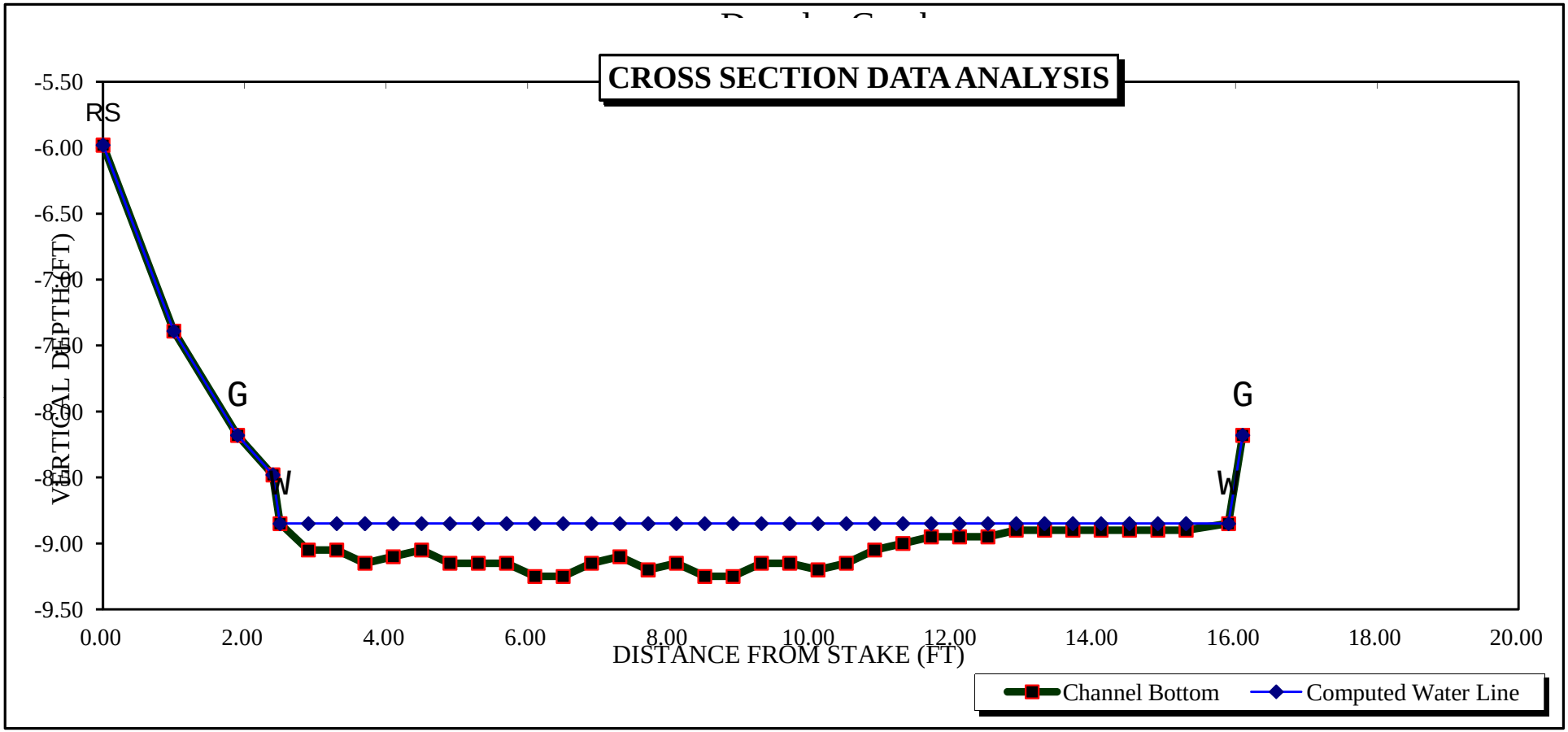
RECOMMENDATION BY: ……………………………………………… AGENCY………………………………………… DATE:……………………………

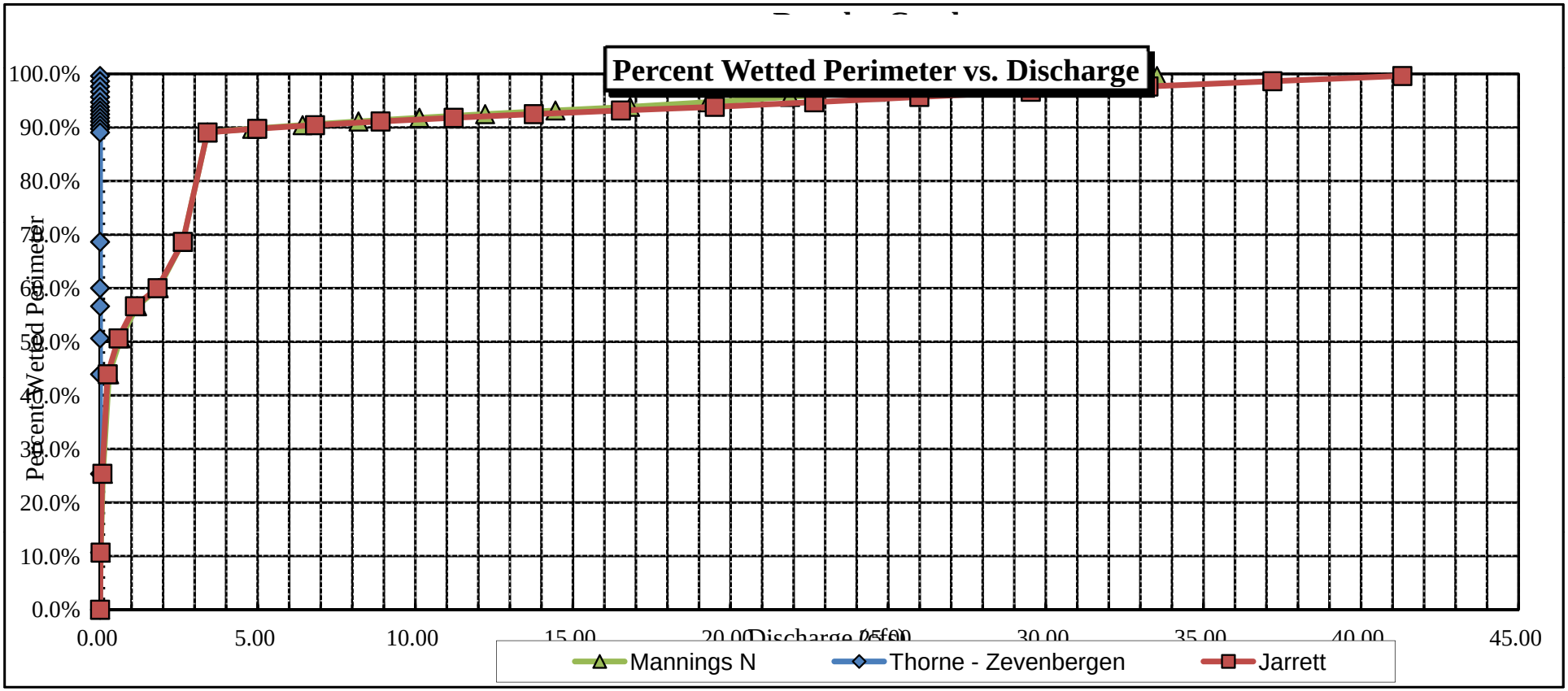
CWCB REVIEW BY: …………………………………………………………………………………………………… DATE:……………………………

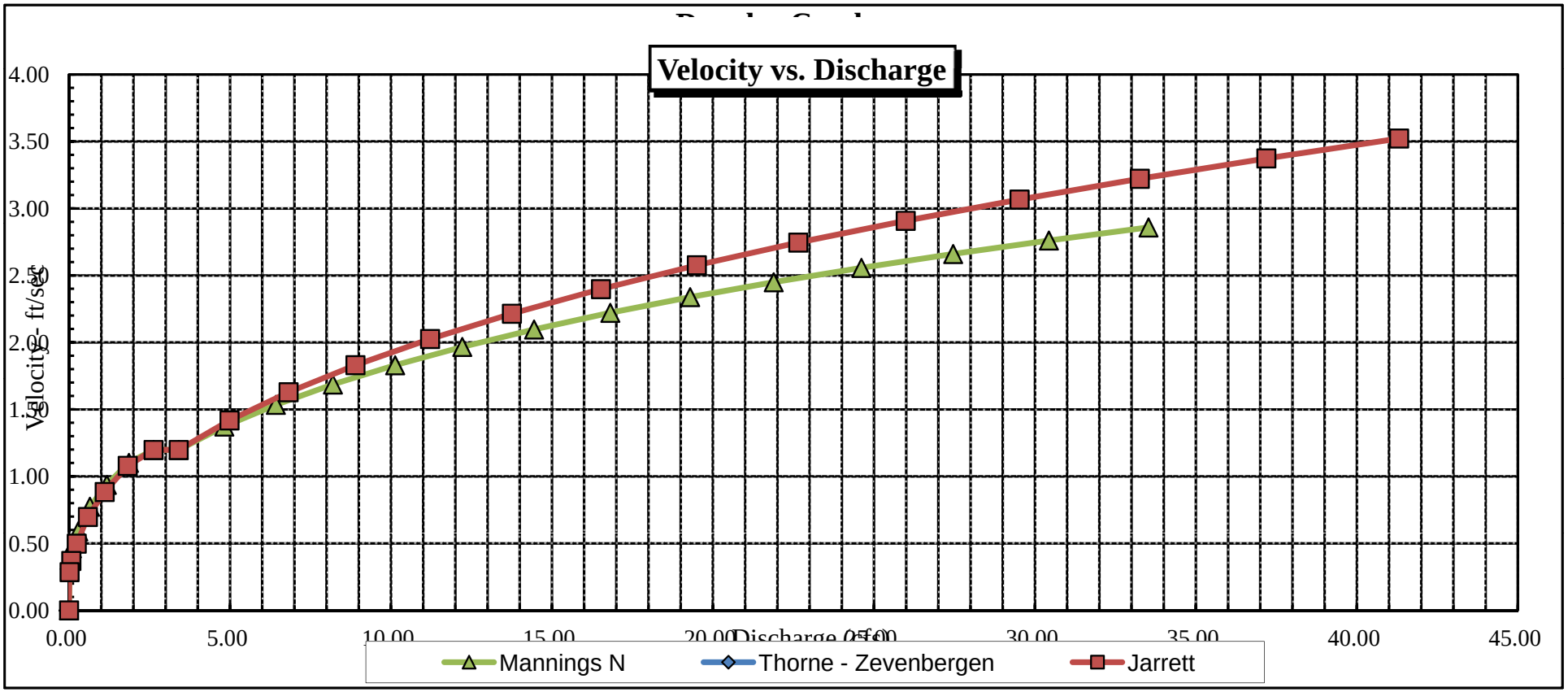
STREAM NAME: Douglas Creek
XS LOCATION: Dwnstr from Rio Blanco County Rd 138
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

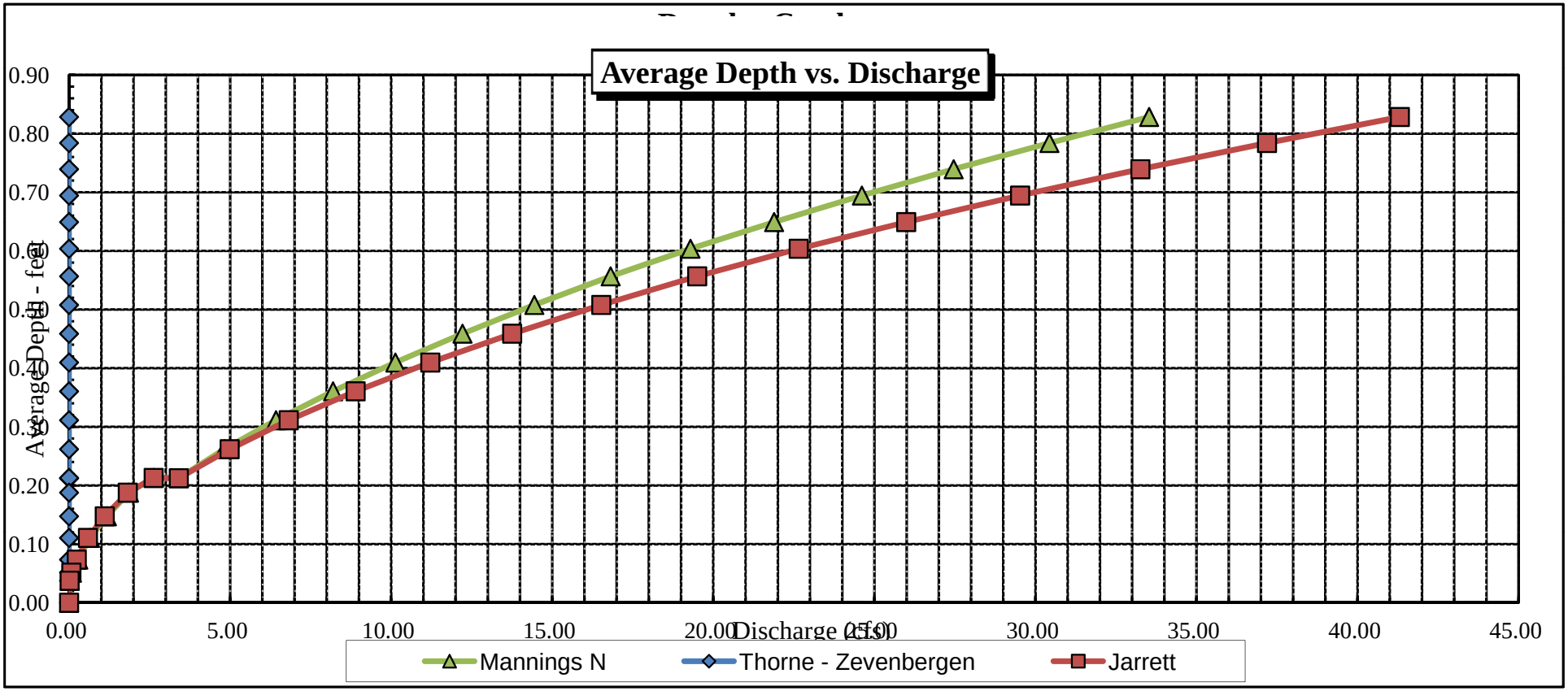
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

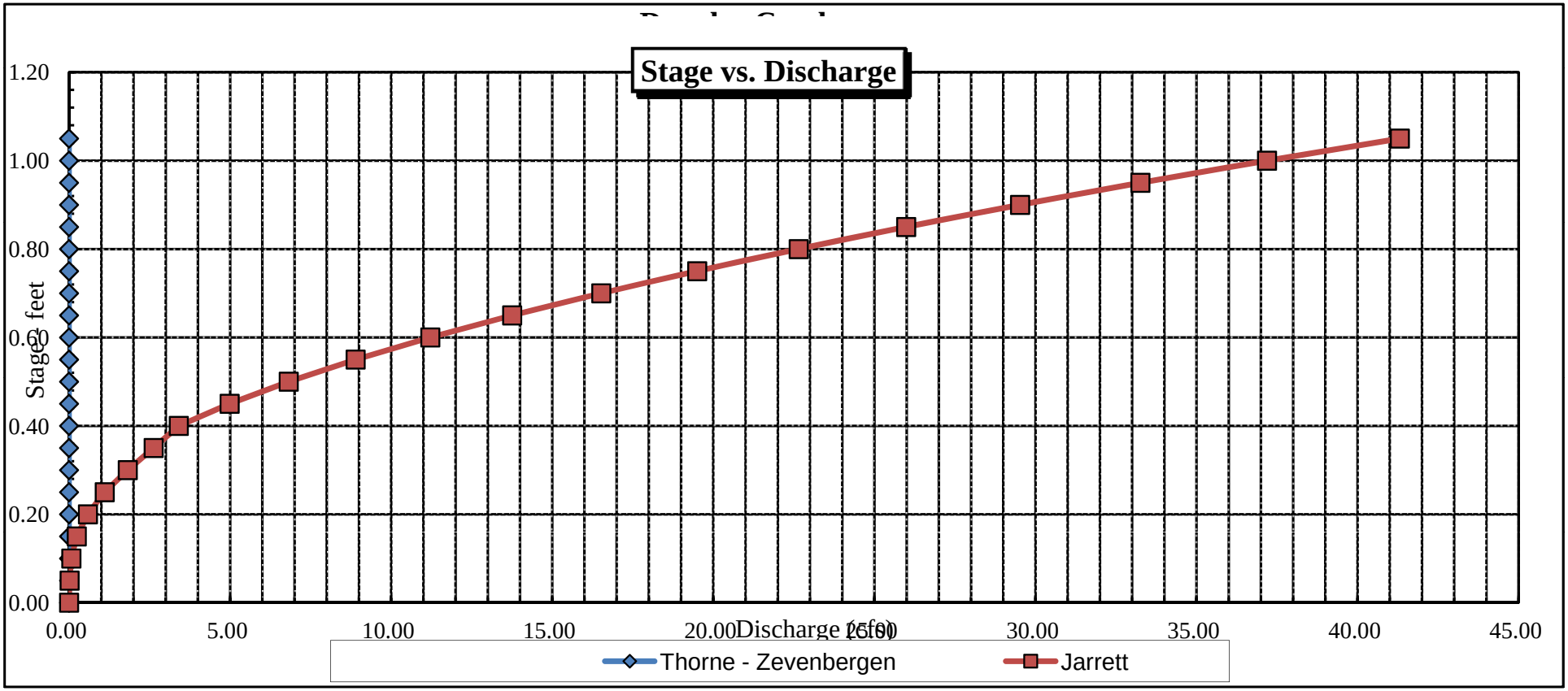
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	8.18	14.20	0.85	1.07	12.01	15.24	100.0%	0.79	43.01	3.58
	8.20	14.16	0.83	1.05	11.73	15.18	99.6%	0.77	41.31	3.52
	8.25	14.06	0.78	1.00	11.02	15.03	98.6%	0.73	37.19	3.37
	8.30	13.96	0.74	0.95	10.32	14.88	97.6%	0.69	33.26	3.22
	8.35	13.87	0.69	0.90	9.63	14.73	96.7%	0.65	29.52	3.07
	8.40	13.77	0.65	0.85	8.94	14.58	95.7%	0.61	25.99	2.91
	8.45	13.67	0.60	0.80	8.25	14.43	94.7%	0.57	22.65	2.75
	8.50	13.60	0.56	0.75	7.57	14.30	93.8%	0.53	19.50	2.58
	8.55	13.57	0.51	0.70	6.89	14.20	93.2%	0.49	16.52	2.40
	8.60	13.54	0.46	0.65	6.21	14.10	92.5%	0.44	13.76	2.21
	8.65	13.51	0.41	0.60	5.54	13.99	91.8%	0.40	11.21	2.03
	8.70	13.49	0.36	0.55	4.86	13.89	91.1%	0.35	8.90	1.83
	8.75	13.46	0.31	0.50	4.19	13.78	90.4%	0.30	6.82	1.63
	8.80	13.43	0.26	0.45	3.52	13.68	89.8%	0.26	4.98	1.42
WL	8.85	13.40	0.21	0.40	2.84	13.58	89.1%	0.21	3.41	1.20
	8.90	10.30	0.21	0.35	2.19	10.46	68.6%	0.21	2.63	1.20
	8.95	9.00	0.19	0.30	1.69	9.15	60.0%	0.18	1.82	1.08
	9.00	8.50	0.15	0.25	1.25	8.63	56.6%	0.15	1.11	0.88
	9.05	7.60	0.11	0.20	0.84	7.72	50.6%	0.11	0.59	0.70
	9.10	6.60	0.07	0.15	0.49	6.70	43.9%	0.07	0.24	0.50
	9.15	3.80	0.05	0.10	0.20	3.86	25.4%	0.05	0.07	0.37
	9.20	1.60	0.04	0.05	0.06	1.62	10.7%	0.04	0.02	0.29
	9.25	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
-9.00
-9.50
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


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


Velocity vs. Discharge
Velocity - ft/sec
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
30.00
35.00
40.00
45.00
Mannings N
Thorne - Zevenbergen
Jarrett


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
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


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

Data Input & Proofing

STREAM NAME:	Douglas Creek
XS LOCATION:	
XS NUMBER:	2
DATE:	4/23/2015
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NW
SECTION:	7
TWP:	1N
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	25317
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.012 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					
	RS	0.00	0.90			0.00	0.00	0.00
1	G	1.20	1.55			0.00	0.00	0.00
		1.50	3.08			0.00	0.00	0.00
	W	1.60	4.15	0.00	0.00	0.00	0.00	0.00
		2.00	4.45	0.30	0.83	0.14	0.11	4.15
		2.50	4.65	0.50	1.10	0.25	0.28	4.15
		3.00	4.75	0.60	1.40	0.30	0.42	4.15
		3.50	4.65	0.50	0.98	0.25	0.25	4.15
		4.00	4.50	0.35	0.78	0.18	0.14	4.15
		4.50	4.35	0.20	0.60	0.10	0.06	4.15
		5.00	4.25	0.10	0.52	0.05	0.03	4.15
		5.50	4.25	0.10	0.55	0.05	0.03	4.15
		6.00	4.35	0.20	1.06	0.10	0.11	4.15
		6.50	4.25	0.10	1.43	0.05	0.07	4.15
		7.00	4.25	0.10	1.37	0.05	0.07	4.15
		7.50	4.25	0.10	1.31	0.05	0.07	4.15
		8.00	4.25	0.10	1.32	0.05	0.07	4.15
		8.50	4.25	0.10	1.32	0.05	0.07	4.15
		9.00	4.25	0.10	1.41	0.05	0.07	4.15
		9.50	4.25	0.10	1.52	0.05	0.08	4.15
		10.00	4.35	0.20	1.27	0.10	0.13	4.15
		10.50	4.25	0.10	0.81	0.05	0.04	4.15
		11.00	4.25	0.10	0.79	0.05	0.04	4.15
		11.50	4.35	0.20	0.99	0.10	0.10	4.15
		12.00	4.50	0.35	1.81	0.18	0.32	4.15
		12.50	4.55	0.40	1.84	0.20	0.37	4.15
		13.00	4.60	0.45	1.05	0.23	0.24	4.15
		13.50	4.65	0.50	0.74	0.25	0.19	4.15
		14.00	4.65	0.50	0.98	0.25	0.25	4.15
		14.50	4.75	0.60	1.49	0.30	0.45	4.15
	W	15.00	4.15	0.00	0.00	0.00	0.00	0.00
1	G	15.20	1.55			0.00	0.00	0.00
	LS	17.70	0.70			0.00	0.00	0.00
					Totals	3.46	4.00	

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

LOCATION INFORMATION

STREAM NAME:	Douglas Creek
XS LOCATION:	0
XS NUMBER:	2
DATE:	23-Apr-15
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NW
SECTION:	7
TWP:	1N
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	25317
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.012

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

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

STREAM NAME: Douglas Creek
XS LOCATION: 0
XS NUMBER: 2

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
	RS	0.00	0.90			0.00		0.00	0.00	0.0%
1	G	1.20	1.55			0.00		0.00	0.00	0.0%
		1.50	3.08			0.00		0.00	0.00	0.0%
	W	1.60	4.15	0.00	0.00	0.00		0.00	0.00	0.0%
		2.00	4.45	0.30	0.83	0.50	0.30	0.14	0.11	2.8%
		2.50	4.65	0.50	1.10	0.54	0.50	0.25	0.28	6.9%
		3.00	4.75	0.60	1.40	0.51	0.60	0.30	0.42	10.5%
		3.50	4.65	0.50	0.98	0.51	0.50	0.25	0.25	6.1%
		4.00	4.50	0.35	0.78	0.52	0.35	0.18	0.14	3.4%
		4.50	4.35	0.20	0.60	0.52	0.20	0.10	0.06	1.5%
		5.00	4.25	0.10	0.52	0.51	0.10	0.05	0.03	0.7%
		5.50	4.25	0.10	0.55	0.50	0.10	0.05	0.03	0.7%
		6.00	4.35	0.20	1.06	0.51	0.20	0.10	0.11	2.7%
		6.50	4.25	0.10	1.43	0.51	0.10	0.05	0.07	1.8%
		7.00	4.25	0.10	1.37	0.50	0.10	0.05	0.07	1.7%
		7.50	4.25	0.10	1.31	0.50	0.10	0.05	0.07	1.6%
		8.00	4.25	0.10	1.32	0.50	0.10	0.05	0.07	1.7%
		8.50	4.25	0.10	1.32	0.50	0.10	0.05	0.07	1.7%
		9.00	4.25	0.10	1.41	0.50	0.10	0.05	0.07	1.8%
		9.50	4.25	0.10	1.52	0.50	0.10	0.05	0.08	1.9%
		10.00	4.35	0.20	1.27	0.51	0.20	0.10	0.13	3.2%
		10.50	4.25	0.10	0.81	0.51	0.10	0.05	0.04	1.0%
		11.00	4.25	0.10	0.79	0.50	0.10	0.05	0.04	1.0%
		11.50	4.35	0.20	0.99	0.51	0.20	0.10	0.10	2.5%
		12.00	4.50	0.35	1.81	0.52	0.35	0.18	0.32	7.9%
		12.50	4.55	0.40	1.84	0.50	0.40	0.20	0.37	9.2%
		13.00	4.60	0.45	1.05	0.50	0.45	0.23	0.24	5.9%
		13.50	4.65	0.50	0.74	0.50	0.50	0.25	0.19	4.6%
		14.00	4.65	0.50	0.98	0.50	0.50	0.25	0.25	6.1%
		14.50	4.75	0.60	1.49	0.51	0.60	0.30	0.45	11.2%
	W	15.00	4.15	0.00	0.00	0.78		0.00	0.00	0.0%
1	G	15.20	1.55			0.00		0.00	0.00	0.0%
	LS	17.70	0.70			0.00		0.00	0.00	0.0%
	TOTALS ----------					13.98	0.6 (Max.)	3.46	4.00	100.0%

Manning's n = 0.0556
Hydraulic Radius= 0.24745772

STREAM NAME: Douglas Creek
XS LOCATION: 0
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.46	3.46	0.0%
3.90	3.46	6.82	97.0%
3.92	3.46	6.55	89.2%
3.94	3.46	6.28	81.4%
3.96	3.46	6.01	73.7%
3.98	3.46	5.74	65.9%
4.00	3.46	5.47	58.1%
4.02	3.46	5.20	50.4%
4.04	3.46	4.94	42.6%
4.06	3.46	4.67	34.9%
4.08	3.46	4.40	27.1%
4.10	3.46	4.13	19.4%
4.11	3.46	4.00	15.5%
4.12	3.46	3.86	11.6%
4.13	3.46	3.73	7.7%
4.14	3.46	3.59	3.9%
4.15	3.46	3.46	0.0%
4.16	3.46	3.33	-3.9%
4.17	3.46	3.19	-7.7%
4.18	3.46	3.06	-11.6%
4.19	3.46	2.93	-15.4%
4.20	3.46	2.79	-19.3%
4.22	3.46	2.53	-27.0%
4.24	3.46	2.26	-34.6%
4.26	3.46	2.04	-41.0%
4.28	3.46	1.87	-46.0%
4.30	3.46	1.71	-50.5%
4.32	3.46	1.57	-54.7%
4.34	3.46	1.43	-58.5%
4.36	3.46	1.31	-62.0%
4.38	3.46	1.20	-65.4%
4.40	3.46	1.09	-68.6%

WATERLINE AT ZERO
AREA ERROR = 4.150

STREAM NAME: Douglas Creek
XS LOCATION: 0
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	1.55	14.00	2.79	3.20	39.00	19.22	100.0%	2.03	183.12	4.70
	3.15	13.57	1.25	1.60	16.95	15.99	83.2%	1.06	51.61	3.05
	3.20	13.56	1.20	1.55	16.27	15.89	82.7%	1.02	48.42	2.98
	3.25	13.55	1.15	1.50	15.59	15.79	82.1%	0.99	45.29	2.91
	3.30	13.54	1.10	1.45	14.91	15.69	81.6%	0.95	42.24	2.83
	3.35	13.54	1.05	1.40	14.23	15.59	81.1%	0.91	39.26	2.76
	3.40	13.53	1.00	1.35	13.56	15.49	80.6%	0.88	36.36	2.68
	3.45	13.52	0.95	1.30	12.88	15.39	80.0%	0.84	33.53	2.60
	3.50	13.51	0.90	1.25	12.21	15.29	79.5%	0.80	30.78	2.52
	3.55	13.50	0.85	1.20	11.53	15.19	79.0%	0.76	28.12	2.44
	3.60	13.49	0.80	1.15	10.86	15.09	78.5%	0.72	25.54	2.35
	3.65	13.49	0.75	1.10	10.18	14.99	78.0%	0.68	23.06	2.26
	3.70	13.48	0.71	1.05	9.51	14.89	77.4%	0.64	20.66	2.17
	3.75	13.47	0.66	1.00	8.83	14.79	76.9%	0.60	18.36	2.08
	3.80	13.46	0.61	0.95	8.16	14.68	76.4%	0.56	16.16	1.98
	3.85	13.45	0.56	0.90	7.49	14.58	75.9%	0.51	14.07	1.88
	3.90	13.44	0.51	0.85	6.82	14.48	75.3%	0.47	12.08	1.77
	3.95	13.43	0.46	0.80	6.14	14.38	74.8%	0.43	10.21	1.66
	4.00	13.43	0.41	0.75	5.47	14.28	74.3%	0.38	8.46	1.55
	4.05	13.42	0.36	0.70	4.80	14.18	73.8%	0.34	6.83	1.42
	4.10	13.41	0.31	0.65	4.13	14.08	73.3%	0.29	5.34	1.29
WL	4.15	13.40	0.26	0.60	3.46	13.98	72.7%	0.25	4.00	1.15
	4.20	13.29	0.21	0.55	2.79	13.83	72.0%	0.20	2.82	1.01
	4.25	9.18	0.23	0.50	2.13	9.69	50.4%	0.22	2.28	1.07
	4.30	7.58	0.23	0.45	1.71	8.01	41.7%	0.21	1.79	1.05
	4.35	5.97	0.23	0.40	1.37	6.33	32.9%	0.22	1.45	1.06
	4.40	5.52	0.20	0.35	1.09	5.83	30.3%	0.19	1.04	0.96
	4.45	5.08	0.16	0.30	0.82	5.34	27.8%	0.15	0.69	0.84
	4.50	4.58	0.13	0.25	0.58	4.79	24.9%	0.12	0.42	0.72
	4.55	3.75	0.10	0.20	0.37	3.91	20.4%	0.09	0.23	0.61
	4.60	2.92	0.07	0.15	0.20	3.04	15.8%	0.07	0.10	0.48
	4.65	1.58	0.05	0.10	0.08	1.66	8.6%	0.05	0.03	0.39
	4.70	0.79	0.02	0.05	0.02	0.83	4.3%	0.02	0.00	0.24

STREAM NAME: Douglas Creek
XS LOCATION: 0
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.00	cfs
CALCULATED FLOW (Qc)=	4.00	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.15	ft
CALCULATED WATERLINE (WLc)=	4.15	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.60	ft
MAX CALCULATED DEPTH (Dc)=	0.60	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.15	ft/sec
MANNING'S N=	0.056	
SLOPE=	0.012	ft/ft
.4 * Qm =	1.6	cfs
2.5 * Qm=	10.0	cfs

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

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

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

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

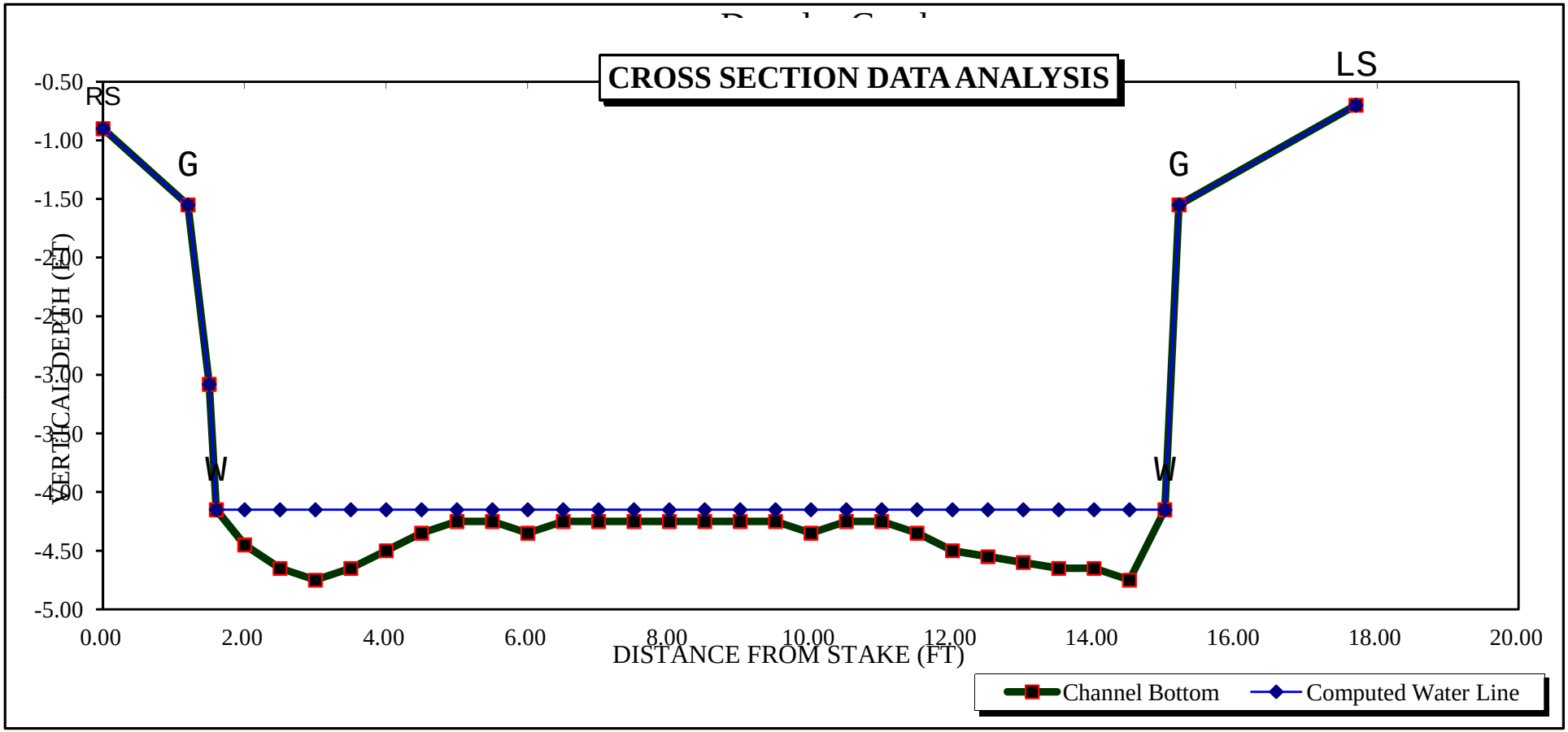
CWCB REVIEW BY: ..……………………………...……………………………………………………...…............. DATE:.................…………….....

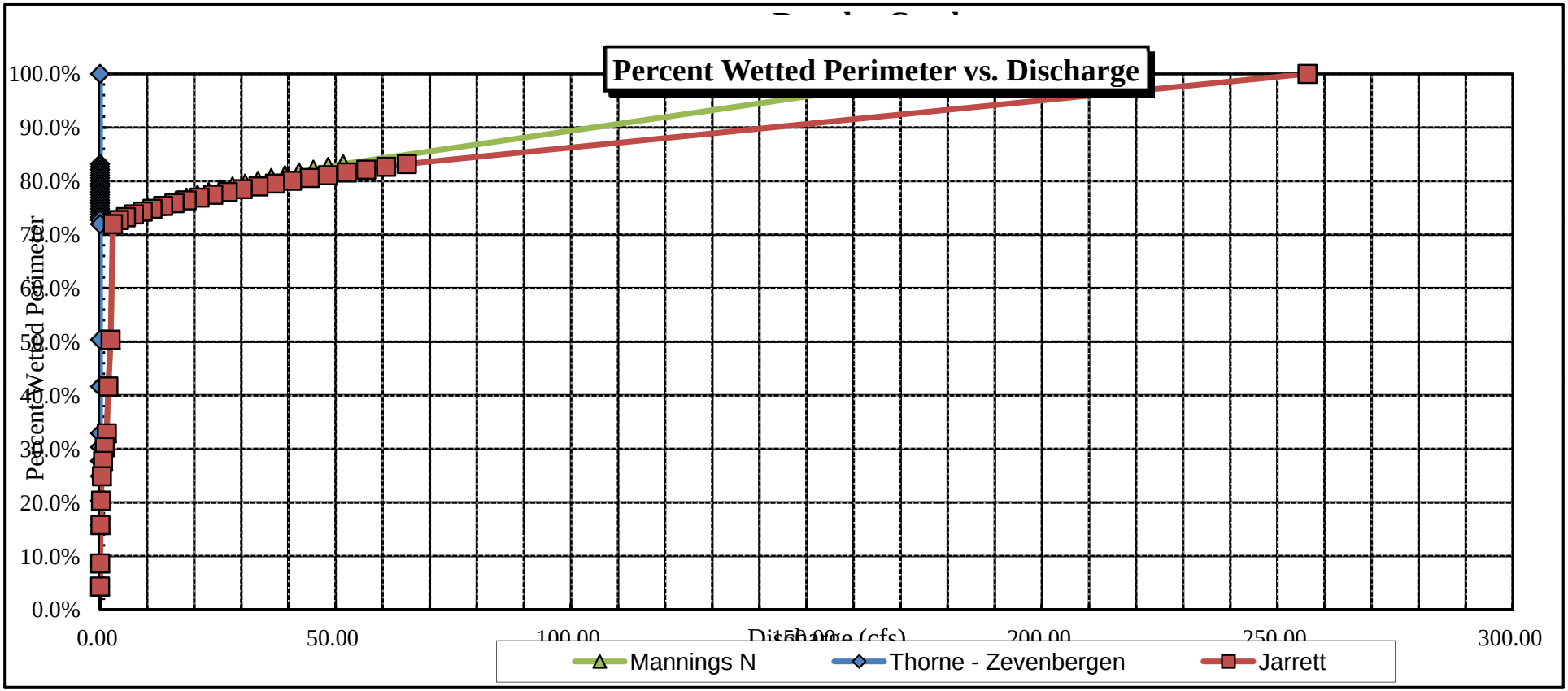
STREAM NAME: Douglas Creek
XS LOCATION: 0
XS NUMBER: 2

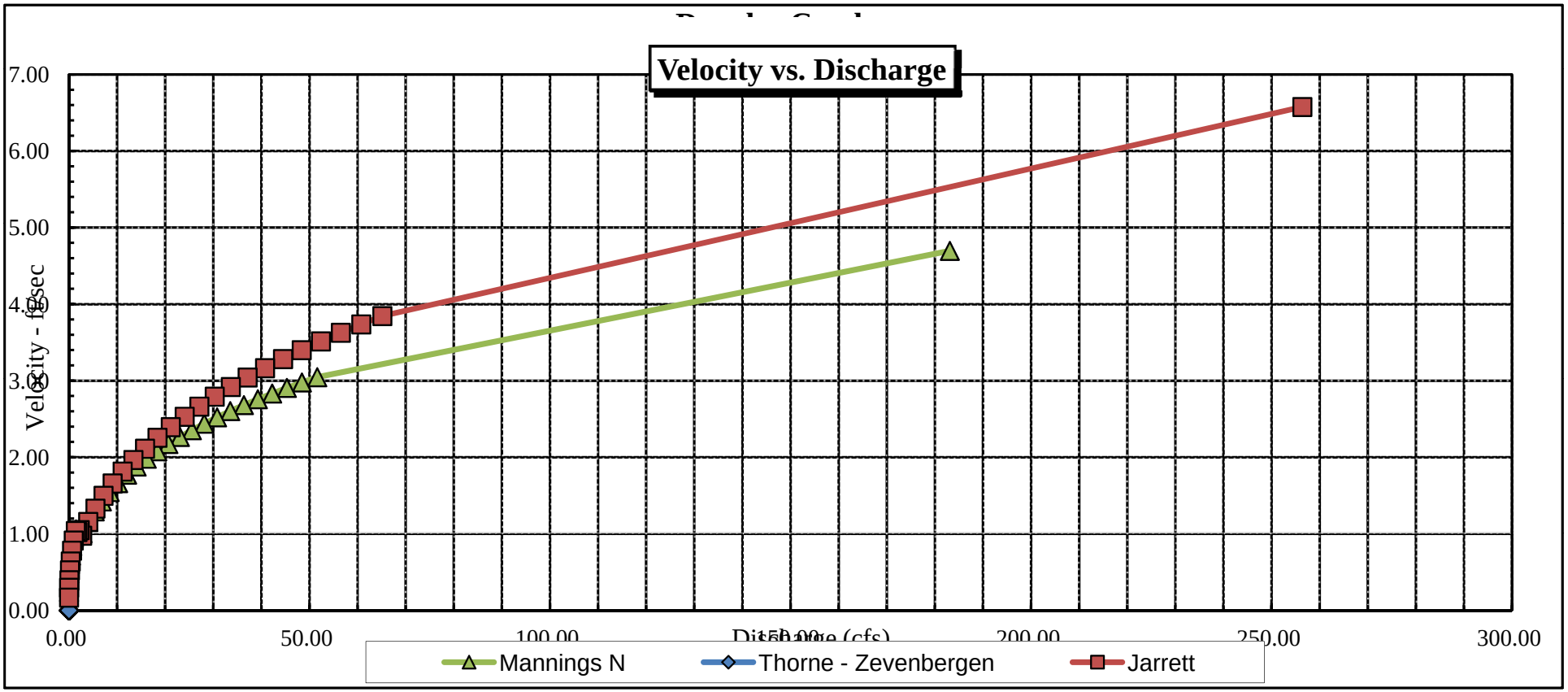
Jarrett Variable Manning's n Correction Applied

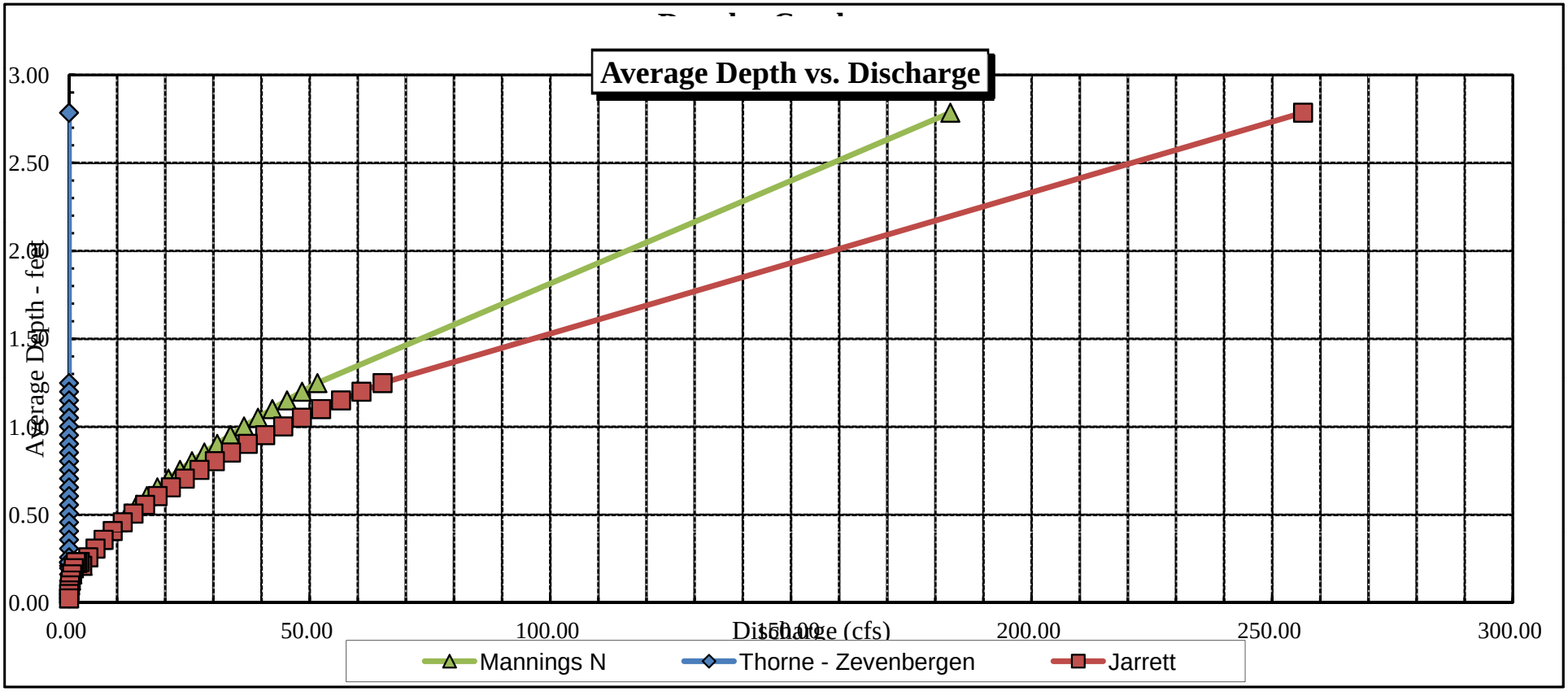
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

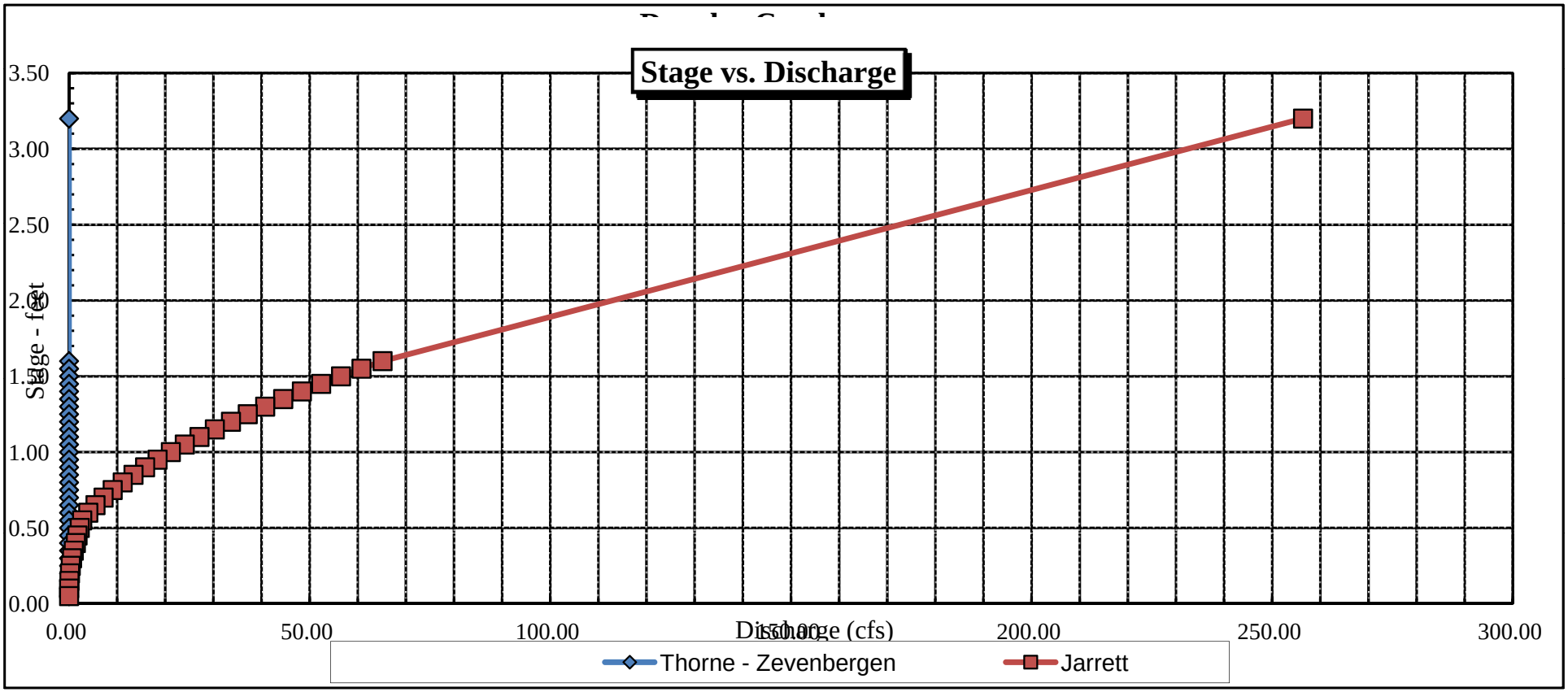
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	1.55	14.00	2.79	3.20	39.00	19.22	100.0%	2.03	256.40	6.58
	3.15	13.57	1.25	1.60	16.95	15.99	83.2%	1.06	65.14	3.84
	3.20	13.56	1.20	1.55	16.27	15.89	82.7%	1.02	60.77	3.74
	3.25	13.55	1.15	1.50	15.59	15.79	82.1%	0.99	56.52	3.63
	3.30	13.54	1.10	1.45	14.91	15.69	81.6%	0.95	52.39	3.51
	3.35	13.54	1.05	1.40	14.23	15.59	81.1%	0.91	48.38	3.40
	3.40	13.53	1.00	1.35	13.56	15.49	80.6%	0.88	44.50	3.28
	3.45	13.52	0.95	1.30	12.88	15.39	80.0%	0.84	40.75	3.16
	3.50	13.51	0.90	1.25	12.21	15.29	79.5%	0.80	37.13	3.04
	3.55	13.50	0.85	1.20	11.53	15.19	79.0%	0.76	33.65	2.92
	3.60	13.49	0.80	1.15	10.86	15.09	78.5%	0.72	30.30	2.79
	3.65	13.49	0.75	1.10	10.18	14.99	78.0%	0.68	27.10	2.66
	3.70	13.48	0.71	1.05	9.51	14.89	77.4%	0.64	24.05	2.53
	3.75	13.47	0.66	1.00	8.83	14.79	76.9%	0.60	21.14	2.39
	3.80	13.46	0.61	0.95	8.16	14.68	76.4%	0.56	18.40	2.25
	3.85	13.45	0.56	0.90	7.49	14.58	75.9%	0.51	15.81	2.11
	3.90	13.44	0.51	0.85	6.82	14.48	75.3%	0.47	13.39	1.96
	3.95	13.43	0.46	0.80	6.14	14.38	74.8%	0.43	11.14	1.81
	4.00	13.43	0.41	0.75	5.47	14.28	74.3%	0.38	9.07	1.66
	4.05	13.42	0.36	0.70	4.80	14.18	73.8%	0.34	7.18	1.50
	4.10	13.41	0.31	0.65	4.13	14.08	73.3%	0.29	5.49	1.33
WL	4.15	13.40	0.26	0.60	3.46	13.98	72.7%	0.25	4.00	1.15
	4.20	13.29	0.21	0.55	2.79	13.83	72.0%	0.20	2.73	0.98
	4.25	9.18	0.23	0.50	2.13	9.69	50.4%	0.22	2.23	1.05
	4.30	7.58	0.23	0.45	1.71	8.01	41.7%	0.21	1.75	1.02
	4.35	5.97	0.23	0.40	1.37	6.33	32.9%	0.22	1.42	1.04
	4.40	5.52	0.20	0.35	1.09	5.83	30.3%	0.19	0.99	0.91
	4.45	5.08	0.16	0.30	0.82	5.34	27.8%	0.15	0.64	0.78
	4.50	4.58	0.13	0.25	0.58	4.79	24.9%	0.12	0.37	0.64
	4.55	3.75	0.10	0.20	0.37	3.91	20.4%	0.09	0.19	0.52
	4.60	2.92	0.07	0.15	0.20	3.04	15.8%	0.07	0.08	0.39
	4.65	1.58	0.05	0.10	0.08	1.66	8.6%	0.05	0.02	0.30
	4.70	0.79	0.02	0.05	0.02	0.83	4.3%	0.02	0.00	0.17


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
50.00
100.00
150.00
200.00
250.00
300.00
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
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Douglas Creek
XS LOCATION:	Downstr from Rio Blanco Cty Rd 138
XS NUMBER:	1
DATE:	4/23/2015
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NE
SECTION:	18
TWP:	1N
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	25317
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.012 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					
	RS	0.00	4.50			0.00	0.00	0.00
1	G	1.10	5.40			0.00	0.00	0.00
		2.00	6.02			0.00	0.00	0.00
		2.50	6.62			0.00	0.00	0.00
	W	3.20	7.80	0.00	0.00	0.00	0.00	0.00
		3.50	8.10	0.30	1.09	0.12	0.13	7.80
		4.00	8.05	0.25	1.15	0.13	0.14	7.80
		4.50	8.00	0.20	1.14	0.10	0.11	7.80
		5.00	8.10	0.30	0.69	0.15	0.10	7.80
		5.50	8.05	0.25	0.76	0.13	0.10	7.80
		6.00	8.00	0.20	0.98	0.10	0.10	7.80
		6.50	8.10	0.30	1.65	0.15	0.25	7.80
		7.00	8.10	0.30	1.73	0.15	0.26	7.80
		7.50	8.00	0.20	1.74	0.10	0.17	7.80
		8.00	8.00	0.20	1.34	0.10	0.13	7.80
		8.50	8.05	0.25	1.28	0.13	0.16	7.80
		9.00	8.10	0.30	1.45	0.15	0.22	7.80
		9.50	8.10	0.30	1.46	0.15	0.22	7.80
		10.00	8.10	0.30	1.53	0.15	0.23	7.80
		10.50	8.10	0.30	1.52	0.15	0.23	7.80
		11.00	8.10	0.30	1.55	0.15	0.23	7.80
		11.50	8.15	0.35	1.45	0.18	0.25	7.80
		12.00	8.15	0.35	1.51	0.18	0.26	7.80
		12.50	8.10	0.30	1.59	0.15	0.24	7.80
		13.00	8.10	0.30	1.59	0.15	0.24	7.80
		13.50	8.10	0.30	1.57	0.15	0.24	7.80
		14.00	8.10	0.30	1.51	0.15	0.23	7.80
		14.50	8.10	0.30	1.12	0.15	0.17	7.80
		15.00	8.10	0.30	1.32	0.15	0.20	7.80
		15.50	8.15	0.35	1.30	0.18	0.23	7.80
	W	16.00	7.80	0.00	0.00	0.00	0.00	0.00
		17.50	6.34			0.00	0.00	0.00
1	RS&G	20.30	5.45			0.00	0.00	0.00
					Totals	3.52	4.84	

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

LOCATION INFORMATION

STREAM NAME:	Douglas Creek
XS LOCATION:	Downstr from Rio Blanco Cty Rd 138
XS NUMBER:	1
DATE:	23-Apr-15
OBSERVERS:	R. Smith, K. Sauter
1/4 SEC:	NE
SECTION:	18
TWP:	1N
RANGE:	101W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	25317
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.012

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

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

STREAM NAME: Douglas Creek
XS LOCATION: Downstr from Rio Blanco Cty Rd 138
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
RS	0.00	4.50			0.00		0.00	0.00	0.0%
1 G	1.10	5.40			0.00		0.00	0.00	0.0%
	2.00	6.02			0.00		0.00	0.00	0.0%
	2.50	6.62			0.00		0.00	0.00	0.0%
W	3.20	7.80	0.00	0.00	0.00		0.00	0.00	0.0%
	3.50	8.10	0.30	1.09	0.42	0.30	0.12	0.13	2.7%
	4.00	8.05	0.25	1.15	0.50	0.25	0.13	0.14	3.0%
	4.50	8.00	0.20	1.14	0.50	0.20	0.10	0.11	2.4%
	5.00	8.10	0.30	0.69	0.51	0.30	0.15	0.10	2.1%
	5.50	8.05	0.25	0.76	0.50	0.25	0.13	0.10	2.0%
	6.00	8.00	0.20	0.98	0.50	0.20	0.10	0.10	2.0%
	6.50	8.10	0.30	1.65	0.51	0.30	0.15	0.25	5.1%
	7.00	8.10	0.30	1.73	0.50	0.30	0.15	0.26	5.4%
	7.50	8.00	0.20	1.74	0.51	0.20	0.10	0.17	3.6%
	8.00	8.00	0.20	1.34	0.50	0.20	0.10	0.13	2.8%
	8.50	8.05	0.25	1.28	0.50	0.25	0.13	0.16	3.3%
	9.00	8.10	0.30	1.45	0.50	0.30	0.15	0.22	4.5%
	9.50	8.10	0.30	1.46	0.50	0.30	0.15	0.22	4.5%
	10.00	8.10	0.30	1.53	0.50	0.30	0.15	0.23	4.7%
	10.50	8.10	0.30	1.52	0.50	0.30	0.15	0.23	4.7%
	11.00	8.10	0.30	1.55	0.50	0.30	0.15	0.23	4.8%
	11.50	8.15	0.35	1.45	0.50	0.35	0.18	0.25	5.2%
	12.00	8.15	0.35	1.51	0.50	0.35	0.18	0.26	5.5%
	12.50	8.10	0.30	1.59	0.50	0.30	0.15	0.24	4.9%
	13.00	8.10	0.30	1.59	0.50	0.30	0.15	0.24	4.9%
	13.50	8.10	0.30	1.57	0.50	0.30	0.15	0.24	4.9%
	14.00	8.10	0.30	1.51	0.50	0.30	0.15	0.23	4.7%
	14.50	8.10	0.30	1.12	0.50	0.30	0.15	0.17	3.5%
	15.00	8.10	0.30	1.32	0.50	0.30	0.15	0.20	4.1%
	15.50	8.15	0.35	1.30	0.50	0.35	0.18	0.23	4.7%
W	16.00	7.80	0.00	0.00	0.61		0.00	0.00	0.0%
	17.50	6.34			0.00		0.00	0.00	0.0%
1 RS&G	20.30	5.45			0.00		0.00	0.00	0.0%
TOTALS ----------					13.09	0.35 (Max.)	3.52	4.84	100.0%

Manning's n = 0.0494
Hydraulic Radius= 0.26897451

STREAM NAME: Douglas Creek
XS LOCATION: Downstr from Rio Blanco Cty Rd 138
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.52	3.52	0.0%
7.55	3.52	6.77	92.3%
7.57	3.52	6.51	84.9%
7.59	3.52	6.24	77.4%
7.61	3.52	5.98	69.9%
7.63	3.52	5.72	62.5%
7.65	3.52	5.46	55.1%
7.67	3.52	5.20	47.7%
7.69	3.52	4.94	40.3%
7.71	3.52	4.68	32.9%
7.73	3.52	4.42	25.6%
7.75	3.52	4.16	18.2%
7.76	3.52	4.03	14.6%
7.77	3.52	3.90	10.9%
7.78	3.52	3.78	7.3%
7.79	3.52	3.65	3.6%
7.80	3.52	3.52	0.0%
7.81	3.52	3.39	-3.6%
7.82	3.52	3.26	-7.3%
7.83	3.52	3.14	-10.9%
7.84	3.52	3.01	-14.5%
7.85	3.52	2.88	-18.1%
7.87	3.52	2.63	-25.3%
7.89	3.52	2.38	-32.4%
7.91	3.52	2.13	-39.6%
7.93	3.52	1.88	-46.7%
7.95	3.52	1.63	-53.8%
7.97	3.52	1.38	-60.8%
7.99	3.52	1.13	-67.8%
8.01	3.52	0.89	-74.6%
8.03	3.52	0.68	-80.8%
8.05	3.52	0.48	-86.4%

WATERLINE AT ZERO
AREA ERROR = 7.800

STREAM NAME: Douglas Creek
XS LOCATION: Downstr from Rio Blanco Cty Rd 138
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	5.45	19.13	2.05	2.70	39.18	21.28	100.0%	1.84	194.13	4.95
	6.80	14.42	1.19	1.35	17.13	15.68	73.7%	1.09	59.92	3.50
	6.85	14.34	1.14	1.30	16.41	15.55	73.1%	1.06	56.10	3.42
	6.90	14.26	1.10	1.25	15.70	15.42	72.5%	1.02	52.38	3.34
	6.95	14.18	1.06	1.20	14.99	15.29	71.9%	0.98	48.76	3.25
	7.00	14.10	1.01	1.15	14.28	15.16	71.3%	0.94	45.24	3.17
	7.05	14.02	0.97	1.10	13.58	15.03	70.7%	0.90	41.83	3.08
	7.10	13.93	0.92	1.05	12.88	14.90	70.1%	0.86	38.52	2.99
	7.15	13.85	0.88	1.00	12.18	14.77	69.4%	0.82	35.33	2.90
	7.20	13.77	0.83	0.95	11.49	14.64	68.8%	0.78	32.24	2.81
	7.25	13.69	0.79	0.90	10.81	14.51	68.2%	0.74	29.27	2.71
	7.30	13.61	0.74	0.85	10.12	14.38	67.6%	0.70	26.41	2.61
	7.35	13.53	0.70	0.80	9.44	14.26	67.0%	0.66	23.67	2.51
	7.40	13.45	0.65	0.75	8.77	14.13	66.4%	0.62	21.05	2.40
	7.45	13.37	0.61	0.70	8.10	14.00	65.8%	0.58	18.55	2.29
	7.50	13.29	0.56	0.65	7.43	13.87	65.2%	0.54	16.18	2.18
	7.55	13.21	0.51	0.60	6.77	13.74	64.6%	0.49	13.93	2.06
	7.60	13.12	0.47	0.55	6.11	13.61	64.0%	0.45	11.82	1.93
	7.65	13.04	0.42	0.50	5.46	13.48	63.3%	0.41	9.85	1.81
	7.70	12.96	0.37	0.45	4.81	13.35	62.7%	0.36	8.03	1.67
	7.75	12.88	0.32	0.40	4.16	13.22	62.1%	0.31	6.35	1.53
WL	7.80	12.80	0.28	0.35	3.52	13.09	61.5%	0.27	4.84	1.37
	7.85	12.68	0.23	0.30	2.88	12.93	60.8%	0.22	3.50	1.21
	7.90	12.56	0.18	0.25	2.25	12.77	60.0%	0.18	2.34	1.04
	7.95	12.44	0.13	0.20	1.63	12.61	59.3%	0.13	1.37	0.84
	8.00	11.81	0.09	0.15	1.01	11.96	56.2%	0.08	0.64	0.63
	8.05	9.44	0.05	0.10	0.48	9.52	44.8%	0.05	0.21	0.45
	8.10	2.07	0.03	0.05	0.06	2.09	9.8%	0.03	0.02	0.32
	8.15	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Douglas Creek
XS LOCATION: Downstr from Rio Blanco Cty Rd 138
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.84	cfs
CALCULATED FLOW (Qc)=	4.84	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.80	ft
CALCULATED WATERLINE (WLc)=	7.80	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.37	ft/sec
MANNING'S N=	0.049	
SLOPE=	0.012	ft/ft
.4 * Qm =	1.9	cfs
2.5 * Qm=	12.1	cfs

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

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

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

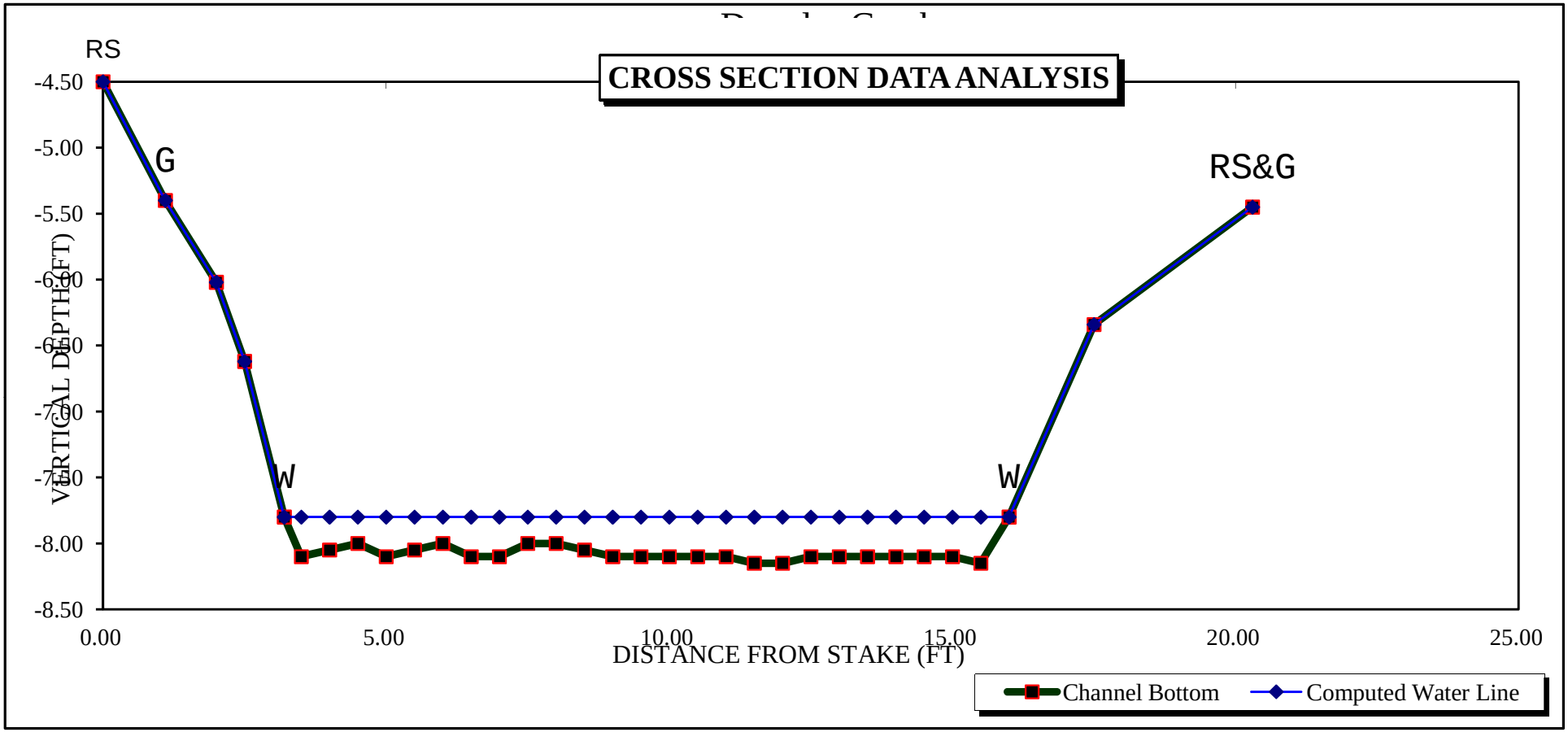
RECOMMENDATION BY: ……………………………………………… AGENCY…………………………………………… DATE:……………………………

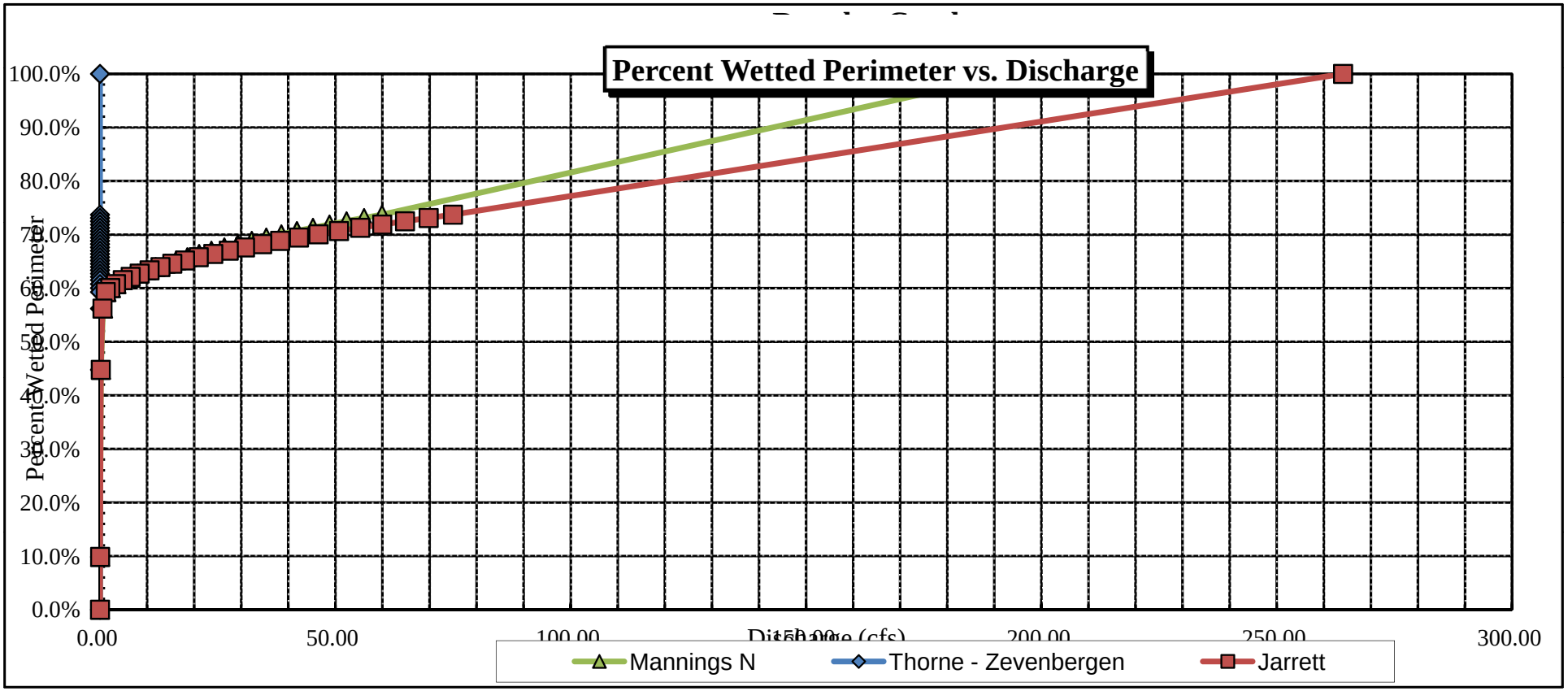
CWCB REVIEW BY: ……………………………………………………………………………………………… DATE:……………………………

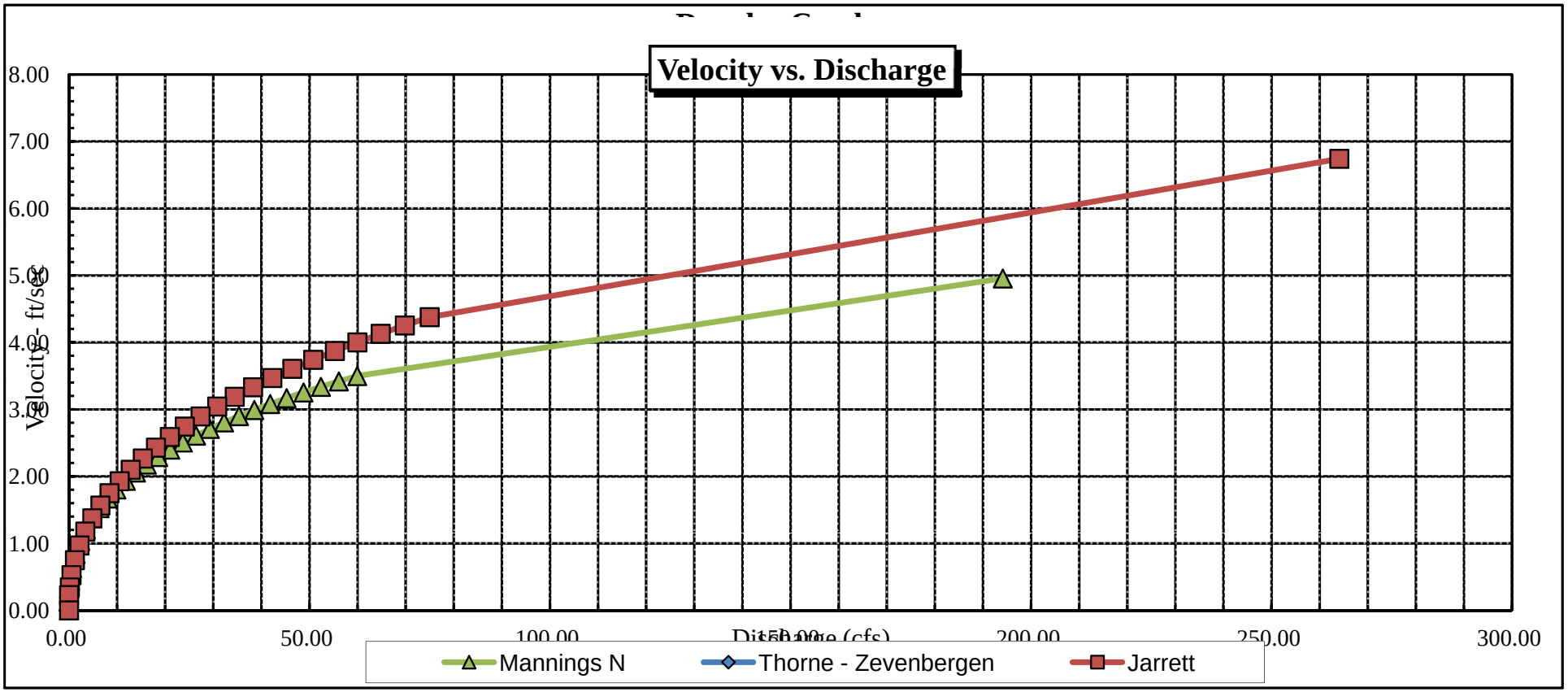
STREAM NAME: Douglas Creek
XS LOCATION: Downstr from Rio Blanco Cty Rd 138
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

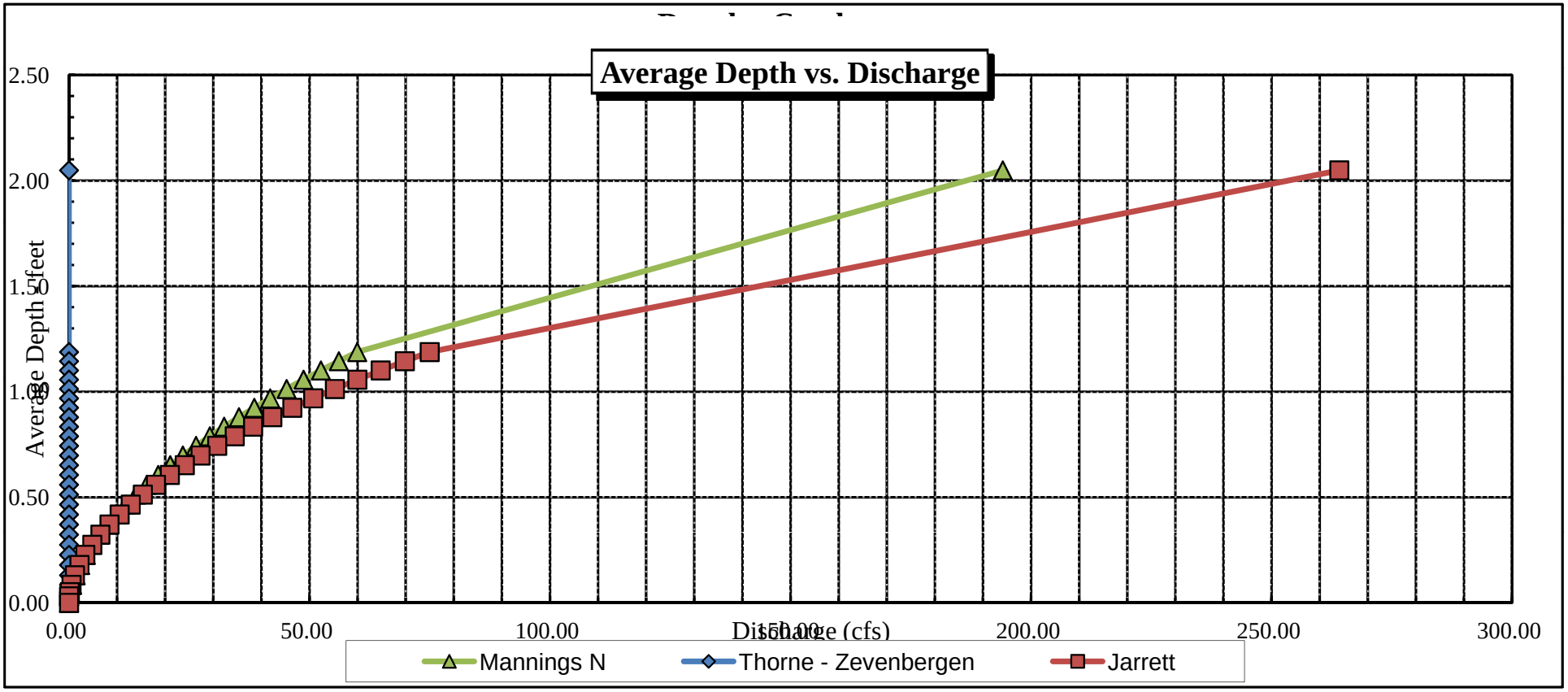
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

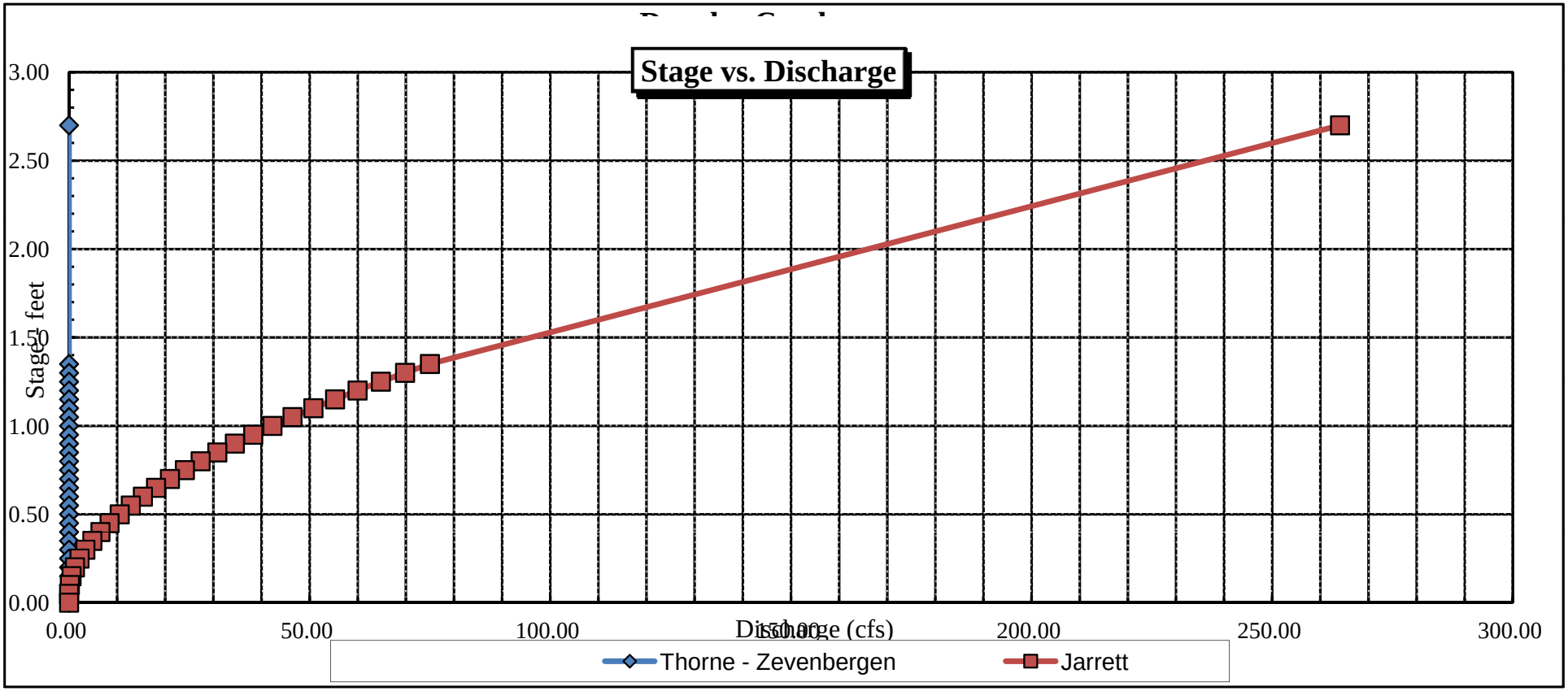
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.45	19.13	2.05	2.70	39.18	21.28	100.0%	1.84	264.10	6.74
	6.80	14.42	1.19	1.35	17.13	15.68	73.7%	1.09	74.98	4.38
	6.85	14.34	1.14	1.30	16.41	15.55	73.1%	1.06	69.81	4.25
	6.90	14.26	1.10	1.25	15.70	15.42	72.5%	1.02	64.80	4.13
	6.95	14.18	1.06	1.20	14.99	15.29	71.9%	0.98	59.96	4.00
	7.00	14.10	1.01	1.15	14.28	15.16	71.3%	0.94	55.28	3.87
	7.05	14.02	0.97	1.10	13.58	15.03	70.7%	0.90	50.77	3.74
	7.10	13.93	0.92	1.05	12.88	14.90	70.1%	0.86	46.43	3.61
	7.15	13.85	0.88	1.00	12.18	14.77	69.4%	0.82	42.26	3.47
	7.20	13.77	0.83	0.95	11.49	14.64	68.8%	0.78	38.27	3.33
	7.25	13.69	0.79	0.90	10.81	14.51	68.2%	0.74	34.45	3.19
	7.30	13.61	0.74	0.85	10.12	14.38	67.6%	0.70	30.80	3.04
	7.35	13.53	0.70	0.80	9.44	14.26	67.0%	0.66	27.34	2.90
	7.40	13.45	0.65	0.75	8.77	14.13	66.4%	0.62	24.06	2.74
	7.45	13.37	0.61	0.70	8.10	14.00	65.8%	0.58	20.97	2.59
	7.50	13.29	0.56	0.65	7.43	13.87	65.2%	0.54	18.06	2.43
	7.55	13.21	0.51	0.60	6.77	13.74	64.6%	0.49	15.35	2.27
	7.60	13.12	0.47	0.55	6.11	13.61	64.0%	0.45	12.84	2.10
	7.65	13.04	0.42	0.50	5.46	13.48	63.3%	0.41	10.52	1.93
	7.70	12.96	0.37	0.45	4.81	13.35	62.7%	0.36	8.41	1.75
	7.75	12.88	0.32	0.40	4.16	13.22	62.1%	0.31	6.52	1.57
WL	7.80	12.80	0.28	0.35	3.52	13.09	61.5%	0.27	4.84	1.37
	7.85	12.68	0.23	0.30	2.88	12.93	60.8%	0.22	3.39	1.18
	7.90	12.56	0.18	0.25	2.25	12.77	60.0%	0.18	2.18	0.97
	7.95	12.44	0.13	0.20	1.63	12.61	59.3%	0.13	1.22	0.75
	8.00	11.81	0.09	0.15	1.01	11.96	56.2%	0.08	0.53	0.53
	8.05	9.44	0.05	0.10	0.48	9.52	44.8%	0.05	0.16	0.34
	8.10	2.07	0.03	0.05	0.06	2.09	9.8%	0.03	0.01	0.23
	8.15	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
RS
G
W
W
RS&G
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
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
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth (feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
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
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett