



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7210
www.co.blm.gov



In Reply Refer To:
7250 (CO-930)

DEC 22 2014

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on Hubbard Creek, located in Water Division 4.

Location and Land Status. Hubbard Creek originates approximately twelve miles northwest of Paonia near Crater Peak on the Grand Mesa. The creek flows into the North Fork of the Gunnison River near Bowie. This recommendation covers a reach that starts at the U.S. Forest Service boundary and extends downstream to the headgate of the Deertrail Ditch. This stream reach covers a distance of approximately 1.6 miles. The BLM manages approximately 1.1 miles of this stream reach, while 0.5 miles are in private ownership.

Existing Instream Flow Water Rights. In 1984, the Colorado Water Conservation Board appropriated an instream flow water right on Hubbard Creek as follows:

Upper Forest Service boundary in Section 14, T12S R91W to lower Forest Service boundary in Section 35, T12S R91W – 3.0 cfs, January 1 to December 31.

The purpose of the recommendation is to extend instream flow protection further downstream to include BLM lands within the Hubbard Creek watershed.

Biological Summary. Hubbard Creek is a cold-water, moderate to high gradient stream. It flows through a canyon with a valley floor approximately one-fourth mile in width. The stream cuts through alluvial deposits in some locations and is constrained by bedrock in locations where the stream comes close to the canyon walls. The stream generally has medium-sized substrate, consisting of gravels, cobbles, and small boulders. The stream has a good mix of pool and riffle habitat for supporting salmonids and native fishes.

Fisheries surveys have revealed self-sustaining populations of speckled dace, bluehead sucker, rainbow trout, and white sucker.

Speckled dace and bluehead suckers are native species, and bluehead sucker appears on the BLM's sensitive species list. Fish surveys were completed during September, indicating that bluehead suckers utilize this habitat year-round, and not just during snowmelt runoff periods when bluehead suckers spawn. It is likely that bluehead sucker populations found in the Gunnison River also make use of habitat found in lower Hubbard Creek.

The riparian community in this part of Hubbard Creek is generally comprised of willow species, alder, and narrowleaf cottonwood. In general, the riparian community is in good condition, and provides adequate shading and cover for fish habitat, and provides stream stability during flood events.

R2Cross Analysis. The BLM collected the following R2Cross data from Hubbard 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)
09/27/2007 #1	19.16 cfs	24.4 feet	Out of range	8.26 cfs
10/21/2008 #1	2.70 cfs	23.8 feet	1.65 cfs	Out of range
10/21/2008 #2	3.45 cfs	24.9 feet	1.70 cfs	Out of range
10/11/2012 #1	1.33 cfs	25.5 feet	3.01 cfs	Out of range
Averages:			2.11 cfs	8.26 cfs

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

8.3 cubic feet per second is recommended for the snowmelt runoff period from April 1 through June 10. This recommendation is driven by the average velocity criteria. 8.6 cfs will also provide approximately 67 percent wetted perimeter in Hubbard Creek's channel, which averages approximately 24 feet in width. Wetting 67 percent of the channel will provide important physical habitat during a time of year when the fish population is completing key life cycle functions.

2.6 cubic feet per second is recommended for the summer time period between June 11 and August 15. This flow rate will generally meet the wetted perimeter and average depth criteria, while providing velocities in the range between 0.5 feet and 1.0 feet per second.

1.8 cubic feet per second is recommended during the fall and winter period between August 16 and March 31. This recommendation is driven by limited water availability during the fall and winter. This flow rate generally meets the wetted perimeter and average velocity criteria in riffle habitat, and should prevent icing in pools.

Water Availability. The BLM recommends relying upon two data sources to confirm water availability. The first information source is diversion records from the Deertrail Ditch. Not only does this ditch have continuous diversion records from 1970 to the present, it also has some diversion records for winter months. The second information source is the U.S. Geological Survey (USGS) Gage 09132940 (Hubbard Creek above Iron Point Gulch). This gage has been operated since 2012 in a location approximately two miles upstream from the upper terminus for the proposed instream flow water right. Estimates developed when using data from this gage will be conservative, because the gage does not measure inflow from downstream tributaries that contribute to flow in the proposed reach, such as Iron Point Gulch. In addition, the gage has not been operated during the winter because icing conditions in the canyon make the gage records inaccurate.

The BLM recommends use of USGS Gage 09132960 (Hubbard Creek at Highway 133 near Bowie Creek) for winter period flow estimates. Usage of this gage for the remainder of the year is not recommended because the gage is heavily influenced by operation of Deertrail Ditch. The winter data will need to be adjusted to account for limited diversions into Deertrail Ditch during the winter months.

The BLM is not aware of any decreed water rights for surface diversion within the proposed instream flow reach. However, the BLM is aware of the following absolute water rights in upstream locations:

Carl Galpin Ditch – 3.0 cfs
 West Hubbard Ditch – 9.0 cfs
 William Beezly Ditch – 2.0 cfs
 Bill McMillan Ditch – 5.0 cfs
 Pilot Knob Ditch – 1.0 cfs
 Terror Ditch Extension – 29.0 cfs
 Jessie J. Barrow Ditches #1 and 2 – 1.5 cfs
 Willow Creek Ditch – 0.62 cfs
 Carter Ditch - 2.12 cfs
 Wade Allen Ditch – 7 cfs

The Overland Ditch, owned by Overland Ditch and Reservoir Company, diverts from multiple small tributaries in the headwaters of the Hubbard Creek watershed. The water rights for the ditch allow the company to divert up to a total of 75 cfs from the Hubbard, Terror, Roadmap, Lower Cow Creek, and Leroux Creek drainages.

The BLM is also aware of 85 cfs of undeveloped conditional water rights in upstream locations associated with the Grand Mesa Canal. These rights appear to be owned by the Grand Mesa Water Conservancy District and North Fork Water Conservancy District.

The USGS Gage 09132940 appears to be located downstream from all of these ditches, so the gage records should reflect the hydrologic impacts of ditch operations.

Relationship to Land Management Plans. The BLM land use plan for this area calls for actions to maintain and enhance riparian and fisheries habitat. In general, any proposed new land use, such as right-of-way corridors or mineral development, must be implemented with no surface occupancy to avoid impacts to the creek. Any proposed land uses along this creek are also carefully reviewed and mitigated to prevent impacts to sensitive aquatic species which appear on BLM's sensitive species list. Establishing an instream flow water right would assist in meeting these objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2014. We thank both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Acting



Brian St. George
Deputy State Director
Resources and Fire Management

cc: Jedd Sondergard, Uncompahgre FO
Barbara Sharrow, Uncompahgre FO
Lori Armstrong, Southwest District Office

Uncompahgre Field Office Stream Surveys

September 2007

Hubbard Creek - Water Code #40751

Hubbard Creek, located northeast of Paonia, Colorado on BLM lands managed by the Uncompahgre Field Office was sampled on September 27, 2007. Hubbard Creek is tributary to North Fork Gunnison River. Presence/absence sampling was done in support of the Colorado BLM in-stream flow program. Sampling was conducted via backpack electro-shocker and approximately 250 feet of stream was sampled. Personnel present were Tom Fresques, Dennis Murphy, Roy Smith, Mike Eberle, and Gregor Dekleva.

A total of 28 fish were collected. See data sheet below.



Fish



Bluehead sucker



White sucker



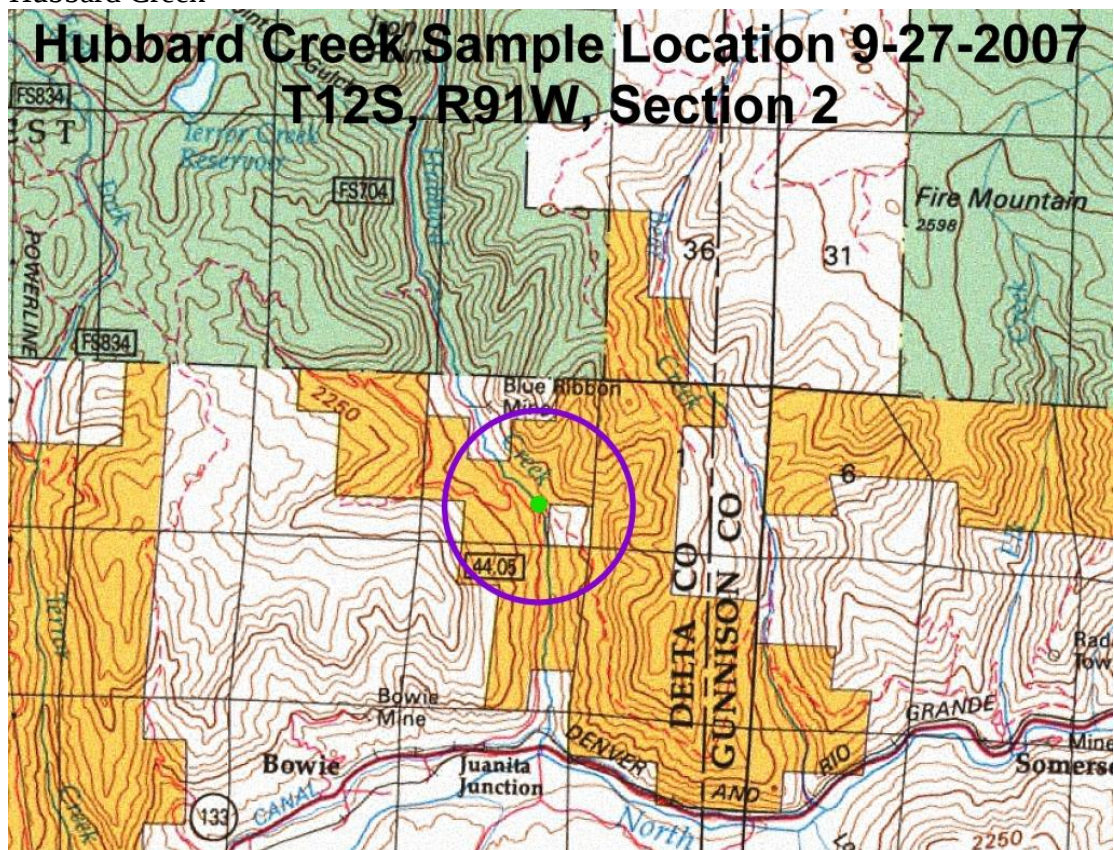
Rainbow trout



Hubbard Creek



Hubbard Creek



Map

STREAM SURVEY FISH SAMPLING FORM

WATER_Hubbard Creek_____ H2O CODE_40751_DATE_9-27-07

GEAR_Backpack Electroshocker EFFORT_250 ft._____ STATION #_1_ PASS 1

CREW Fresques, Murphy, Smith, Mike, Gregor DRAINAGE N. F. Gunnison River

LOCATION Just below confluence of West and East Fork Terror Creek

Pass	species	length	weight		species	length	weight	Pass
1	WHS	147						
	WHS	185						
	WHS	143						
	WHS	104						
	WHS	142						
	RBT	59						
	RBT	68						
	RBT	66						
	RBT	148						
	RBT	176						
	RBT	189						
	RBT	72						
	RBT	142						
	RBT	148						
	RBT	73						
	SPD	112						
	SPD	102						
	SPD	81						
	SPD	84						
	SPD	63						
	SPD	83						
	SPD	65						
	SPD	68						
	SPD	69						
	SPD	55						
	BHS	127						
	BHS	86						

SPD = Speckled dace
BHS = Bluehead sucker
RBT = Rainbow trout
WHS = White sucker

GPS Location:

Notes: Stream Width 12-20 ft. Sample Reach 250 ft.
Conductivity: Electroshocker settings

Discussion

The stream was running at approximately 4 to 5 cfs. Riparian habitat looked vigorous and some good pools were present. Water was slightly off color with an orange/brown tint that looked like oxidized iron. A two-pass removal estimate was not performed as flows and large pools did not allow for efficient sampling with only one shocker. Aquatic insects consisted primarily of caddisflies. No stoneflies or mayflies were observed during the brief survey. All fish appeared healthy and at least two age classes of trout were present. Bluehead suckers were rare and the presence of white suckers is a concern as they can hybridize with the native blueheads. An instream flow recommendation on this creek would be valuable in maintaining this fishery.

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

LOCATION INFORMATION

STREAM NAME: Hubbard Creek
XS LOCATION: 200' upstream from bridge
XS NUMBER: 1

DATE: 11-Oct-12
OBSERVERS: R. Smith, J. Sondergard

1/4 SEC: SE
SECTION: 2
TWP: 13S
RANGE: 91W
PM: Sixth

COUNTY: Delta
WATERSHED: N. Fk. Gunnison River
DIVISION: 4
DOW CODE: 40751

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

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

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.018

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Hubbard Creek
 XS LOCATION: 200' upstream from bridge
 XS NUMBER: 1

DATA POINTS= 24

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
1 RS & G	3.50	2.52		
	8.80	4.48		
W	12.10	4.95	0.00	0.00
	13.10	5.12	0.17	0.15
	13.60	5.15	0.20	0.61
	14.10	5.20	0.25	0.86
	14.60	5.16	0.21	1.01
	15.10	5.25	0.30	1.12
	15.60	5.15	0.20	1.02
	16.10	5.27	0.32	0.92
	16.60	5.25	0.30	1.10
	17.10	5.12	0.17	1.02
	17.60	5.25	0.30	0.90
	17.80	5.32	0.37	0.10
	18.10	5.15	0.20	0.00
	18.60	5.17	0.22	0.79
	18.90	5.14	0.19	0.64
	19.10	5.17	0.22	1.09
	19.60	5.12	0.17	0.75
	20.10	5.09	0.14	0.23
	20.60	4.97	0.02	0.00
W	21.70	4.95	0.00	0.00
	24.50	3.58		
1 LS & G	29.00	2.52		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
1.01	0.17	0.13	0.02	1.4%
0.50	0.20	0.10	0.06	4.6%
0.50	0.25	0.13	0.11	8.1%
0.50	0.21	0.11	0.11	8.0%
0.51	0.30	0.15	0.17	12.6%
0.51	0.20	0.10	0.10	7.7%
0.51	0.32	0.16	0.15	11.1%
0.50	0.30	0.15	0.17	12.4%
0.52	0.17	0.09	0.09	6.5%
0.52	0.30	0.11	0.09	7.1%
0.21	0.37	0.09	0.01	0.7%
0.34	0.20	0.08	0.00	0.0%
0.50	0.22	0.09	0.07	5.2%
0.30	0.19	0.05	0.03	2.3%
0.20	0.22	0.08	0.08	6.3%
0.50	0.17	0.09	0.06	4.8%
0.50	0.14	0.07	0.02	1.2%
0.51	0.02	0.02	0.00	0.0%
1.10		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

9.76	0.37	1.76	1.33	100.0%
(Max.)				

Manning's n = 0.0845
 Hydraulic Radius= 0.18061722

STREAM NAME: Hubbard Creek
 XS LOCATION: 200' upstream from bridge
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.76	1.76	0.0%
4.70	1.76	4.45	152.2%
4.72	1.76	4.21	138.8%
4.74	1.76	3.98	125.7%
4.76	1.76	3.75	112.7%
4.78	1.76	3.53	100.0%
4.80	1.76	3.31	87.4%
4.82	1.76	3.09	75.1%
4.84	1.76	2.87	63.0%
4.86	1.76	2.66	51.1%
4.88	1.76	2.46	39.4%
4.90	1.76	2.25	27.9%
4.91	1.76	2.15	22.2%
4.92	1.76	2.06	16.6%
4.93	1.76	1.96	11.0%
4.94	1.76	1.86	5.5%
4.95	1.76	1.76	0.0%
4.96	1.76	1.67	-5.3%
4.97	1.76	1.58	-10.2%
4.98	1.76	1.50	-14.9%
4.99	1.76	1.42	-19.6%
5.00	1.76	1.34	-24.2%
5.02	1.76	1.18	-33.3%
5.04	1.76	1.02	-42.1%
5.06	1.76	0.87	-50.7%
5.08	1.76	0.72	-59.0%
5.10	1.76	0.58	-67.1%
5.12	1.76	0.45	-74.8%
5.14	1.76	0.32	-81.7%
5.16	1.76	0.22	-87.7%
5.18	1.76	0.14	-91.8%
5.20	1.76	0.09	-94.7%

WATERLINE AT ZERO

AREA ERROR = 4.950

STREAM NAME: Hubbard Creek
 XS LOCATION: 200' upstream from bridge
 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	2.52	25.50	1.76	2.80	44.80	26.49	100.0%	1.69	150.12	3.35
	3.95	16.38	0.93	1.37	15.29	16.90	63.8%	0.90	33.76	2.21
	4.00	16.14	0.90	1.32	14.48	16.64	62.8%	0.87	31.14	2.15
	4.05	15.90	0.86	1.27	13.68	16.38	61.9%	0.83	28.62	2.09
	4.10	15.66	0.82	1.22	12.89	16.13	60.9%	0.80	26.19	2.03
	4.15	15.43	0.78	1.17	12.11	15.87	59.9%	0.76	23.87	1.97
	4.20	15.19	0.75	1.12	11.34	15.61	58.9%	0.73	21.64	1.91
	4.25	14.95	0.71	1.07	10.59	15.35	58.0%	0.69	19.52	1.84
	4.30	14.72	0.67	1.02	9.85	15.09	57.0%	0.65	17.49	1.78
	4.35	14.48	0.63	0.97	9.12	14.84	56.0%	0.61	15.56	1.71
	4.40	14.24	0.59	0.92	8.40	14.58	55.0%	0.58	13.73	1.63
	4.45	14.00	0.55	0.87	7.69	14.32	54.1%	0.54	12.00	1.56
	4.50	13.68	0.51	0.82	7.00	13.98	52.8%	0.50	10.42	1.49
	4.55	13.23	0.48	0.77	6.33	13.51	51.0%	0.47	9.01	1.42
	4.60	12.77	0.44	0.72	5.68	13.04	49.2%	0.44	7.70	1.36
	4.65	12.32	0.41	0.67	5.05	12.57	47.5%	0.40	6.49	1.29
	4.70	11.87	0.37	0.62	4.45	12.11	45.7%	0.37	5.38	1.21
	4.75	11.41	0.34	0.57	3.86	11.64	43.9%	0.33	4.37	1.13
	4.80	10.96	0.30	0.52	3.31	11.17	42.2%	0.30	3.47	1.05
	4.85	10.51	0.26	0.47	2.77	10.70	40.4%	0.26	2.65	0.96
	4.90	10.05	0.22	0.42	2.25	10.23	38.6%	0.22	1.94	0.86
WL	4.95	9.60	0.18	0.37	1.76	9.76	36.9%	0.18	1.33	0.75
	5.00	8.08	0.17	0.32	1.34	8.24	31.1%	0.16	0.94	0.70
	5.05	7.58	0.12	0.27	0.95	7.72	29.2%	0.12	0.55	0.58
	5.10	6.95	0.08	0.22	0.58	7.09	26.8%	0.08	0.26	0.44
	5.15	5.30	0.05	0.17	0.27	5.43	20.5%	0.05	0.08	0.32
	5.20	2.12	0.04	0.12	0.09	2.19	8.3%	0.04	0.03	0.29
	5.25	0.91	0.02	0.07	0.02	0.94	3.5%	0.02	0.00	0.16
	5.30	0.09	0.01	0.02	0.00	0.10	0.4%	0.01	0.00	0.10

STREAM NAME: Hubbard Creek
XS LOCATION: 200' upstream from bridge
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)= 1.33 cfs
CALCULATED FLOW (Qc)= 1.33 cfs
(Qm-Qc)/Qm * 100 = 0.0 %

MEASURED WATERLINE (WLm)= 4.95 ft
CALCULATED WATERLINE (WLc)= 4.95 ft
(WLm-WLc)/WLm * 100 = 0.0 %

MAX MEASURED DEPTH (Dm)= 0.37 ft
MAX CALCULATED DEPTH (Dc)= 0.37 ft
(Dm-Dc)/Dm * 100 = 0.0 %

MEAN VELOCITY= 0.75 ft/sec
MANNING'S N= 0.084
SLOPE= 0.018 ft/ft

.4 * Qm = 0.5 cfs
2.5 * Qm= 3.3 cfs

RECOMMENDED INSTREAM FLOW:
=====

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

RATIONALE FOR RECOMMENDATION:
=====

RECOMMENDATION BY: AGENCY..... DATE:.....
CWCB REVIEW BY: DATE:.....

STREAM NAME: Hubbard Creek
 XS LOCATION: 200' upstream from bridge
 XS NUMBER: 1

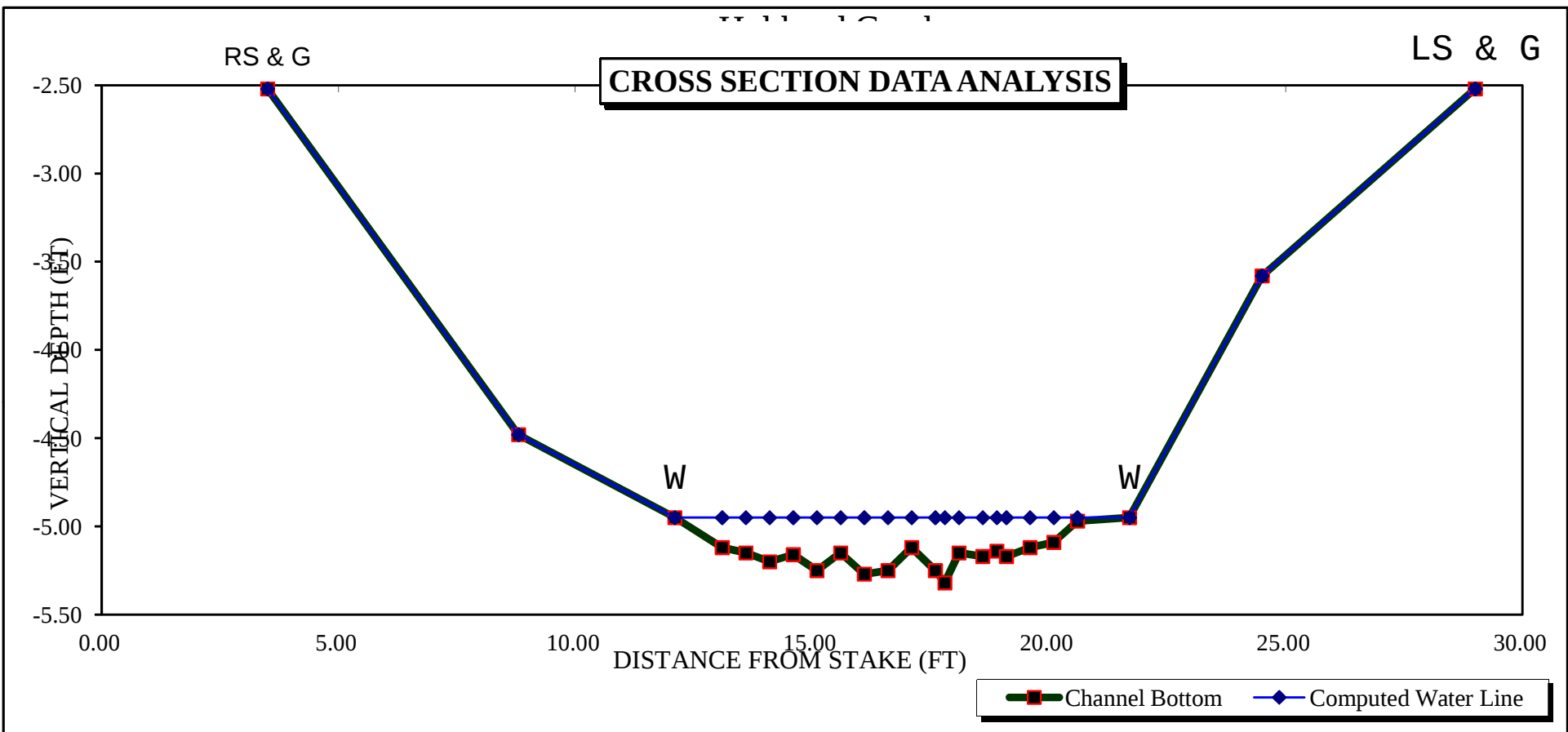
Jarrett Variable Manning's n Correction Applied

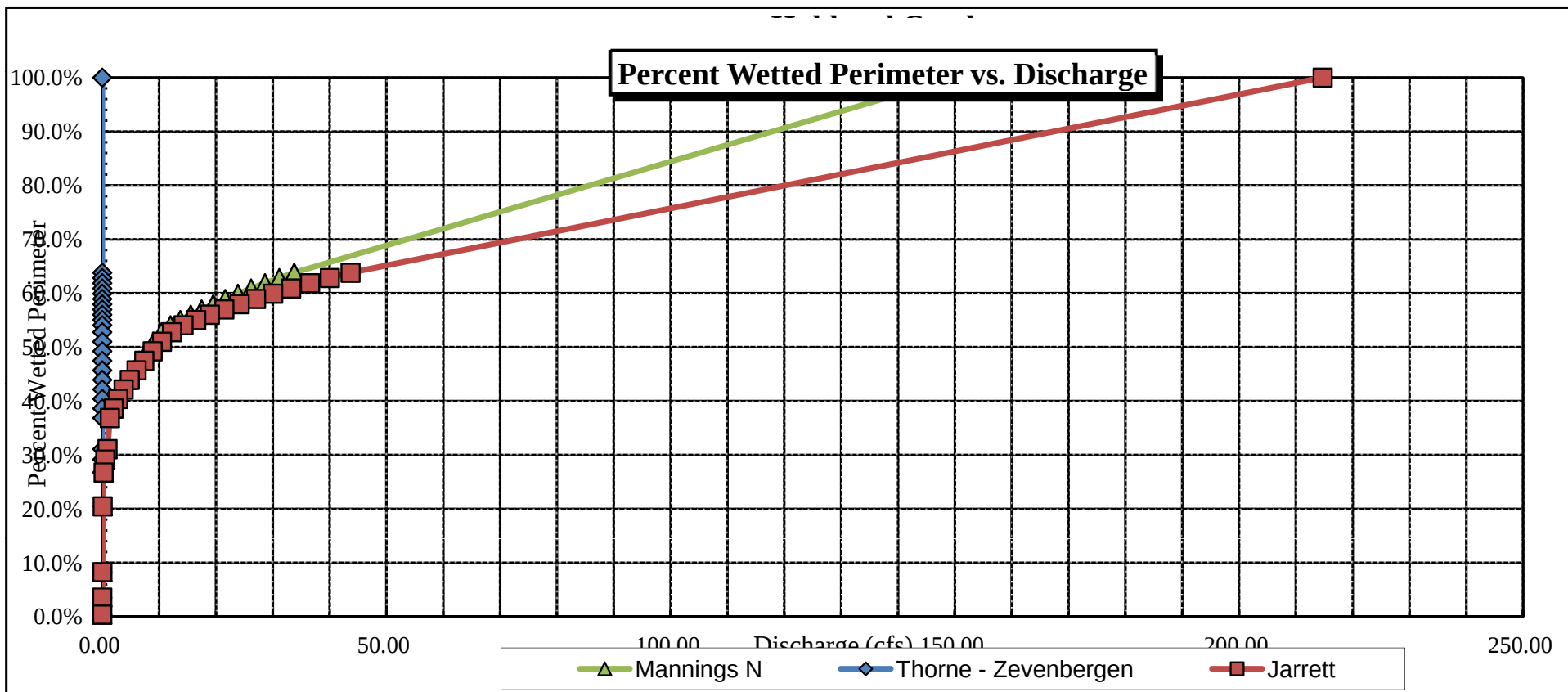
GL = lowest Grassline elevation corrected for sag

STAGING TABLE

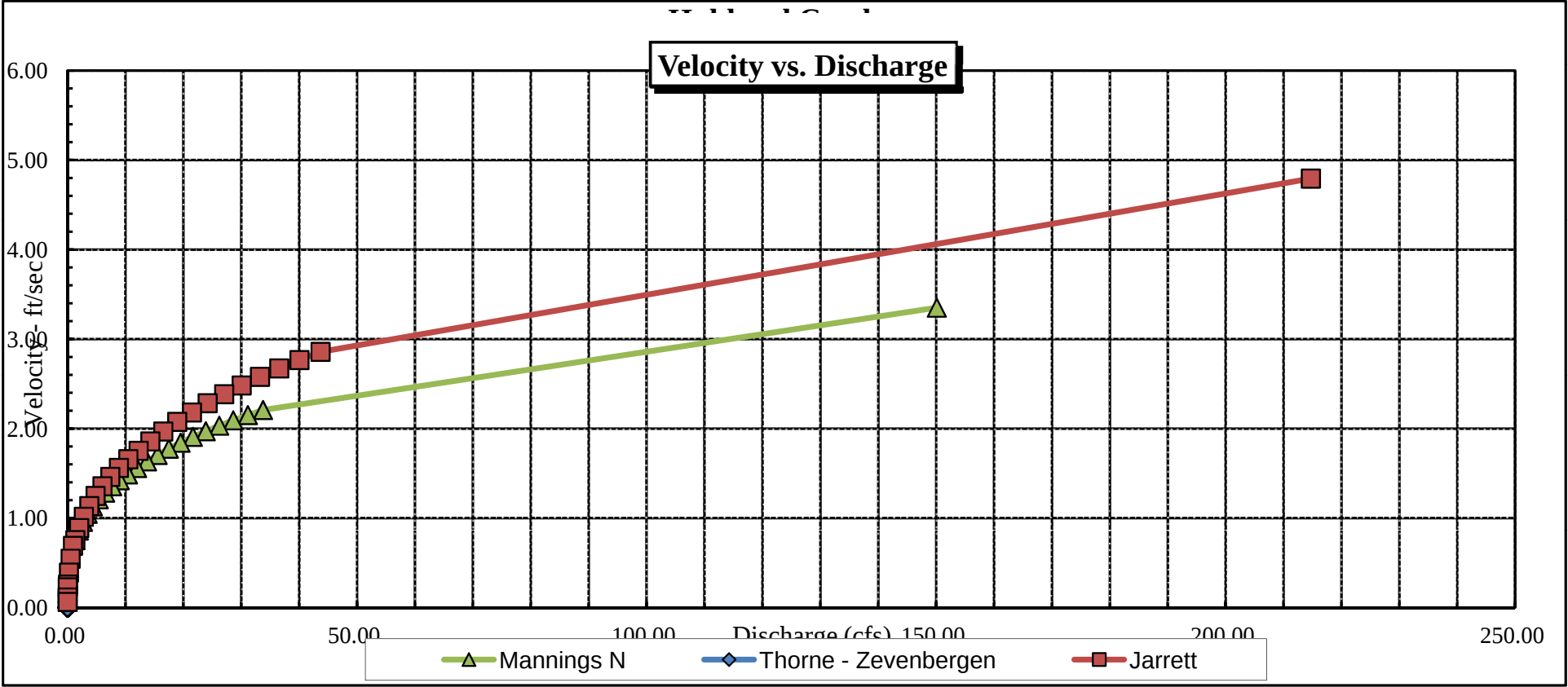
WL = Waterline corrected for variations in field measured water surface elevations and sag

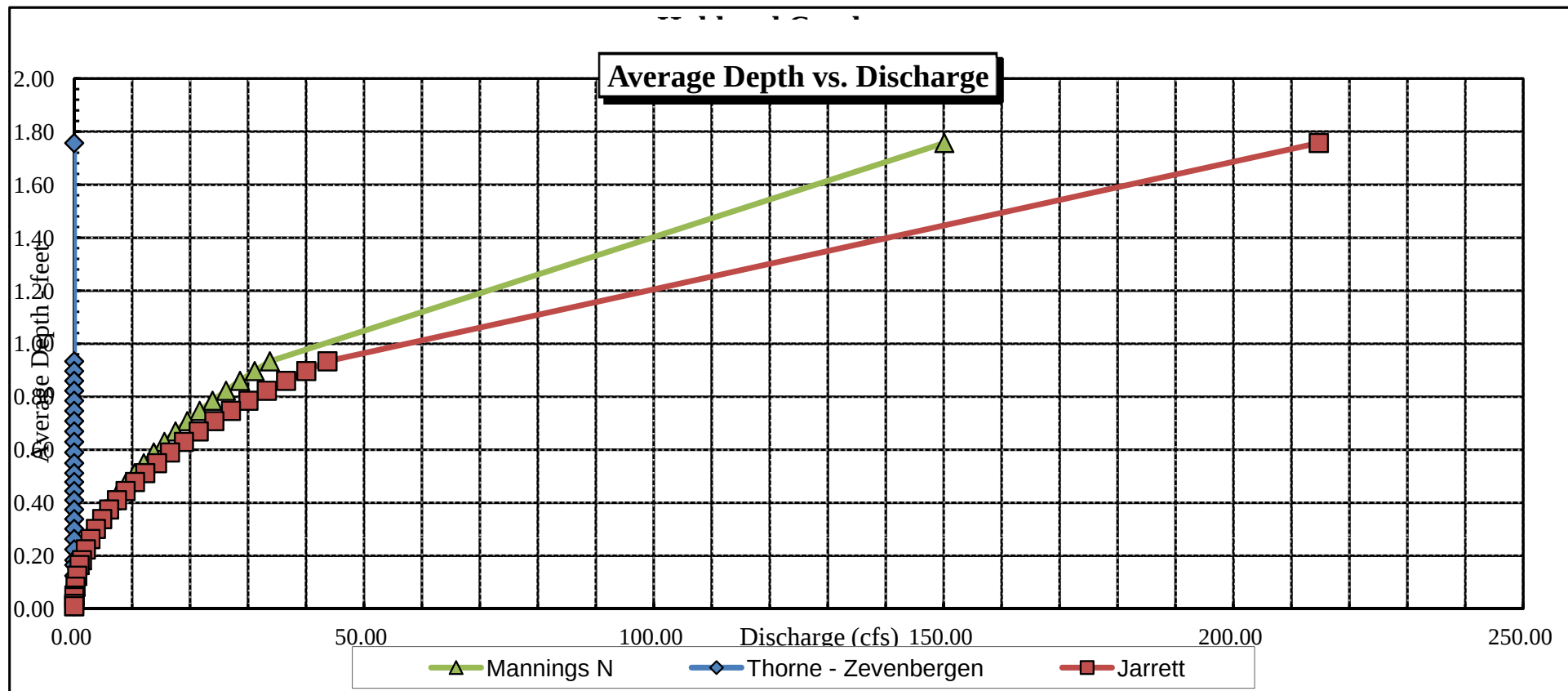
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.52	25.50	1.76	2.80	44.80	26.49	100.0%	1.69	214.72	4.79
	3.95	16.38	0.93	1.37	15.29	16.90	63.8%	0.90	43.69	2.86
	4.00	16.14	0.90	1.32	14.48	16.64	62.8%	0.87	40.04	2.77
	4.05	15.90	0.86	1.27	13.68	16.38	61.9%	0.83	36.56	2.67
	4.10	15.66	0.82	1.22	12.89	16.13	60.9%	0.80	33.23	2.58
	4.15	15.43	0.78	1.17	12.11	15.87	59.9%	0.76	30.06	2.48
	4.20	15.19	0.75	1.12	11.34	15.61	58.9%	0.73	27.04	2.38
	4.25	14.95	0.71	1.07	10.59	15.35	58.0%	0.69	24.18	2.28
	4.30	14.72	0.67	1.02	9.85	15.09	57.0%	0.65	21.48	2.18
	4.35	14.48	0.63	0.97	9.12	14.84	56.0%	0.61	18.93	2.08
	4.40	14.24	0.59	0.92	8.40	14.58	55.0%	0.58	16.53	1.97
	4.45	14.00	0.55	0.87	7.69	14.32	54.1%	0.54	14.29	1.86
	4.50	13.68	0.51	0.82	7.00	13.98	52.8%	0.50	12.27	1.75
	4.55	13.23	0.48	0.77	6.33	13.51	51.0%	0.47	10.49	1.66
	4.60	12.77	0.44	0.72	5.68	13.04	49.2%	0.44	8.86	1.56
	4.65	12.32	0.41	0.67	5.05	12.57	47.5%	0.40	7.38	1.46
	4.70	11.87	0.37	0.62	4.45	12.11	45.7%	0.37	6.03	1.36
	4.75	11.41	0.34	0.57	3.86	11.64	43.9%	0.33	4.82	1.25
	4.80	10.96	0.30	0.52	3.31	11.17	42.2%	0.30	3.75	1.13
	4.85	10.51	0.26	0.47	2.77	10.70	40.4%	0.26	2.81	1.02
	4.90	10.05	0.22	0.42	2.25	10.23	38.6%	0.22	2.00	0.89
WL	4.95	9.60	0.18	0.37	1.76	9.76	36.9%	0.18	1.33	0.75
	5.00	8.08	0.17	0.32	1.34	8.24	31.1%	0.16	0.92	0.69
	5.05	7.58	0.12	0.27	0.95	7.72	29.2%	0.12	0.52	0.55
	5.10	6.95	0.08	0.22	0.58	7.09	26.8%	0.08	0.23	0.39
	5.15	5.30	0.05	0.17	0.27	5.43	20.5%	0.05	0.07	0.26
	5.20	2.12	0.04	0.12	0.09	2.19	8.3%	0.04	0.02	0.23
	5.25	0.91	0.02	0.07	0.02	0.94	3.5%	0.02	0.00	0.11
	5.30	0.09	0.01	0.02	0.00	0.10	0.4%	0.01	0.00	0.06



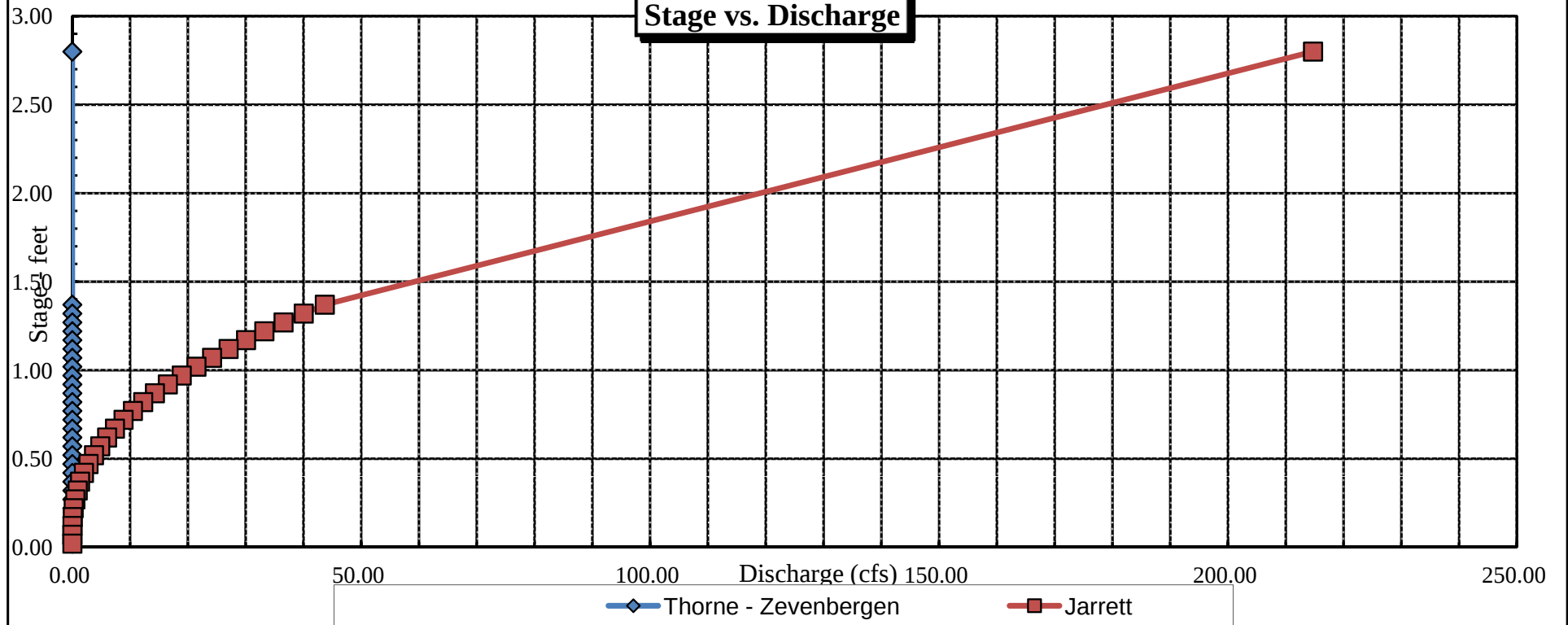


Velocity vs. Discharge





Stage vs. Discharge





FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: <u>Hubbard Creek</u>		CROSS-SECTION NO.: <u>1</u>	
CROSS-SECTION LOCATION: <u>200' upstream from bridge</u>			
DATE: <u>10-11-12</u>	OBSERVERS: <u>R. Smith, J. Sondergaard</u>		
LEGAL DESCRIPTION:	SECTION: <u>SE</u>	SECTION: <u>2</u>	TOWNSHIP: <u>13 N</u>
COUNTY: <u>Delta</u>	WATERSHED: <u>N Fk Gunnison</u>	WATER DIVISION: <u>4</u>	RANGE: <u>9 E</u> PM: <u>6th</u>
MAP(S):	USGS: <u>GPS Zone 13 280992</u>	DOW WATER CODE: <u>40751</u>	
	USFS: <u>4314732</u>		

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION	YES/NO	METER TYPE: <u>M-M</u>
METER NUMBER	DATE RATED:	CALIB/SPIN: <u>suveyed</u>
		TAPE WEIGHT: <u>suveyed</u> lbs/100
CHANNEL BED MATERIAL SIZE RANGE: <u>gravel to 4" cobbles</u>		TAPE TENSION: <u>3</u> lbs
PHOTOGRAPHS TAKEN: <u>(YES/NO)</u>		NUMBER OF PHOTOGRAPHS: <u>3</u>

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	<u>suveyed</u>
⊗ Tape @ Stake RB	0.0	<u>suveyed</u>
① WS @ Tape LB/RB	0.0 21.7	4.95 / 4.95
② WS Upstream	36.7	4.04
③ WS Downstream	27.0	5.23
SLOPE	<u>1.19/63.7 = .018</u>	

SKETCH

12-1

LEGEND:

Stake ⊗

Station ①

Photo ◇

Direction of Flow →

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO: <u>(NO)</u>	DISTANCE ELECTROFISHED: <u>11</u>	FISH CAUGHT YES/NO	WATER CHEMISTRY SAMPLED: <u>(YES/NO)</u>														
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

<u>Ph = 8.04</u>
<u>Cond = 247</u>
<u>Temp = 11.7° C</u>
<u>Salinity = 0.1</u>

STREAM NAME: Hubbard Creek				CROSS-SECTION NO	DATE	SHEET				
BEGINNING OF MEASUREMENT				EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading	TIME			
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 Mean in Vertical	Area (ft ²)	Discharge (cfs)
LS/G	3.5		2.52							
	8.8		4.48							
W	12.1		4.95							
	13.1		5.12	.17				.15		
	13.6		5.15	.20				.61		
	14.1		5.20	.25				.86		
	14.6		5.16	.21				1.01		
	15.1		5.25	.30				1.12		
	15.6		5.15	.20				1.02		
	16.1		5.27	.32				.92		
	16.6		5.25	.30				1.10		
	17.1		5.12	.17				1.02		
17.8	17.6	5.32	5.25	.30	.37			.90	<.1	
	18.1		5.15	.20				φ		
18.9	18.6	5.14	5.17	.22	<.17			.79	<.64	
	19.1		5.17	.22				1.09		
	19.6		5.12	.17				.75		
	20.1		5.09	.14				.73		
	20.6		4.97	.02				φ		
W	21.7		4.95							
	24.5		3.58							
LS/G	29.0		2.52							
TOTALS										
End of Measurement	Time	Gage Reading	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: Hubbard Creek
XS LOCATION: 500' upst. Fr USFS-Coal Co. boundary
XS NUMBER: 1

DATE: 21-Oct-08
OBSERVERS: R. Smith, D. Murphy

1/4 SEC: SW
SECTION: 35
TWP: 12S
RANGE: 91W
PM: Sixth

COUNTY: Delta
WATERSHED: N. Fk. Gunnison River
DIVISION: 4
DOW CODE: 40751

USGS MAP: Bowie 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: 0.006

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Hubbard Creek
 XS LOCATION: 500' upst. Fr USFS-Coal Co. boundary
 XS NUMBER: 1

DATA POINTS= 28

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED	WATER	AREA	Q	% Q
					PERIM.	DEPTH	(Am)	(Qm)	CELL
1 RS & G	6.00	4.01			0.00		0.00	0.00	0.0%
	8.50	4.48			0.00		0.00	0.00	0.0%
W	9.50	4.70			0.00		0.00	0.00	0.0%
	10.00	4.90	0.20	0.37	0.54	0.20	0.10	0.04	1.4%
	10.50	4.75	0.05	0.00	0.52	0.05	0.03	0.00	0.0%
	11.00	4.80	0.10	0.69	0.50	0.10	0.05	0.03	1.3%
	11.50	4.90	0.20	1.06	0.51	0.20	0.10	0.11	3.9%
	12.00	5.25	0.55	0.01	0.61	0.55	0.41	0.00	0.2%
	13.00	4.75	0.05	0.00	1.12	0.05	0.05	0.00	0.0%
	14.00	4.80	0.10	0.38	1.00	0.10	0.10	0.04	1.4%
	15.00	4.75	0.20	0.57	1.00	0.20	0.20	0.11	4.2%
	16.00	4.75	0.20	0.15	1.00	0.20	0.20	0.03	1.1%
	17.00	5.10	0.40	0.15	1.06	0.40	0.40	0.06	2.2%
	18.00	5.10	0.40	0.34	1.00	0.40	0.40	0.14	5.0%
	19.00	5.20	0.50	0.78	1.00	0.50	0.50	0.39	14.4%
	20.00	5.25	0.55	0.84	1.00	0.55	0.55	0.46	17.1%
	21.00	5.20	0.50	0.90	1.00	0.50	0.50	0.45	16.6%
	22.00	5.30	0.60	0.51	1.00	0.60	0.60	0.31	11.3%
	23.00	4.95	0.25	0.05	1.06	0.25	0.25	0.01	0.5%
	24.00	5.00	0.30	1.10	1.00	0.30	0.30	0.33	12.2%
	25.00	4.85	0.20	0.74	1.01	0.20	0.20	0.15	5.5%
	26.00	4.80	0.10	0.22	1.00	0.10	0.08	0.02	0.6%
	26.50	4.85	0.05	0.00	0.50	0.05	0.03	0.00	0.0%
	27.00	5.10	0.40	0.15	0.56	0.40	0.20	0.03	1.1%
	27.50	4.75	0.05	0.00	0.61	0.05	0.03	0.00	0.0%
W	28.00	4.70			0.50		0.00	0.00	0.0%
1 G	30.00	3.95			0.00		0.00	0.00	0.0%
LS	31.00	3.35			0.00		0.00	0.00	0.0%
TOTALS -----					19.12	0.6	5.26	2.70	100.0%
					(Max.)				
					Manning's n =		0.0948		
					Hydraulic Radius=		0.2751887		

STREAM NAME: Hubbard Creek
 XS LOCATION: 500' upst. Fr USFS-Coal Co. boundary
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	5.26	4.96	-5.7%
4.45	5.26	9.81	86.5%
4.47	5.26	9.41	78.8%
4.49	5.26	9.01	71.1%
4.51	5.26	8.61	63.6%
4.53	5.26	8.21	56.0%
4.55	5.26	7.82	48.6%
4.57	5.26	7.43	41.2%
4.59	5.26	7.04	33.8%
4.61	5.26	6.66	26.5%
4.63	5.26	6.28	19.2%
4.65	5.26	5.90	12.0%
4.66	5.26	5.71	8.5%
4.67	5.26	5.52	4.9%
4.68	5.26	5.33	1.4%
4.69	5.26	5.15	-2.2%
4.70	5.26	4.96	-5.7%
4.71	5.26	4.78	-9.2%
4.72	5.26	4.60	-12.7%
4.73	5.26	4.41	-16.1%
4.74	5.26	4.23	-19.6%
4.75	5.26	4.05	-23.0%
4.77	5.26	3.73	-29.2%
4.79	5.26	3.43	-34.9%
4.81	5.26	3.15	-40.1%
4.83	5.26	2.90	-45.0%
4.85	5.26	2.66	-49.5%
4.87	5.26	2.43	-53.7%
4.89	5.26	2.22	-57.8%
4.91	5.26	2.02	-61.6%
4.93	5.26	1.82	-65.4%
4.95	5.26	1.63	-69.0%

WATERLINE AT ZERO

AREA ERROR = 4.684

STREAM NAME: Hubbard Creek
 XS LOCATION: 500' upst. Fr USFS-Coal Co. boundary
 XS NUMBER: 1

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.01	23.84	0.82	1.29	19.53	24.66	100.0%	0.79	20.31	1.04
	4.03	23.65	0.80	1.27	18.96	24.46	99.2%	0.78	19.44	1.03
	4.08	23.25	0.77	1.22	17.79	24.05	97.5%	0.74	17.68	0.99
	4.13	22.85	0.73	1.17	16.64	23.63	95.9%	0.70	16.00	0.96
	4.18	22.45	0.69	1.12	15.51	23.22	94.2%	0.67	14.39	0.93
	4.23	22.05	0.65	1.07	14.39	22.81	92.5%	0.63	12.86	0.89
	4.28	21.65	0.61	1.02	13.30	22.39	90.8%	0.59	11.42	0.86
	4.33	21.25	0.58	0.97	12.23	21.98	89.2%	0.56	10.05	0.82
	4.38	20.85	0.54	0.92	11.18	21.57	87.5%	0.52	8.76	0.78
	4.43	20.46	0.50	0.87	10.14	21.15	85.8%	0.48	7.55	0.74
	4.48	20.06	0.46	0.82	9.13	20.74	84.1%	0.44	6.42	0.70
	4.53	19.70	0.41	0.77	8.14	20.37	82.6%	0.40	5.36	0.66
	4.58	19.34	0.37	0.72	7.16	19.99	81.1%	0.36	4.39	0.61
	4.63	18.98	0.33	0.67	6.20	19.62	79.6%	0.32	3.50	0.56
WL	4.68	18.62	0.28	0.62	5.26	19.24	78.1%	0.27	2.69	0.51
	4.73	18.08	0.24	0.57	4.34	18.69	75.8%	0.23	1.99	0.46
	4.78	14.77	0.24	0.52	3.52	15.34	62.2%	0.23	1.60	0.46
	4.83	12.17	0.23	0.47	2.85	12.69	51.5%	0.22	1.28	0.45
	4.88	10.54	0.22	0.42	2.29	10.98	44.5%	0.21	0.98	0.43
	4.93	9.57	0.19	0.37	1.79	9.94	40.3%	0.18	0.69	0.39
	4.98	7.98	0.17	0.32	1.34	8.28	33.6%	0.16	0.48	0.36
	5.03	6.92	0.14	0.27	0.98	7.14	29.0%	0.14	0.31	0.32
	5.08	6.29	0.10	0.22	0.65	6.44	26.1%	0.10	0.17	0.26
	5.13	4.53	0.08	0.17	0.38	4.64	18.8%	0.08	0.09	0.23
	5.18	3.72	0.05	0.12	0.18	3.78	15.4%	0.05	0.03	0.16
	5.23	1.55	0.02	0.07	0.03	1.58	6.4%	0.02	0.00	0.09
	5.28	0.21	0.01	0.02	0.00	0.21	0.9%	0.01	0.00	0.05

STREAM NAME: Hubbard Creek
XS LOCATION: 500' upst. Fr USFS-Coal Co. boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)= 2.70 cfs
CALCULATED FLOW (Qc)= 2.69 cfs
(Qm-Qc)/Qm * 100 = 0.4 %

MEASURED WATERLINE (WLm)= 4.70 ft
CALCULATED WATERLINE (WLc)= 4.68 ft
(WLm-WLc)/WLm * 100 = 0.3 %

MAX MEASURED DEPTH (Dm)= 0.60 ft
MAX CALCULATED DEPTH (Dc)= 0.62 ft
(Dm-Dc)/Dm * 100 = -2.7 %

MEAN VELOCITY= 0.51 ft/sec
MANNING'S N= 0.095
SLOPE= 0.006 ft/ft

.4 * Qm = 1.1 cfs
2.5 * Qm= 6.8 cfs

RECOMMENDED INSTREAM FLOW:
=====

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

RATIONALE FOR RECOMMENDATION:
=====

RECOMMENDATION BY: AGENCY..... DATE:.....
CWCB REVIEW BY: DATE:.....

STREAM NAME: Hubbard Creek
 XS LOCATION: 500' upst. Fr USFS-Coal Co. boundary
 XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

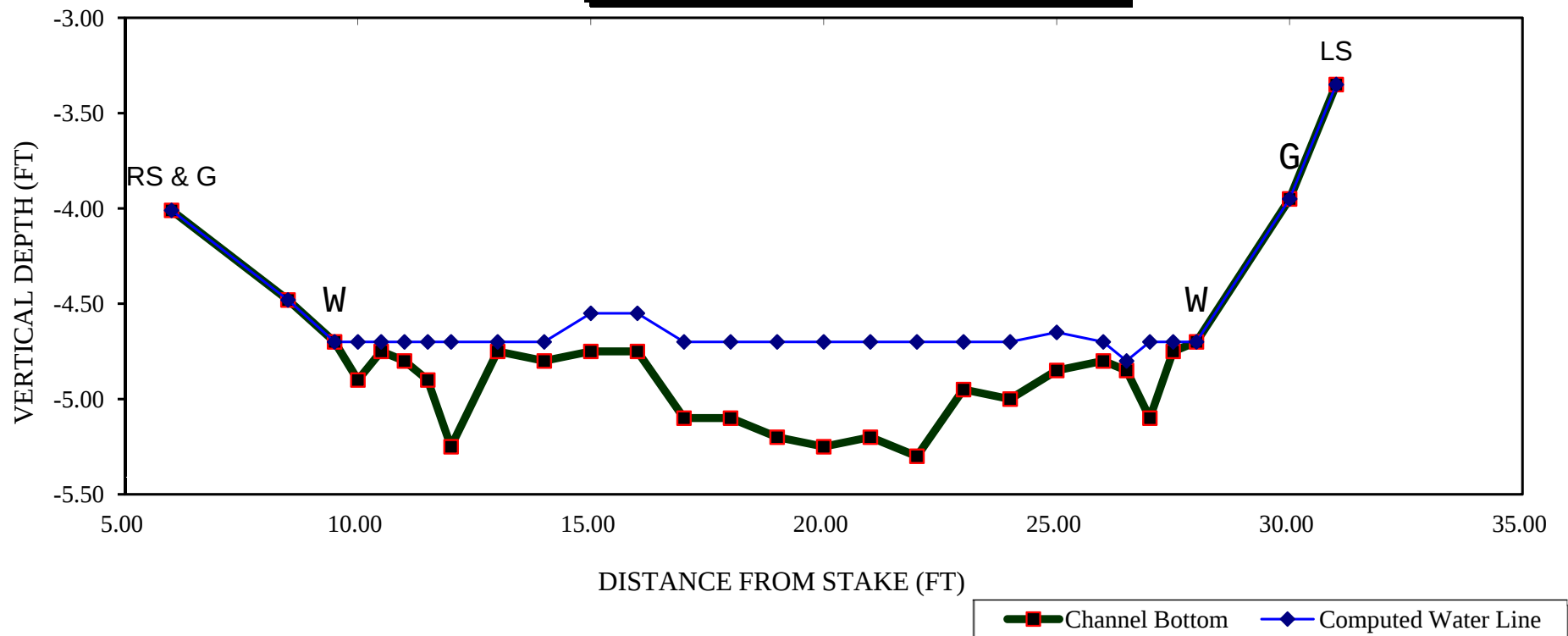
GL = lowest Grassline elevation corrected for sag

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

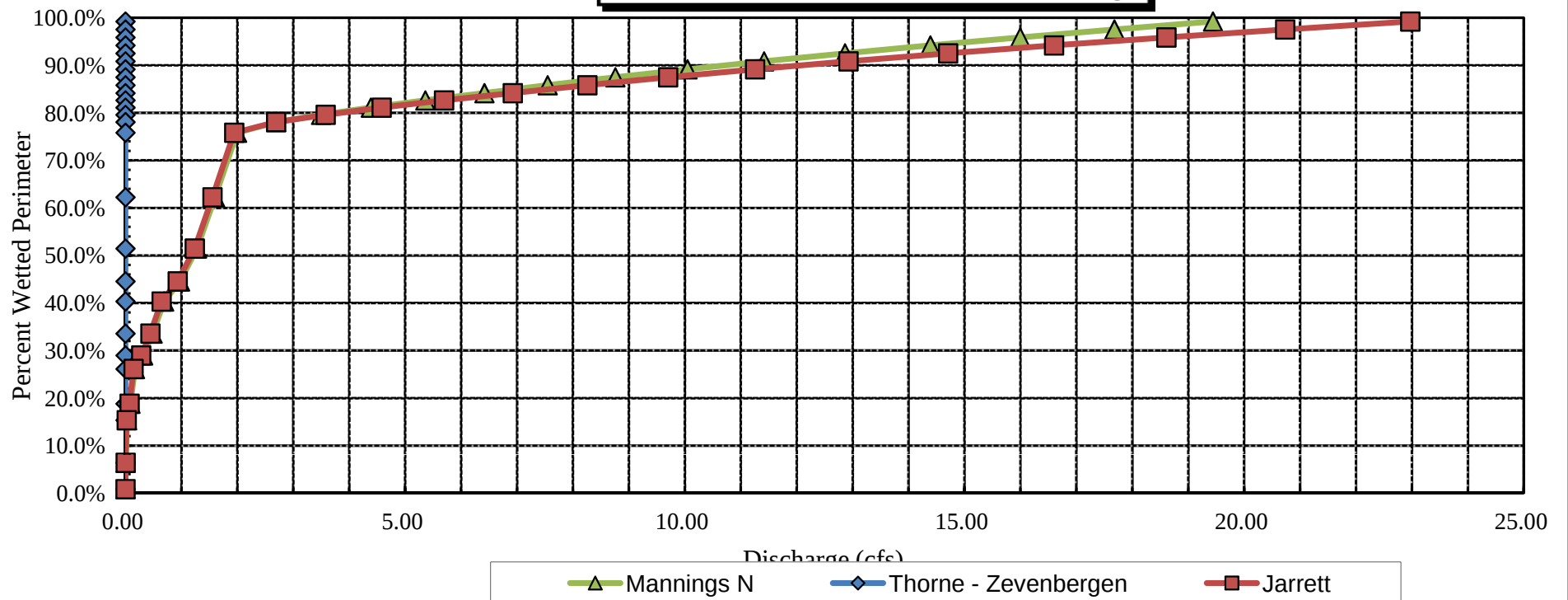
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.01	23.84	0.82	1.29	19.53	24.66	100.0%	0.79	24.08	1.23
	4.03	23.65	0.80	1.27	18.96	24.46	99.2%	0.78	22.97	1.21
	4.08	23.25	0.77	1.22	17.79	24.05	97.5%	0.74	20.73	1.17
	4.13	22.85	0.73	1.17	16.64	23.63	95.9%	0.70	18.61	1.12
	4.18	22.45	0.69	1.12	15.51	23.22	94.2%	0.67	16.60	1.07
	4.23	22.05	0.65	1.07	14.39	22.81	92.5%	0.63	14.71	1.02
	4.28	21.65	0.61	1.02	13.30	22.39	90.8%	0.59	12.93	0.97
	4.33	21.25	0.58	0.97	12.23	21.98	89.2%	0.56	11.26	0.92
	4.38	20.85	0.54	0.92	11.18	21.57	87.5%	0.52	9.70	0.87
	4.43	20.46	0.50	0.87	10.14	21.15	85.8%	0.48	8.26	0.81
	4.48	20.06	0.46	0.82	9.13	20.74	84.1%	0.44	6.92	0.76
	4.53	19.70	0.41	0.77	8.14	20.37	82.6%	0.40	5.70	0.70
	4.58	19.34	0.37	0.72	7.16	19.99	81.1%	0.36	4.58	0.64
	4.63	18.98	0.33	0.67	6.20	19.62	79.6%	0.32	3.58	0.58
WL	4.68	18.62	0.28	0.62	5.26	19.24	78.1%	0.27	2.69	0.51
	4.73	18.08	0.24	0.57	4.34	18.69	75.8%	0.23	1.94	0.45
	4.78	14.77	0.24	0.52	3.52	15.34	62.2%	0.23	1.56	0.44
	4.83	12.17	0.23	0.47	2.85	12.69	51.5%	0.22	1.24	0.43
	4.88	10.54	0.22	0.42	2.29	10.98	44.5%	0.21	0.93	0.41
	4.93	9.57	0.19	0.37	1.79	9.94	40.3%	0.18	0.65	0.36
	4.98	7.98	0.17	0.32	1.34	8.28	33.6%	0.16	0.45	0.33
	5.03	6.92	0.14	0.27	0.98	7.14	29.0%	0.14	0.28	0.29
	5.08	6.29	0.10	0.22	0.65	6.44	26.1%	0.10	0.14	0.22
	5.13	4.53	0.08	0.17	0.38	4.64	18.8%	0.08	0.07	0.19
	5.18	3.72	0.05	0.12	0.18	3.78	15.4%	0.05	0.02	0.12
	5.23	1.55	0.02	0.07	0.03	1.58	6.4%	0.02	0.00	0.06
	5.28	0.21	0.01	0.02	0.00	0.21	0.9%	0.01	0.00	0.03

Hubbard Creek

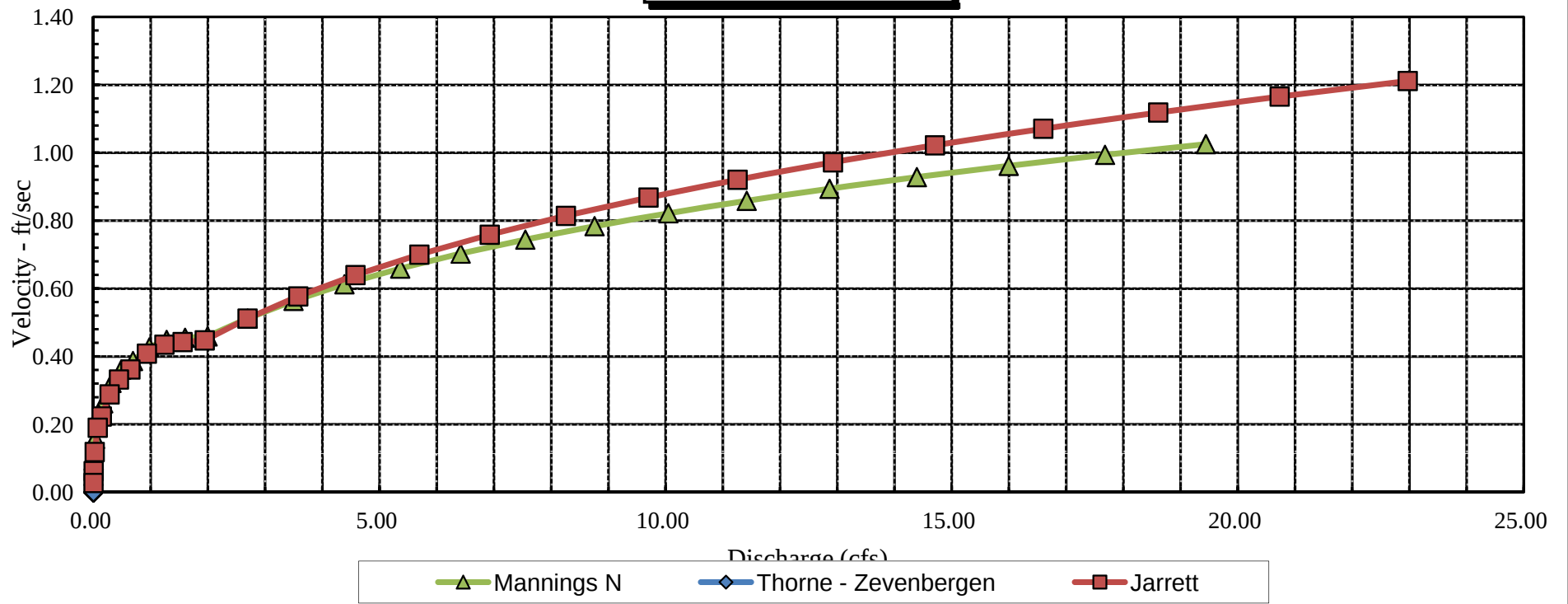
CROSS SECTION DATA ANALYSIS



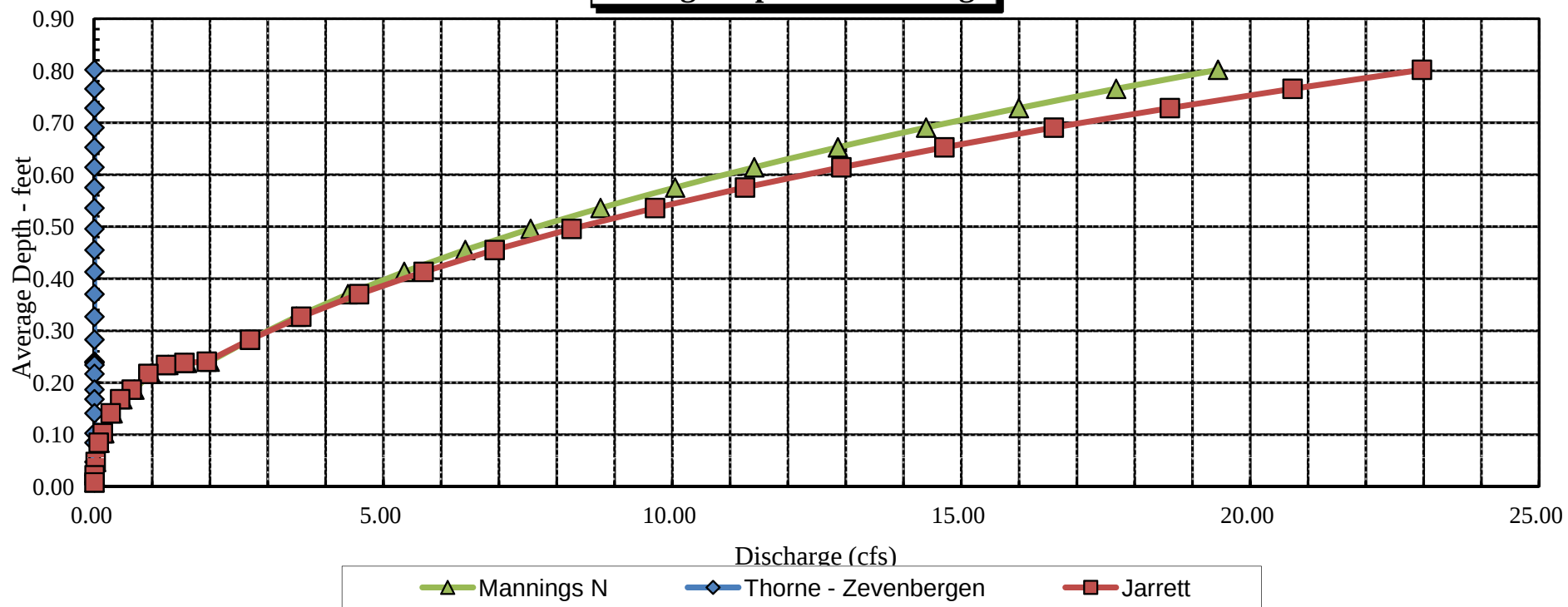
Hubbard Creek
Percent Wetted Perimeter vs. Discharge



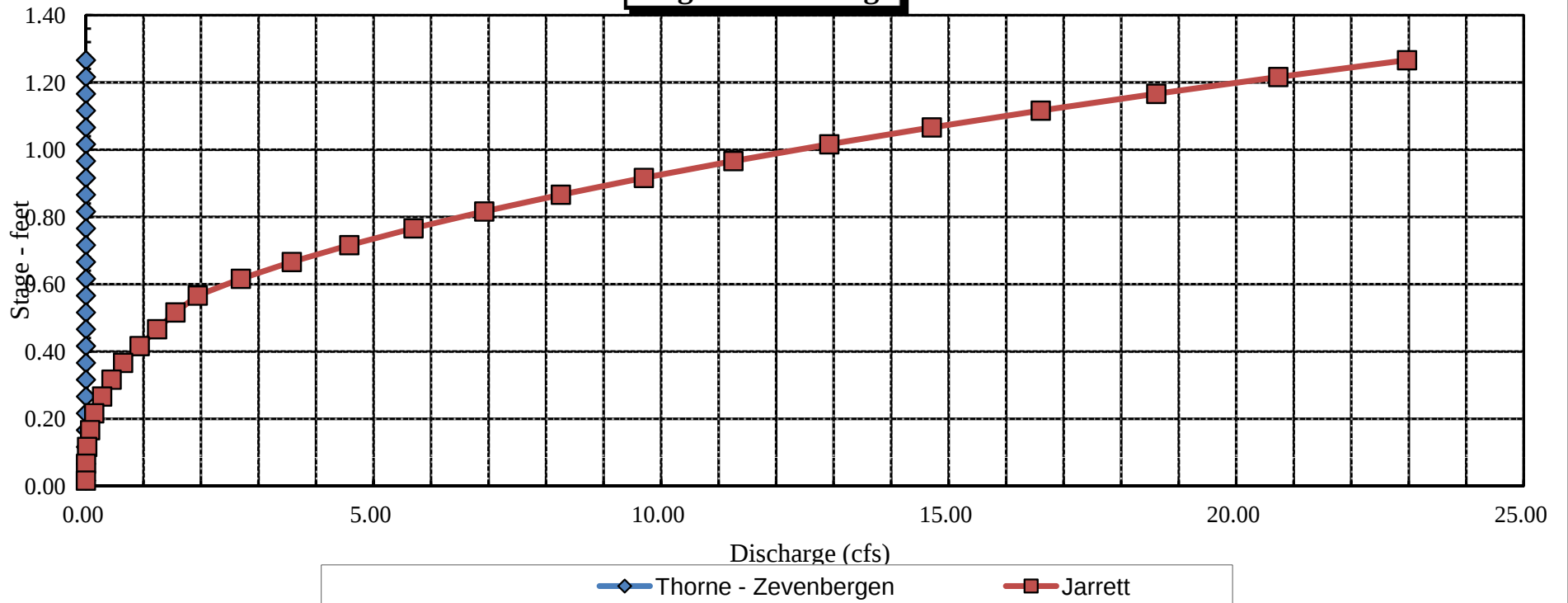
Hubbard Creek
Velocity vs. Discharge



Hubbard Creek
Average Depth vs. Discharge



**Hubbard Creek
Stage vs. Discharge**





COLORADO WATER
CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <u>Hubbard Creek</u>		CROSS-SECTION NO.: <u>1</u>	
CROSS-SECTION LOCATION: <u>500 ft. upstream from USFS - coal company boundary</u>			
DATE: <u>10-21-08</u>	OBSERVERS: <u>R. Smith, D. Murphy</u>		
LEGAL DESCRIPTION:	1/4 SECTION: <u>SW</u>	SECTION: <u>35</u>	TOWNSHIP: <u>12 N/S</u>
		RANGE: <u>91</u>	E/W: <u>6E</u>
COUNTY: <u>Delta</u>	WATERSHED: <u>N. Ft. Gunnison</u>	WATER DIVISION: <u>4</u>	DOW WATER CODE: <u>40751</u>
MAP(S):	USGS: <u>Bowie 7.5'</u>		
	USFS:		

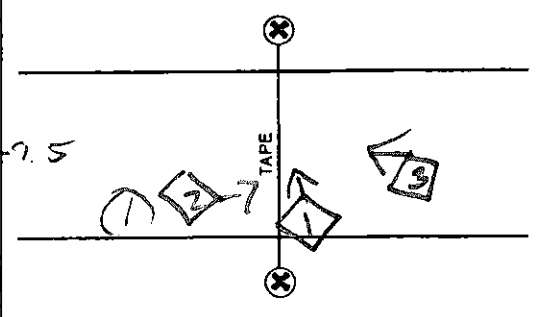
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: ☒ YES ☐ NO	METER TYPE: <u>M-M</u>			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: <u>Surveyed</u> lbs/foot	TAPE TENSION: <u>Surveyed</u> lbs
CHANNEL BED MATERIAL SIZE RANGE: <u>2" to 18"</u>	PHOTOGRAPHS TAKEN: ☒ YES ☐ NO	NUMBER OF PHOTOGRAPHS: <u>3</u>		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	<u>Surveyed</u>
(X) Tape @ Stake RB	0.0	<u>Surveyed</u>
(1) WS @ Tape LB/RB	0.0 <u>28.0</u>	<u>4.70 / 4.70</u> ← <u>7.5</u>
(2) WS Upstream	<u>14.0</u>	<u>4.65</u>
(3) WS Downstream	<u>10.0</u>	<u>4.80</u>
SLOPE	<u>0.15 / 24.0 =</u>	

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:																	
<u>mayfly, caddisfly</u>																	

COMMENTS

<u>Ph = 8.5</u>
<u>TDS = 220</u>
<u>Temp = 40 C</u>

[illegible]

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

LOCATION INFORMATION

STREAM NAME: Hubbard Creek
XS LOCATION: 200 ft. upstream from bridge
XS NUMBER: 2

DATE: 21-Oct-08
OBSERVERS: R. Smith, D. Murphy

1/4 SEC: SE
SECTION: 2
TWP: 13S
RANGE: 91W
PM: Sixth

COUNTY: Delta
WATERSHED: N. Fk. Gunnison
DIVISION: 4
DOW CODE: 40751

USGS MAP: Bowie 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: 0.01

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Hubbard Creek
 XS LOCATION: 200 ft. upstream from bridge
 XS NUMBER: 2

DATA POINTS= 25

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
1 RS & G	9.50	3.75		
W	11.70	4.75		
	12.00	4.85	0.10	0.00
	13.00	5.00	0.25	0.00
	14.00	4.95	0.20	0.00
	15.00	5.00	0.25	0.55
	16.00	5.00	0.25	0.99
	17.00	5.00	0.25	1.23
	18.00	5.15	0.45	0.90
	19.00	5.15	0.40	0.39
	20.00	5.15	0.40	0.01
	21.00	5.05	0.30	0.27
	22.00	5.15	0.40	0.38
	23.00	5.15	0.40	0.60
	23.50	5.15	0.40	1.03
	24.00	5.20	0.45	1.96
	25.00	5.35	0.65	0.40
	26.00	5.15	0.50	0.73
	27.00	5.30	0.60	0.08
	28.00	5.30	0.60	0.12
	29.00	5.15	0.45	0.16
	30.00	5.15	0.45	0.20
	31.00	4.75	0.05	0.00
W	31.50	4.70		
1 LS & G	34.50	3.70		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.32	0.10	0.07	0.00	0.0%
1.01	0.25	0.25	0.00	0.0%
1.00	0.20	0.20	0.00	0.0%
1.00	0.25	0.25	0.14	4.0%
1.00	0.25	0.25	0.25	7.2%
1.00	0.25	0.25	0.31	8.9%
1.01	0.45	0.45	0.41	11.8%
1.00	0.40	0.40	0.16	4.5%
1.00	0.40	0.40	0.00	0.1%
1.00	0.30	0.30	0.08	2.4%
1.00	0.40	0.40	0.15	4.4%
1.00	0.40	0.30	0.18	5.2%
0.50	0.40	0.20	0.21	6.0%
0.50	0.45	0.34	0.66	19.2%
1.01	0.65	0.65	0.26	7.5%
1.02	0.50	0.50	0.37	10.6%
1.01	0.60	0.60	0.05	1.4%
1.00	0.60	0.60	0.07	2.1%
1.01	0.45	0.45	0.07	2.1%
1.00	0.45	0.45	0.09	2.6%
1.08	0.05	0.04	0.00	0.0%
0.50		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

19.99	0.65	7.34	3.45	100.0%
	(Max.)			

Manning's n = 0.1624
 Hydraulic Radius= 0.36724857

STREAM NAME: Hubbard Creek
 XS LOCATION: 200 ft. upstream from bridge
 XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	7.34	7.39	0.7%
4.48	7.34	12.49	70.2%
4.50	7.34	12.07	64.5%
4.52	7.34	11.66	58.8%
4.54	7.34	11.24	53.1%
4.56	7.34	10.82	47.5%
4.58	7.34	10.41	41.9%
4.60	7.34	10.00	36.3%
4.62	7.34	9.59	30.7%
4.64	7.34	9.19	25.2%
4.66	7.34	8.78	19.7%
4.68	7.34	8.38	14.2%
4.69	7.34	8.18	11.5%
4.70	7.34	7.98	8.8%
4.71	7.34	7.78	6.0%
4.72	7.34	7.59	3.3%
4.73	7.34	7.39	0.7%
4.74	7.34	7.19	-2.0%
4.75	7.34	7.00	-4.6%
4.76	7.34	6.81	-7.3%
4.77	7.34	6.61	-9.9%
4.78	7.34	6.42	-12.5%
4.80	7.34	6.04	-17.7%
4.82	7.34	5.66	-22.9%
4.84	7.34	5.28	-28.0%
4.86	7.34	4.91	-33.2%
4.88	7.34	4.53	-38.2%
4.90	7.34	4.17	-43.2%
4.92	7.34	3.80	-48.2%
4.94	7.34	3.44	-53.1%
4.96	7.34	3.08	-58.0%
4.98	7.34	2.74	-62.7%

WATERLINE AT ZERO

AREA ERROR = 4.728

STREAM NAME: Hubbard Creek
 XS LOCATION: 200 ft. upstream from bridge
 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	3.75	24.85	1.17	1.60	29.14	25.41	100.0%	1.15	29.23	1.00
	3.78	24.71	1.15	1.57	28.46	25.25	99.4%	1.13	28.21	0.99
	3.83	24.45	1.11	1.52	27.23	24.97	98.3%	1.09	26.41	0.97
	3.88	24.19	1.08	1.47	26.02	24.70	97.2%	1.05	24.65	0.95
	3.93	23.93	1.04	1.42	24.81	24.42	96.1%	1.02	22.96	0.93
	3.98	23.67	1.00	1.37	23.62	24.14	95.0%	0.98	21.31	0.90
	4.03	23.41	0.96	1.32	22.45	23.86	93.9%	0.94	19.73	0.88
	4.08	23.15	0.92	1.27	21.28	23.58	92.8%	0.90	18.19	0.85
	4.13	22.89	0.88	1.22	20.13	23.30	91.7%	0.86	16.72	0.83
	4.18	22.63	0.84	1.17	19.00	23.02	90.6%	0.83	15.29	0.81
	4.23	22.37	0.80	1.12	17.87	22.74	89.5%	0.79	13.93	0.78
	4.28	22.11	0.76	1.07	16.76	22.46	88.4%	0.75	12.62	0.75
	4.33	21.85	0.72	1.02	15.66	22.19	87.3%	0.71	11.36	0.73
	4.38	21.59	0.68	0.97	14.57	21.91	86.2%	0.67	10.17	0.70
	4.43	21.33	0.63	0.92	13.50	21.63	85.1%	0.62	9.03	0.67
	4.48	21.07	0.59	0.87	12.44	21.35	84.0%	0.58	7.94	0.64
	4.53	20.81	0.55	0.82	11.39	21.07	82.9%	0.54	6.92	0.61
	4.58	20.55	0.50	0.77	10.36	20.79	81.8%	0.50	5.96	0.58
	4.63	20.29	0.46	0.72	9.34	20.51	80.7%	0.46	5.06	0.54
	4.68	20.03	0.42	0.67	8.33	20.23	79.6%	0.41	4.22	0.51
WL	4.73	19.57	0.37	0.62	7.34	19.76	77.8%	0.37	3.47	0.47
	4.78	19.15	0.33	0.57	6.37	19.32	76.1%	0.33	2.78	0.44
	4.83	18.87	0.29	0.52	5.42	19.03	74.9%	0.28	2.15	0.40
	4.88	18.50	0.24	0.47	4.49	18.64	73.4%	0.24	1.59	0.35
	4.93	18.04	0.20	0.42	3.57	18.17	71.5%	0.20	1.11	0.31
	4.98	16.48	0.16	0.37	2.70	16.59	65.3%	0.16	0.74	0.27
	5.03	13.12	0.15	0.32	1.98	13.22	52.0%	0.15	0.51	0.26
	5.08	12.11	0.11	0.27	1.34	12.20	48.0%	0.11	0.28	0.21
	5.13	10.66	0.07	0.22	0.77	10.72	42.2%	0.07	0.12	0.16
	5.18	4.72	0.08	0.17	0.40	4.77	18.8%	0.08	0.07	0.17
	5.23	3.40	0.06	0.12	0.20	3.43	13.5%	0.06	0.03	0.14
	5.28	2.15	0.03	0.07	0.06	2.16	8.5%	0.03	0.00	0.08
	5.33	0.26	0.01	0.02	0.00	0.27	1.0%	0.01	0.00	0.05

STREAM NAME: Hubbard Creek
XS LOCATION: 200 ft. upstream from bridge
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.45 cfs
CALCULATED FLOW (Qc)=	3.47 cfs
(Qm-Qc)/Qm * 100 =	-0.7 %
MEASURED WATERLINE (WLm)=	4.73 ft
CALCULATED WATERLINE (WLc)=	4.73 ft
(WLm-WLc)/WLm * 100 =	-0.1 %
MAX MEASURED DEPTH (Dm)=	0.65 ft
MAX CALCULATED DEPTH (Dc)=	0.62 ft
(Dm-Dc)/Dm * 100	4.2 %
MEAN VELOCITY=	0.47 ft/sec
MANNING'S N=	0.162
SLOPE=	0.01 ft/ft
.4 * Qm =	1.4 cfs
2.5 * Qm=	8.6 cfs

RECOMMENDED INSTREAM FLOW:
=====

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

RATIONALE FOR RECOMMENDATION:
=====

[illegible]

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

CWCB REVIEW BY: DATE:

STREAM NAME: Hubbard Creek
 XS LOCATION: 200 ft. upstream from bridge
 XS NUMBER: 2

Jarrett Variable Manning's n Correction Applied

GL = lowest Grassline elevation corrected for sag

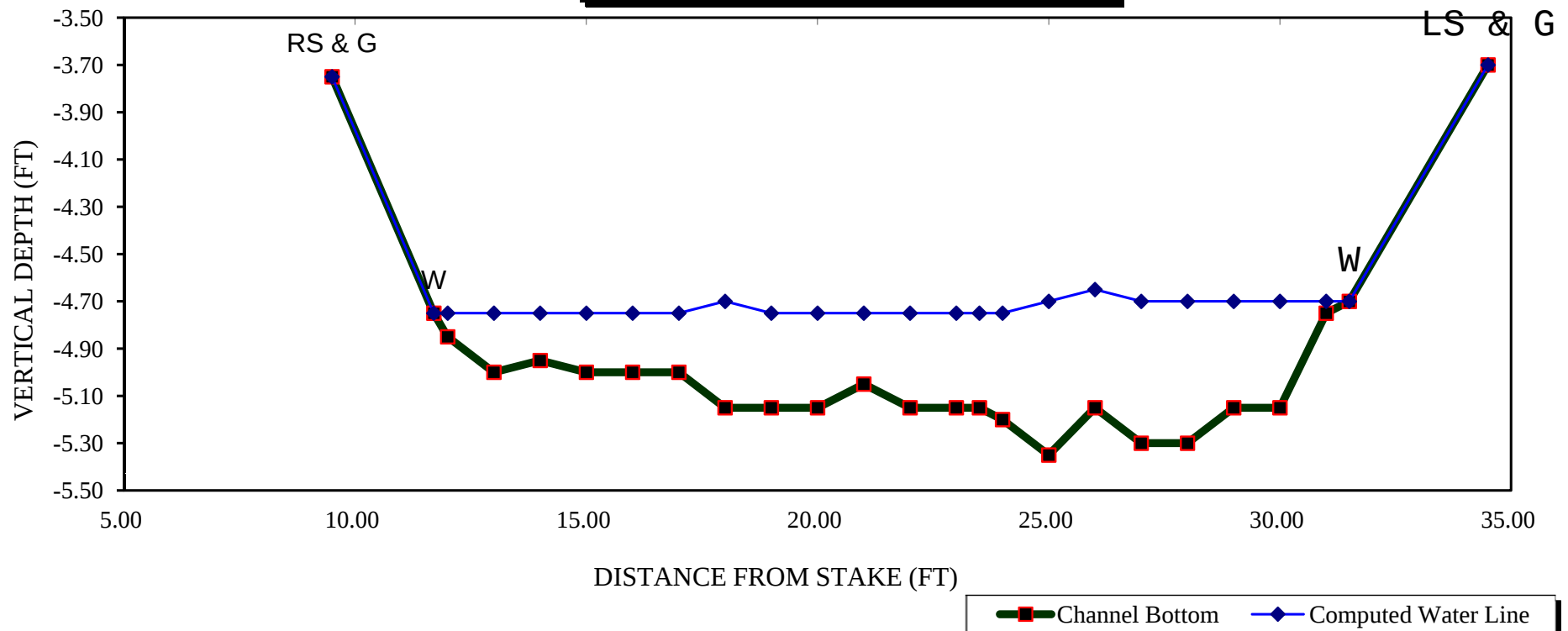
STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

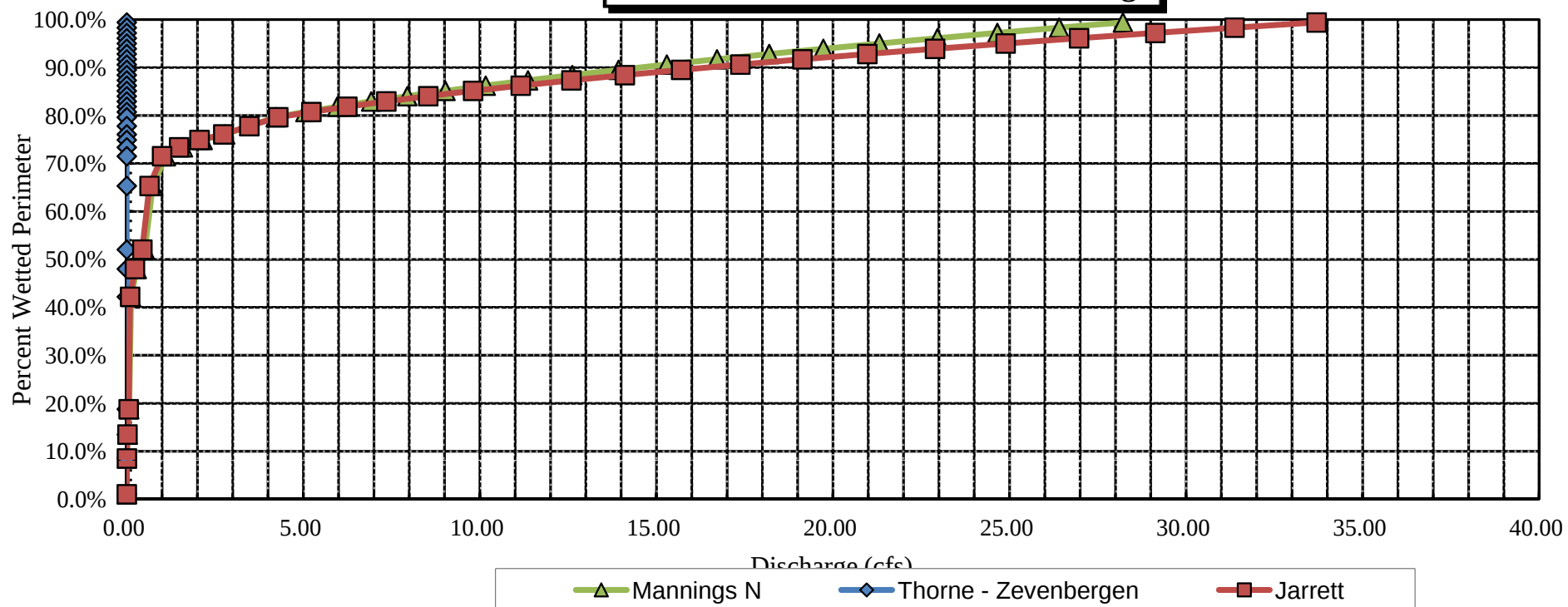
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.75	24.85	1.17	1.60	29.14	25.41	100.0%	1.15	35.01	1.20
	3.78	24.71	1.15	1.57	28.46	25.25	99.4%	1.13	33.70	1.18
	3.83	24.45	1.11	1.52	27.23	24.97	98.3%	1.09	31.37	1.15
	3.88	24.19	1.08	1.47	26.02	24.70	97.2%	1.05	29.13	1.12
	3.93	23.93	1.04	1.42	24.81	24.42	96.1%	1.02	26.97	1.09
	3.98	23.67	1.00	1.37	23.62	24.14	95.0%	0.98	24.89	1.05
	4.03	23.41	0.96	1.32	22.45	23.86	93.9%	0.94	22.89	1.02
	4.08	23.15	0.92	1.27	21.28	23.58	92.8%	0.90	20.97	0.99
	4.13	22.89	0.88	1.22	20.13	23.30	91.7%	0.86	19.13	0.95
	4.18	22.63	0.84	1.17	19.00	23.02	90.6%	0.83	17.38	0.91
	4.23	22.37	0.80	1.12	17.87	22.74	89.5%	0.79	15.70	0.88
	4.28	22.11	0.76	1.07	16.76	22.46	88.4%	0.75	14.11	0.84
	4.33	21.85	0.72	1.02	15.66	22.19	87.3%	0.71	12.59	0.80
	4.38	21.59	0.68	0.97	14.57	21.91	86.2%	0.67	11.16	0.77
	4.43	21.33	0.63	0.92	13.50	21.63	85.1%	0.62	9.81	0.73
	4.48	21.07	0.59	0.87	12.44	21.35	84.0%	0.58	8.54	0.69
	4.53	20.81	0.55	0.82	11.39	21.07	82.9%	0.54	7.35	0.65
	4.58	20.55	0.50	0.77	10.36	20.79	81.8%	0.50	6.25	0.60
	4.63	20.29	0.46	0.72	9.34	20.51	80.7%	0.46	5.23	0.56
	4.68	20.03	0.42	0.67	8.33	20.23	79.6%	0.41	4.29	0.52
WL	4.73	19.57	0.37	0.62	7.34	19.76	77.8%	0.37	3.47	0.47
	4.78	19.15	0.33	0.57	6.37	19.32	76.1%	0.33	2.73	0.43
	4.83	18.87	0.29	0.52	5.42	19.03	74.9%	0.28	2.06	0.38
	4.88	18.50	0.24	0.47	4.49	18.64	73.4%	0.24	1.48	0.33
	4.93	18.04	0.20	0.42	3.57	18.17	71.5%	0.20	1.00	0.28
	4.98	16.48	0.16	0.37	2.70	16.59	65.3%	0.16	0.64	0.24
	5.03	13.12	0.15	0.32	1.98	13.22	52.0%	0.15	0.44	0.22
	5.08	12.11	0.11	0.27	1.34	12.20	48.0%	0.11	0.23	0.17
	5.13	10.66	0.07	0.22	0.77	10.72	42.2%	0.07	0.09	0.12
	5.18	4.72	0.08	0.17	0.40	4.77	18.8%	0.08	0.05	0.14
	5.23	3.40	0.06	0.12	0.20	3.43	13.5%	0.06	0.02	0.10
	5.28	2.15	0.03	0.07	0.06	2.16	8.5%	0.03	0.00	0.05
	5.33	0.26	0.01	0.02	0.00	0.27	1.0%	0.01	0.00	0.03

Hubbard Creek

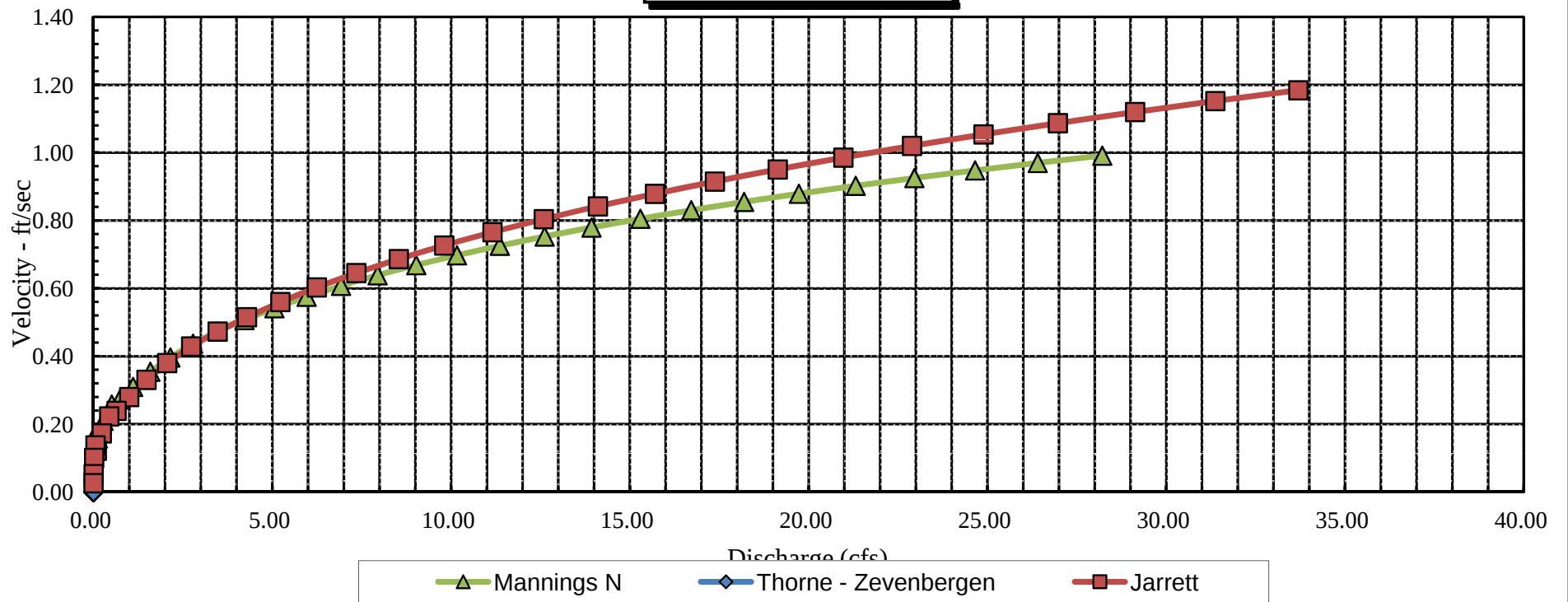
CROSS SECTION DATA ANALYSIS



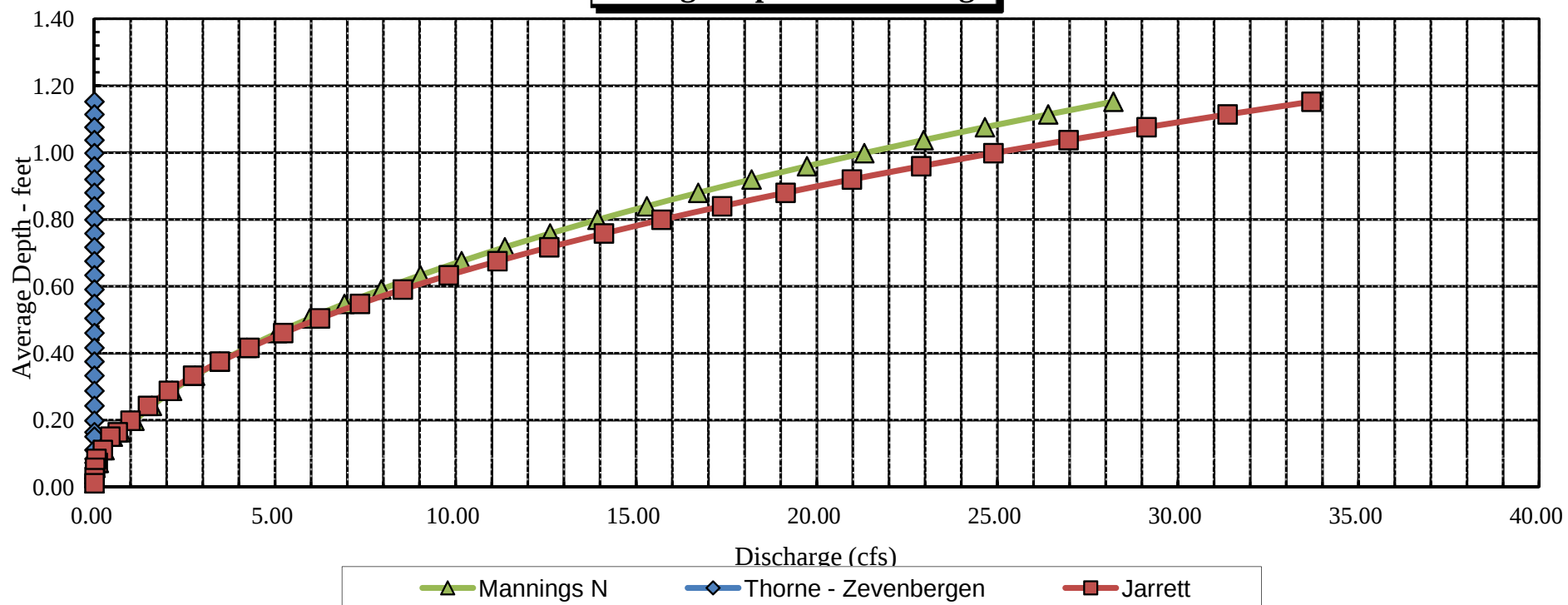
Hubbard Creek
Percent Wetted Perimeter vs. Discharge



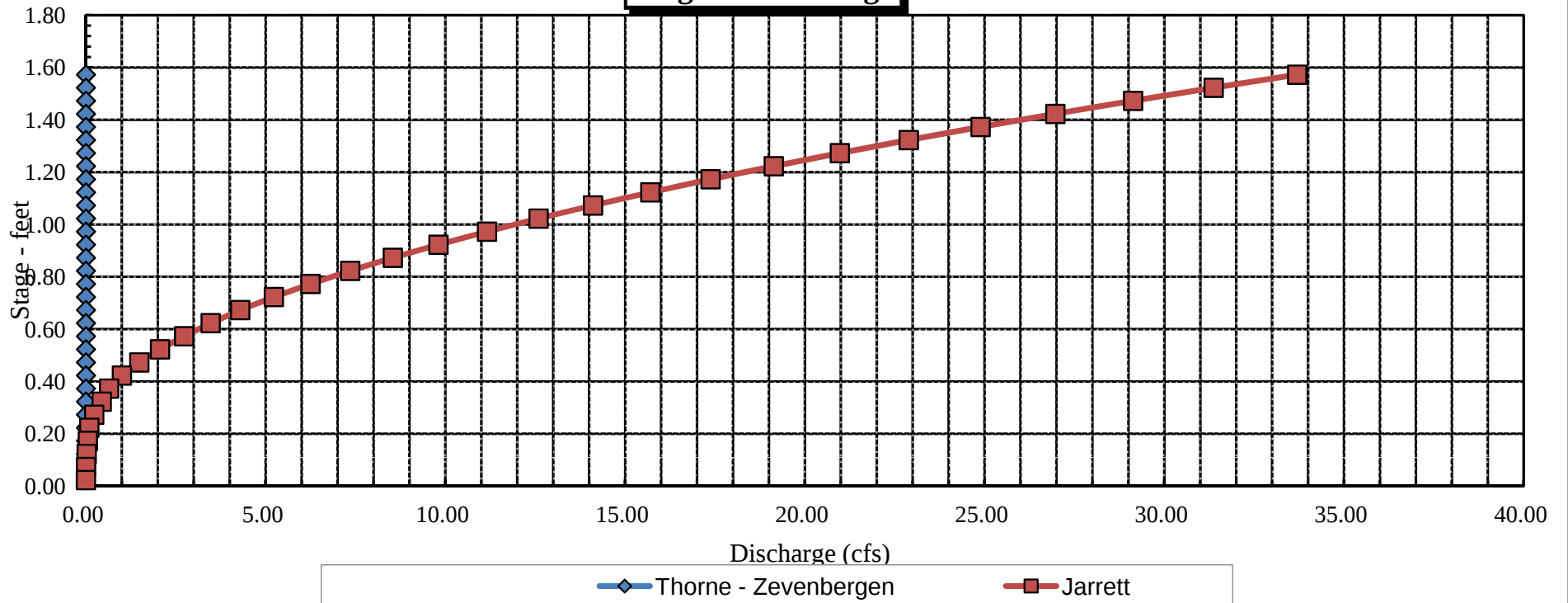
Hubbard Creek
Velocity vs. Discharge



Hubbard Creek
Average Depth vs. Discharge



Hubbard Creek
Stage vs. Discharge





COLORADO WATER
CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <u>Hubbard Creek</u>		CROSS-SECTION NO.: <u>2</u>
CROSS-SECTION LOCATION: <u>200 ft. upstream from bridge</u>		
DATE: <u>10-21-08</u> OBSERVERS: <u>R. Smith, D. Murphy</u>		
LEGAL DESCRIPTION	1/4 SECTION: <u>SE</u>	SECTION: <u>2</u>
	TOWNSHIP: <u>13 N/S</u>	RANGE: <u>7 E/W</u> PM. <u>6th</u>
COUNTY: <u>Delta</u>	WATERSHED: <u>N Fk. Gunnison</u>	WATER DIVISION: <u>4</u>
		DOW WATER CODE: <u>40751</u>
MAP(S):	USGS: <u>Bowle 7.5'</u>	USFS:

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: <u>YES/NO</u>	METER TYPE: <u>M-M</u>
METER NUMBER:	DATE RATED:
CALIB/SPIN: _____ sec	TAPE WEIGHT: <u>surveyed</u> lbs/foot
	TAPE TENSION: <u>surveyed</u> lbs
CHANNEL BED MATERIAL SIZE RANGE: <u>2" to 18"</u>	PHOTOGRAPHS TAKEN: <u>YES/NO</u>
	NUMBER OF PHOTOGRAPHS: <u>3</u>

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	<u>surveyed</u>
(X) Tape @ Stake RB	0.0	<u>surveyed</u>
(1) WS @ Tape LB/RB	0.0	<u>31.5 - 4.70 / 4.75</u>
(2) WS Upstream	7.0	<u>4.65</u>
(3) WS Downstream	10.0	<u>4.82</u>
SLOPE	<u>0.17 / 17.0 = 0.01</u>	

SKETCH

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: <u>YES/NO</u>	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:																	
<u>mayfly, caddisfly</u>																	

COMMENTS

TDS = <u>220</u>
PH = <u>8.5</u>
Temp = <u>5° C</u>

DISCHARGE/CROSS SECTION NOTES

[illegible]

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

LOCATION INFORMATION

STREAM NAME: Hubbard Creek
XS LOCATION: 1.5 miles u.s. f/ conf. w/ N Fk. Gunnison
XS NUMBER: 1

DATE: 27-Sep-07
OBSERVERS: R. Smith, D. Murphy

1/4 SEC: SE
SECTION: 2
TWP: 13S
RANGE: 91W
PM: Sixth

COUNTY: Delta
WATERSHED: Gunnison
DIVISION: 4
DOW CODE: 40751

USGS MAP: Bowie 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: 0.018

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Hubbard Creek
 XS LOCATION: 1.5 miles u.s. f/ conf. w/ N Fk. Gunnison
 XS NUMBER: 1

DATA POINTS= 27

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	1.50	4.95			0.00		0.00	0.00	0.0%
		6.00	5.12			0.00		0.00	0.00	0.0%
		8.00	5.57			0.00		0.00	0.00	0.0%
1	G	9.00	5.96			0.00		0.00	0.00	0.0%
		11.00	6.62			0.00		0.00	0.00	0.0%
	W	12.20	7.18			0.00		0.00	0.00	0.0%
		12.30	7.60	0.40	0.88	0.43	0.40	0.16	0.14	0.7%
		13.00	7.85	0.65	1.55	0.74	0.65	0.55	0.86	4.5%
		14.00	7.65	0.45	1.32	1.02	0.45	0.45	0.59	3.1%
		15.00	8.10	0.90	1.18	1.10	0.90	0.90	1.06	5.5%
		16.00	8.15	0.95	0.71	1.00	0.95	0.95	0.67	3.5%
		17.00	8.00	0.80	0.67	1.01	0.80	0.80	0.54	2.8%
		18.00	7.95	0.75	3.04	1.00	0.75	0.75	2.28	11.9%
		19.00	8.00	0.80	1.16	1.00	0.80	0.80	0.93	4.8%
		20.00	8.10	0.90	1.87	1.00	0.90	0.90	1.68	8.8%
		21.00	8.05	0.85	3.31	1.00	0.85	0.85	2.81	14.7%
		22.00	8.10	0.90	2.69	1.00	0.90	0.90	2.42	12.6%
		23.00	8.00	0.80	1.80	1.00	0.80	0.80	1.44	7.5%
		24.00	8.20	1.00	1.16	1.02	1.00	1.00	1.16	6.1%
		25.00	8.20	1.00	0.89	1.00	1.00	1.00	0.89	4.6%
		26.00	8.20	1.00	0.62	1.00	1.00	1.00	0.62	3.2%
		27.00	8.40	1.20	0.71	1.02	1.20	1.20	0.85	4.4%
		28.00	8.10	0.90	0.23	1.04	0.90	0.90	0.21	1.1%
		29.00	7.50	0.20	0.01	1.17	0.20	0.16	0.00	0.0%
	W	29.60	7.17			0.68		0.00	0.00	0.0%
1	G	33.50	5.92			0.00		0.00	0.00	0.0%
	LS	35.00	5.10			0.00		0.00	0.00	0.0%

TOTALS -----

18.25 1.2 14.07 19.16 100.0%
 (Max.)

Manning's n = 0.1231
 Hydraulic Radius= 0.77095083

STREAM NAME: Hubbard Creek
 XS LOCATION: 1.5 miles u.s. f/ conf. w/ N Fk. Gunnison
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	14.07	14.58	3.6%
6.93	14.07	19.09	35.7%
6.95	14.07	18.72	33.0%
6.97	14.07	18.35	30.4%
6.99	14.07	17.98	27.8%
7.01	14.07	17.61	25.1%
7.03	14.07	17.25	22.6%
7.05	14.07	16.88	20.0%
7.07	14.07	16.52	17.4%
7.09	14.07	16.16	14.9%
7.11	14.07	15.81	12.3%
7.13	14.07	15.45	9.8%
7.14	14.07	15.28	8.6%
7.15	14.07	15.10	7.3%
7.16	14.07	14.93	6.1%
7.17	14.07	14.75	4.8%
7.18	14.07	14.58	3.6%
7.19	14.07	14.40	2.4%
7.20	14.07	14.23	1.1%
7.21	14.07	14.06	-0.1%
7.22	14.07	13.88	-1.3%
7.23	14.07	13.71	-2.6%
7.25	14.07	13.37	-5.0%
7.27	14.07	13.02	-7.5%
7.29	14.07	12.68	-9.9%
7.31	14.07	12.33	-12.4%
7.33	14.07	11.99	-14.8%
7.35	14.07	11.65	-17.2%
7.37	14.07	11.31	-19.6%
7.39	14.07	10.97	-22.0%
7.41	14.07	10.63	-24.4%
7.43	14.07	10.29	-26.9%

WATERLINE AT ZERO

AREA ERROR = 7.204

STREAM NAME: Hubbard Creek
 XS LOCATION: 1.5 miles u.s. f/ conf. w/ N Fk. Gunnison
 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	5.96	24.38	1.63	2.44	39.79	25.65	100.0%	1.55	86.35	2.17
	6.20	22.87	1.49	2.20	34.02	24.07	93.8%	1.41	69.40	2.04
	6.25	22.57	1.46	2.15	32.89	23.75	92.6%	1.38	66.17	2.01
	6.30	22.26	1.43	2.10	31.77	23.42	91.3%	1.36	63.03	1.98
	6.35	21.95	1.40	2.05	30.66	23.10	90.1%	1.33	59.97	1.96
	6.40	21.64	1.37	2.00	29.57	22.78	88.8%	1.30	56.99	1.93
	6.45	21.34	1.34	1.95	28.50	22.45	87.5%	1.27	54.10	1.90
	6.50	21.03	1.30	1.90	27.44	22.13	86.3%	1.24	51.28	1.87
	6.55	20.72	1.27	1.85	26.39	21.81	85.0%	1.21	48.55	1.84
	6.60	20.41	1.24	1.80	25.37	21.48	83.8%	1.18	45.89	1.81
	6.65	20.14	1.21	1.75	24.35	21.19	82.6%	1.15	43.27	1.78
	6.70	19.87	1.18	1.70	23.35	20.91	81.5%	1.12	40.71	1.74
	6.75	19.61	1.14	1.65	22.37	20.62	80.4%	1.08	38.23	1.71
	6.80	19.35	1.11	1.60	21.39	20.34	79.3%	1.05	35.82	1.67
	6.85	19.08	1.07	1.55	20.43	20.06	78.2%	1.02	33.49	1.64
	6.90	18.82	1.04	1.50	19.48	19.78	77.1%	0.99	31.24	1.60
	6.95	18.56	1.00	1.45	18.55	19.50	76.0%	0.95	29.06	1.57
	7.00	18.29	0.96	1.40	17.63	19.21	74.9%	0.92	26.95	1.53
	7.05	18.03	0.93	1.35	16.72	18.93	73.8%	0.88	24.92	1.49
	7.10	17.77	0.89	1.30	15.82	18.65	72.7%	0.85	22.97	1.45
	7.15	17.51	0.85	1.25	14.94	18.37	71.6%	0.81	21.09	1.41
WL	7.20	17.33	0.81	1.20	14.07	18.16	70.8%	0.78	19.23	1.37
	7.25	17.23	0.77	1.15	13.21	18.00	70.2%	0.73	17.40	1.32
	7.30	17.13	0.72	1.10	12.35	17.85	69.6%	0.69	15.64	1.27
	7.35	17.02	0.68	1.05	11.50	17.69	69.0%	0.65	13.96	1.21
	7.40	16.92	0.63	1.00	10.65	17.54	68.4%	0.61	12.36	1.16
	7.45	16.82	0.58	0.95	9.80	17.38	67.8%	0.56	10.84	1.11
	7.50	16.72	0.54	0.90	8.97	17.23	67.2%	0.52	9.39	1.05
	7.55	16.62	0.49	0.85	8.13	17.08	66.6%	0.48	8.03	0.99
	7.60	16.52	0.44	0.80	7.30	16.92	66.0%	0.43	6.75	0.92
	7.65	16.26	0.40	0.75	6.48	16.65	64.9%	0.39	5.60	0.86
	7.70	15.68	0.36	0.70	5.68	16.02	62.5%	0.35	4.61	0.81
	7.75	15.09	0.33	0.65	4.92	15.40	60.0%	0.32	3.72	0.76
	7.80	14.51	0.29	0.60	4.18	14.78	57.6%	0.28	2.91	0.70
	7.85	13.96	0.25	0.55	3.46	14.19	55.3%	0.24	2.19	0.63
	7.90	13.76	0.20	0.50	2.77	13.97	54.5%	0.20	1.53	0.55
	7.95	13.40	0.16	0.45	2.09	13.59	53.0%	0.15	0.97	0.46
	8.00	11.24	0.13	0.40	1.47	11.40	44.4%	0.13	0.61	0.41
	8.05	9.30	0.10	0.35	0.96	9.42	36.7%	0.10	0.34	0.35
	8.10	5.69	0.10	0.30	0.58	5.77	22.5%	0.10	0.21	0.35
	8.15	4.05	0.08	0.25	0.34	4.11	16.0%	0.08	0.11	0.31
	8.20	1.63	0.10	0.20	0.16	1.68	6.6%	0.10	0.05	0.34
	8.25	1.22	0.07	0.15	0.09	1.25	4.9%	0.07	0.02	0.28
	8.30	0.80	0.05	0.10	0.04	0.82	3.2%	0.05	0.01	0.21
	8.35	0.38	0.02	0.05	0.01	0.39	1.5%	0.02	0.00	0.13

STREAM NAME: Hubbard Creek
XS LOCATION: 1.5 miles u.s. f/ conf. w/ N Fk. Gunnison
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)= 19.16 cfs
CALCULATED FLOW (Qc)= 19.23 cfs
(Qm-Qc)/Qm * 100 = -0.4 %

MEASURED WATERLINE (WLm)= 7.18 ft
CALCULATED WATERLINE (WLc)= 7.20 ft
(WLm-WLc)/WLm * 100 = -0.4 %

MAX MEASURED DEPTH (Dm)= 1.20 ft
MAX CALCULATED DEPTH (Dc)= 1.20 ft
(Dm-Dc)/Dm * 100 = 0.3 %

MEAN VELOCITY= 1.37 ft/sec
MANNING'S N= 0.123
SLOPE= 0.018 ft/ft

.4 * Qm = 7.7 cfs
2.5 * Qm= 47.9 cfs

RECOMMENDED INSTREAM FLOW:
=====

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

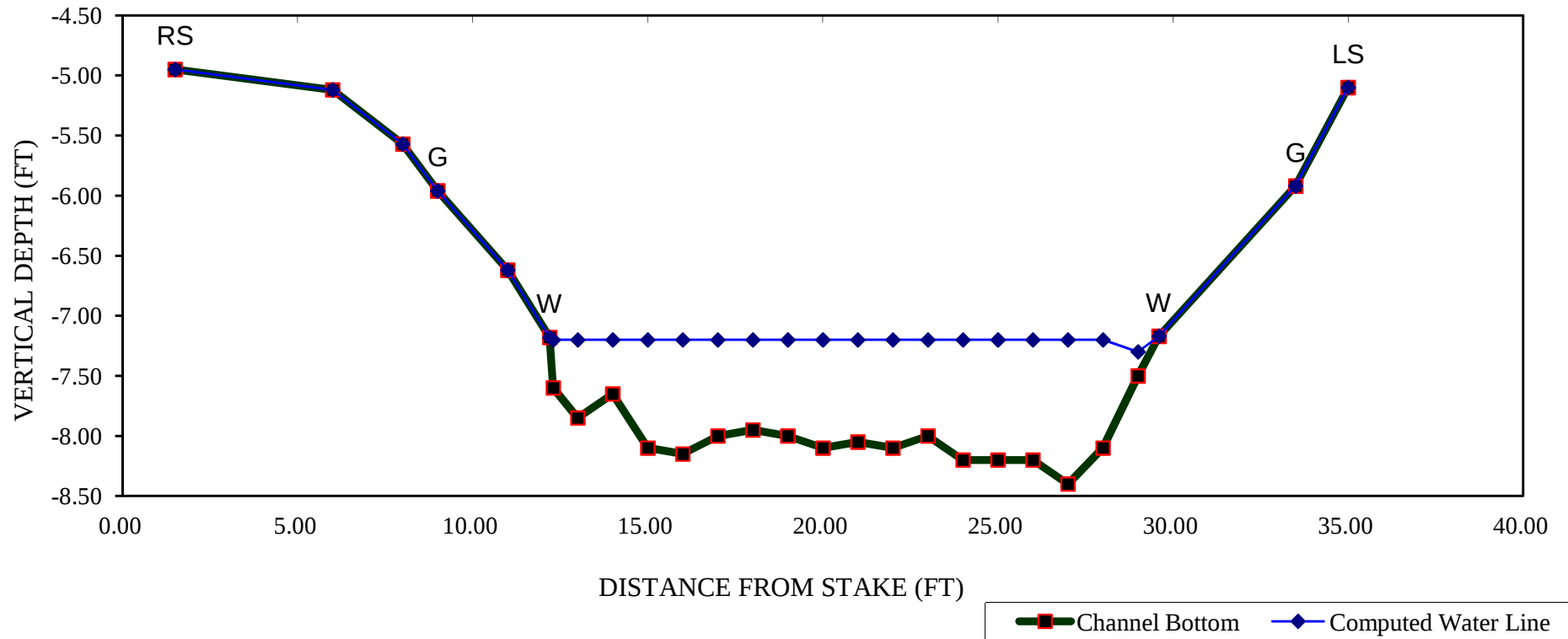
RATIONALE FOR RECOMMENDATION:
=====

RECOMMENDATION BY: AGENCY..... DATE:.....
CWCB REVIEW BY: DATE:.....

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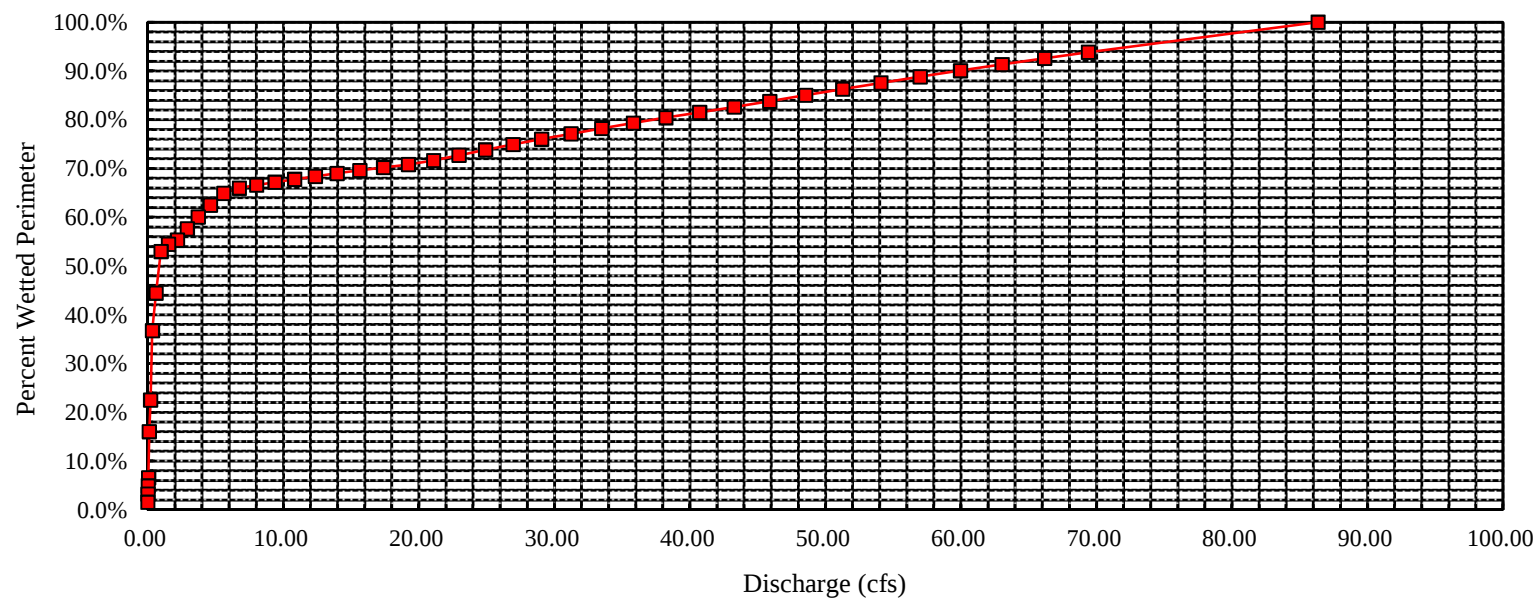
Hubbard Creek

CROSS SECTION DATA ANALYSIS



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Percent Wetted Perimeter vs. Discharge





FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: <u>Hubbard Creek</u>				CROSS-SECTION NO.:	
CROSS-SECTION LOCATION: <u>Approx 1.5 miles upstream from confluence w/ N. Fk. Gunnison</u>					
DATE: <u>9-27-07</u>	OBSERVERS: <u>R. Smith, D. Murphy</u>				
LEGAL DESCRIPTION:	1/4 SECTION: <u>SE</u>	SECTION: <u>2</u>	TOWNSHIP: <u>13 N(S)</u>	RANGE: <u>91 E(W)</u>	PM: <u>6:42</u>
COUNTY: <u>Delta</u>	WATERSHED: <u>N. Fk. Gunn.</u>		WATER DIVISION: <u>4</u>		DOW WATER CODE: <u>40751</u>
MAP(S):	USGS: <u>Bowie 7.5'</u> GPS <u>0281646</u> USFS: <u>4313568</u>				

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION:	YES / NO	METER TYPE: <u>Marsh-McBirney</u>			
METER NUMBER:	DATE RATED:	CALIB/SPIN: <u>sec</u>	TAPE WEIGHT: <u>surveyed</u> lbs/foot	TAPE TENSION: <u>surveyed</u> lbs	
CHANNEL BED MATERIAL SIZE RANGE: <u>4" cobbles to 2 foot</u>		PHOTOGRAPHS TAKEN: <u>(YES/NO)</u>	NUMBER OF PHOTOGRAPHS: <u>3</u>		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	<u>surveyed</u>
⊗ Tape @ Stake RB	0.0	<u>surveyed</u>
① WS @ Tape LB/RB	0.0	<u>7.17/7.18</u>
② WS Upstream	<u>5.0</u>	<u>6.80</u>
③ WS Downstream	<u>15.0</u>	<u>7.34</u>
SLOPE	<u>0.54/30.0 = 0.018</u>	

SKETCH

Sketch showing stations 1, 2, and 3. Station 1 is at the bottom, station 2 is in the middle, and station 3 is at the top. A vertical line labeled 'TAPE' connects them. Arrows indicate flow direction from station 3 towards station 1.

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

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: <u>(YES/NO)</u>	DISTANCE ELECTROFISHED: <u>ft</u>	FISH CAUGHT: <u>(YES/NO)</u>	WATER CHEMISTRY SAMPLED: <u>(YES/NO)</u>														
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
<u>see attached survey</u>																	
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:																	

COMMENTS

<u>TDS = 110</u>
<u>Ph = 8.2</u>
<u>Temp = 40°F</u>

DISCHARGE/CROSS SECTION NOTES

[illegible]







