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-932)

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on Morgan Gulch, located in Water Division 5.

Location and Land Status. Morgan Gulch originates on the Arapahoe National Forest approximately seven miles southeast of Williams Fork Reservoir. This reach begins at the headwaters of the creek and extends downstream to the confluence with the Williams Fork River, a distance of approximately 4.0 miles. The BLM manages approximately 1.2 miles of this reach, the U.S. Forest Service manages 2.5 miles, and 0.2 miles are in private ownership.

Biological Summary. Morgan Gulch is a cold-water, high gradient stream. It flows through a narrow valley floor slightly less than one-fourth mile in width. The stream cuts through alluvial deposits in the narrow valley and is confined by bedrock in many locations. The stream generally has small-sized substrate, consisting of gravels and small cobbles. The stream has a good mix of pools, small riffles and runs.

Fisheries surveys have revealed a self-sustaining population of brook trout. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly and stonefly.

The riparian community is generally comprised of douglas fir, subalpine fir, willow species and alder. The riparian community is in very good condition, and provides abundant shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Morgan Gulch:

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)
06/30/2014 #1	0.93 cfs	10.09 feet	0.84 cfs	2.05 cfs
06/30/2014 #2	1.15 cfs	12.67 feet	1.48 cfs	Out of range
06/05/2013 #1	5.01 cfs	9.20 feet	Out of range	2.29 cfs
06/05/2013 #2	5.01 cfs	12.06 feet	Out of range	2.01 cfs
		Averages:	1.16 cfs	2.12 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.

> 2.1 cubic feet per second is recommended during the snowmelt runoff period from May 1 to July 31. This recommendation is driven by the average depth criteria. This creek is narrow and has limited physical habitat, so it is important to protect a flow rate that makes most of this habitat available to the fish population while they are completing critical life history functions during the warm weather months.
>
> 0.8 cubic feet per second is recommended during late summer, from August 1 to September 30. This recommendation is driven by limited water availability. This flow rate exceeds the wetted perimeter and average velocity criteria in most cross sections that were surveyed, and it meets the average depth criteria in some, but not all locations, that were surveyed.
>
> 0.3 cubic feet per second is recommended from October 1 to April 30. This recommendation is driven by limited water availability. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter. Even though the base flow in this creek is small, it is extremely consistent, allowing the fishery to persist.

Water Availability. The BLM recommends relying upon three sources of data for water availability analysis. Unite States Geological Survey (USGS) Gage 09037200 (Skylark Creek near Parshall, CO), and USGS Gage 09036500 (Keyser Creek near Leal, CO) measure flow from watersheds that are close to Morgan Gulch and share similar watershed characteristics. A basin apportionment analysis could be performed to derive flow rates for Morgan Gulch. In addition, Streamstats should be consulted. The Streamstats model produces similar estimates of base flow as basin apportionment calculations.

The BLM is not aware of any water rights within or upstream from the proposed instream flow reach.

Relationship to Land Management Plans. The BLM's land use plan calls for Morgan Gulch to be managed to maintain, restore or improve riparian conditions, such that proper functioning conditions are achieved. It also specifies that instream flow appropriations are pursued on fishery streams to ensure sufficient flows rates for fisheries protection. Appropriation of an instream flow water right would assist the BLM in long-term management of outstanding riparian values and important fishery values.

Data sheets, R2Cross output, fishery survey information and photographs of the cross section were included with BLM's draft recommendation in February 2015. We thank both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

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

Sincerely,

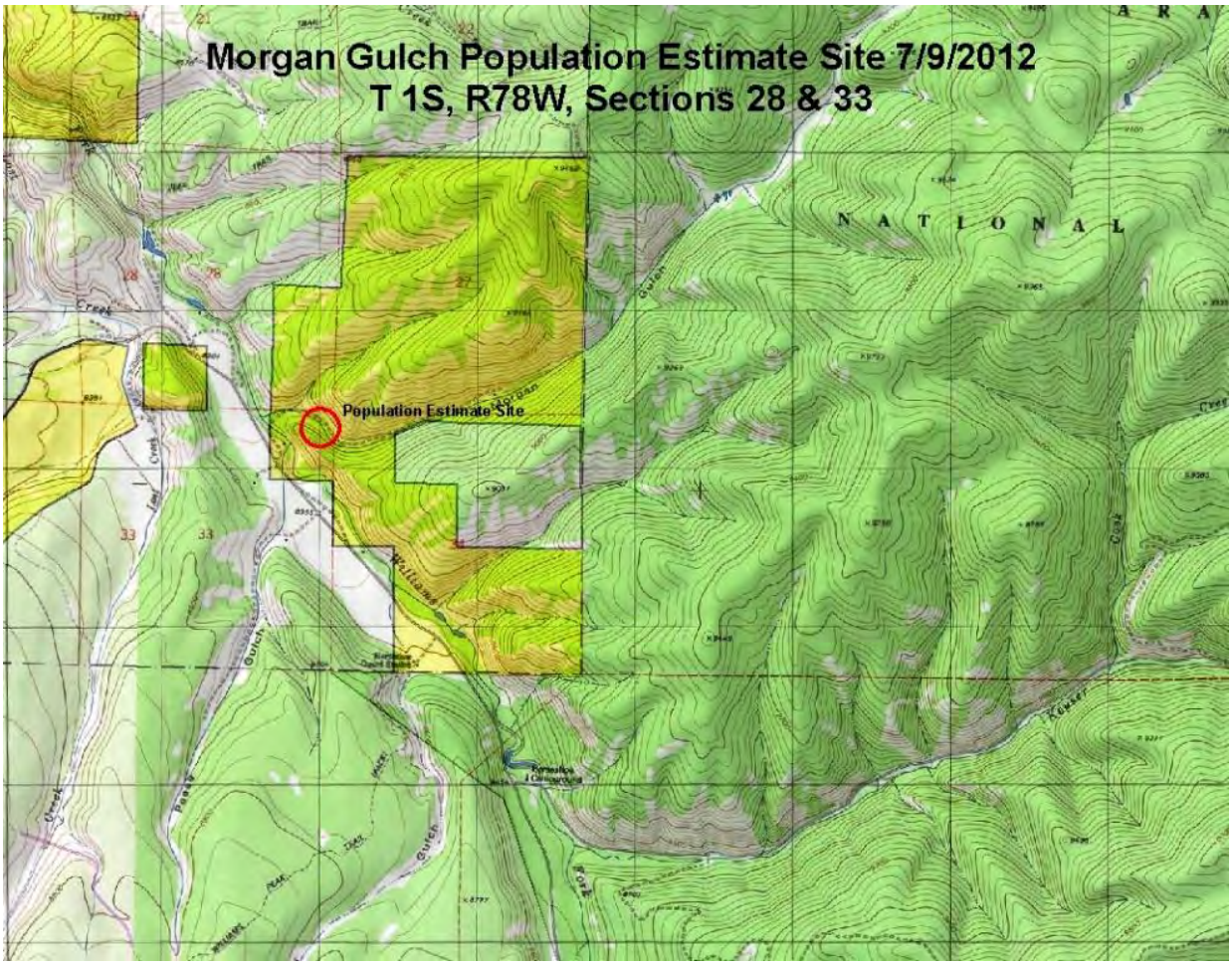
Brian St. George
Deputy State Director
Resources and Fire

Cc: Stephanie Odell, Kremmling Field Office
Joseph Meyer, Northwest District Office
Paula Belcher, Kremmling Field Office

Kremmling Field Office Stream Surveys
July 2012

Morgan Gulch - Water Code # 23680

Morgan Gulch, located south of Hot Sulphur Springs, Colorado on BLM lands managed by the Kremmling Field Office, was sampled on July 9, 2012. Sampling was conducted to determine fish species composition and to assist with an instream flow recommendation. The stream was sampled with one backpack shocker and a two-pass removal population estimate was conducted. Brook trout were the only species seen or collected. Personnel present were Gregor Dekleva, and Andrea Sponseller, BLM.



Morgan Gulch

Morgan Gulch

Brook trout

Discussion:

Morgan Gulch is a small stream and given the drought conditions had limited flow. Despite the low flows, the steam contains good habitat diversity with riffles, runs, and some decent pools. The stream appeared to have blown out in 2011 under high spring flows as evidenced by bed material and debris above the bank. Riparian vegetation was dense and lush and consisted of willows, alder, sedges, marestail, and lodgepole pine – most of which was dead or dying. The stream contains a healthy brook trout fishery with good age-class diversity. Aquatic insect production appeared good.

Recommendations:

- Determine brook trout distribution limits in the stream
- Pursue instream flow recommendation
- Consider reclamation potential for cutthroat in relation to other priority streams
- Periodically monitor fish population and stream habitats

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

LOCATION INFORMATION

STREAM NAME:	Morgan Gulch
XS LOCATION:	1/4 mile u/s fr. Conf. w/ Williams Fork
XS NUMBER:	2
DATE:	5-Jun-13
OBSERVERS:	R. Smith, B. Logan, B. Epstein
1/4 SEC:	NE
SECTION:	33
TWP:	1S
RANGE:	84W
PM:	Sixth
COUNTY:	Grand
WATERSHED:	Williams Fork River
DIVISION:	5
DOW CODE:	23680
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.0314

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

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

STREAM NAME: Morgan Gulch
XS LOCATION: 1/4 mile u/s fr. Conf. w/ Williams Fork
XS NUMBER: 2

DATA POINTS= 25

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	4.52			0.00		0.00	0.00	0.0%
1	G	2.70	4.86			0.00		0.00	0.00	0.0%
	W	2.90	6.00	0.00	0.00	0.00		0.00	0.00	0.0%
		3.50	6.32	0.32	0.97	0.68	0.32	0.16	0.16	3.1%
		3.90	6.31	0.31	1.72	0.40	0.31	0.12	0.21	4.3%
		4.30	6.42	0.42	2.02	0.41	0.42	0.17	0.34	6.8%
		4.70	6.40	0.40	2.60	0.40	0.40	0.16	0.42	8.3%
		5.10	6.47	0.47	2.69	0.41	0.47	0.19	0.51	10.1%
		5.50	6.49	0.49	2.30	0.40	0.49	0.20	0.45	9.0%
		5.90	6.43	0.43	2.46	0.40	0.43	0.17	0.42	8.4%
		6.30	6.40	0.40	2.80	0.40	0.40	0.16	0.45	8.9%
		6.70	6.46	0.46	2.30	0.40	0.46	0.18	0.42	8.4%
		7.10	6.39	0.39	2.19	0.41	0.39	0.16	0.34	6.8%
		7.50	6.31	0.31	2.22	0.41	0.31	0.12	0.28	5.5%
		7.90	6.30	0.30	1.96	0.40	0.30	0.12	0.24	4.7%
		8.30	6.30	0.30	1.04	0.40	0.30	0.12	0.12	2.5%
		8.70	6.30	0.30	1.60	0.40	0.30	0.12	0.19	3.8%
		9.10	6.23	0.23	1.14	0.41	0.23	0.09	0.10	2.1%
		9.50	6.25	0.25	1.12	0.40	0.25	0.10	0.11	2.2%
		9.90	6.32	0.32	1.12	0.41	0.32	0.13	0.14	2.9%
		10.30	6.21	0.21	1.27	0.41	0.21	0.08	0.11	2.1%
	W	10.70	6.00	0.00	0.00	0.45		0.00	0.00	0.0%
		11.10	5.66			0.00		0.00	0.00	0.0%
		13.30	5.46			0.00		0.00	0.00	0.0%
1	RS/G	15.00	4.76			0.00		0.00	0.00	0.0%
	TOTALS ----------					8.01	0.49 (Max.)	2.56	5.01	100.0%

Manning's n = 0.0627
Hydraulic Radius= 0.31927921

STREAM NAME: Morgan Gulch
XS LOCATION: 1/4 mile u/s fr. Conf. w/ Williams Fork
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.56	2.56	0.0%
5.75	2.56	4.55	77.9%
5.77	2.56	4.39	71.6%
5.79	2.56	4.22	65.3%
5.81	2.56	4.06	58.9%
5.83	2.56	3.90	52.6%
5.85	2.56	3.74	46.4%
5.87	2.56	3.58	40.1%
5.89	2.56	3.42	33.9%
5.91	2.56	3.26	27.7%
5.93	2.56	3.11	21.5%
5.95	2.56	2.95	15.3%
5.96	2.56	2.87	12.2%
5.97	2.56	2.79	9.2%
5.98	2.56	2.71	6.1%
5.99	2.56	2.63	3.1%
6.00	2.56	2.56	0.0%
6.01	2.56	2.48	-3.0%
6.02	2.56	2.40	-6.1%
6.03	2.56	2.32	-9.1%
6.04	2.56	2.25	-12.1%
6.05	2.56	2.17	-15.1%
6.07	2.56	2.02	-21.0%
6.09	2.56	1.87	-26.9%
6.11	2.56	1.72	-32.7%
6.13	2.56	1.57	-38.4%
6.15	2.56	1.43	-44.1%
6.17	2.56	1.28	-49.7%
6.19	2.56	1.14	-55.3%
6.21	2.56	1.00	-60.8%
6.23	2.56	0.86	-66.3%
6.25	2.56	0.73	-71.4%

WATERLINE AT ZERO
AREA ERROR = 6.000

STREAM NAME: Morgan Gulch
XS LOCATION: 1/4 mile u/s fr. Conf. w/ Williams Fork
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	4.86	12.06	1.16	1.63	13.93	13.47	100.0%	1.03	59.75	4.29
	5.00	11.69	1.05	1.49	12.26	12.96	96.2%	0.95	49.60	4.04
	5.05	11.56	1.01	1.44	11.68	12.78	94.9%	0.91	46.18	3.95
	5.10	11.43	0.97	1.39	11.11	12.60	93.5%	0.88	42.86	3.86
	5.15	11.30	0.93	1.34	10.54	12.42	92.2%	0.85	39.65	3.76
	5.20	11.17	0.89	1.29	9.98	12.23	90.8%	0.82	36.55	3.66
	5.25	11.04	0.85	1.24	9.42	12.05	89.5%	0.78	33.56	3.56
	5.30	10.91	0.81	1.19	8.87	11.87	88.1%	0.75	30.67	3.46
	5.35	10.78	0.77	1.14	8.33	11.69	86.8%	0.71	27.90	3.35
	5.40	10.65	0.73	1.09	7.80	11.51	85.4%	0.68	25.24	3.24
	5.45	10.52	0.69	1.04	7.27	11.32	84.1%	0.64	22.69	3.12
	5.50	10.05	0.67	0.99	6.75	10.81	80.2%	0.62	20.70	3.07
	5.55	9.49	0.66	0.94	6.26	10.20	75.7%	0.61	18.98	3.03
	5.60	8.93	0.65	0.89	5.80	9.60	71.2%	0.60	17.40	3.00
	5.65	8.37	0.64	0.84	5.37	9.00	66.8%	0.60	15.97	2.97
	5.70	8.21	0.60	0.79	4.96	8.77	65.1%	0.56	14.22	2.87
	5.75	8.14	0.56	0.74	4.55	8.65	64.2%	0.53	12.44	2.73
	5.80	8.07	0.51	0.69	4.14	8.52	63.2%	0.49	10.75	2.60
	5.85	8.00	0.47	0.64	3.74	8.39	62.3%	0.45	9.16	2.45
	5.90	7.94	0.42	0.59	3.34	8.26	61.3%	0.40	7.67	2.30
	5.95	7.87	0.37	0.54	2.95	8.13	60.4%	0.36	6.29	2.13
WL	6.00	7.80	0.33	0.49	2.56	8.01	59.4%	0.32	5.01	1.96
	6.05	7.61	0.29	0.44	2.17	7.79	57.8%	0.28	3.89	1.79
	6.10	7.42	0.24	0.39	1.79	7.58	56.2%	0.24	2.88	1.61
	6.15	7.23	0.20	0.34	1.43	7.36	54.7%	0.19	2.01	1.41
	6.20	7.04	0.15	0.29	1.07	7.15	53.1%	0.15	1.27	1.18
	6.25	6.27	0.12	0.24	0.73	6.36	47.2%	0.11	0.72	0.99
	6.30	4.62	0.09	0.19	0.44	4.68	34.7%	0.09	0.38	0.87
	6.35	3.25	0.08	0.14	0.25	3.29	24.4%	0.08	0.19	0.76
	6.40	2.82	0.04	0.09	0.10	2.84	21.1%	0.04	0.05	0.46
	6.45	0.90	0.02	0.04	0.02	0.91	6.8%	0.02	0.01	0.32

STREAM NAME: Morgan Gulch
XS LOCATION: 1/4 mile u/s fr. Conf. w/ Williams Fork
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.01	cfs
CALCULATED FLOW (Qc)=	5.01	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.00	ft
CALCULATED WATERLINE (WLc)=	6.00	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.49	ft
MAX CALCULATED DEPTH (Dc)=	0.49	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.96	ft/sec
MANNING'S N=	0.063	
SLOPE=	0.0314	ft/ft
.4 * Qm =	2.0	cfs
2.5 * Qm=	12.5	cfs

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

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

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

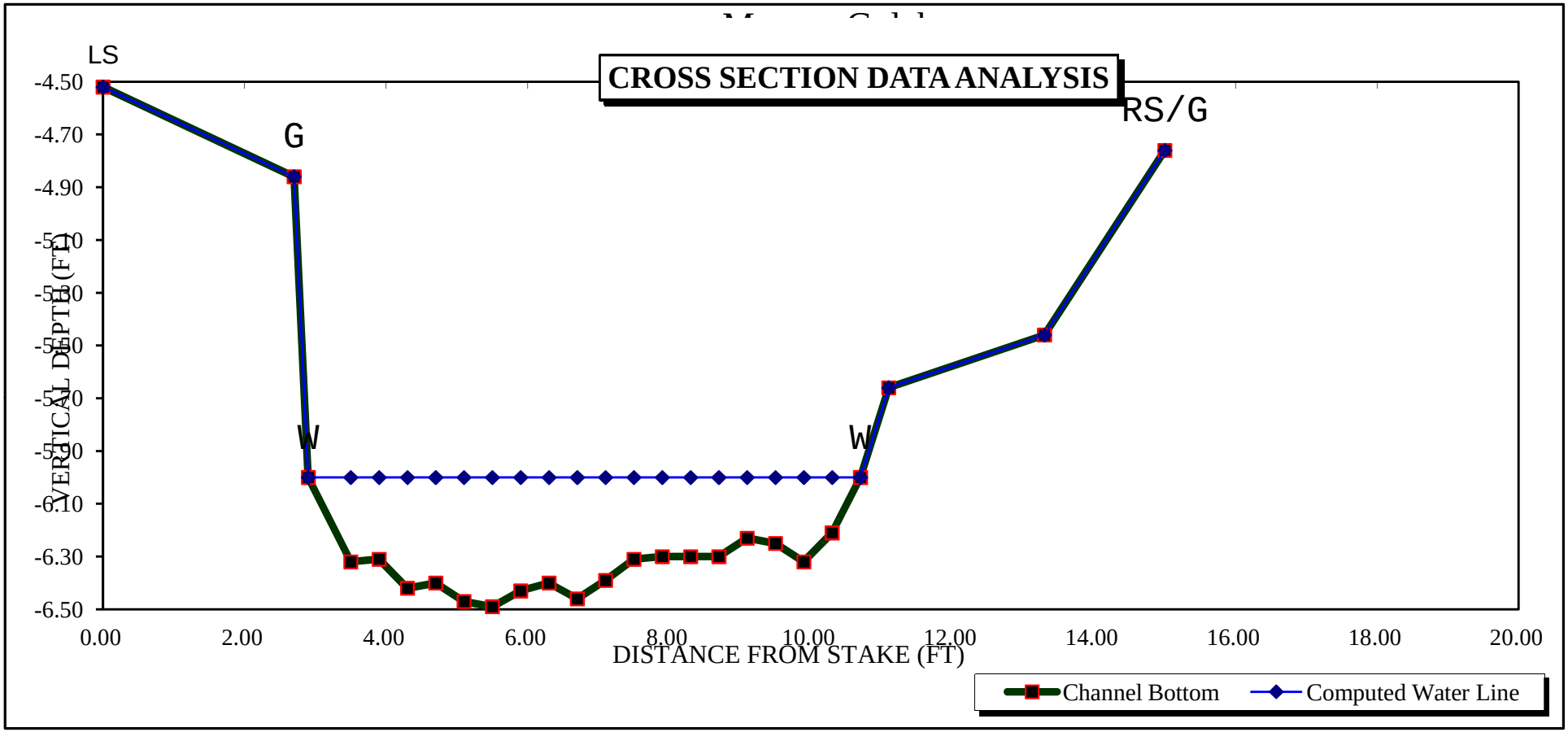
RECOMMENDATION BY: ……………………………………………… AGENCY……………………………………………… DATE:………………………

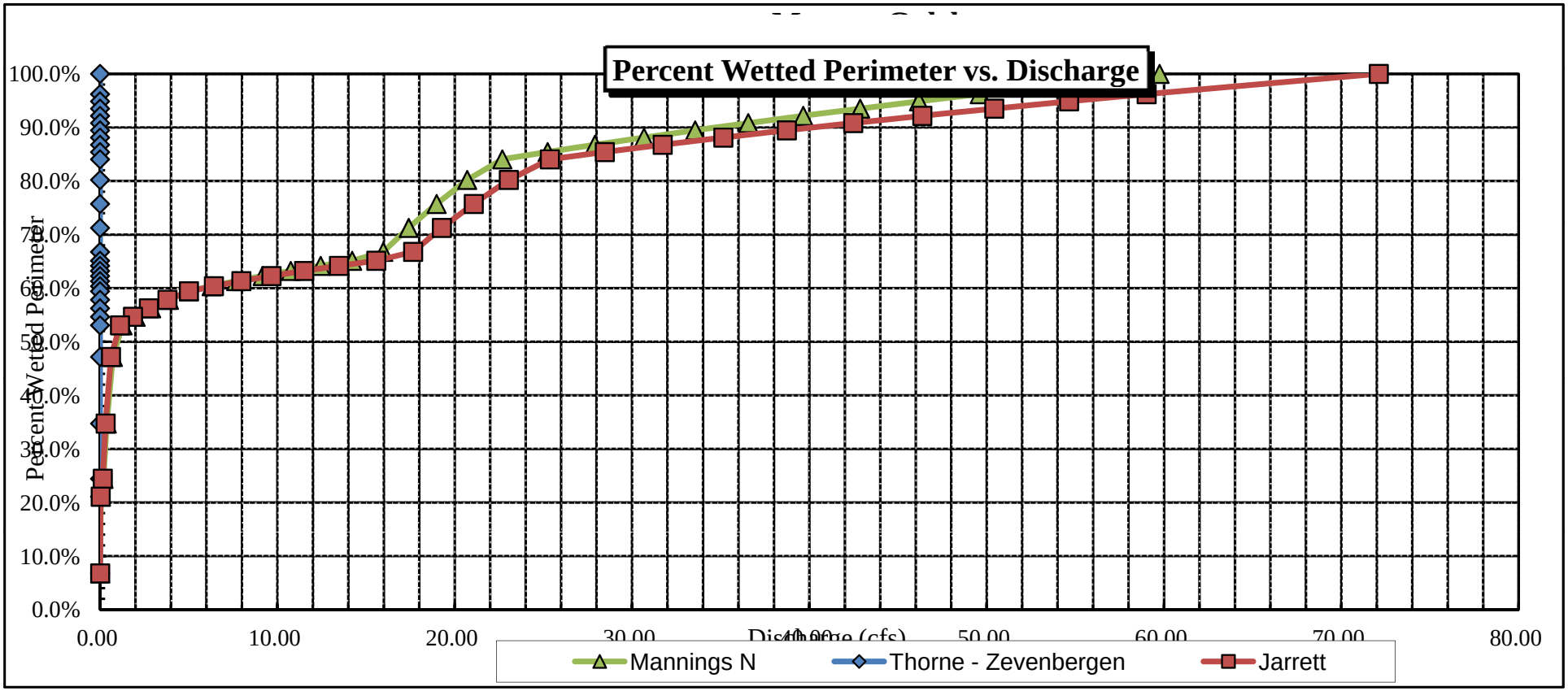
CWCB REVIEW BY: ……………………………………………………………………………………………… DATE:………………………

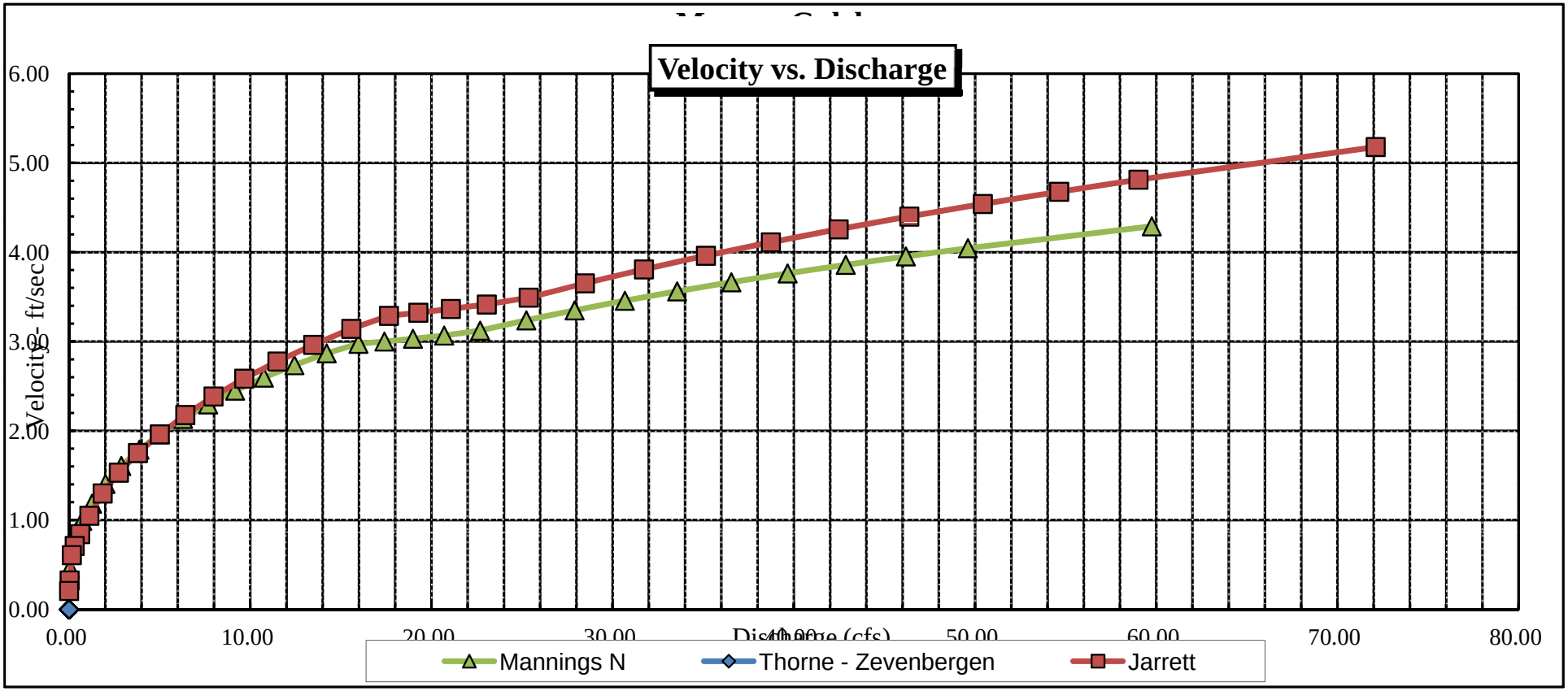
STREAM NAME: Morgan Gulch
XS LOCATION: 1/4 mile u/s fr. Conf. w/ Williams Fork
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

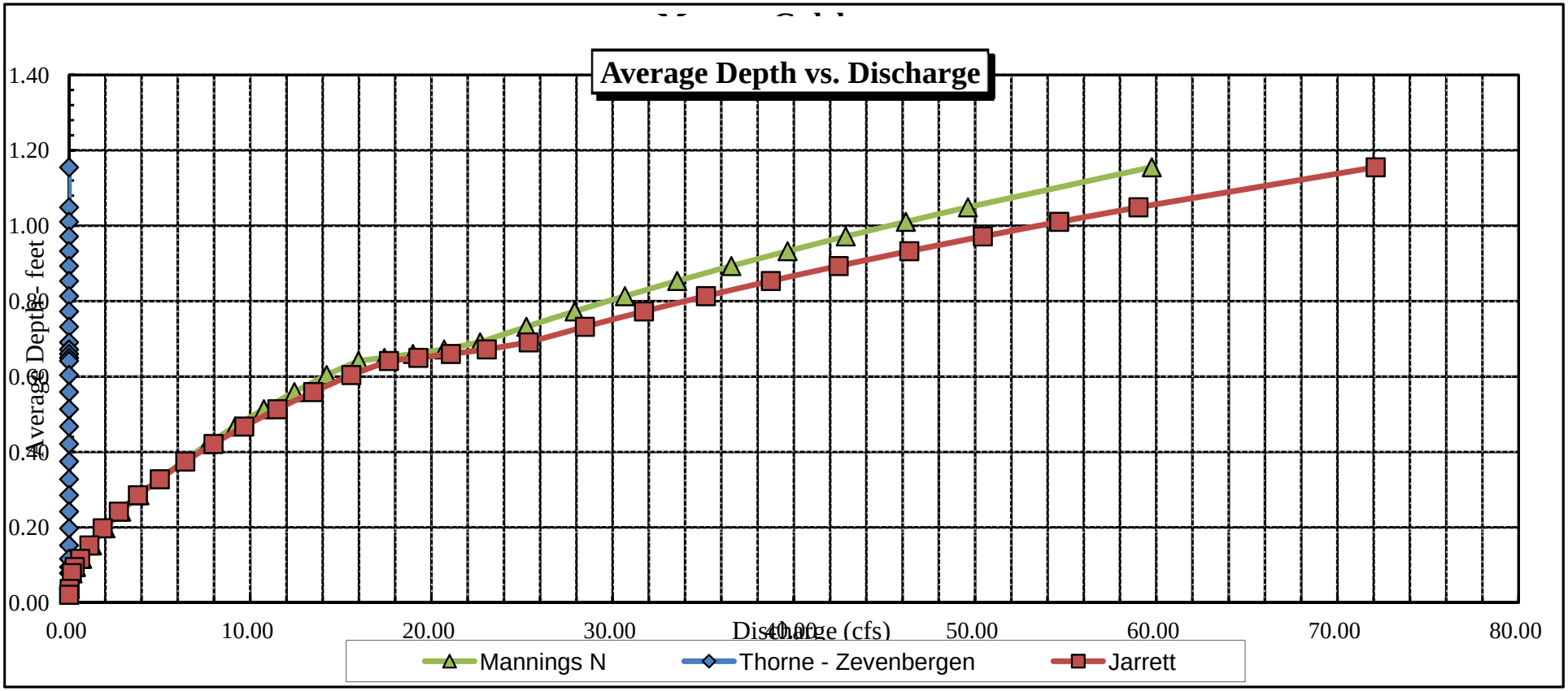
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

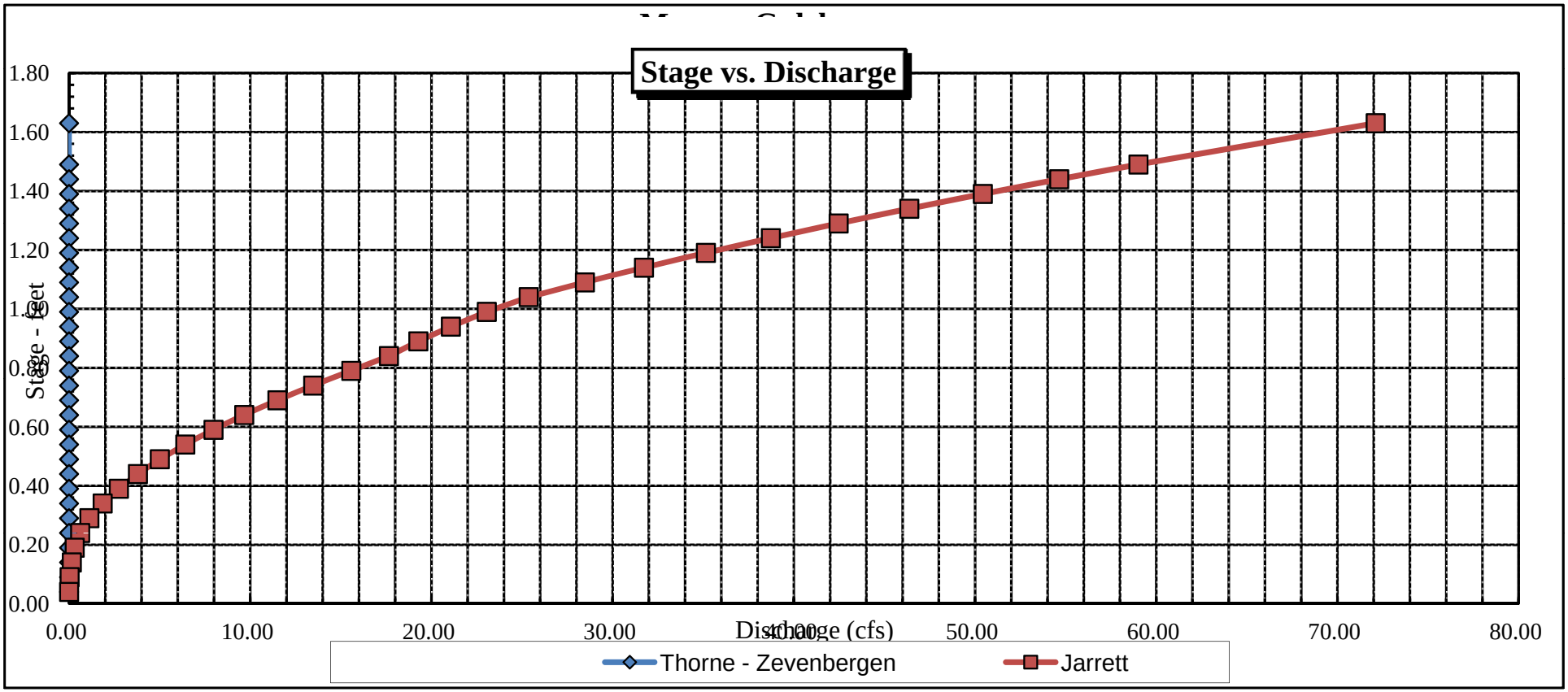
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.86	12.06	1.16	1.63	13.93	13.47	100.0%	1.03	72.11	5.18
	5.00	11.69	1.05	1.49	12.26	12.96	96.2%	0.95	59.02	4.81
	5.05	11.56	1.01	1.44	11.68	12.78	94.9%	0.91	54.64	4.68
	5.10	11.43	0.97	1.39	11.11	12.60	93.5%	0.88	50.43	4.54
	5.15	11.30	0.93	1.34	10.54	12.42	92.2%	0.85	46.37	4.40
	5.20	11.17	0.89	1.29	9.98	12.23	90.8%	0.82	42.47	4.26
	5.25	11.04	0.85	1.24	9.42	12.05	89.5%	0.78	38.73	4.11
	5.30	10.91	0.81	1.19	8.87	11.87	88.1%	0.75	35.15	3.96
	5.35	10.78	0.77	1.14	8.33	11.69	86.8%	0.71	31.73	3.81
	5.40	10.65	0.73	1.09	7.80	11.51	85.4%	0.68	28.47	3.65
	5.45	10.52	0.69	1.04	7.27	11.32	84.1%	0.64	25.37	3.49
	5.50	10.05	0.67	0.99	6.75	10.81	80.2%	0.62	23.05	3.41
	5.55	9.49	0.66	0.94	6.26	10.20	75.7%	0.61	21.07	3.37
	5.60	8.93	0.65	0.89	5.80	9.60	71.2%	0.60	19.28	3.32
	5.65	8.37	0.64	0.84	5.37	9.00	66.8%	0.60	17.65	3.29
	5.70	8.21	0.60	0.79	4.96	8.77	65.1%	0.56	15.58	3.14
	5.75	8.14	0.56	0.74	4.55	8.65	64.2%	0.53	13.47	2.96
	5.80	8.07	0.51	0.69	4.14	8.52	63.2%	0.49	11.50	2.78
	5.85	8.00	0.47	0.64	3.74	8.39	62.3%	0.45	9.67	2.58
	5.90	7.94	0.42	0.59	3.34	8.26	61.3%	0.40	7.97	2.38
	5.95	7.87	0.37	0.54	2.95	8.13	60.4%	0.36	6.42	2.18
WL	6.00	7.80	0.33	0.49	2.56	8.01	59.4%	0.32	5.01	1.96
	6.05	7.61	0.29	0.44	2.17	7.79	57.8%	0.28	3.80	1.75
	6.10	7.42	0.24	0.39	1.79	7.58	56.2%	0.24	2.75	1.53
	6.15	7.23	0.20	0.34	1.43	7.36	54.7%	0.19	1.85	1.30
	6.20	7.04	0.15	0.29	1.07	7.15	53.1%	0.15	1.12	1.05
	6.25	6.27	0.12	0.24	0.73	6.36	47.2%	0.11	0.62	0.84
	6.30	4.62	0.09	0.19	0.44	4.68	34.7%	0.09	0.31	0.71
	6.35	3.25	0.08	0.14	0.25	3.29	24.4%	0.08	0.15	0.61
	6.40	2.82	0.04	0.09	0.10	2.84	21.1%	0.04	0.03	0.32
	6.45	0.90	0.02	0.04	0.02	0.91	6.8%	0.02	0.00	0.21


CROSS SECTION DATA ANALYSIS
LS
G
W
W
RS/G
-4.50
-4.70
-4.90
-6.10
-6.30
-6.50
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
10.00
20.00
30.00
50.00
60.00
70.00
80.00
Mannings N
Thorne - Zevenbergen
Jarrett


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


Average Depth vs. Discharge
Average Depth - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Morgan Gulch
XS LOCATION:	1/3 mile u/s fr conf. w/ Sheephorn Creek
XS NUMBER:	1
DATE:	5-Jun-13
OBSERVERS:	R. Smith, B. Logan, B. Epstein
1/4 SEC:	NW
SECTION:	34
TWP:	1S
RANGE:	78W
PM:	Sixth
COUNTY:	Grand
WATERSHED:	Williams Fork
DIVISION:	5
DOW CODE:	23680
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:	0.0153

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

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

STREAM NAME: Morgan Gulch
XS LOCATION: 1/3 mile u/s fr conf. w/ Sheephorn Creek
XS NUMBER: 1

DATA POINTS= 26

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	4.24			0.00		0.00	0.00	0.0%
1	G	2.90	4.96			0.00		0.00	0.00	0.0%
		3.30	5.80			0.00		0.00	0.00	0.0%
	W	3.90	6.55	0.00	0.00	0.00		0.00	0.00	0.0%
		4.30	6.65	0.10	0.00	0.41	0.10	0.04	0.00	0.0%
		4.70	6.82	0.27	0.65	0.43	0.27	0.11	0.07	1.4%
		5.10	6.86	0.31	1.51	0.40	0.31	0.12	0.19	3.7%
		5.50	6.85	0.30	2.10	0.40	0.30	0.12	0.25	5.0%
		5.90	6.88	0.33	1.79	0.40	0.33	0.13	0.24	4.7%
		6.30	6.90	0.35	2.50	0.40	0.35	0.14	0.35	7.0%
		6.70	6.95	0.40	2.50	0.40	0.40	0.16	0.40	8.0%
		7.10	6.91	0.36	2.58	0.40	0.36	0.14	0.37	7.4%
		7.50	6.86	0.31	2.64	0.40	0.31	0.12	0.33	6.5%
		7.90	6.95	0.40	2.21	0.41	0.40	0.16	0.35	7.1%
		8.30	6.83	0.28	2.22	0.42	0.28	0.11	0.25	5.0%
		8.70	6.91	0.36	2.08	0.41	0.36	0.14	0.30	6.0%
		9.10	6.98	0.43	2.28	0.41	0.43	0.17	0.39	7.8%
		9.50	7.00	0.45	2.21	0.40	0.45	0.18	0.40	7.9%
		9.90	6.94	0.39	2.91	0.40	0.39	0.16	0.45	9.1%
		10.30	6.83	0.28	3.11	0.41	0.28	0.11	0.35	7.0%
		10.70	6.83	0.28	2.86	0.40	0.28	0.11	0.32	6.4%
		11.10	6.70	0.15	0.00	0.42	0.15	0.05	0.00	0.0%
	W	11.40	6.55	0.00	0.00	0.34		0.00	0.00	0.0%
		11.70	5.96			0.00		0.00	0.00	0.0%
1	G	12.30	5.38			0.00		0.00	0.00	0.0%
	RS	15.00	4.32			0.00		0.00	0.00	0.0%
	TOTALS ----------					7.68	0.45 (Max.)	2.29	5.01	100.0%

Manning's n = 0.0376
Hydraulic Radius= 0.29864483

STREAM NAME: Morgan Gulch
XS LOCATION: 1/3 mile u/s fr conf. w/ Sheephorn Creek
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.29	2.29	0.0%
6.30	2.29	4.21	83.6%
6.32	2.29	4.05	76.8%
6.34	2.29	3.90	70.0%
6.36	2.29	3.74	63.2%
6.38	2.29	3.59	56.4%
6.40	2.29	3.43	49.7%
6.42	2.29	3.28	43.0%
6.44	2.29	3.13	36.3%
6.46	2.29	2.97	29.7%
6.48	2.29	2.82	23.0%
6.50	2.29	2.67	16.4%
6.51	2.29	2.59	13.1%
6.52	2.29	2.52	9.8%
6.53	2.29	2.44	6.6%
6.54	2.29	2.37	3.3%
6.55	2.29	2.29	0.0%
6.56	2.29	2.22	-3.3%
6.57	2.29	2.14	-6.5%
6.58	2.29	2.07	-9.7%
6.59	2.29	2.00	-12.9%
6.60	2.29	1.93	-16.0%
6.62	2.29	1.78	-22.3%
6.64	2.29	1.64	-28.4%
6.66	2.29	1.50	-34.4%
6.68	2.29	1.37	-40.4%
6.70	2.29	1.23	-46.2%
6.72	2.29	1.10	-52.0%
6.74	2.29	0.97	-57.7%
6.76	2.29	0.84	-63.3%
6.78	2.29	0.72	-68.8%
6.80	2.29	0.59	-74.2%

WATERLINE AT ZERO
AREA ERROR = 6.550

STREAM NAME: Morgan Gulch
XS LOCATION: 1/3 mile u/s fr conf. w/ Sheephorn Creek
XS NUMBER: 1 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.38	9.20	1.31	1.62	12.02	10.60	100.0%	1.13	63.96	5.32
	5.55	8.94	1.17	1.45	10.48	10.17	95.9%	1.03	52.31	4.99
	5.60	8.87	1.13	1.40	10.04	10.04	94.7%	1.00	49.07	4.89
	5.65	8.79	1.09	1.35	9.59	9.91	93.5%	0.97	45.91	4.79
	5.70	8.72	1.05	1.30	9.16	9.78	92.3%	0.94	42.84	4.68
	5.75	8.64	1.01	1.25	8.72	9.66	91.1%	0.90	39.86	4.57
	5.80	8.57	0.97	1.20	8.29	9.53	89.9%	0.87	36.96	4.46
	5.85	8.47	0.93	1.15	7.87	9.39	88.6%	0.84	34.18	4.35
	5.90	8.38	0.89	1.10	7.44	9.26	87.3%	0.80	31.49	4.23
	5.95	8.29	0.85	1.05	7.03	9.12	86.1%	0.77	28.89	4.11
	6.00	8.22	0.80	1.00	6.62	9.00	84.9%	0.74	26.35	3.98
	6.05	8.15	0.76	0.95	6.21	8.88	83.8%	0.70	23.91	3.85
	6.10	8.09	0.72	0.90	5.80	8.76	82.6%	0.66	21.55	3.72
	6.15	8.02	0.67	0.85	5.40	8.64	81.5%	0.62	19.29	3.57
	6.20	7.96	0.63	0.80	5.00	8.52	80.4%	0.59	17.13	3.43
	6.25	7.89	0.58	0.75	4.60	8.40	79.2%	0.55	15.07	3.27
	6.30	7.83	0.54	0.70	4.21	8.28	78.1%	0.51	13.11	3.12
	6.35	7.76	0.49	0.65	3.82	8.16	77.0%	0.47	11.26	2.95
	6.40	7.70	0.45	0.60	3.43	8.04	75.8%	0.43	9.52	2.77
	6.45	7.63	0.40	0.55	3.05	7.92	74.7%	0.39	7.89	2.59
	6.50	7.57	0.35	0.50	2.67	7.80	73.6%	0.34	6.39	2.39
WL	6.55	7.50	0.31	0.45	2.29	7.68	72.4%	0.30	5.01	2.18
	6.60	7.20	0.27	0.40	1.93	7.36	69.4%	0.26	3.85	2.00
	6.65	6.90	0.23	0.35	1.57	7.04	66.4%	0.22	2.83	1.80
	6.70	6.68	0.18	0.30	1.23	6.80	64.2%	0.18	1.93	1.57
	6.75	6.41	0.14	0.25	0.91	6.51	61.4%	0.14	1.19	1.31
	6.80	6.14	0.10	0.20	0.59	6.22	58.7%	0.10	0.60	1.02
	6.85	5.06	0.06	0.15	0.30	5.12	48.4%	0.06	0.23	0.75
	6.90	2.66	0.04	0.10	0.12	2.70	25.5%	0.04	0.07	0.60
	6.95	0.90	0.03	0.05	0.03	0.91	8.6%	0.03	0.01	0.47
	7.00	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Morgan Gulch
XS LOCATION: 1/3 mile u/s fr conf. w/ Sheephorn Creek
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.01	cfs
CALCULATED FLOW (Qc)=	5.01	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.55	ft
CALCULATED WATERLINE (WLc)=	6.55	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.45	ft
MAX CALCULATED DEPTH (Dc)=	0.45	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	2.18	ft/sec
MANNING'S N=	0.038	
SLOPE=	0.0153	ft/ft
.4 * Qm =	2.0	cfs
2.5 * Qm=	12.5	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

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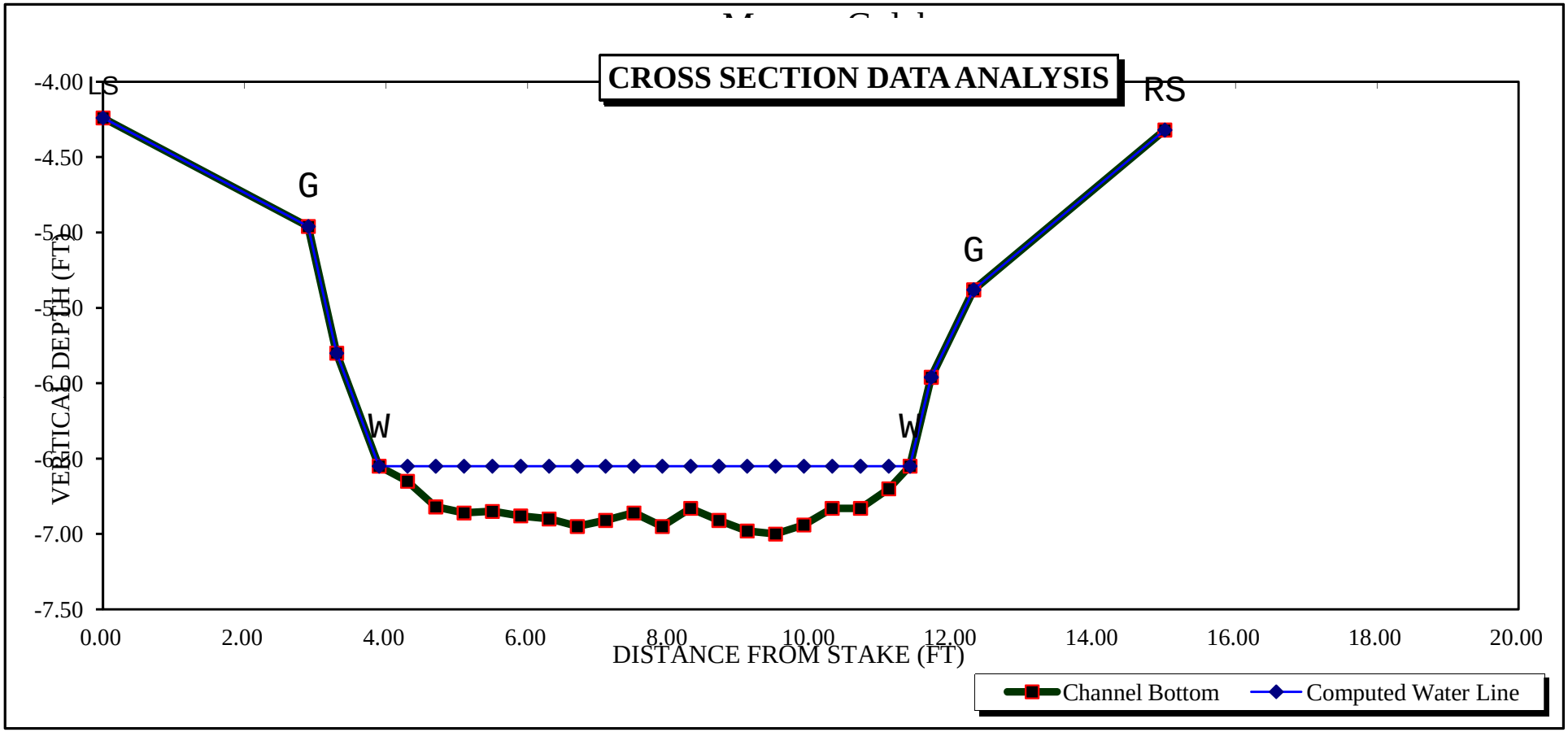
RECOMMENDATION BY: ………………...……..…….............................. AGENCY...……………………......…....…...…...... DATE:......…...…......……………

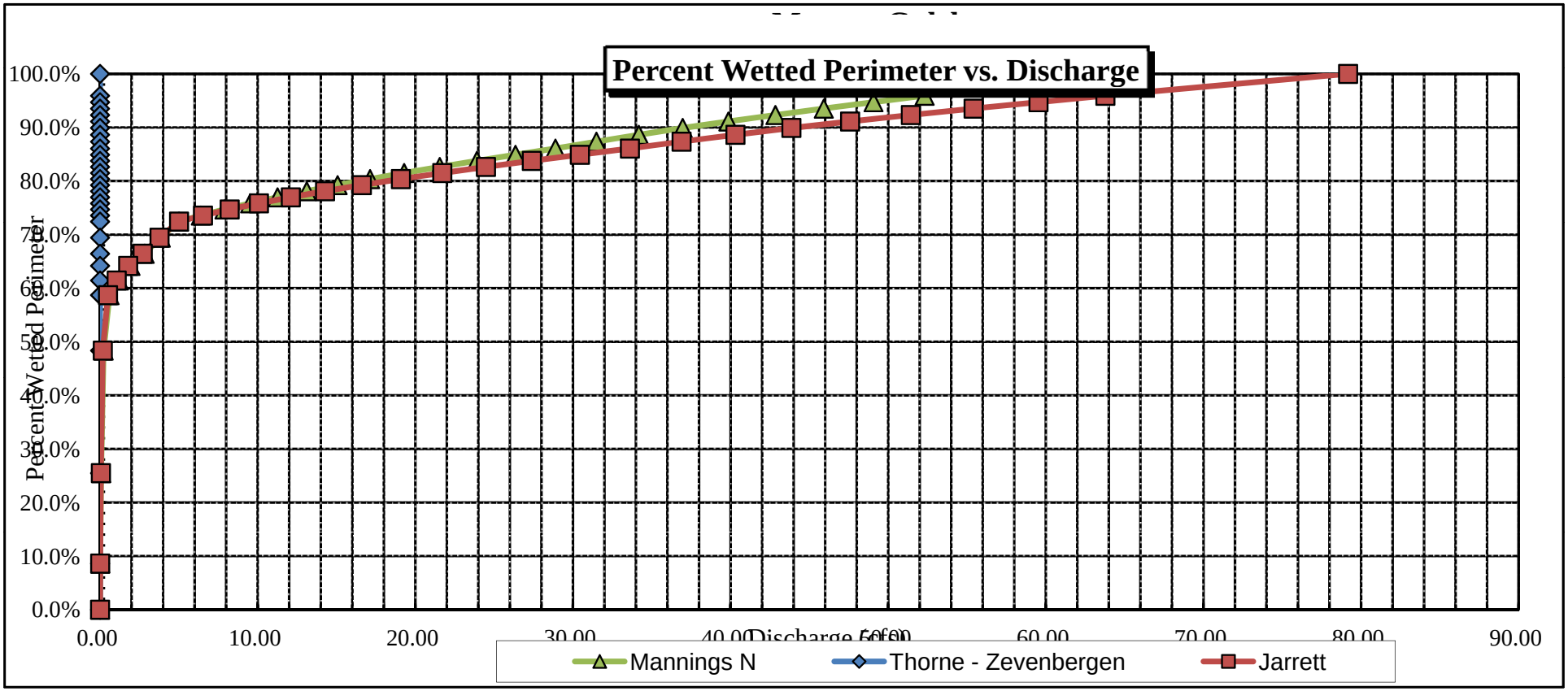
CWCB REVIEW BY: ..…………………………....………………………………………………...…............. DATE:.................…………….…

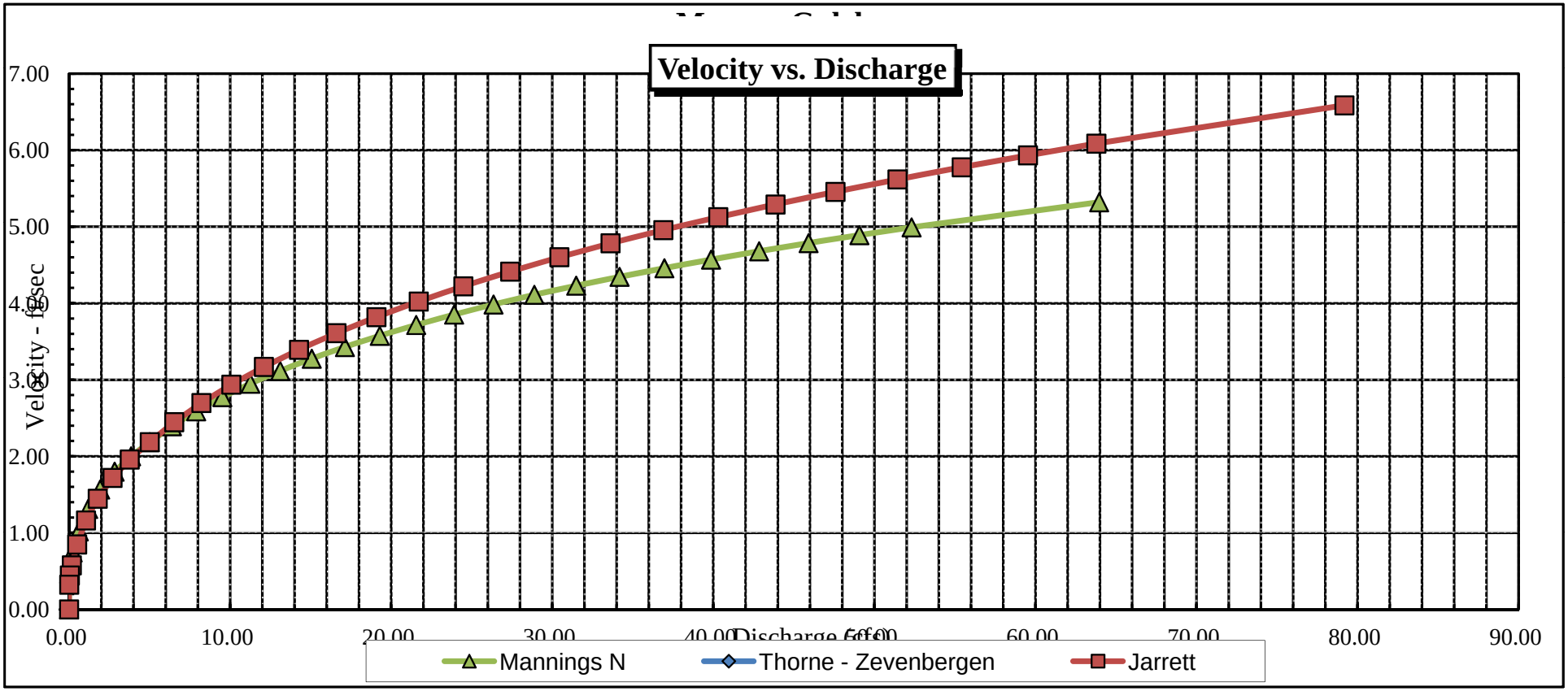
STREAM NAME: Morgan Gulch
XS LOCATION: 1/3 mile u/s fr conf. w/ Sheephorn Creek
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

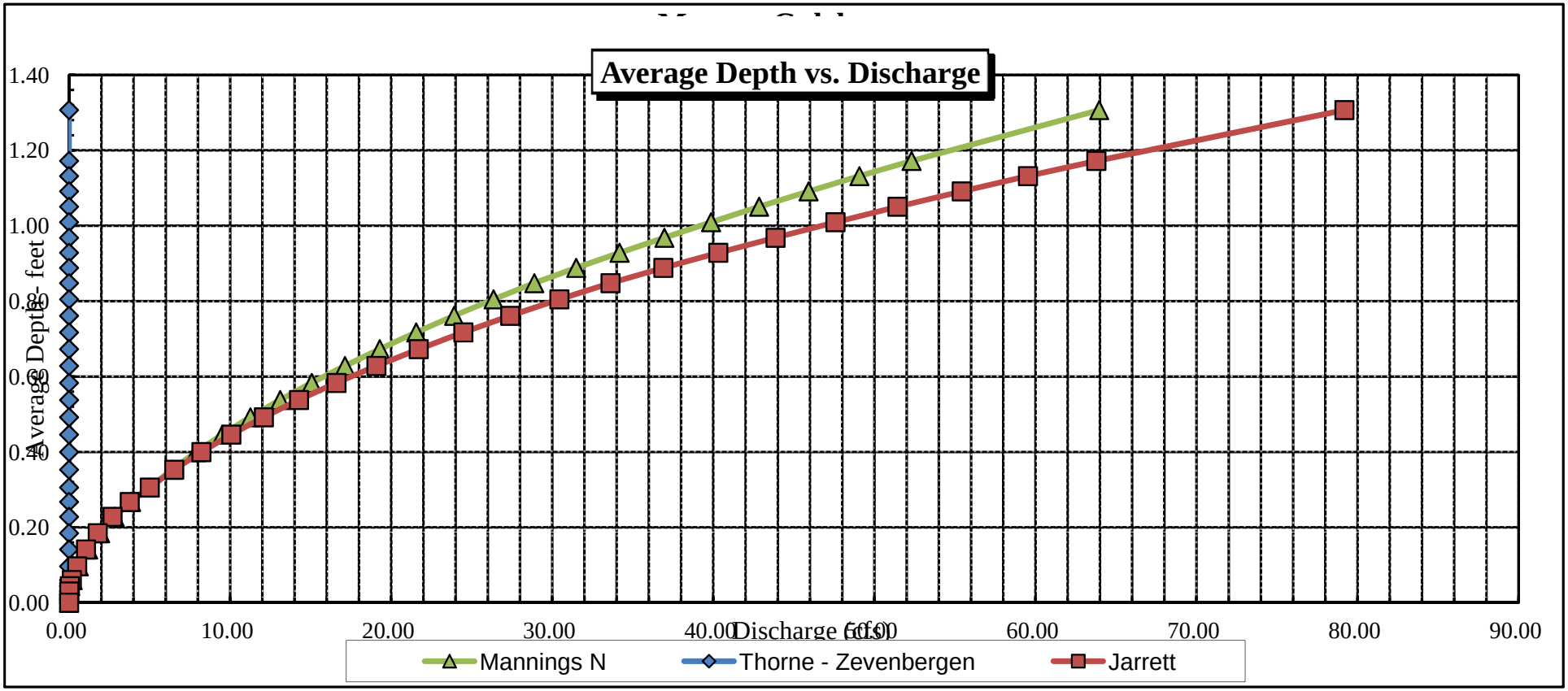
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

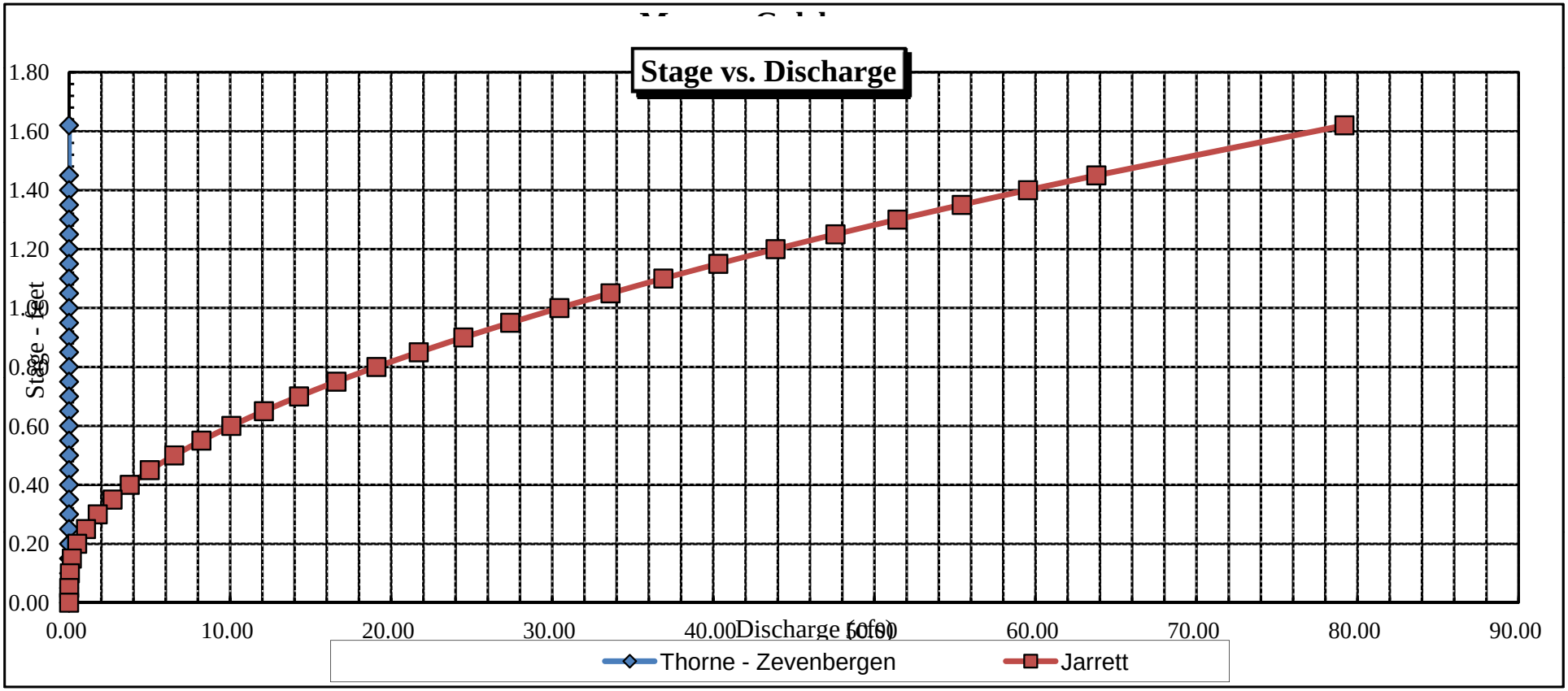
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.38	9.20	1.31	1.62	12.02	10.60	100.0%	1.13	79.18	6.59
	5.55	8.94	1.17	1.45	10.48	10.17	95.9%	1.03	63.78	6.09
	5.60	8.87	1.13	1.40	10.04	10.04	94.7%	1.00	59.53	5.93
	5.65	8.79	1.09	1.35	9.59	9.91	93.5%	0.97	55.42	5.78
	5.70	8.72	1.05	1.30	9.16	9.78	92.3%	0.94	51.43	5.62
	5.75	8.64	1.01	1.25	8.72	9.66	91.1%	0.90	47.58	5.46
	5.80	8.57	0.97	1.20	8.29	9.53	89.9%	0.87	43.86	5.29
	5.85	8.47	0.93	1.15	7.87	9.39	88.6%	0.84	40.31	5.12
	5.90	8.38	0.89	1.10	7.44	9.26	87.3%	0.80	36.89	4.96
	5.95	8.29	0.85	1.05	7.03	9.12	86.1%	0.77	33.62	4.78
	6.00	8.22	0.80	1.00	6.62	9.00	84.9%	0.74	30.44	4.60
	6.05	8.15	0.76	0.95	6.21	8.88	83.8%	0.70	27.39	4.41
	6.10	8.09	0.72	0.90	5.80	8.76	82.6%	0.66	24.48	4.22
	6.15	8.02	0.67	0.85	5.40	8.64	81.5%	0.62	21.71	4.02
	6.20	7.96	0.63	0.80	5.00	8.52	80.4%	0.59	19.08	3.82
	6.25	7.89	0.58	0.75	4.60	8.40	79.2%	0.55	16.61	3.61
	6.30	7.83	0.54	0.70	4.21	8.28	78.1%	0.51	14.28	3.39
	6.35	7.76	0.49	0.65	3.82	8.16	77.0%	0.47	12.10	3.17
	6.40	7.70	0.45	0.60	3.43	8.04	75.8%	0.43	10.08	2.94
	6.45	7.63	0.40	0.55	3.05	7.92	74.7%	0.39	8.22	2.70
	6.50	7.57	0.35	0.50	2.67	7.80	73.6%	0.34	6.53	2.45
WL	6.55	7.50	0.31	0.45	2.29	7.68	72.4%	0.30	5.01	2.18
	6.60	7.20	0.27	0.40	1.93	7.36	69.4%	0.26	3.77	1.96
	6.65	6.90	0.23	0.35	1.57	7.04	66.4%	0.22	2.70	1.72
	6.70	6.68	0.18	0.30	1.23	6.80	64.2%	0.18	1.78	1.45
	6.75	6.41	0.14	0.25	0.91	6.51	61.4%	0.14	1.05	1.16
	6.80	6.14	0.10	0.20	0.59	6.22	58.7%	0.10	0.50	0.85
	6.85	5.06	0.06	0.15	0.30	5.12	48.4%	0.06	0.18	0.58
	6.90	2.66	0.04	0.10	0.12	2.70	25.5%	0.04	0.05	0.44
	6.95	0.90	0.03	0.05	0.03	0.91	8.6%	0.03	0.01	0.32
	7.00	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
RS
G
G
W
W
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
10.00
20.00
30.00
40.00
60.00
70.00
80.00
90.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
Discharge cfs
60.00
70.00
80.00
90.00
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.80
1.60
1.40
1.20
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
60.00
70.00
80.00
90.00
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Morgan Gulch
XS LOCATION:	0.25 mi upstr fr conf w Williams Fork
XS NUMBER:	2
DATE:	30-Jun-14
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NE
SECTION:	33
TWP:	1S
RANGE:	78W
PM:	Sixth
COUNTY:	Grand
WATERSHED:	Williams Fork
DIVISION:	5
DOW CODE:	23680
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.028

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

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

STREAM NAME: Morgan Gulch
XS LOCATION: 0.25 mi upstr fr conf w Williams Fork
XS NUMBER: 2

DATA POINTS= 24

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	4.93			0.00		0.00	0.00	0.0%
1	G	1.80	5.16			0.00		0.00	0.00	0.0%
		2.40	6.52			0.00		0.00	0.00	0.0%
	W	3.60	6.70	0.00	0.00	0.00		0.00	0.00	0.0%
		3.90	6.80	0.10	0.71	0.32	0.10	0.03	0.02	1.9%
		4.20	6.80	0.10	1.01	0.30	0.10	0.03	0.03	2.6%
		4.50	6.75	0.05	0.97	0.30	0.05	0.02	0.01	1.3%
		4.80	6.95	0.25	1.03	0.36	0.25	0.08	0.08	6.7%
		5.10	6.90	0.20	1.13	0.30	0.20	0.06	0.07	5.9%
		5.40	6.90	0.20	1.13	0.30	0.20	0.06	0.07	5.9%
		5.70	6.90	0.20	1.25	0.30	0.20	0.06	0.08	6.5%
		6.00	6.95	0.25	1.40	0.30	0.25	0.08	0.11	9.1%
		6.30	7.00	0.30	1.73	0.30	0.30	0.09	0.16	13.5%
		6.60	6.90	0.20	2.21	0.32	0.20	0.06	0.13	11.5%
		6.90	6.90	0.20	1.33	0.30	0.20	0.06	0.08	6.9%
		7.20	6.90	0.20	1.00	0.30	0.20	0.06	0.06	5.2%
		7.50	7.00	0.30	1.70	0.32	0.30	0.09	0.15	13.3%
		7.80	6.90	0.20	1.32	0.32	0.20	0.06	0.08	6.9%
		8.10	6.80	0.10	1.28	0.32	0.10	0.03	0.03	2.8%
	W	8.30	6.70	0.00	0.00	0.22		0.00	0.00	0.0%
		10.40	6.20			0.00		0.00	0.00	0.0%
		12.00	5.64			0.00		0.00	0.00	0.0%
1	G	14.50	5.23			0.00		0.00	0.00	0.0%
	RS	15.00	5.04			0.00		0.00	0.00	0.0%
	TOTALS ----------					4.88	0.3 (Max.)	0.85	1.15	100.0%

Manning's n = 0.0572
Hydraulic Radius= 0.17411421

STREAM NAME: Morgan Gulch
XS LOCATION: 0.25 mi upstr fr conf w Williams Fork
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.85	0.85	0.0%
6.45	0.85	2.35	176.4%
6.47	0.85	2.21	160.1%
6.49	0.85	2.07	144.0%
6.51	0.85	1.94	128.1%
6.53	0.85	1.81	112.5%
6.55	0.85	1.68	97.3%
6.57	0.85	1.55	82.7%
6.59	0.85	1.43	68.6%
6.61	0.85	1.32	54.9%
6.63	0.85	1.21	41.8%
6.65	0.85	1.10	29.2%
6.66	0.85	1.05	23.1%
6.67	0.85	1.00	17.2%
6.68	0.85	0.95	11.3%
6.69	0.85	0.90	5.6%
6.70	0.85	0.85	0.0%
6.71	0.85	0.80	-5.5%
6.72	0.85	0.76	-10.9%
6.73	0.85	0.71	-16.3%
6.74	0.85	0.67	-21.6%
6.75	0.85	0.62	-26.9%
6.77	0.85	0.53	-37.1%
6.79	0.85	0.45	-46.7%
6.81	0.85	0.38	-55.4%
6.83	0.85	0.31	-63.5%
6.85	0.85	0.24	-71.3%
6.87	0.85	0.18	-79.0%
6.89	0.85	0.12	-86.4%
6.91	0.85	0.07	-92.1%
6.93	0.85	0.04	-95.5%
6.95	0.85	0.02	-97.8%

WATERLINE AT ZERO
AREA ERROR = 6.700

STREAM NAME: Morgan Gulch
XS LOCATION: 0.25 mi upstr fr conf w Williams Fork
XS NUMBER: 2

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.23	12.67	1.10	1.77	13.96	13.89	100.0%	1.00	60.85	4.36
	5.70	9.79	0.89	1.30	8.72	10.66	76.8%	0.82	33.14	3.80
	5.75	9.63	0.86	1.25	8.24	10.46	75.3%	0.79	30.52	3.71
	5.80	9.46	0.82	1.20	7.76	10.25	73.8%	0.76	28.00	3.61
	5.85	9.30	0.78	1.15	7.29	10.05	72.3%	0.73	25.58	3.51
	5.90	9.13	0.75	1.10	6.83	9.84	70.8%	0.69	23.26	3.41
	5.95	8.97	0.71	1.05	6.38	9.63	69.3%	0.66	21.05	3.30
	6.00	8.80	0.67	1.00	5.93	9.43	67.9%	0.63	18.93	3.19
	6.05	8.64	0.64	0.95	5.50	9.22	66.4%	0.60	16.92	3.08
	6.10	8.47	0.60	0.90	5.07	9.02	64.9%	0.56	15.01	2.96
	6.15	8.31	0.56	0.85	4.65	8.81	63.4%	0.53	13.20	2.84
	6.20	8.14	0.52	0.80	4.24	8.60	61.9%	0.49	11.49	2.71
	6.25	7.91	0.49	0.75	3.84	8.33	60.0%	0.46	9.94	2.59
	6.30	7.68	0.45	0.70	3.45	8.06	58.0%	0.43	8.50	2.47
	6.35	7.44	0.41	0.65	3.07	7.79	56.1%	0.39	7.17	2.33
	6.40	7.21	0.37	0.60	2.70	7.52	54.1%	0.36	5.94	2.20
	6.45	6.98	0.34	0.55	2.35	7.25	52.2%	0.32	4.81	2.05
	6.50	6.75	0.30	0.50	2.01	6.98	50.2%	0.29	3.79	1.89
	6.55	6.33	0.26	0.45	1.68	6.54	47.1%	0.26	2.94	1.75
	6.60	5.79	0.24	0.40	1.37	5.99	43.1%	0.23	2.24	1.63
	6.65	5.24	0.21	0.35	1.10	5.43	39.1%	0.20	1.64	1.50
WL	6.70	4.70	0.18	0.30	0.85	4.88	35.1%	0.17	1.15	1.35
	6.75	4.45	0.14	0.25	0.62	4.61	33.2%	0.13	0.71	1.14
	6.80	3.53	0.12	0.20	0.41	3.65	26.3%	0.11	0.42	1.02
	6.85	3.30	0.07	0.15	0.24	3.40	24.5%	0.07	0.18	0.75
	6.90	1.88	0.05	0.10	0.08	1.95	14.0%	0.04	0.05	0.54
	6.95	0.75	0.03	0.05	0.02	0.78	5.6%	0.02	0.01	0.36
	7.00	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Morgan Gulch
XS LOCATION: 0.25 mi upstr fr conf w Williams Fork
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.15	cfs
CALCULATED FLOW (Qc)=	1.15	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.70	ft
CALCULATED WATERLINE (WLc)=	6.70	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.30	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.35	ft/sec
MANNING'S N=	0.057	
SLOPE=	0.028	ft/ft
.4 * Qm =	0.5	cfs
2.5 * Qm=	2.9	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

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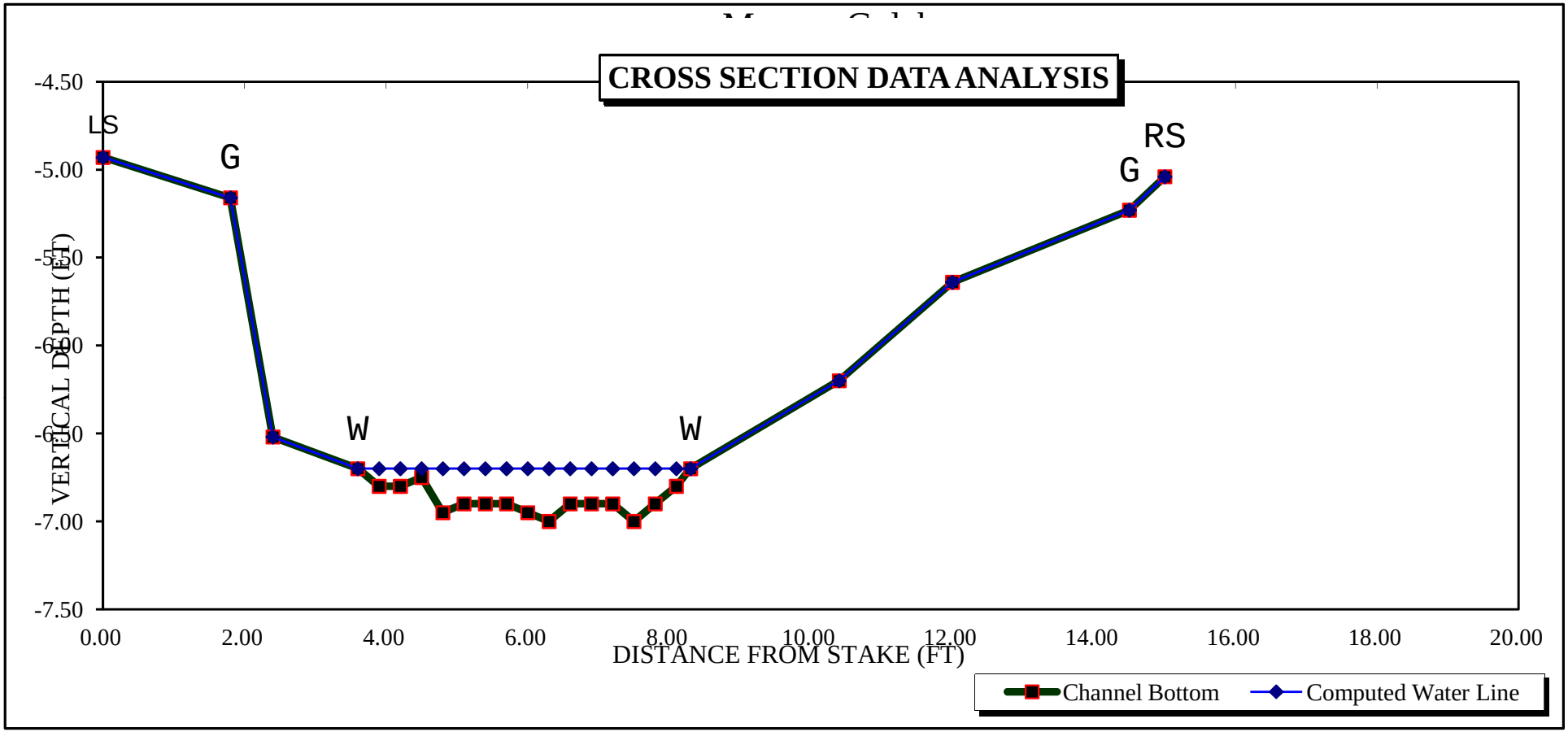
RECOMMENDATION BY: ……………………...………..……............................... AGENCY...……………………….....……...…...…...……....... DATE:.......…...…......……………

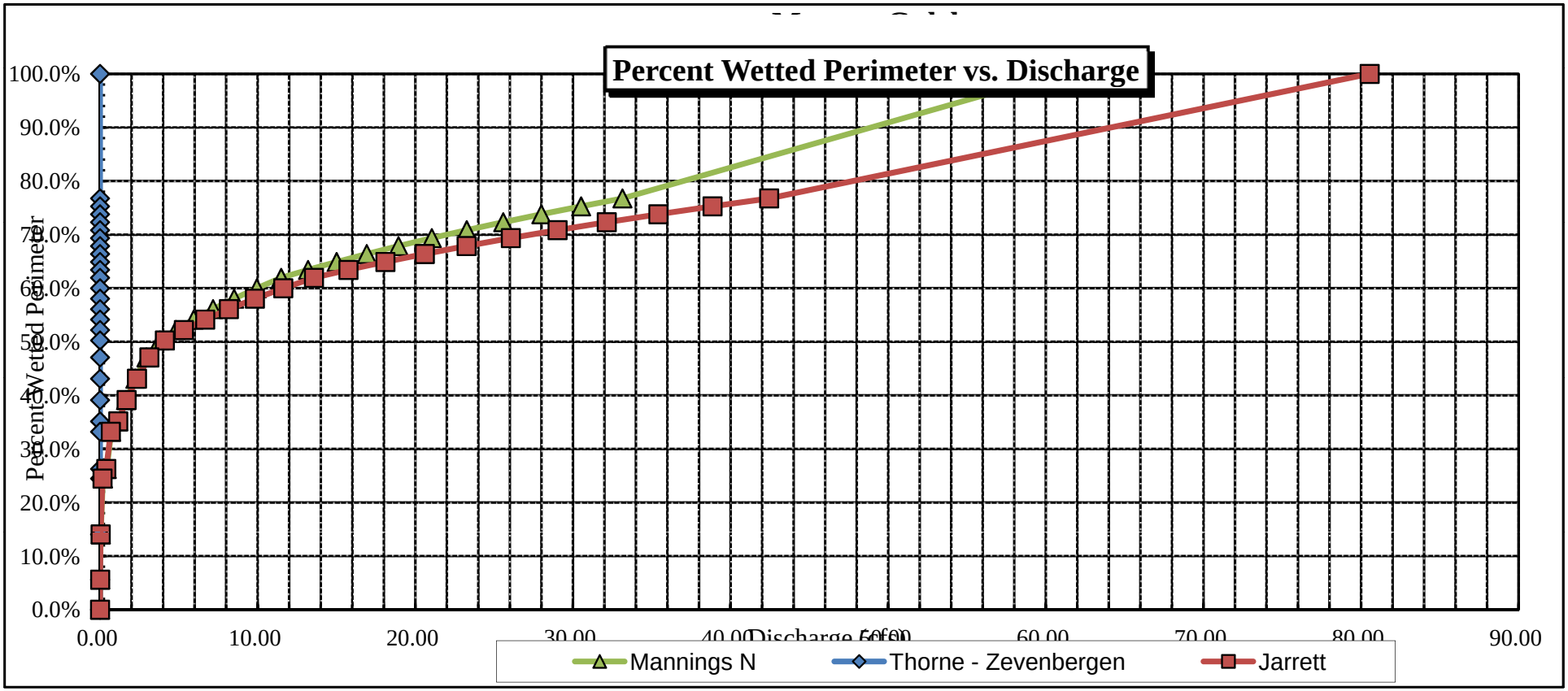
CWCB REVIEW BY: ...…………………………....…………………………………………………...…............. DATE:..................……………...…

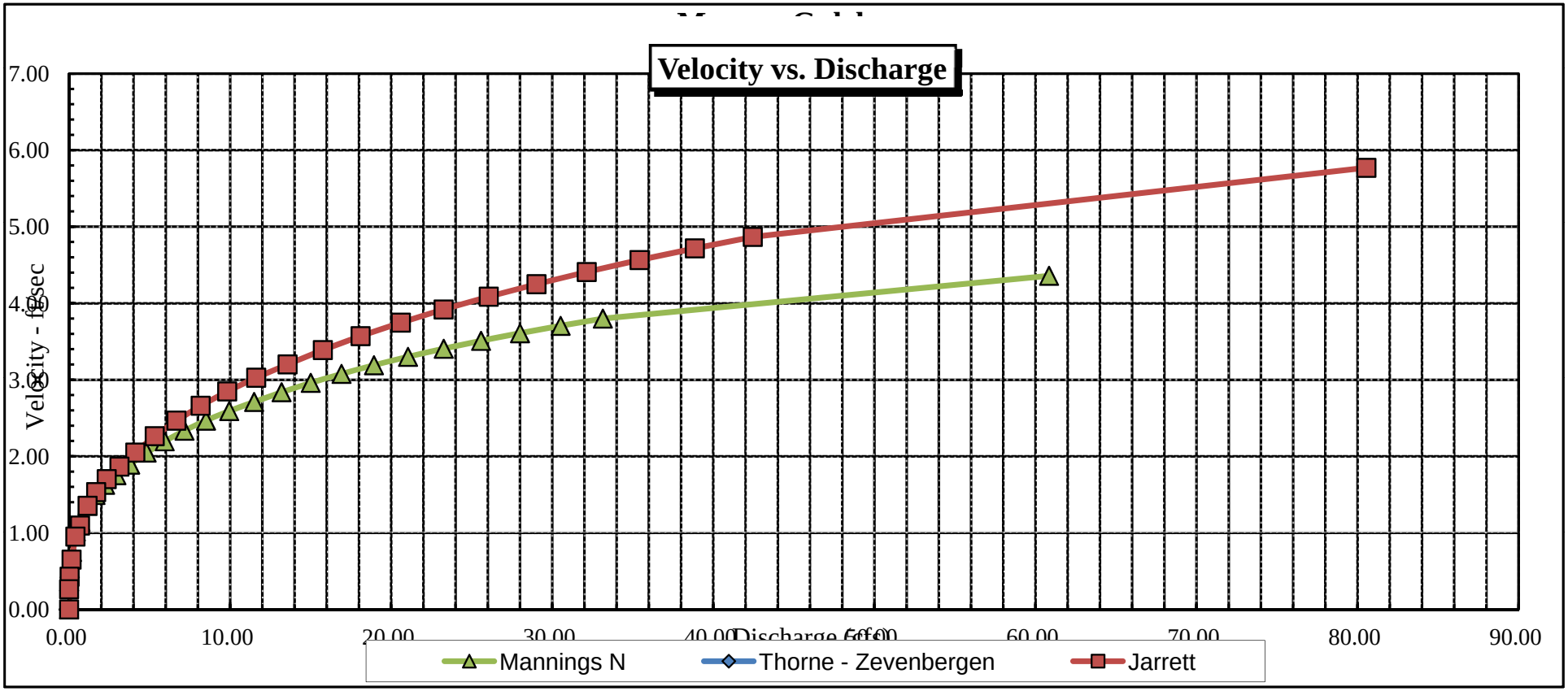
STREAM NAME: Morgan Gulch
XS LOCATION: 0.25 mi upstr fr conf w Williams Fork
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

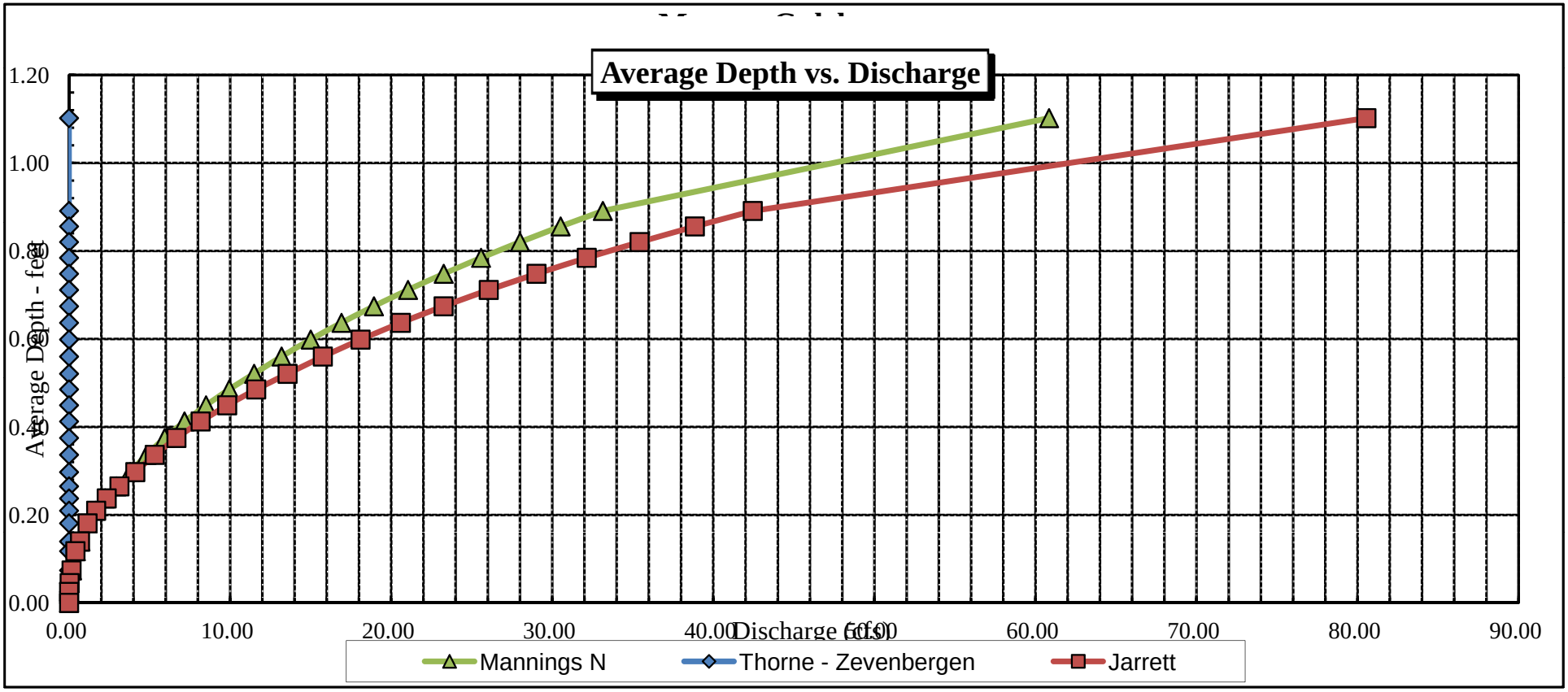
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

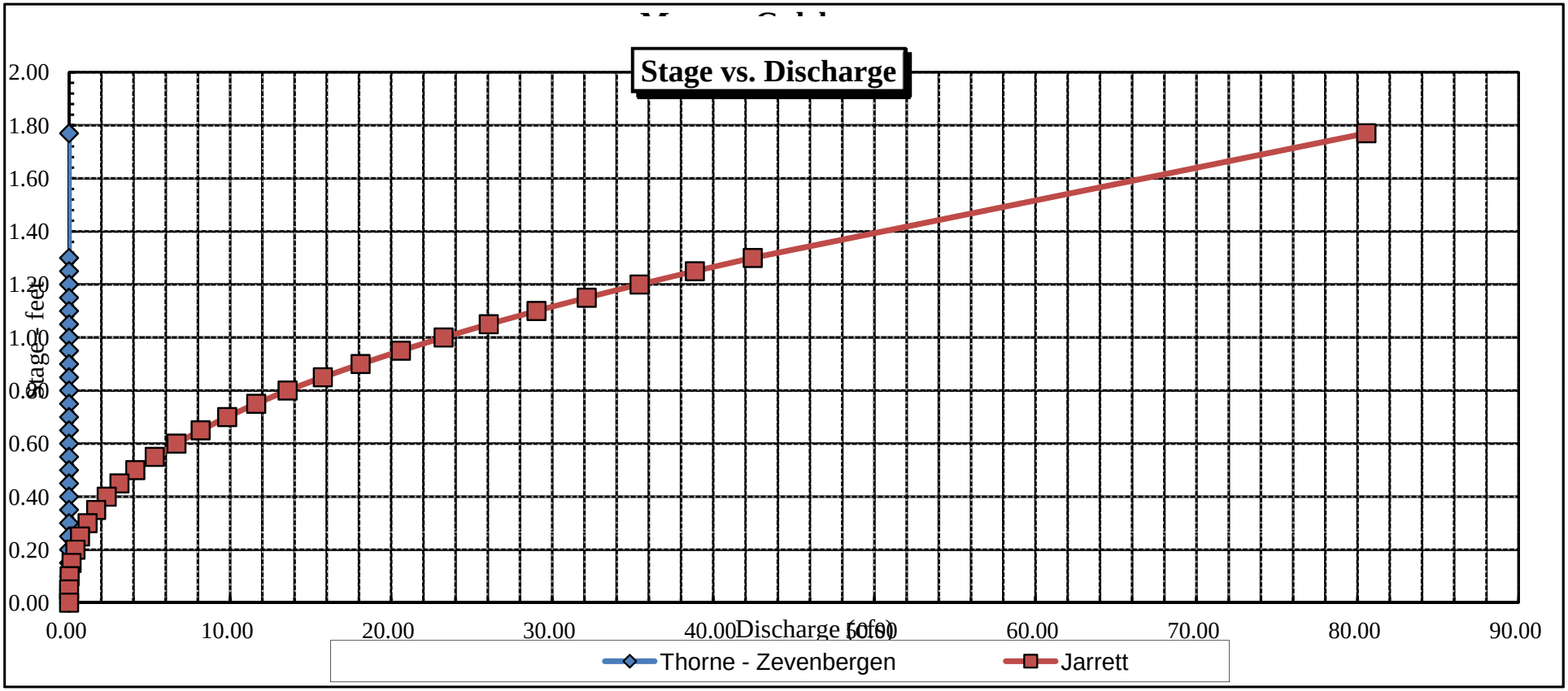
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.23	12.67	1.10	1.77	13.96	13.89	100.0%	1.00	80.54	5.77
	5.70	9.79	0.89	1.30	8.72	10.66	76.8%	0.82	42.45	4.87
	5.75	9.63	0.86	1.25	8.24	10.46	75.3%	0.79	38.85	4.72
	5.80	9.46	0.82	1.20	7.76	10.25	73.8%	0.76	35.42	4.56
	5.85	9.30	0.78	1.15	7.29	10.05	72.3%	0.73	32.14	4.41
	5.90	9.13	0.75	1.10	6.83	9.84	70.8%	0.69	29.02	4.25
	5.95	8.97	0.71	1.05	6.38	9.63	69.3%	0.66	26.06	4.09
	6.00	8.80	0.67	1.00	5.93	9.43	67.9%	0.63	23.25	3.92
	6.05	8.64	0.64	0.95	5.50	9.22	66.4%	0.60	20.60	3.75
	6.10	8.47	0.60	0.90	5.07	9.02	64.9%	0.56	18.10	3.57
	6.15	8.31	0.56	0.85	4.65	8.81	63.4%	0.53	15.76	3.39
	6.20	8.14	0.52	0.80	4.24	8.60	61.9%	0.49	13.57	3.20
	6.25	7.91	0.49	0.75	3.84	8.33	60.0%	0.46	11.62	3.03
	6.30	7.68	0.45	0.70	3.45	8.06	58.0%	0.43	9.82	2.85
	6.35	7.44	0.41	0.65	3.07	7.79	56.1%	0.39	8.17	2.66
	6.40	7.21	0.37	0.60	2.70	7.52	54.1%	0.36	6.67	2.47
	6.45	6.98	0.34	0.55	2.35	7.25	52.2%	0.32	5.32	2.26
	6.50	6.75	0.30	0.50	2.01	6.98	50.2%	0.29	4.11	2.05
	6.55	6.33	0.26	0.45	1.68	6.54	47.1%	0.26	3.13	1.87
	6.60	5.79	0.24	0.40	1.37	5.99	43.1%	0.23	2.34	1.70
	6.65	5.24	0.21	0.35	1.10	5.43	39.1%	0.20	1.68	1.53
WL	6.70	4.70	0.18	0.30	0.85	4.88	35.1%	0.17	1.15	1.35
	6.75	4.45	0.14	0.25	0.62	4.61	33.2%	0.13	0.68	1.10
	6.80	3.53	0.12	0.20	0.41	3.65	26.3%	0.11	0.39	0.95
	6.85	3.30	0.07	0.15	0.24	3.40	24.5%	0.07	0.16	0.65
	6.90	1.88	0.05	0.10	0.08	1.95	14.0%	0.04	0.04	0.43
	6.95	0.75	0.03	0.05	0.02	0.78	5.6%	0.02	0.00	0.26
	7.00	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
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
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
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
10.00
20.00
30.00
40.00
60.00
70.00
80.00
90.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
Discharge cfs
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage (ft)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Morgan Gulch
XS LOCATION:	0.33 mi fr conf w Williams Fork
XS NUMBER:	1
DATE:	30-Jun-14
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NW
SECTION:	34
TWP:	1S
RANGE:	78W
PM:	Sixth
COUNTY:	Grand
WATERSHED:	Williams Fork
DIVISION:	5
DOW CODE:	23680
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:	0.011

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

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

STREAM NAME: Morgan Gulch
XS LOCATION: 0.33 mi fr conf w Williams Fork
XS NUMBER: 1

DATA POINTS= 26

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	5.90			0.00		0.00	0.00	0.0%
1	G	0.10	5.95			0.00		0.00	0.00	0.0%
		1.40	6.19			0.00		0.00	0.00	0.0%
		2.00	6.45			0.00		0.00	0.00	0.0%
	W	2.50	6.85	0.00	0.00	0.00		0.00	0.00	0.0%
		2.70	7.05	0.20	0.23	0.28	0.20	0.05	0.01	1.2%
		3.00	7.25	0.40	0.47	0.36	0.40	0.12	0.06	6.1%
		3.30	7.10	0.25	0.94	0.34	0.25	0.08	0.07	7.6%
		3.60	7.20	0.35	1.09	0.32	0.35	0.11	0.11	12.3%
		3.90	7.20	0.35	1.06	0.30	0.35	0.11	0.11	12.0%
		4.20	7.20	0.35	1.18	0.30	0.35	0.11	0.12	13.4%
		4.50	7.10	0.25	1.02	0.32	0.25	0.08	0.08	8.3%
		4.80	7.10	0.25	0.43	0.30	0.25	0.08	0.03	3.5%
		5.10	7.10	0.25	1.09	0.30	0.25	0.08	0.08	8.8%
		5.40	7.05	0.20	0.38	0.30	0.20	0.06	0.02	2.5%
		5.70	7.05	0.20	0.48	0.30	0.20	0.06	0.03	3.1%
		6.00	7.05	0.20	0.82	0.30	0.20	0.06	0.05	5.3%
		6.30	7.05	0.20	0.62	0.30	0.20	0.06	0.04	4.0%
		6.60	7.05	0.20	0.52	0.30	0.20	0.06	0.03	3.4%
		6.90	7.05	0.20	0.78	0.30	0.20	0.06	0.05	5.0%
		7.20	6.95	0.10	0.59	0.32	0.10	0.03	0.02	1.9%
		7.50	6.95	0.10	0.31	0.30	0.10	0.03	0.01	1.0%
		7.80	6.90	0.05	0.28	0.30	0.05	0.02	0.01	0.6%
	W	8.30	6.85	0.00	0.00	0.50		0.00	0.00	0.0%
1	G	10.40	5.85			0.00		0.00	0.00	0.0%
	LS	10.90	5.25			0.00		0.00	0.00	0.0%
	TOTALS ----------					6.04	0.4 (Max.)	1.23	0.93	100.0%

Manning's n = 0.0711
Hydraulic Radius= 0.20287297

STREAM NAME: Morgan Gulch
XS LOCATION: 0.33 mi fr conf w Williams Fork
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.23	1.23	0.0%
6.60	1.23	2.78	126.9%
6.62	1.23	2.65	116.1%
6.64	1.23	2.52	105.5%
6.66	1.23	2.39	94.9%
6.68	1.23	2.26	84.4%
6.70	1.23	2.13	74.1%
6.72	1.23	2.01	63.9%
6.74	1.23	1.88	53.7%
6.76	1.23	1.76	43.7%
6.78	1.23	1.64	33.8%
6.80	1.23	1.52	24.0%
6.81	1.23	1.46	19.2%
6.82	1.23	1.40	14.3%
6.83	1.23	1.34	9.5%
6.84	1.23	1.28	4.7%
6.85	1.23	1.23	0.0%
6.86	1.23	1.17	-4.7%
6.87	1.23	1.11	-9.3%
6.88	1.23	1.06	-13.8%
6.89	1.23	1.00	-18.2%
6.90	1.23	0.95	-22.6%
6.92	1.23	0.85	-31.0%
6.94	1.23	0.74	-39.2%
6.96	1.23	0.65	-47.0%
6.98	1.23	0.56	-54.4%
7.00	1.23	0.47	-61.6%
7.02	1.23	0.38	-68.8%
7.04	1.23	0.30	-75.7%
7.06	1.23	0.23	-81.4%
7.08	1.23	0.18	-85.5%
7.10	1.23	0.13	-89.4%

WATERLINE AT ZERO
AREA ERROR = 6.850

STREAM NAME: Morgan Gulch
XS LOCATION: 0.33 mi fr conf w Williams Fork
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.95	10.09	0.80	1.30	8.02	10.75	100.0%	0.75	14.47	1.80
	5.95	10.09	0.80	1.30	8.02	10.75	100.0%	0.75	14.47	1.80
	6.00	9.71	0.77	1.25	7.53	10.36	96.4%	0.73	13.34	1.77
	6.05	9.34	0.76	1.20	7.05	9.96	92.7%	0.71	12.28	1.74
	6.10	8.96	0.74	1.15	6.59	9.57	89.1%	0.69	11.28	1.71
	6.15	8.59	0.72	1.10	6.16	9.18	85.4%	0.67	10.34	1.68
	6.20	8.24	0.70	1.05	5.74	8.82	82.1%	0.65	9.44	1.65
	6.25	8.02	0.66	1.00	5.33	8.58	79.8%	0.62	8.51	1.60
	6.30	7.80	0.63	0.95	4.93	8.34	77.6%	0.59	7.62	1.55
	6.35	7.58	0.60	0.90	4.55	8.09	75.3%	0.56	6.79	1.49
	6.40	7.36	0.57	0.85	4.18	7.85	73.0%	0.53	6.01	1.44
	6.45	7.14	0.53	0.80	3.81	7.61	70.8%	0.50	5.27	1.38
	6.50	6.97	0.50	0.75	3.46	7.41	69.0%	0.47	4.56	1.32
	6.55	6.80	0.46	0.70	3.12	7.22	67.1%	0.43	3.90	1.25
	6.60	6.64	0.42	0.65	2.78	7.02	65.3%	0.40	3.29	1.18
	6.65	6.47	0.38	0.60	2.45	6.82	63.5%	0.36	2.72	1.11
	6.70	6.30	0.34	0.55	2.13	6.63	61.7%	0.32	2.20	1.03
	6.75	6.13	0.30	0.50	1.82	6.43	59.8%	0.28	1.72	0.95
	6.80	5.97	0.25	0.45	1.52	6.23	58.0%	0.24	1.30	0.86
WL	6.85	5.80	0.21	0.40	1.22	6.04	56.2%	0.20	0.93	0.76
	6.90	5.25	0.18	0.35	0.95	5.47	50.8%	0.17	0.65	0.68
	6.95	4.60	0.15	0.30	0.70	4.79	44.6%	0.15	0.42	0.61
	7.00	4.40	0.11	0.25	0.47	4.56	42.4%	0.10	0.23	0.48
	7.05	2.70	0.09	0.20	0.26	2.83	26.4%	0.09	0.11	0.44
	7.10	1.72	0.08	0.15	0.13	1.84	17.1%	0.07	0.05	0.37
	7.15	1.25	0.04	0.10	0.05	1.32	12.3%	0.04	0.01	0.26
	7.20	0.17	0.02	0.05	0.00	0.20	1.9%	0.02	0.00	0.17

STREAM NAME: Morgan Gulch
XS LOCATION: 0.33 mi fr conf w Williams Fork
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.93	cfs
CALCULATED FLOW (Qc)=	0.93	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.85	ft
CALCULATED WATERLINE (WLc)=	6.85	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=	0.76	ft/sec
MANNING'S N=	0.071	
SLOPE=	0.011	ft/ft
.4 * Qm =	0.4	cfs
2.5 * Qm=	2.3	cfs

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

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

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

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

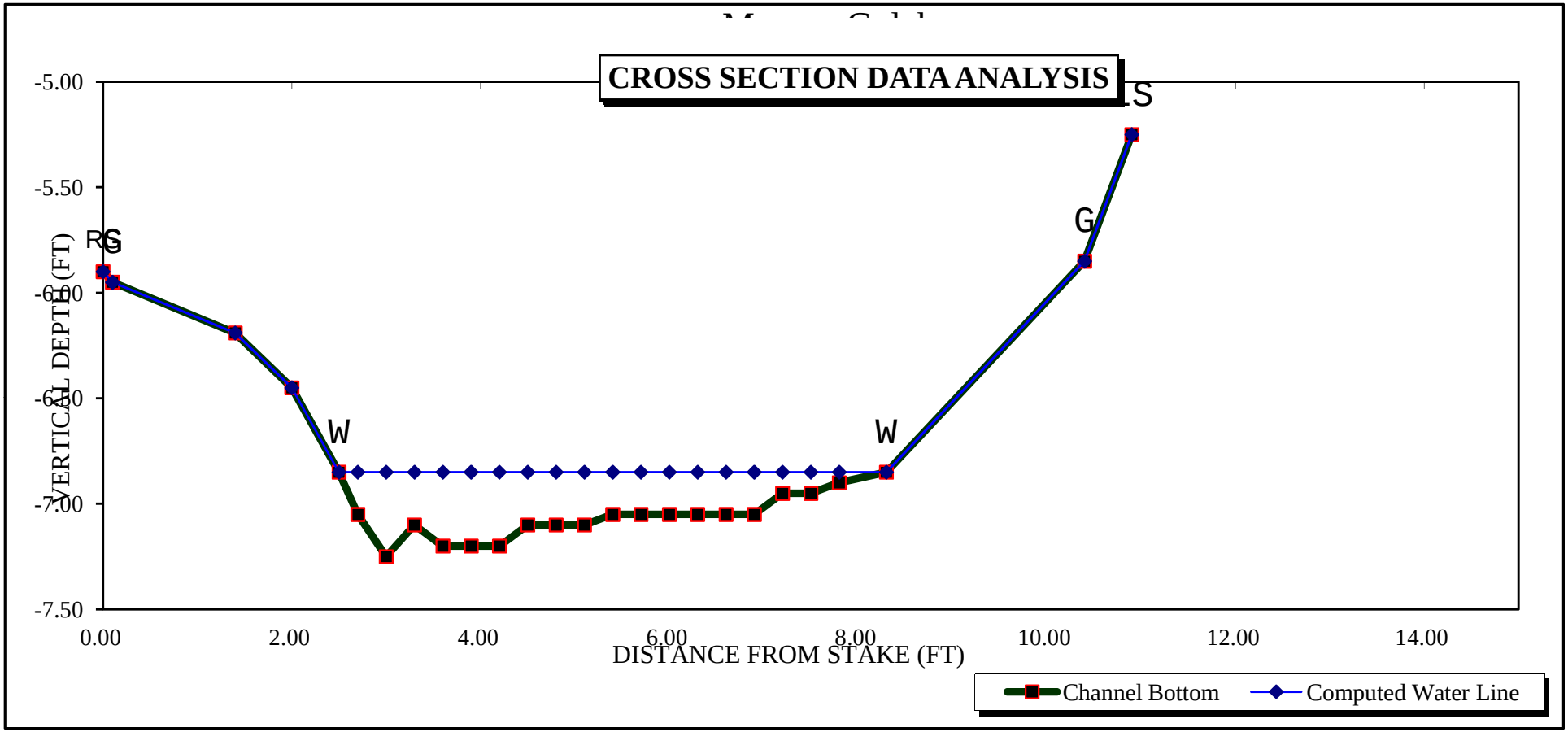
CWCB REVIEW BY: ..…………………………......……………………………………………………...….............. DATE:.................…………….....

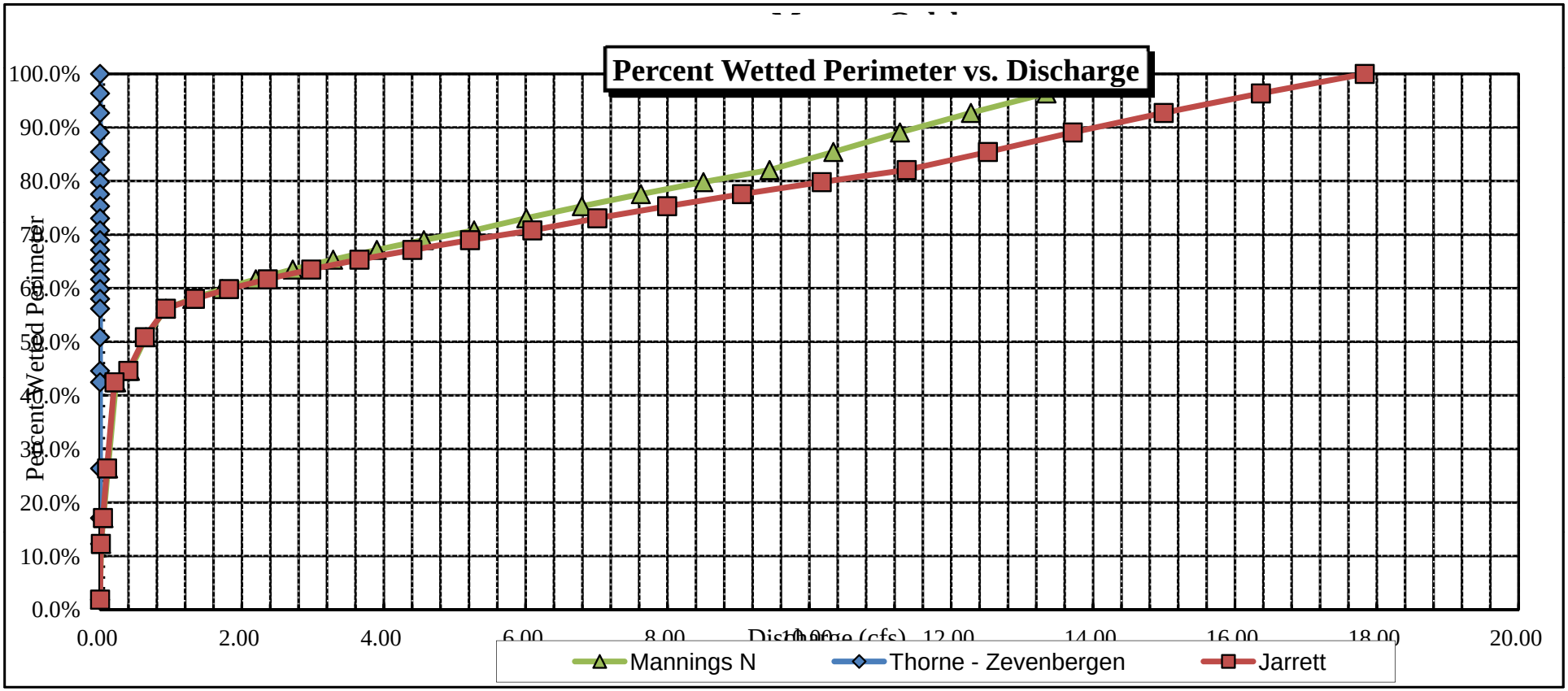
STREAM NAME: Morgan Gulch
XS LOCATION: 0.33 mi fr conf w Williams Fork
XS NUMBER: 1

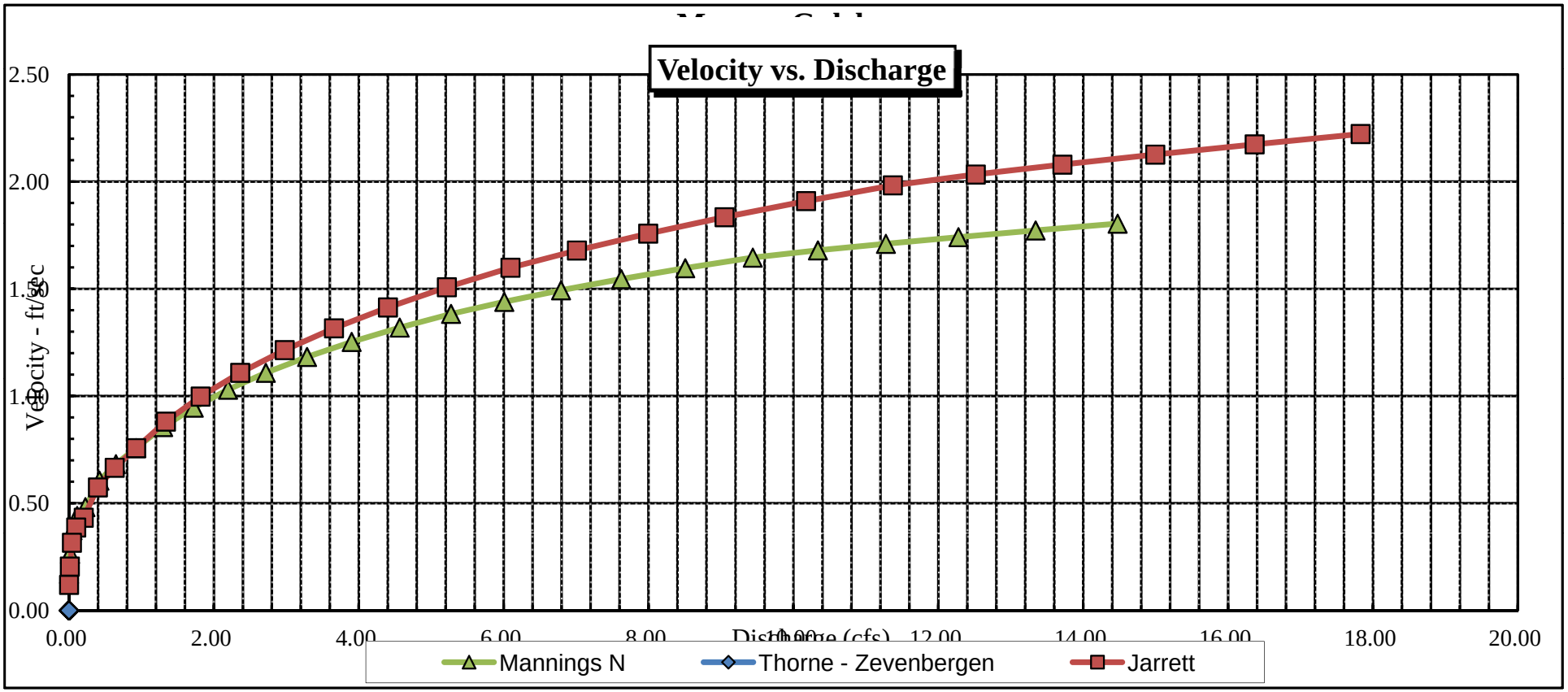
Jarrett Variable Manning's n Correction Applied

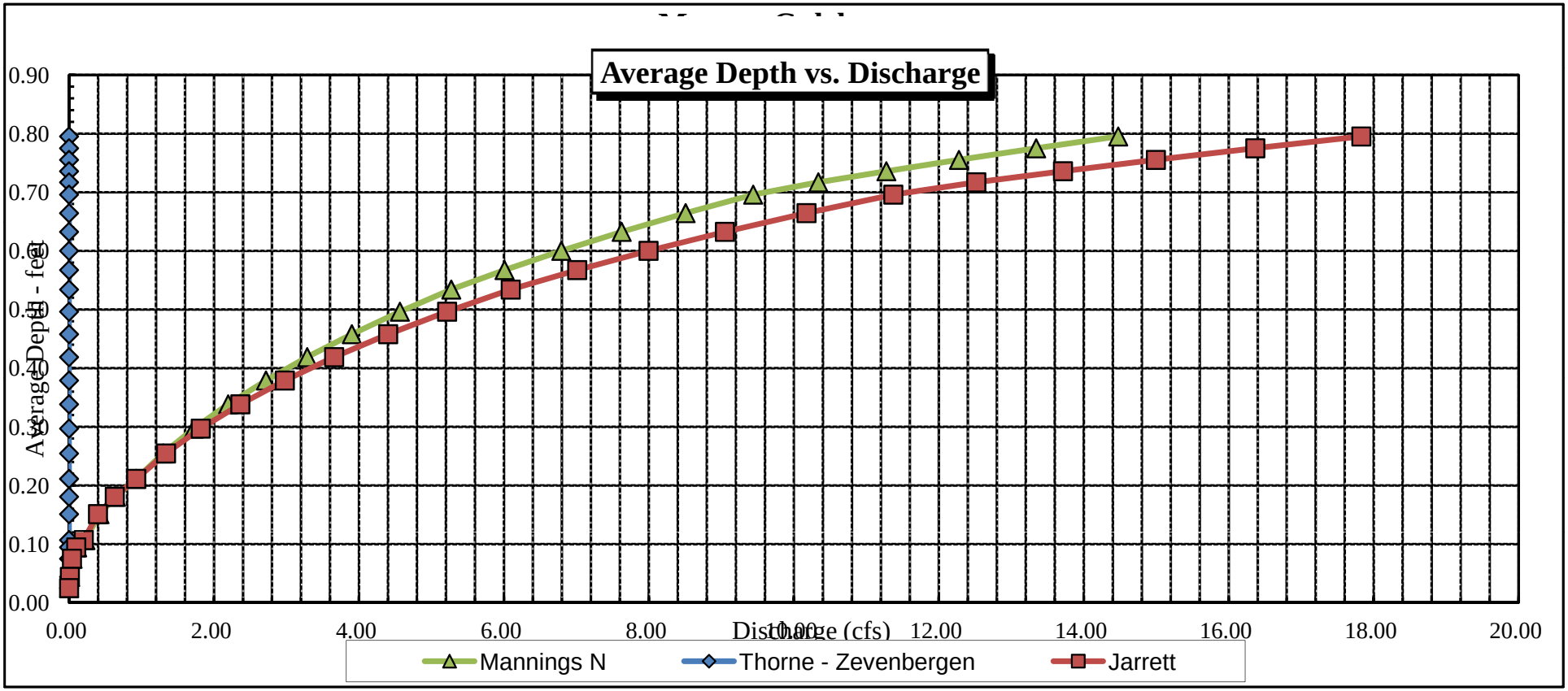
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

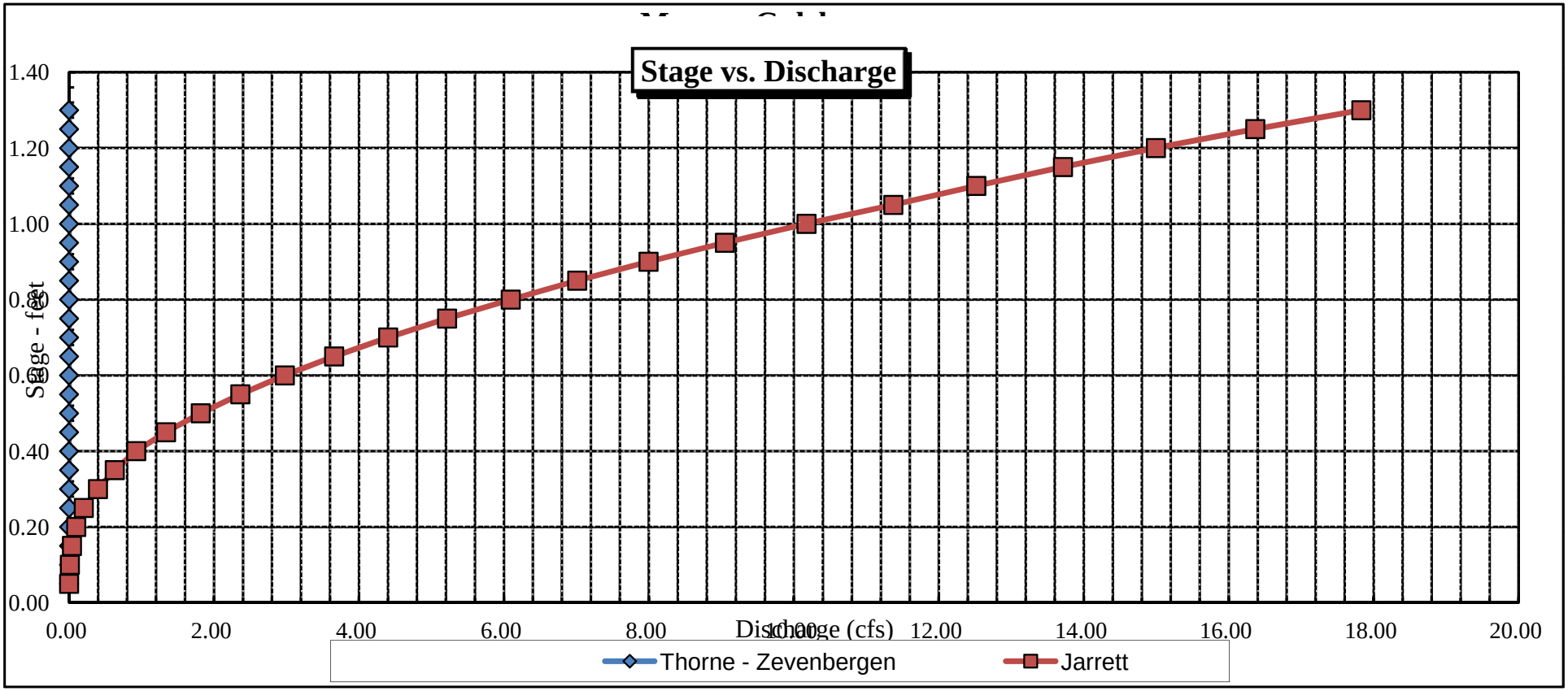
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.95	10.09	0.80	1.30	8.02	10.75	100.0%	0.75	17.83	2.22
	5.95	10.09	0.80	1.30	8.02	10.75	100.0%	0.75	17.83	2.22
	6.00	9.71	0.77	1.25	7.53	10.36	96.4%	0.73	16.37	2.17
	6.05	9.34	0.76	1.20	7.05	9.96	92.7%	0.71	14.99	2.13
	6.10	8.96	0.74	1.15	6.59	9.57	89.1%	0.69	13.71	2.08
	6.15	8.59	0.72	1.10	6.16	9.18	85.4%	0.67	12.52	2.03
	6.20	8.24	0.70	1.05	5.74	8.82	82.1%	0.65	11.37	1.98
	6.25	8.02	0.66	1.00	5.33	8.58	79.8%	0.62	10.17	1.91
	6.30	7.80	0.63	0.95	4.93	8.34	77.6%	0.59	9.05	1.83
	6.35	7.58	0.60	0.90	4.55	8.09	75.3%	0.56	7.99	1.76
	6.40	7.36	0.57	0.85	4.18	7.85	73.0%	0.53	7.01	1.68
	6.45	7.14	0.53	0.80	3.81	7.61	70.8%	0.50	6.09	1.60
	6.50	6.97	0.50	0.75	3.46	7.41	69.0%	0.47	5.22	1.51
	6.55	6.80	0.46	0.70	3.12	7.22	67.1%	0.43	4.40	1.41
	6.60	6.64	0.42	0.65	2.78	7.02	65.3%	0.40	3.66	1.32
	6.65	6.47	0.38	0.60	2.45	6.82	63.5%	0.36	2.98	1.21
	6.70	6.30	0.34	0.55	2.13	6.63	61.7%	0.32	2.36	1.11
	6.75	6.13	0.30	0.50	1.82	6.43	59.8%	0.28	1.82	1.00
	6.80	5.97	0.25	0.45	1.52	6.23	58.0%	0.24	1.34	0.88
WL	6.85	5.80	0.21	0.40	1.22	6.04	56.2%	0.20	0.93	0.76
	6.90	5.25	0.18	0.35	0.95	5.47	50.8%	0.17	0.63	0.67
	6.95	4.60	0.15	0.30	0.70	4.79	44.6%	0.15	0.40	0.57
	7.00	4.40	0.11	0.25	0.47	4.56	42.4%	0.10	0.20	0.43
	7.05	2.70	0.09	0.20	0.26	2.83	26.4%	0.09	0.10	0.39
	7.10	1.72	0.08	0.15	0.13	1.84	17.1%	0.07	0.04	0.32
	7.15	1.25	0.04	0.10	0.05	1.32	12.3%	0.04	0.01	0.20
	7.20	0.17	0.02	0.05	0.00	0.20	1.9%	0.02	0.00	0.12


CROSS SECTION DATA ANALYSIS
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
RG
W
W
G
S
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
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
2.50
2.00
1.50
1.00
0.50
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Discharge (cfs)
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
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Morgan Gulch						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 1/4 mile upstream from confluence with Williams Fork						
DATE: 6-30-14	OBSERVERS: R. Smith, P. Belcher					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 33	TOWNSHIP: / N/S	RANGE: 78 E/W	PM: 6th	
COUNTY: Grand	WATERSHED: Williams Ft.	WATER DIVISION: 5	DOW WATER CODE: 23680			
MAP(S): USGS:	GPS 39° 55' 14.18"					
USFS:	106° 06' 44.97"					

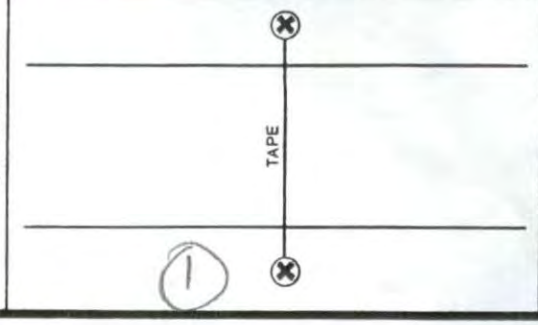
SUPPLEMENTAL DATA

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 6" 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	6.73/6.69
② WS Upstream	338'	5.95
③ WS Downstream	41.5'	8.08
SLOPE	2.13/75.3 = .028	

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 #105-ER-1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Morgan Gulch | CROSS-SECTION NO.: 2 | DATE: 6-30-14 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: _____ ft | TIME: 10:40 am.

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec): At Point	Velocity (ft/sec): Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.93								
G	1.8		5.16								
	2.4		6.52								
W	3.6		6.70								
	3.9		6.80	0.10				0.71			
	4.2		6.80	0.10				1.01			
	4.5		6.75	0.05				0.97			
	4.8		6.95	0.25				1.03			
	5.1		6.90	0.20				1.13			
	5.4		6.90	0.20				1.13			
	5.7		6.90	0.20				1.25			
	6.0		6.95	0.25				1.40			
	6.3		7.00	0.30				1.73			
	6.6		6.90	0.20				2.21			
	6.9		6.90	0.20				1.33			
	7.2		6.90	0.20				1.00			
	7.5		7.00	0.30				1.70			
	7.8		6.90	0.20				1.32			
	8.1		6.80	0.10				1.28			
W	8.3	6.70 →									
	10.4	6.20 →									
	12.0	5.64 →									
G	14.5	5.23 →									
RS	15.0	5.04 →									
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: Morgan Gulch						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: Approx. 1/3 mile upstream from confluence w/ Williams Fork							
DATE: 6-30-94	OBSERVERS: R. Smith, P. Belcher						
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 34	TOWNSHIP: 1 N/S	RANGE: 78 E/W	PM: 6th		
COUNTY: Grand	WATERSHED: Williams F.	WATER DIVISION: 5	DOW WATER CODE: 23680				
MAP(S): USGS: GPS 4052760 4419342							
USFS:							

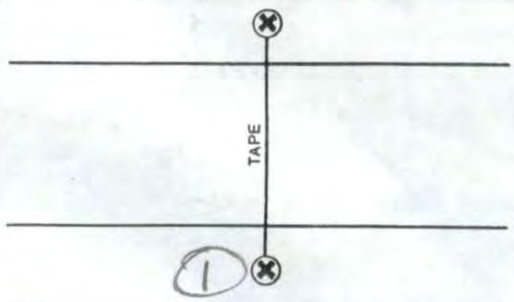
SUPPLEMENTAL DATA

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 6" 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	6.80/6.77
② WS Upstream	39.7	6.52"
③ WS Downstream	49.5	7.04
SLOPE	0.52/49.2 = .011	

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 #DOE-ED-1.05

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Morgan Gulch	CROSS-SECTION NO.: 1	DATE 6-30-14	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 9:30 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst. (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
G+RG	0.1		5.95								
	1.4		6.19								
	2.0		6.45								
W	2.5		6.85								
	2.7	0.25	7.05	0.2					0.23		
	3.0	0.3	7.25	0.4					0.47		
	3.3	0.3	7.10	0.25					0.94		
	3.6	0.3	7.20	0.35					1.09		
	3.9	0.3	7.20	0.35					1.06		
	4.2	0.3	7.20	0.35					1.18		
	4.5	0.3	7.10	0.25					1.02		
	4.8	0.3	7.10	0.25					0.43		
	5.1	0.3	7.10	0.25					1.09		
	5.4	0.3	7.05	0.2					0.38		
	5.7	0.3	7.05	0.2					0.48		
	6.0	0.3	7.05	0.2					0.82		
	6.3	0.3	7.05	0.2					0.62		
	6.6	0.3	7.05	0.2					0.52		
	6.9	0.3	7.05	0.2					0.78		
	7.2	0.3	6.95	0.1					0.59		
	7.5	0.3	6.95	0.1					0.31		
	7.8	0.15	6.90	0.05					0.28		
W	8.3		6.85								
G	10.4		5.85								
LS	10.8		5.52								
LS	10.9		5.25								
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: Morgan Gulch | CROSS-SECTION NO.: 2

CROSS-SECTION LOCATION: Approx. 1/4 mile upstream from confluence with Williams Fork

DATE: 6-5-13 | OBSERVERS: R. Smith, B. Logan, B. Epstein

LEGAL DESCRIPTION | ¼ SECTION: NE | SECTION: 33 | TOWNSHIP: 1 N/S | RANGE: 78 E/W | PM: Sixth

COUNTY: Grand | WATERSHED: Williams Fk | WATER DIVISION: 5 | DOW WATER CODE: 23680

MAP(S): USGS: GPS 39° 55' 14.18" | USFS: 106 06 44.97"

SUPPLEMENTAL DATA

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

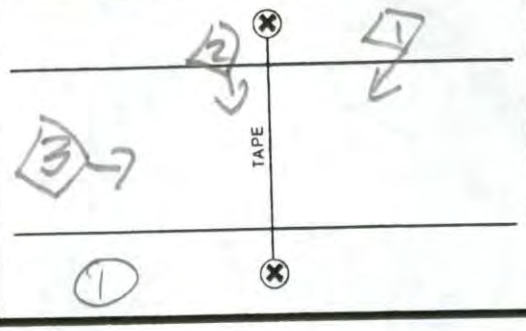
METER NUMBER: | DATE RATED: | CALIB/SPIN: ____ sec | TAPE WEIGHT: surveyed ____ lbs/foot | TAPE TENSION: surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: gravel to 6" 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	6.00 / 6.00
② WS Upstream	17.6	5.98
③ WS Downstream	23.5	7.24
SLOPE	1.26 / 40.1 = .031	

SKETCH



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

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/(NO) | DISTANCE ELECTROFISHED: ____ ft | FISH CAUGHT YES/NO | WATER CHEMISTRY SAMPLED: (YES)/NO

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

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

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

mayfly, stonefly

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Morgan Gulch | CROSS-SECTION NO: | DATE: 8-5-13 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 12:03

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.52								
G	2.7		4.86								
W	2.9		6.00								
	3.5		6.32	0.32				0.97			
	3.9		6.31	0.31				1.72			
	4.3		6.42	0.42				2.02			
	4.7		6.40	0.40				2.60			
	5.1		6.47	0.47				2.69			
	5.5		6.49	0.49				2.30			
	5.9		6.43	0.43				2.46			
	6.3		6.40	0.40				2.80			
	6.7		6.46	0.46				2.30			
	7.1		6.39	0.39				2.19			
	7.5		6.31	0.31				2.22			
	7.9		6.30	0.30				1.96			
	8.3		6.30	0.30				1.04			
	8.7		6.30	0.30				1.60			
	9.1		6.23	0.23				1.14			
	9.5		6.25	0.25				1.12			
	9.9		6.32	0.32				1.12			
	10.3		6.21	0.21				1.27			
W	10.7		6.00								
	11.1		5.66								
	13.3		5.46								
RS/G	15.0		4.76								
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: Morgan Gulch — CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: Approx. 1/3 mile upstream from confluence with Williams Fork

DATE: 6-5-13 — OBSERVERS: R. Smith, B. Logan, B. Epstein

LEGAL DESCRIPTION: ¼ SECTION: NW — SECTION: 34 — TOWNSHIP: 1 N/S — RANGE: 78 E/W — PM: Sixth

COUNTY: Grand — WATERSHED: Williams F. — WATER DIVISION: 5 — DOW WATER CODE: 23680

MAP(S): USGS: GPS 405260 — USFS: 4419342

SUPPLEMENTAL DATA

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

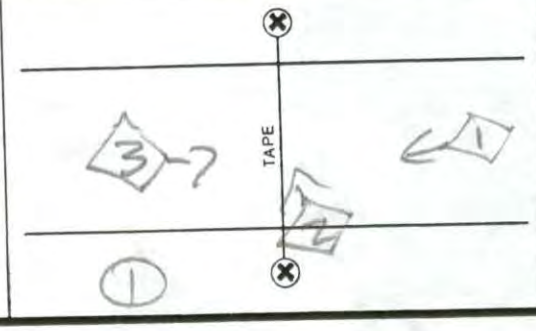
METER NUMBER: — DATE RATED: — CALIB/SPIN: ____ sec — TAPE WEIGHT: surveyed ____ lbs/foot — TAPE TENSION: surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: gravel to 6" 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	6.56 / 6.52
② WS Upstream	12.2	6.44
③ WS Downstream	20.4	6.94
SLOPE	0.50 / 32.6 = 0.0153	

SKETCH



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

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO — DISTANCE ELECTROFISHED: ____ ft — FISH CAUGHT YES/NO — WATER CHEMISTRY SAMPLED: YES/NO

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

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

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

mayfly, stonefly

COMMENTS

TDS = 60
Temp = 8.2°C
Salinity = 0

Riparian = Spruce / Alder

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Morgan Gulch | CROSS-SECTION NO: 1 | DATE: 6-5-13 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 10:51

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec): At Point	Velocity (ft/sec): Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.24								
G	2.9		4.96								
	3.3		5.80								
W	3.9		6.55								
	4.3		6.65	0.10				0			
	4.7		6.82	0.27				0.65			
	5.1		6.86	0.31				1.51			
	5.5		6.85	0.30				2.10			
	5.9		6.88	0.33				1.79			
	6.3		6.90	0.35				2.50			
	6.7		6.95	0.40				2.50			
	7.1		6.91	0.36				2.58			
	7.5		6.86	0.31				2.64			
	7.9		6.95	0.40				2.21			
	8.3		6.83	0.28				2.22			
	8.7		6.91	0.36				2.08			
	9.1		6.98	0.43				2.28			
	9.5		7.00	0.45				2.21			
	9.9		6.94	0.39				2.91			
	10.3		6.83	0.28				3.11			
	10.7		6.83	0.28				2.86			
	11.1		6.70	0.15				0			
W	11.4		6.55	0							
	11.7		5.96								
G	12.3		5.38								
RS	15.0		4.32								
TOTALS:											

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

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Discharge Measurement Summary

Date Generated: Mon Nov 30 2015

File Information

File Name	MORGGLCA.001.WAD
Start Date and Time	2015/07/08 12:56:51

Site Details

Site Name	MORGAN GLC AT CMP GR
Operator(s)	BRIAN EPSTEIN

System Information

Sensor Type	FlowTracker
Serial #	P2354
CPU Firmware Version	3.9
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.3%	1.8%
Velocity	0.5%	2.2%
Width	0.1%	0.1%
Method	1.6%	-
# Stations	2.2%	-
Overall	**3.0%**	**3.0%**

Summary

Averaging Int.	40	# Stations	26
Start Edge	REW	Total Width	4.895
Mean SNR	36.0 dB	Total Area	1.457
Mean Temp	53.45 °F	Mean Depth	0.298
Disch. Equation	Mid-Section	Mean Velocity	0.7888
		Total Discharge	**1.1490**

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:56	0.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	12:56	0.20	None	0.040	0.0	0.0	0.0000	1.00	0.0000	0.008	0.0000	0.0
2	12:56	0.40	None	0.040	0.0	0.0	0.0000	1.00	0.8353	0.004	0.0033	0.3
3	12:56	0.60	0.6	0.200	0.6	0.080	0.8353	1.00	0.8353	0.040	0.0334	2.9
4	13:04	0.80	0.6	0.240	0.6	0.096	0.8189	1.00	0.8189	0.048	0.0392	3.4
5	13:05	1.00	0.6	0.290	0.6	0.116	0.8097	1.00	0.8097	0.058	0.0468	4.1
6	13:07	1.20	0.6	0.290	0.6	0.116	0.8045	1.00	0.8045	0.058	0.0465	4.1
7	13:08	1.40	0.6	0.310	0.6	0.124	0.7697	1.00	0.7697	0.062	0.0476	4.1
8	13:09	1.60	0.6	0.340	0.6	0.136	0.7684	1.00	0.7684	0.068	0.0521	4.5
9	13:10	1.80	0.6	0.350	0.6	0.140	0.7185	1.00	0.7185	0.070	0.0502	4.4
10	13:11	2.00	0.6	0.400	0.6	0.160	0.7024	1.00	0.7024	0.080	0.0560	4.9
11	13:13	2.20	0.6	0.390	0.6	0.156	0.6608	1.00	0.6608	0.078	0.0514	4.5
12	13:13	2.40	0.6	0.390	0.6	0.156	0.6673	1.00	0.6673	0.078	0.0519	4.5
13	13:15	2.60	0.6	0.380	0.6	0.152	0.7431	1.00	0.7431	0.077	0.0571	5.0
14	13:16	2.80	0.6	0.370	0.6	0.148	0.8353	1.00	0.8353	0.076	0.0633	5.5
15	13:18	3.00	0.6	0.380	0.6	0.152	0.8930	1.00	0.8930	0.076	0.0679	5.9
16	13:19	3.20	0.6	0.350	0.6	0.140	0.9052	1.00	0.9052	0.068	0.0620	5.4
17	13:20	3.40	0.6	0.350	0.6	0.140	0.8255	1.00	0.8255	0.070	0.0578	5.0
18	13:21	3.60	0.6	0.400	0.6	0.160	0.7605	1.00	0.7605	0.082	0.0622	5.4
19	13:23	3.80	0.6	0.330	0.6	0.132	0.9311	1.00	0.9311	0.066	0.0615	5.3
20	13:24	4.00	0.6	0.350	0.6	0.140	0.9104	1.00	0.9104	0.068	0.0623	5.4
21	13:26	4.20	0.6	0.350	0.6	0.140	0.8451	1.00	0.8451	0.070	0.0592	5.1
22	13:27	4.40	0.6	0.340	0.6	0.136	0.7749	1.00	0.7749	0.069	0.0538	4.7
23	13:29	4.60	0.6	0.300	0.6	0.120	0.7602	1.00	0.7602	0.060	0.0456	4.0
24	13:29	4.80	None	0.120	0.0	0.0	0.0000	1.00	0.7602	0.023	0.0178	1.6
25	13:29	5.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

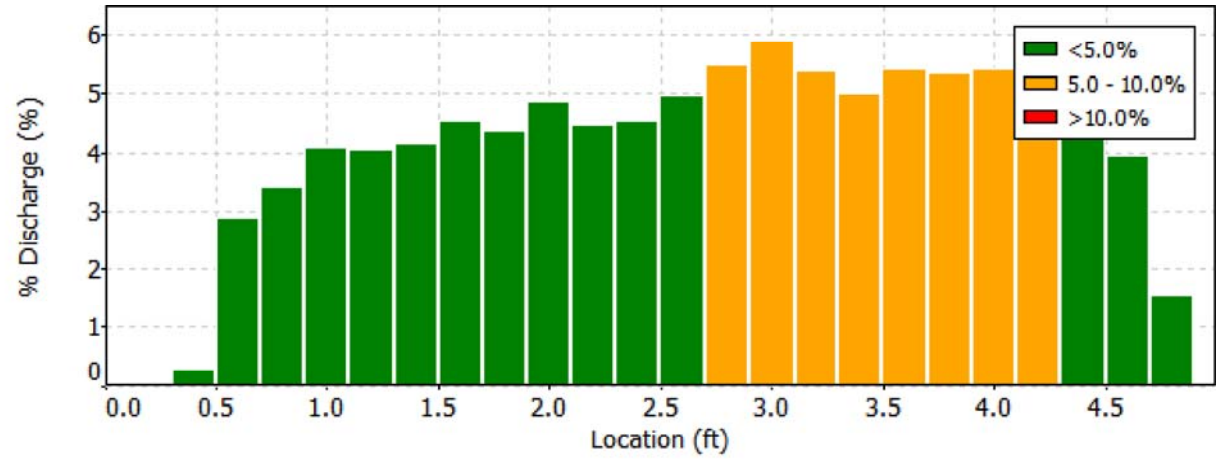
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

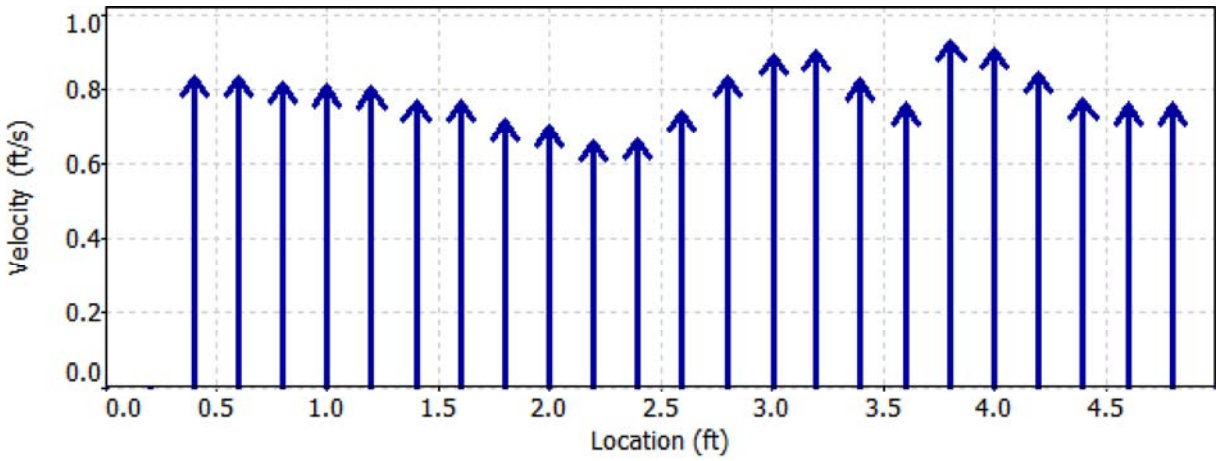
COLORADO
Colorado Water Conservation Board
Department of Natural Resources

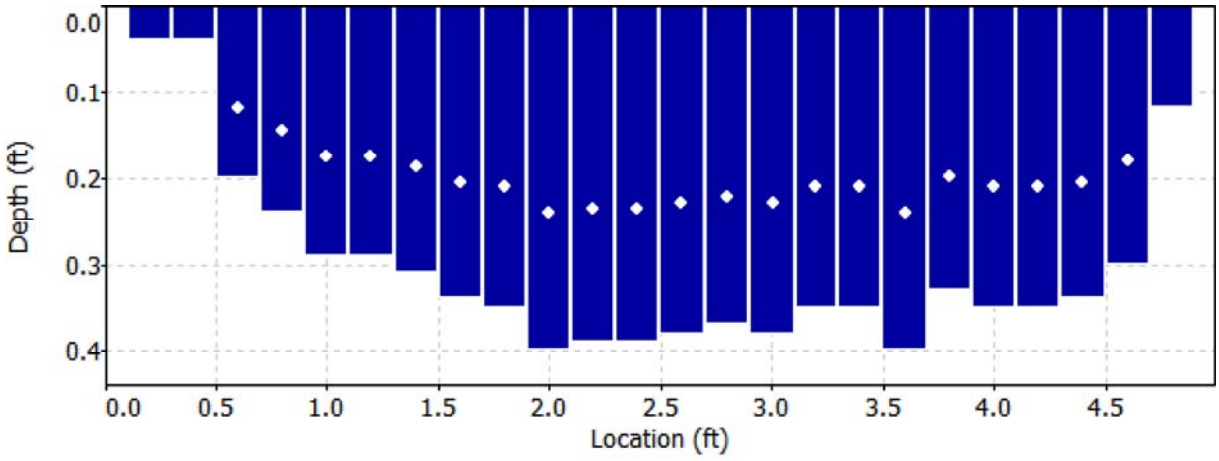
Discharge Measurement Summary

Date Generated: Mon Nov 30 2015

File Information		Site Details	
File Name	MORGGLCA.001.WAD	Site Name	MORGAN GLC AT CMP GR
Start Date and Time	2015/07/08 12:56:51	Operator(s)	BRIAN EPSTEIN







COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Discharge Measurement Summary

Date Generated: Mon Nov 30 2015

File Information		Site Details	
File Name	MORGGLCA.001.WAD	Site Name	MORGAN GLC AT CMP GR
Start Date and Time	2015/07/08 12:56:51	Operator(s)	BRIAN EPSTEIN

Quality Control

No Quality Control warnings

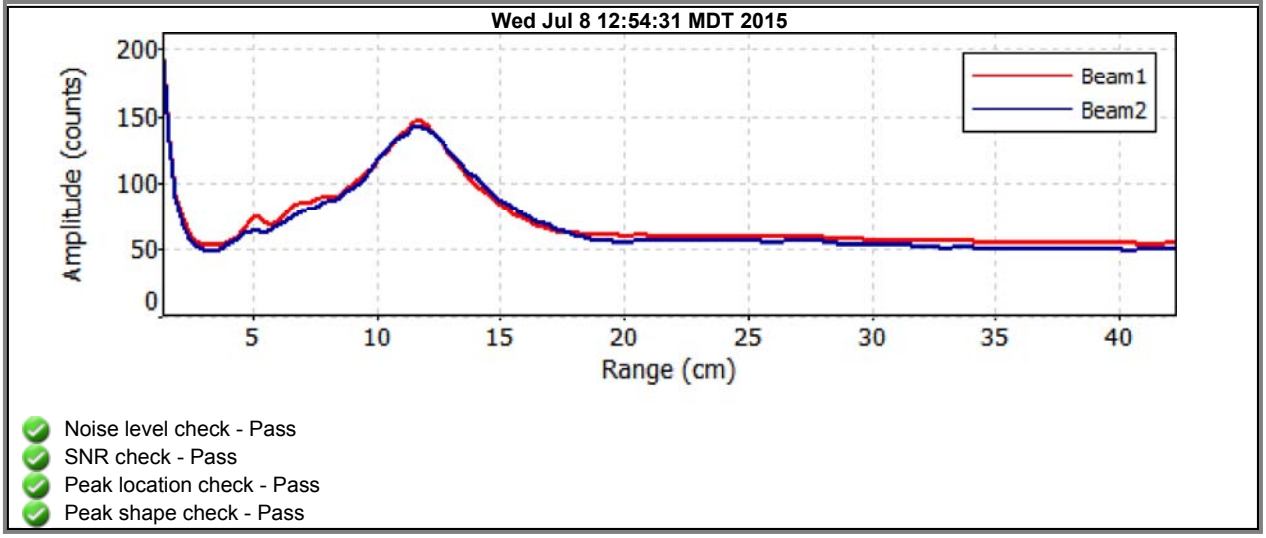
COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Discharge Measurement Summary

Date Generated: Mon Nov 30 2015

File Information		Site Details	
File Name	MORGGLCA.001.WAD	Site Name	MORGAN GLC AT CMP GR
Start Date and Time	2015/07/08 12:56:51	Operator(s)	BRIAN EPSTEIN

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information

File Name	MORGLR2X.002.WAD
Start Date and Time	2013/06/05 12:10:48

Site Details

Site Name	MORGAN GULCH
Operator(s)	BJE

System Information

Sensor Type	FlowTracker
Serial #	P2355
CPU Firmware Version	3.5
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	2.4%
Velocity	0.9%	3.1%
Width	0.1%	0.1%
Method	2.0%	-
# Stations	2.5%	-
Overall	**3.5%**	**4.0%**

Summary

Averaging Int.	40	# Stations	20
Start Edge	LEW	Total Width	7.799
Mean SNR	35.7 dB	Total Area	2.555
Mean Temp	48.02 °F	Mean Depth	0.328
Disch. Equation	Mid-Section	Mean Velocity	1.9602
		Total Discharge	**5.0094**

Measurement Results

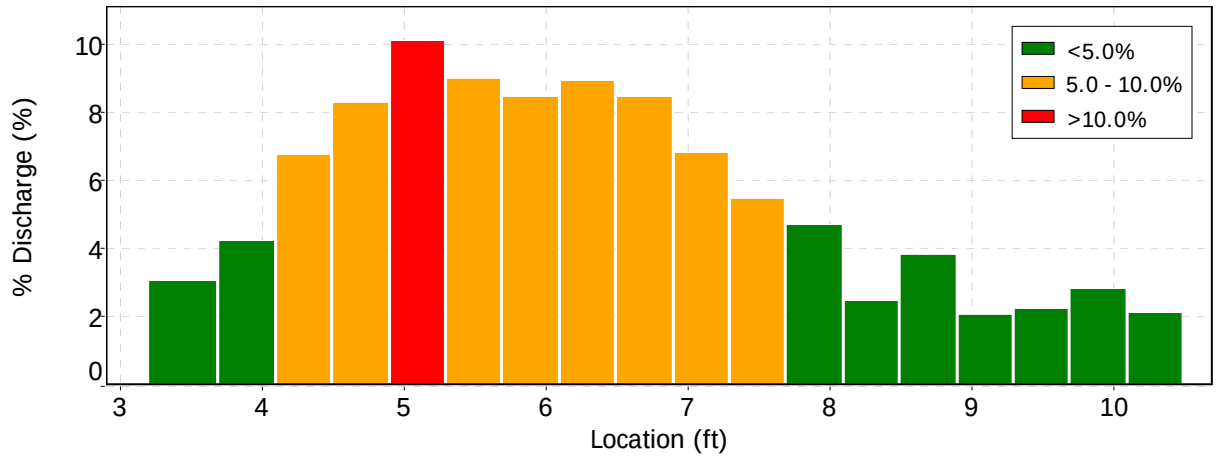
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	12:10	2.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	*12:12*	*3.50*	*0.6*	*0.320*	*0.6*	*0.128*	*0.9692*	*1.00*	*0.9692*	*0.160*	*0.1550*	*3.1*
2	12:14	3.90	0.6	0.310	0.6	0.124	1.7221	1.00	1.7221	0.124	0.2135	4.3
3	12:15	4.30	0.6	0.420	0.6	0.168	2.0174	1.00	2.0174	0.168	0.3388	6.8
4	12:16	4.70	0.6	0.400	0.6	0.160	2.5997	1.00	2.5997	0.160	0.4158	8.3
5	12:18	5.10	0.6	0.470	0.6	0.188	2.6923	1.00	2.6923	0.188	0.5062	10.1
6	12:20	5.50	0.6	0.490	0.6	0.196	2.3012	1.00	2.3012	0.196	0.4511	9.0
7	12:21	5.90	0.6	0.430	0.6	0.172	2.4633	1.00	2.4633	0.172	0.4237	8.5
8	12:23	6.30	0.6	0.400	0.6	0.160	2.8012	1.00	2.8012	0.160	0.4480	8.9
9	12:24	6.70	0.6	0.460	0.6	0.184	2.2963	1.00	2.2963	0.184	0.4224	8.4
10	12:25	7.10	0.6	0.390	0.6	0.156	2.1942	1.00	2.1942	0.156	0.3423	6.8
11	12:27	7.50	0.6	0.310	0.6	0.124	2.2159	1.00	2.2159	0.124	0.2748	5.5
12	12:28	7.90	0.6	0.300	0.6	0.120	1.9560	1.00	1.9560	0.120	0.2346	4.7
13	*12:30*	*8.30*	*0.6*	*0.300*	*0.6*	*0.120*	*1.0377*	*1.00*	*1.0377*	*0.120*	*0.1245*	*2.5*
14	12:31	8.70	0.6	0.300	0.6	0.120	1.5968	1.00	1.5968	0.120	0.1915	3.8
15	12:32	9.10	0.6	0.230	0.6	0.092	1.1447	1.00	1.1447	0.092	0.1053	2.1
16	12:33	9.50	0.6	0.250	0.6	0.100	1.1171	1.00	1.1171	0.100	0.1117	2.2
17	12:35	9.90	0.6	0.320	0.6	0.128	1.1184	1.00	1.1184	0.128	0.1431	2.9
18	12:36	10.30	0.6	0.210	0.6	0.084	1.2740	1.00	1.2740	0.084	0.1070	2.1
19	12:36	10.70	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

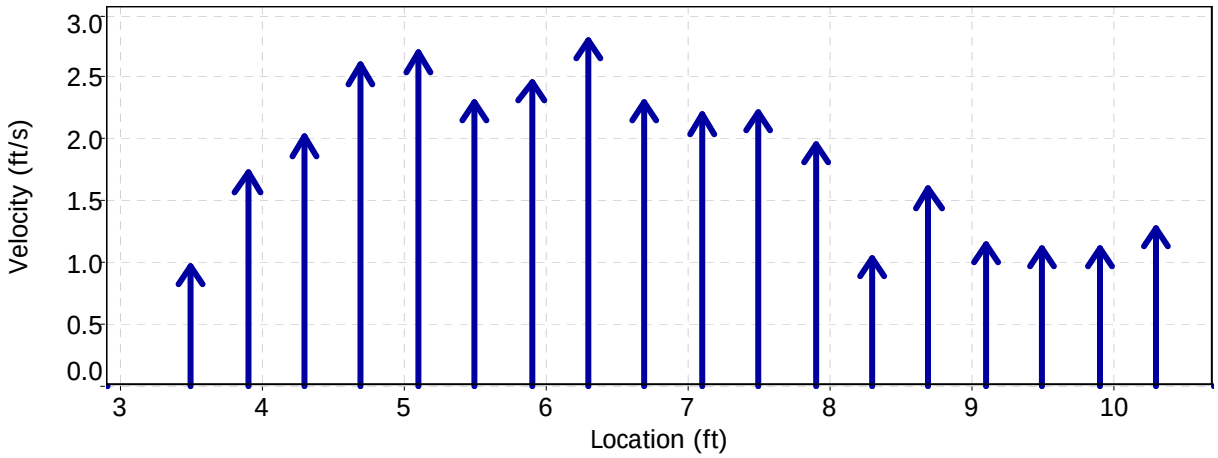
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

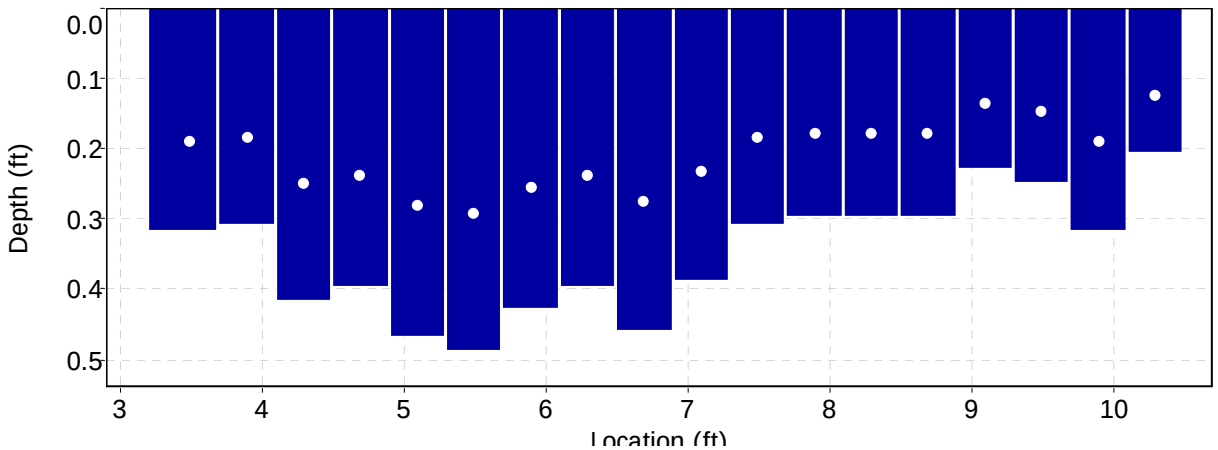
Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information		Site Details	
File Name	MORGLR2X.002.WAD	Site Name	MORGAN GULCH
Start Date and Time	2013/06/05 12:10:48	Operator(s)	BJE







Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information		Site Details	
File Name	MORGLR2X.002.WAD	Site Name	MORGAN GULCH
Start Date and Time	2013/06/05 12:10:48	Operator(s)	BJE

Quality Control

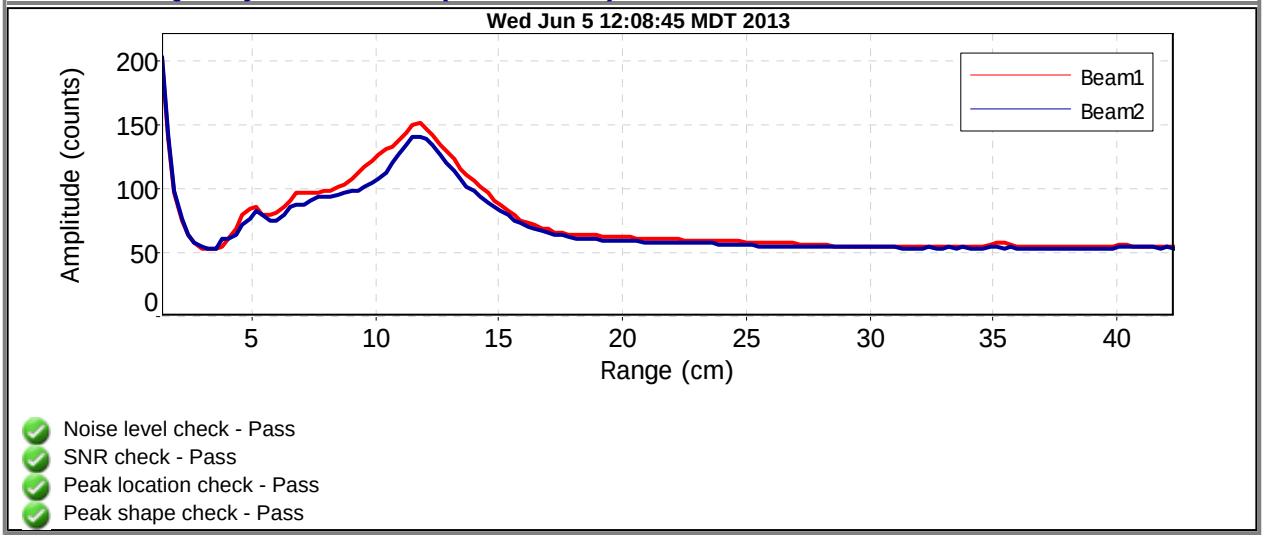
St	Loc	%Dep	Message
1	3.50	0.6	High angle: 21
13	8.30	0.6	High standard error: 0.101

Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information		Site Details	
File Name	MORGLR2X.002.WAD	Site Name	MORGAN GULCH
Start Date and Time	2013/06/05 12:10:48	Operator(s)	BJE

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information

File Name	MORGLR2X.001.WAD
Start Date and Time	2013/06/05 11:04:52

Site Details

Site Name	MORGAN GULCH
Operator(s)	BJE

System Information

Sensor Type	FlowTracker
Serial #	P2355
CPU Firmware Version	3.5
Software Ver	2.30
Mounting Correction	0.0%

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.4%	3.1%
Velocity	0.8%	2.5%
Width	0.1%	0.1%
Method	2.0%	-
# Stations	2.8%	-
Overall	**3.6%**	**4.1%**

Summary

Averaging Int.	40	# Stations	18
Start Edge	LEW	Total Width	7.500
Mean SNR	35.2 dB	Total Area	2.296
Mean Temp	46.20 °F	Mean Depth	0.306
Disch. Equation	Mid-Section	Mean Velocity	2.2500
		Total Discharge	**5.1652**

Measurement Results

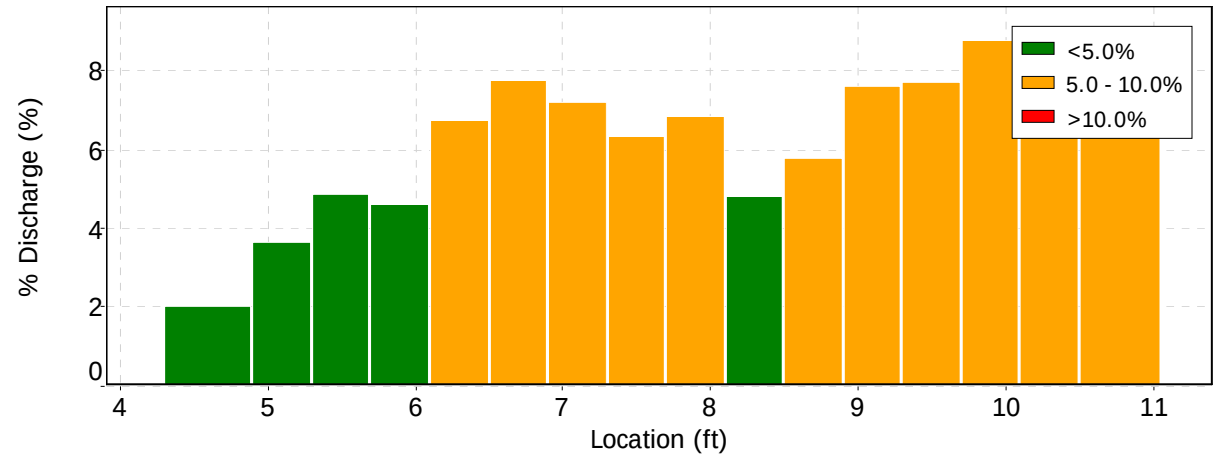
St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	11:04	3.90	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	11:06	4.70	0.6	0.270	0.6	0.108	0.6493	1.00	0.6493	0.162	0.1052	2.0
2	11:08	5.10	0.6	0.310	0.6	0.124	1.5138	1.00	1.5138	0.124	0.1877	3.6
3	11:10	5.50	0.6	0.300	0.6	0.120	2.1024	1.00	2.1024	0.120	0.2521	4.9
4	11:11	5.90	0.6	0.330	0.6	0.132	1.7936	1.00	1.7936	0.132	0.2368	4.6
5	11:13	6.30	0.6	0.350	0.6	0.140	2.4970	1.00	2.4970	0.140	0.3496	6.8
6	11:14	6.70	0.6	0.400	0.6	0.160	2.5049	1.00	2.5049	0.160	0.4007	7.8
7	11:16	7.10	0.6	0.360	0.6	0.144	2.5830	1.00	2.5830	0.144	0.3718	7.2
8	11:17	7.50	0.6	0.310	0.6	0.124	2.6407	1.00	2.6407	0.124	0.3274	6.3
9	11:19	7.90	0.6	0.400	0.6	0.160	2.2129	1.00	2.2129	0.160	0.3540	6.9
10	11:20	8.30	0.6	0.280	0.6	0.112	2.2195	1.00	2.2195	0.112	0.2484	4.8
11	11:22	8.70	0.6	0.360	0.6	0.144	2.0810	1.00	2.0810	0.144	0.2995	5.8
12	11:23	9.10	0.6	0.430	0.6	0.172	2.2795	1.00	2.2795	0.172	0.3921	7.6
13	*11:26*	*9.50*	*0.6*	*0.450*	*0.6*	*0.180*	*2.2067*	*1.00*	*2.2067*	*0.180*	*0.3973*	*7.7*
14	11:27	9.90	0.6	0.390	0.6	0.156	2.9121	1.00	2.9121	0.156	0.4543	8.8
15	*11:29*	*10.30*	*0.6*	*0.280*	*0.6*	*0.112*	*3.1112*	*1.00*	*3.1112*	*0.112*	*0.3482*	*6.7*
16	11:31	10.70	0.6	0.280	0.6	0.112	2.8573	1.00	2.8573	0.154	0.4401	8.5
17	11:31	11.40	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

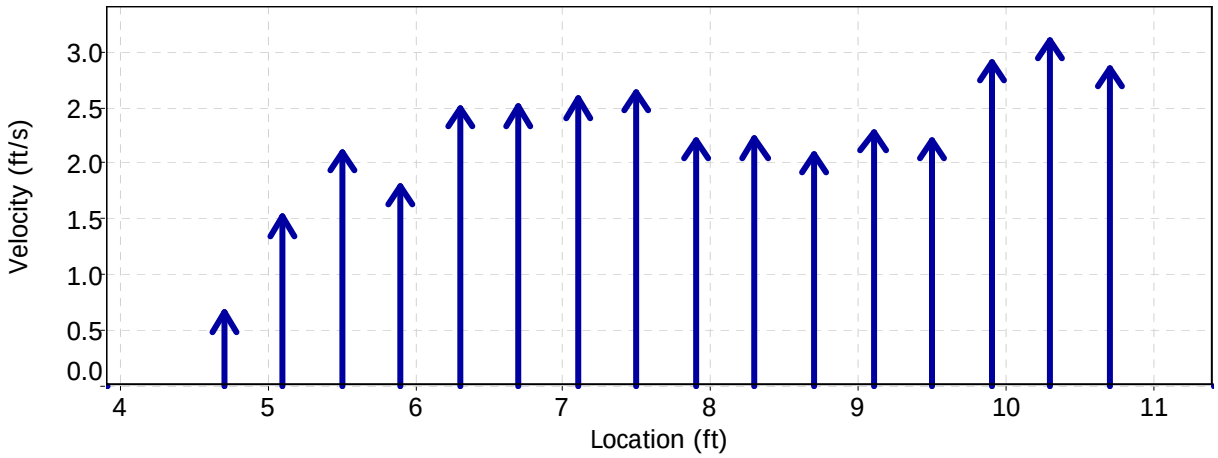
Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

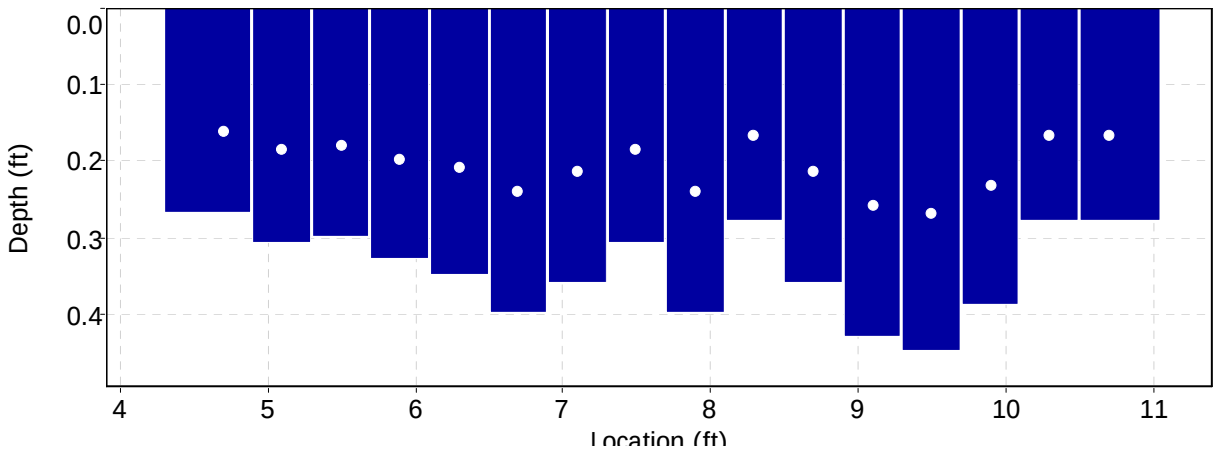
Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information		Site Details	
File Name	MORGLR2X.001.WAD	Site Name	MORGAN GULCH
Start Date and Time	2013/06/05 11:04:52	Operator(s)	BJE







Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information		Site Details	
File Name	MORGLR2X.001.WAD	Site Name	MORGAN GULCH
Start Date and Time	2013/06/05 11:04:52	Operator(s)	BJE

Quality Control

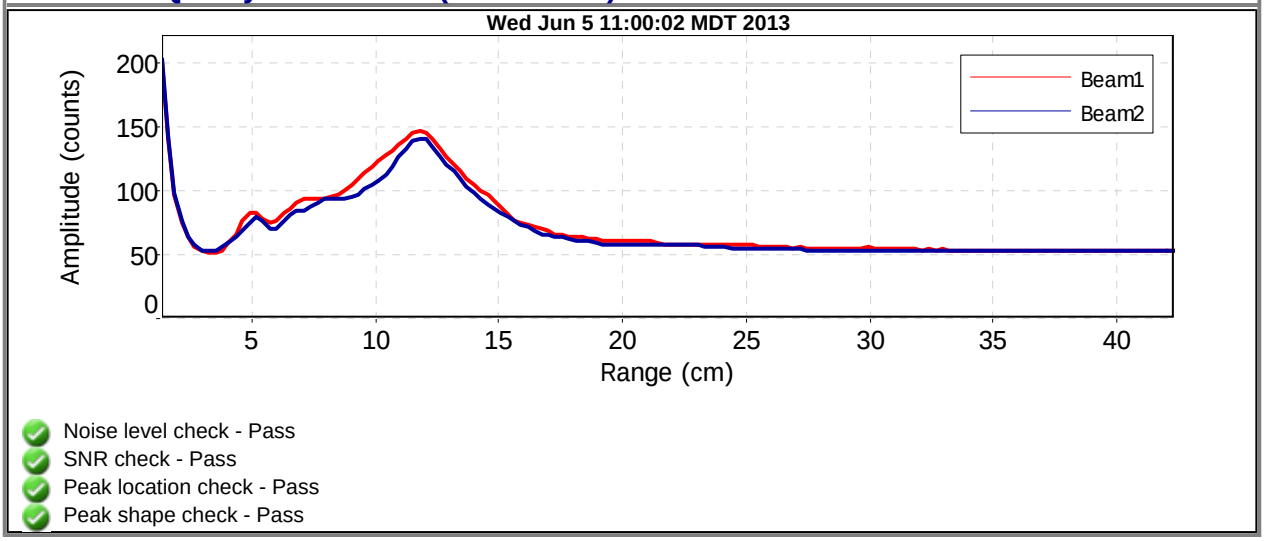
St	Loc	% Dep	Message
13	9.50	0.6	High standard error: 0.132
15	10.30	0.6	High number of spikes: 6

Discharge Measurement Summary

Date Generated: Wed Jun 12 2013

File Information		Site Details	
File Name	MORGLR2X.001.WAD	Site Name	MORGAN GULCH
Start Date and Time	2013/06/05 11:04:52	Operator(s)	BJE

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

State of Colorado

Colorado Water Conservation Board

Field Notes

Morgan Gulch
Party: Brian Epstein & Brandy Logan
09:10 arrive campground and park
09:20 – 10:16 hike up Morgan Gulch observing creek from trail
- Uniform stream type
- healthy vegetation, good age diversity, nice deciduous
- north west facing slope good pine cover
- South east facing slope sage and grass cover

10:30 GPS Point Morgan Gulch Obs 001

Pictures	Contents
1843	from GPS downstream (looking) [camera time 1 hour back from local]
1844	from GPS looking upstream
1845	from GPS close up of pool
1846 - 1848	bugs on rock
1849	substrate
1850	from gps location, GPS in stream
1851 - 1853	looking upstream
1854	from gps location w/ camera gps on looking at tree and pool
1856 - 1857	from hillside looking at GPS location
1858	from hillside looking upstream at GPS location

10:55 GPS Point Morgan Gulch Obs 002
~~1858 - 1859~~ 1858 - 1859 from gps looking down at creek
11:07 GPS Point Morgan Gulch Obs 003
1860 from gps point willows and creek
11:27 GPS Point Morgan Gulch 004
- finer bed material
- Pines on both sides of channel

1861 from gps looking upstream
1862 from gps looking downstream

General Observations

- elk scat
- Pines along creek healthy
- upland pines have isperked brown indicative of pine beetle

Page 2 of 4	State of Colorado	Meas. No.: 001
YYYY: 2015	**Colorado Water Conservation Board**	Division: 5
MM-DD: 07-09	ADV Discharge Measurement Notes	District: 51

Station Name: Morg Glea
Morgan Gulch River, Creek, Canal, Ditch
At, Near, Above, Below Campground, 30m us from Culvert
Latitude: 39° 55.2467 Longitude: 106° 6.8638
Party: Brian Epstan & Brandy

Conditions

Weather: low 60s raining ~9:30-12:00
Wind Spd / Dir: Minimal Water Temp:
X-Sec Desc: Glide, gravel and small cobbles
Flow Conds: Uniform, Straight flow lines
Control Desc.: N/A

Measurement Rated: Excelent (2%) / Good (5%) / Fair (8%) / Poor (>8%) [based on the above conditions]

Water Level Reading

Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.

NO +2

Pressure Transducer Download		Weighted MGH	
File Name:	N/A	GH Corr.	
Time:		Correct MGH	

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / P2355
Firmware:	3.9	Software:	2.20		
Diag Test File:	Yes or No	Raw Data File:	morggleа.001		
Meas Type:	Wading / Boat / Bridge / Cableway			Method:	0.6
	N/A ft. or mi / upstream or downstream of gage				
Start Edge:	LEW 0.0	End Edge:	LEW 5.0	Total Width:	5.06
Start Time:	12:55	End Time:	13:32		
Discharge:	1.149	Unsertainty:	3.0	# Stations:	26
Mean v:	.789	Width	4.895	Mean d:	.30
Max v:	.931	Area:	1.456	Max d:	.40
Mean SNR:	35.9	σv:	.015	Mean Temp:	53.4°

Meas. By:	BE	Notes By:	BE, BL
Processed By:		Reviewed By:	

Remarks:

1863 From right bank looking left

1864 " " " " "

1865 From left looking Right

Page 1 of 2	State of Colorado	Meas. No.: 002
YYYY: 2013	**Colorado Water Conservation Board**	Division: 5
MM-DD: 06-05	ADV Discharge Measurement Notes	District: 51

Station Name: Temp Flow RJCROSS Morgan Gulch River , Creek, Canal, Ditch

At, Near, Above, Below

Latitude: N 39° 55' 14.18" Longitude: W 106° 06' 44.97" NAD 83

Party: Brian Epstein, Brody Logan, Rob Veihl, Ray Smith (USGS)

Conditions

Weather: ~70°F Sunny

Wind Spd / Dir: Water Temp:

X-Sec Desc: Boulder bed, straight 7ft US, 20ft DS

Flow Conds: Mostly laminar

Control Desc.: N/A

Measurement Rated: Excelent (2%) / (Good (5%)) Fair (8%) / Poor (>8%) [based on the above conditions]

Water Level Reading

Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.
N/A					

Pressure Transducer Download		Weighted MGH	
File Name:	N/A	GH Corr.	
Time:		Correct MGH	

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / (P2356)
Firmware:	3.7	Software:	2.20		
Diag Test File:	(Yes) or No	Raw Data File:	MORGLR2X.002		
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
	N/A		ft. or mi / upstream or downstream of gage		
Start Edge:	LEW 2.9	End Edge:	REW 10.7	Total Width:	7.8
Start Time:	12:08	End Time:	12:36		
Discharge:	5.004	Unsertainty:	3.5%	# Stations:	20
Mean v:	1.960	Width	7.799	Mean d:	0.33
Max v:	2.801	Area:	2.555	Max d:	0.49
Mean SNR:	35.6	σv:	0.062	Mean Temp:	48.0°F

Meas. By:	BJE	Notes By:	BJE
Processed By:		Reviewed By:	

Remarks:

Paula Belcher & Mitch Styborisky

12:03 MORGLR2X.002 cross section location gps point

Pictures

11:59	756	R2cross	Echo
12:00	757	"	
12:00	758	"	
12:00	759	"	

Page 1 of 2	State of Colorado	Meas. No.: 001
YYYY: 2013	**Colorado Water Conservation Board**	Division: 5
MM-DD: 06-05	ADV Discharge Measurement Notes	District: 51

Station Name: Temp for R2Cross Morgan Gulch River , Creek, Canal, Ditch

At, Near, Above, Below

Latitude: N 39° 55' 7.6" Longitude: W 106° 06' 31.14" WGS 84

Party: Brian Eblen, Brandy Logan, Rob Veihl, Roy Smith (ORS)

Conditions

Weather: ~62°F Sunny

Wind Spd / Dir: 0 mph / 0° Water Temp:

X-Sec Desc: boulder bed, straight 10 ft wide 1 10 ft long

Flow Conds: Mostly laminar

Control Desc.: N/A

Measurement Rated: Excelent (2%) / (Good (5%)) / Fair (8%) / Poor (>8%) [based on the above conditions]

Water Level Reading

Time	Staff Gage	Pressure Trans.	Time	Staff Gage	Pressure Trans.
N/A					

Pressure Transducer Download		Weighted MGH	
File Name:		GH Corr.	
Time:		Correct MGH	

Discharge Measurement

Manufacturer:	SonTek	Model:	FlowTracker	S/N:	P2354 / (P2355)
Firmware:	3.7	Software:	2.20		
Diag Test File:	(Yes) or No	Raw Data File:	MORGL_R2X.001		
Meas Type:	(Wading) / Boat / Bridge / Cableway			Method:	0.6
	NA	ft. or mi / upstream or downstream of gage			
Start Edge:	LEW 3.9	End Edge:	REW 11.4	Total Width:	7.5
Start Time:	10:59	End Time:	11:34		
Discharge:	5.165	Unsertainty:	3.7%	# Stations:	18
Mean v:	2.250	Width	~~5.11~~ 7.5	Mean d:	0.31
Max v:	3.111	Area:	2.296	Max d:	0.45
Mean SNR:	35.2	σv:	0.059	Mean Temp:	46.2°F

Meas. By: BJE Notes By: BJE

Processed By: Reviewed By:

Remarks:

Paula Belcher, I Mitch Stypinsky

10:52 GPS and FlowTracker
11:37 GPS MORGLR2x.001 cross section

Pictures

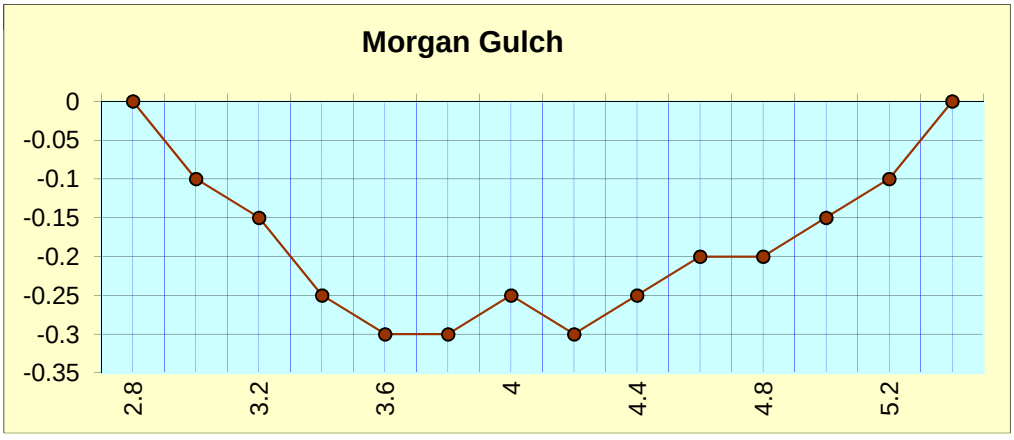
10:44	750	R2 cross sctn
10:45	751	"
10:46	752	"
10:46	753	"
10:46	754	"
10:47	755	"

Flow Mesaurement Calculations

Morgan Gulch

Date: 8/8/2015 **Time:** 9:40 AM
Observers: Baessler / (intern) Cunningham
County: Gunnison
Water Division: 4 *Note: Photos Taken*
Location: ***Latitude:*** 39 55 11.9
Longitude: 106 06 19.5
Comments: Overcast, 60

Distance from bank	Width	Depth	Velocity	Area	Discharge
2.8	water line	0	0		
3	0.2	0.1	0.08	0.02	0.0016
3.2	0.2	0.15	0.23	0.03	0.0069
3.4	0.2	0.25	0.18	0.05	0.009
3.6	0.2	0.3	0.29	0.06	0.0174
3.8	0.2	0.3	0.19	0.06	0.0114
4	0.2	0.25	0.29	0.05	0.0145
4.2	0.2	0.3	0.11	0.06	0.0066
4.4	0.2	0.25	0.06	0.05	0.003
4.6	0.2	0.2	0.04	0.04	0.0016
4.8	0.2	0.2	0.01	0.04	0.0004
5	0.2	0.15	0	0.03	0
5.2	0.2	0.1	0	0.02	0
5.4	water line	0	0		
				FLOW =	**0.07 CFS**



Graph Data

2.8	0
3	-0.1
3.2	-0.15
3.4	-0.25
3.6	-0.3
3.8	-0.3
4	-0.25
4.2	-0.3
4.4	-0.25
4.6	-0.2
4.8	-0.2
5	-0.15
5.2	-0.1
5.4	0


FlowTrac