DRAFT RECOMMENDATION– January 2015 Version

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 Balm of Gilead Creek, located in Water Division 1.

Location and Land Status. Balm of Gilead Creek originates on the north flank of Thirtynine Mile Mountain, approximately eight miles south of Elevenmile Canyon Reservoir. This reach begins at the headwaters and extends downstream to the BLM-private land boundary, a distance of approximately 3.6 miles. The BLM manages approximately 0.60 miles of this reach, and the U.S. Forest Service manages 3.0 miles.

Biological Summary. Balm of Gilead Creek is a cold-water, high gradient stream. The reach flows through a shallow, rolling valley approximately one-fourth mile in width. The stream is confined by bedrock in some locations and travels through alluvium in other locations. The stream generally has medium-sized substrate, ranging from gravels to small boulders. 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 various willow species, alder, river birch, and potentilla. The riparian community is in fair to good condition. The structure of the riparian community provides only limited shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Pruden 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)
08/17/2009 #1	0.12 cfs	2.85 feet	0.17 cfs	Out of range
08/17/2009 #2	0.21 cfs	1.87 feet	0.21 cfs	Out of range
05/19/2014 #1	0.24 cfs	4.25 feet	0.20 cfs	0.6 cfs *See note.*
05/19/2014 #2	0.24 cfs	4.01 feet	0.41 cfs	0.6 cfs See note.
		Averages:	0.25 cfs	0.60 cfs

Note: The flow that meets all three instream flow criteria is outside of the confidence interval for

this data set. 0.6 cfs is within the confidence interval, provides 0,58 to 0.73 feet per second average velocity, and meets the instream flow criteria for average depth and wetted perimeter.

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.

> 0.6 cubic feet per second is recommended during the warm weather period from May 1 to August 31. This recommendation is driven by the average velocity criteria. This creek is very small and steep and has limited physical habitat, so it is important to protect a flow rate that provides usable habitat in riffles when fish are completing critical life history functions during the warm weather months.
>
> 0.35 cubic feet per second is recommended during the fall period, from September 1 to November 30. This recommendation is driven by limited water availability. This flow rate meets two of three instream flow criteria.
>
> 0.25 cfs is recommended during the winter period from December 1 through March 31. 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.
>
> 0.35 cfs is recommended during the early portion of the snowmelt runoff period, from the April 1 to April 30. This flow rate meets two of three instream flow criteria, but reflects the fact that snowmelt runoff is not yet sufficient during April to meet all three instream flow criteria.

Water Availability. The BLM recommends relying exclusively upon Streamstats for water availability analysis because it appears to be the only reliable source of information for this watershed. The BLM does not recommend usage of gage data from this region because all of the gage data either has very short periods of record, or is heavily influenced by water diversion and storage operations.

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

Relationship to Land Management Plans. BLM's land use plan calls for Balm of Gilead Creek to be managed to maintain, restore, or improve riparian conditions, such that proper functioning conditions are achieved. It also specifies that instream flow appropriations will pursued on fishery streams to ensure sufficient flows rates for fisheries protection. Appropriation of an instream flow water right would assist 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: David Gilbert, Royal Gorge FO
Keith Berger, Royal Gorge FO

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

LOCATION INFORMATION

STREAM NAME:	Balm of Gilead Creek
XS LOCATION:	250 yds d/s from USFS-BLM boundary
XS NUMBER:	2
DATE:	17-Aug-09
OBSERVERS:	R. Smith, J. Backstrand, D. Gilbert
1/4 SEC:	SW
SECTION:	26
TWP:	13N
RANGE:	73W
PM:	Sixth
COUNTY:	Park
WATERSHED:	South Platte
DIVISION:	1
DOW CODE:	32223
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:	0.03

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

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

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 2

DATA POINTS= 11

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	2.00	4.68			0.00		0.00	0.00	0.0%
1	G	8.40	4.98			0.00		0.00	0.00	0.0%
	W	8.50	5.34	0.00		0.00		0.00	0.00	0.0%
		9.00	5.45	0.10	0.66	0.51	0.10	0.04	0.03	22.4%
		9.30	5.55	0.20	0.42	0.32	0.20	0.06	0.03	21.4%
		9.60	5.55	0.20	0.57	0.30	0.20	0.06	0.03	29.0%
		9.90	5.50	0.15	0.54	0.30	0.15	0.05	0.02	20.6%
		10.20	5.55	0.20	0.22	0.30	0.20	0.04	0.01	6.5%
	W	10.25	5.34	0.00		0.22		0.00	0.00	0.0%
1	G	10.30	5.10			0.00		0.00	0.00	0.0%
	RS	13.40	5.01			0.00		0.00	0.00	0.0%
	TOTALS ----------					1.95	0.2 (Max.)	0.24	0.12	100.0%

Manning's n = 0.1296
Hydraulic Radius= 0.12292995

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.24	0.25	6.1%
5.09	0.24	0.71	195.5%
5.11	0.24	0.67	179.2%
5.13	0.24	0.63	163.7%
5.15	0.24	0.60	148.3%
5.17	0.24	0.56	133.0%
5.19	0.24	0.52	117.8%
5.21	0.24	0.49	102.6%
5.23	0.24	0.45	87.6%
5.25	0.24	0.41	72.6%
5.27	0.24	0.38	57.7%
5.29	0.24	0.34	42.9%
5.30	0.24	0.33	35.5%
5.31	0.24	0.31	28.1%
5.32	0.24	0.29	20.8%
5.33	0.24	0.27	13.4%
5.34	0.24	0.25	6.1%
5.35	0.24	0.24	-1.0%
5.36	0.24	0.22	-8.0%
5.37	0.24	0.20	-14.8%
5.38	0.24	0.19	-21.4%
5.39	0.24	0.17	-27.8%
5.41	0.24	0.14	-40.0%
5.43	0.24	0.12	-51.4%
5.45	0.24	0.09	-62.0%
5.47	0.24	0.07	-71.9%
5.49	0.24	0.04	-81.3%
5.51	0.24	0.02	-89.9%
5.53	0.24	0.01	-96.2%
5.55	0.24	0.00	-100.0%
5.57	0.24	0.00	-100.0%
5.59	0.24	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 5.349

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 2 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.10	1.87	0.37	0.45	0.69	2.45	100.0%	0.28	0.59	0.85
	5.15	1.84	0.32	0.40	0.60	2.35	95.9%	0.26	0.48	0.80
	5.20	1.82	0.28	0.35	0.51	2.24	91.7%	0.23	0.37	0.74
	5.25	1.79	0.23	0.30	0.42	2.14	87.5%	0.19	0.28	0.67
	5.30	1.77	0.19	0.25	0.33	2.04	83.3%	0.16	0.19	0.59
WL	5.35	1.71	0.14	0.20	0.24	1.90	77.8%	0.13	0.12	0.50
	5.40	1.47	0.11	0.15	0.16	1.62	66.2%	0.10	0.07	0.43
	5.45	1.23	0.08	0.10	0.09	1.34	54.6%	0.07	0.03	0.34
	5.50	1.07	0.03	0.05	0.04	1.12	45.9%	0.03	0.01	0.20
	5.55	0.32	0.00	0.00	0.00	0.32	13.2%	0.00	0.00	0.02

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.12	cfs
CALCULATED FLOW (Qc)=	0.12	cfs
(Qm-Qc)/Qm * 100 =	-1.7	%
MEASURED WATERLINE (WLm)=	5.34	ft
CALCULATED WATERLINE (WLc)=	5.35	ft
(WLm-WLc)/WLm * 100 =	-0.2	%
MAX MEASURED DEPTH (Dm)=	0.20	ft
MAX CALCULATED DEPTH (Dc)=	0.20	ft
(Dm-Dc)/Dm * 100	-0.7	%
MEAN VELOCITY=	0.50	ft/sec
MANNING'S N=	0.130	
SLOPE=	0.03	ft/ft
.4 * Qm =	0.0	cfs
2.5 * Qm=	0.3	cfs

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

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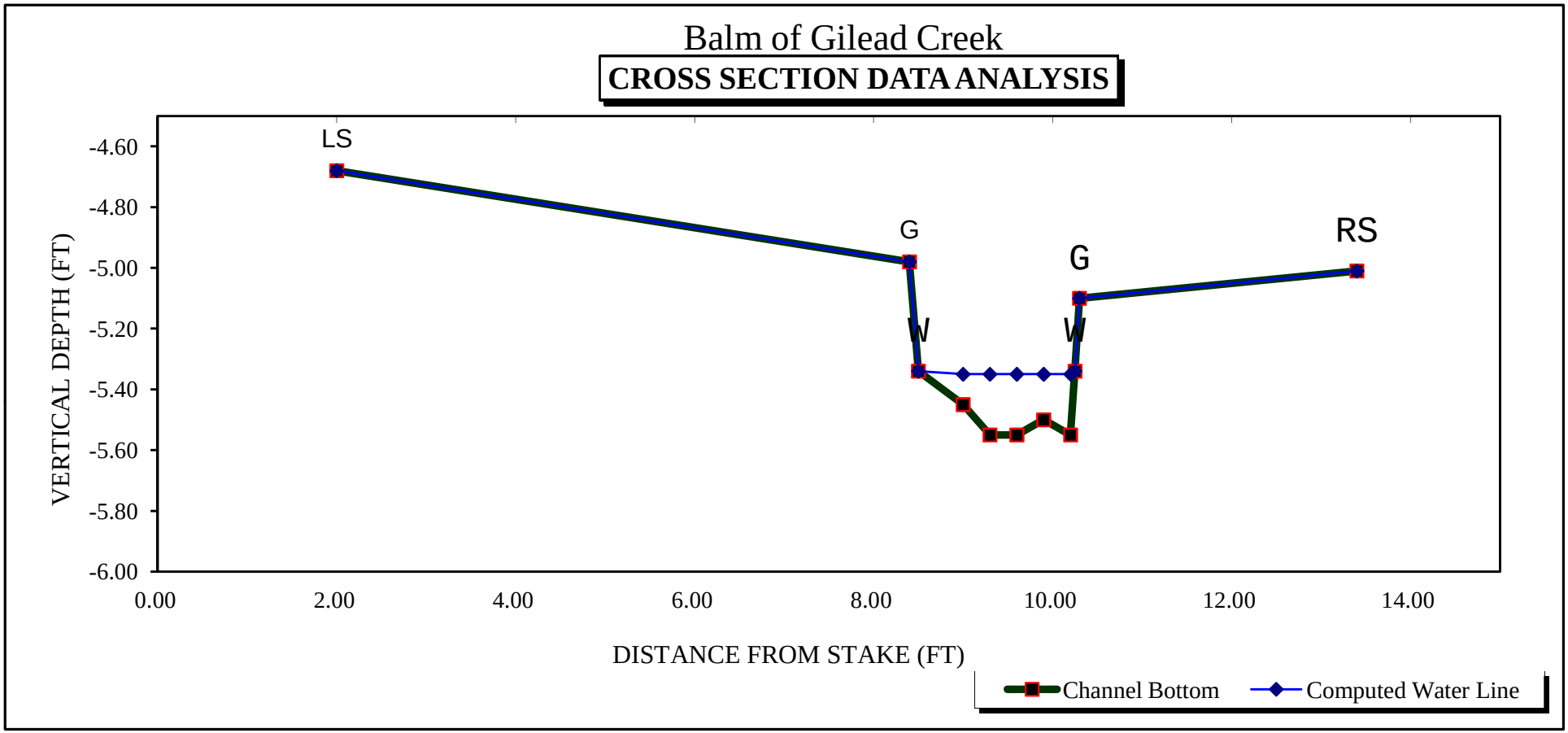
RECOMMENDATION BY: ……………………...………..……............................... AGENCY...…………………………......……....…....……....... DATE:......…...…......……………

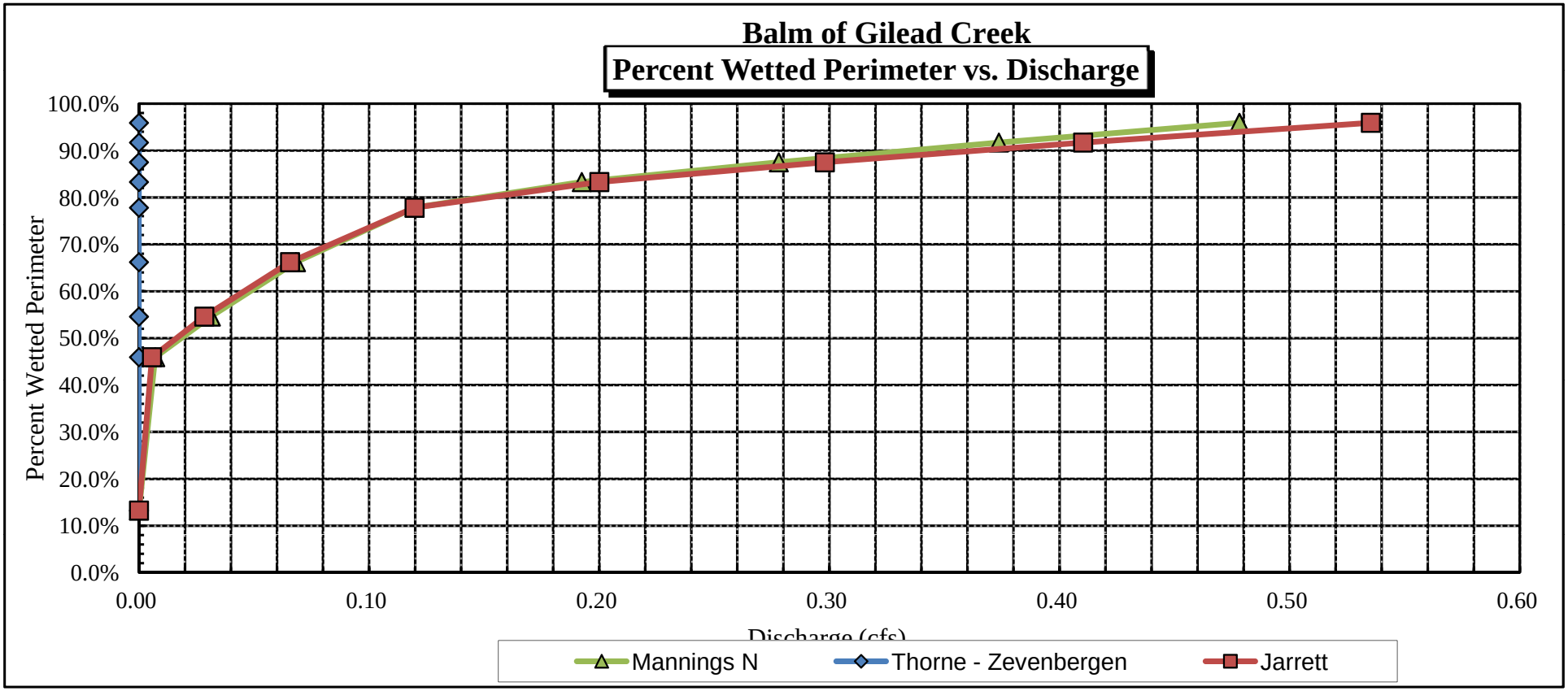
CWCB REVIEW BY: ..…………………………....……………………………………………………..…............. DATE:.................…………….....

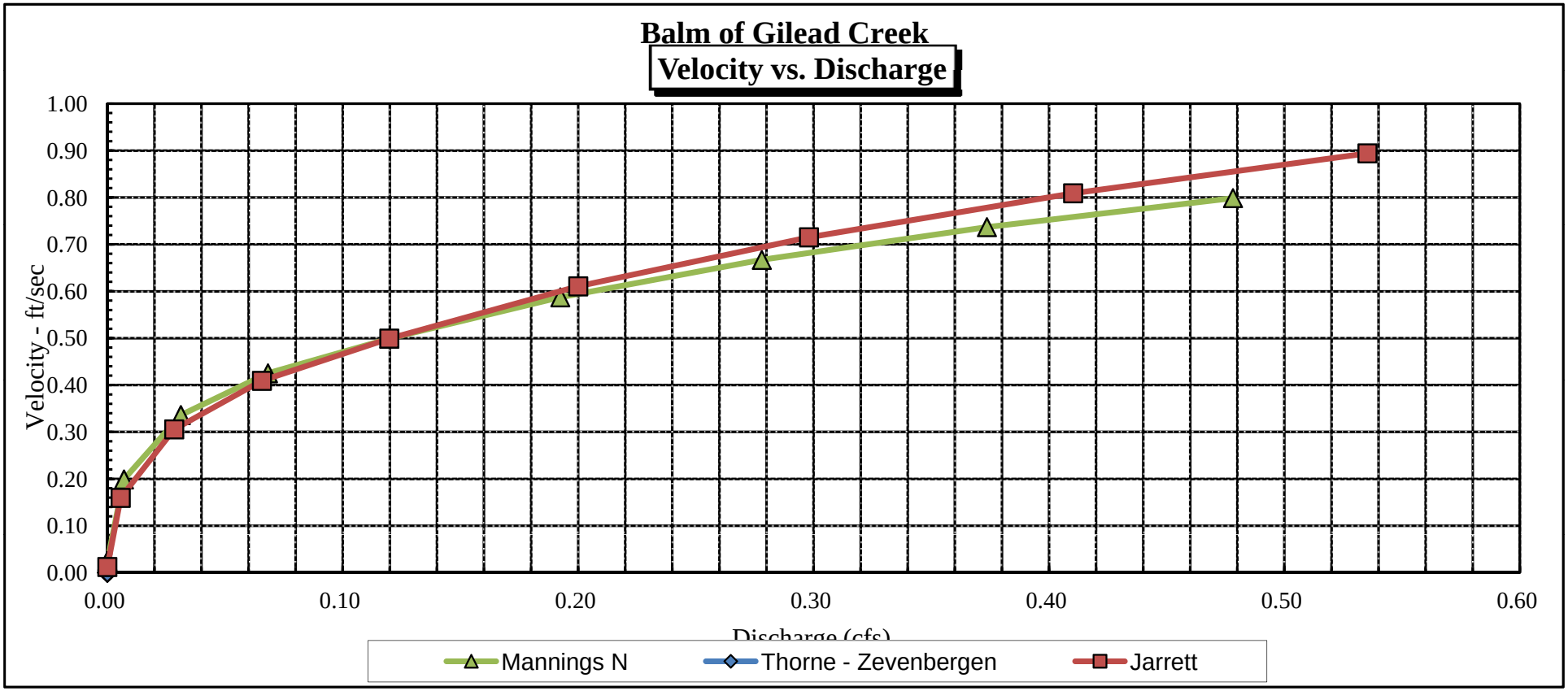
STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

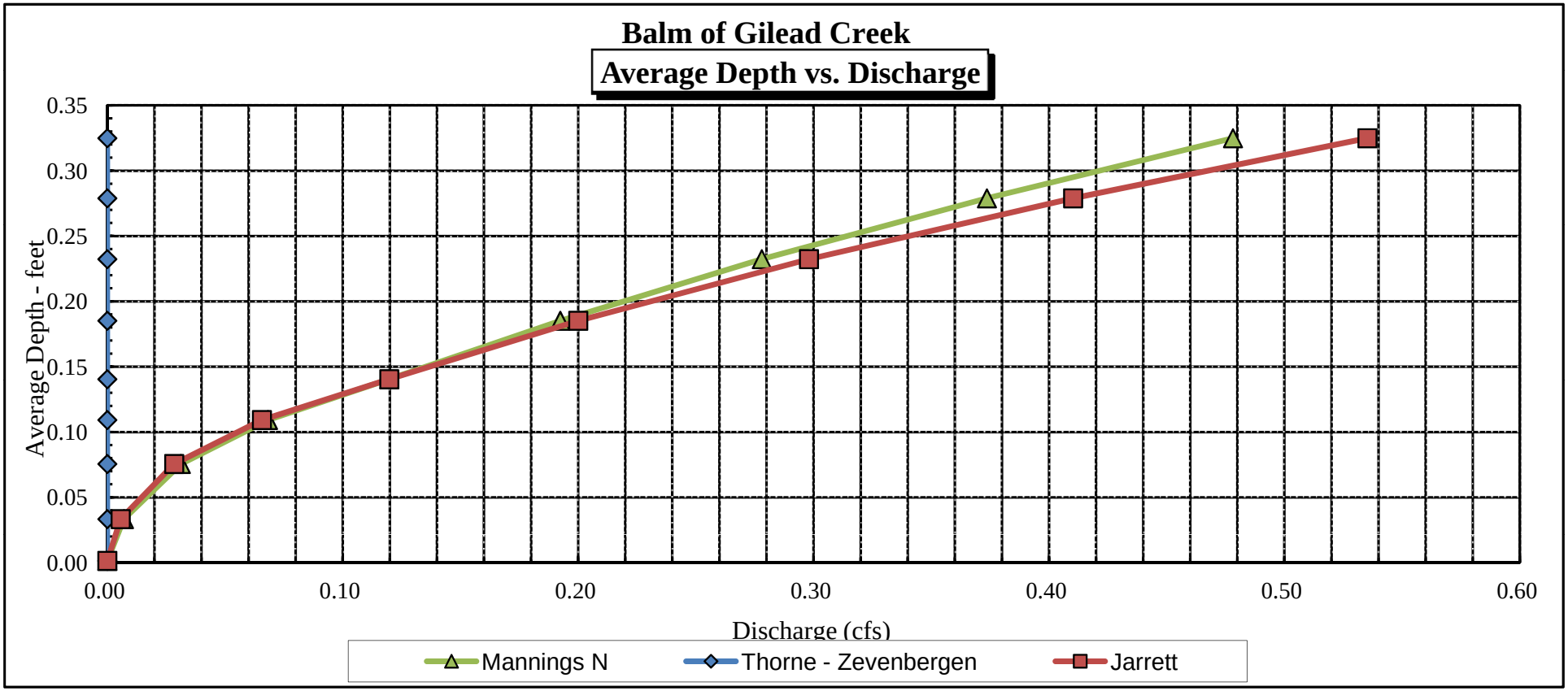
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

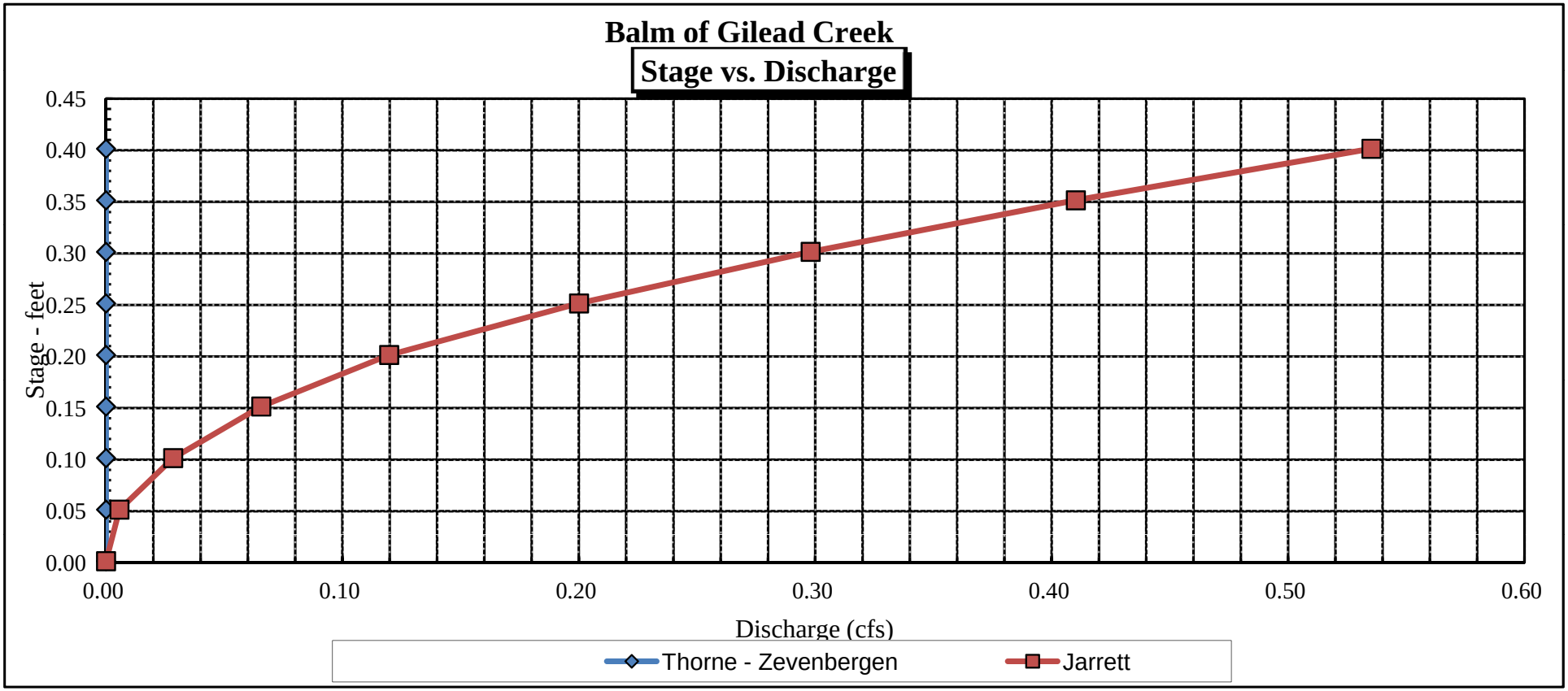
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.10	1.87	0.37	0.45	0.69	2.45	100.0%	0.28	0.67	0.97
	5.15	1.84	0.32	0.40	0.60	2.35	95.9%	0.26	0.54	0.89
	5.20	1.82	0.28	0.35	0.51	2.24	91.7%	0.23	0.41	0.81
	5.25	1.79	0.23	0.30	0.42	2.14	87.5%	0.19	0.30	0.72
	5.30	1.77	0.19	0.25	0.33	2.04	83.3%	0.16	0.20	0.61
WL	5.35	1.71	0.14	0.20	0.24	1.90	77.8%	0.13	0.12	0.50
	5.40	1.47	0.11	0.15	0.16	1.62	66.2%	0.10	0.07	0.41
	5.45	1.23	0.08	0.10	0.09	1.34	54.6%	0.07	0.03	0.31
	5.50	1.07	0.03	0.05	0.04	1.12	45.9%	0.03	0.01	0.16
	5.55	0.32	0.00	0.00	0.00	0.32	13.2%	0.00	0.00	0.01


Balm of Gilead Creek
CROSS SECTION DATA ANALYSIS
LS
G
W
G
W
RS
-4.60
-4.80
-5.00
-5.20
-5.40
-5.60
-5.80
-6.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Balm of Gilead Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Balm of Gilead Creek
Velocity vs. Discharge
Velocity - ft/sec
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Balm of Gilead Creek
Average Depth vs. Discharge
Average Depth - feet
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Balm of Gilead Creek
Stage vs. Discharge
Stage - feet
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
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:	Balm of Gilead Creek
XS LOCATION:	250 yds d/s from USFS-BLM boundary
XS NUMBER:	1
DATE:	17-Aug-09
OBSERVERS:	R. Smith, D. Gilbert, J. Backstrand
1/4 SEC:	SW
SECTION:	26
TWP:	13S
RANGE:	73W
PM:	Sixth
COUNTY:	Park
WATERSHED:	South Platte
DIVISION:	1
DOW CODE:	32223
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:	0.04

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 1

DATA POINTS= 12

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	2.00	3.14			0.00		0.00	0.00	0.0%
1	G	7.90	4.35			0.00		0.00	0.00	0.0%
	W	8.00	4.59			0.00		0.00	0.00	0.0%
		8.30	4.80	0.20	0.20	0.37	0.20	0.06	0.01	9.9%
		8.60	4.80	0.20	0.11	0.30	0.20	0.06	0.01	5.4%
		8.90	4.80	0.20	0.20	0.30	0.20	0.06	0.01	9.9%
		9.20	4.80	0.20	0.49	0.30	0.20	0.06	0.03	24.2%
		9.50	4.80	0.20	0.65	0.30	0.20	0.07	0.05	37.4%
		9.90	4.75	0.15	0.43	0.40	0.15	0.04	0.02	13.3%
	W	10.00	4.60			0.18		0.00	0.00	0.0%
1	G	10.90	4.30			0.00		0.00	0.00	0.0%
	S	15.00	4.12			0.00		0.00	0.00	0.0%
	TOTALS ----------					2.15	0.2 (Max.)	0.35	0.12	100.0%

Manning's n = 0.2520
Hydraulic Radius= 0.16165895

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.35	0.36	2.5%
4.35	0.35	0.97	178.0%
4.37	0.35	0.91	161.7%
4.39	0.35	0.85	145.8%
4.41	0.35	0.80	130.3%
4.43	0.35	0.75	115.1%
4.45	0.35	0.70	100.4%
4.47	0.35	0.65	86.1%
4.49	0.35	0.60	72.1%
4.51	0.35	0.55	58.6%
4.53	0.35	0.51	45.4%
4.55	0.35	0.46	32.7%
4.56	0.35	0.44	26.4%
4.57	0.35	0.42	20.3%
4.58	0.35	0.40	14.2%
4.59	0.35	0.38	8.3%
4.60	0.35	0.36	2.5%
4.61	0.35	0.34	-3.3%
4.62	0.35	0.32	-8.9%
4.63	0.35	0.30	-14.5%
4.64	0.35	0.28	-20.0%
4.65	0.35	0.26	-25.5%
4.67	0.35	0.22	-36.3%
4.69	0.35	0.18	-46.8%
4.71	0.35	0.15	-57.1%
4.73	0.35	0.11	-67.1%
4.75	0.35	0.08	-76.9%
4.77	0.35	0.05	-86.3%
4.79	0.35	0.02	-94.5%
4.81	0.35	0.00	-100.0%
4.83	0.35	0.00	-100.0%
4.85	0.35	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 4.599

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM 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	4.35	2.85	0.33	0.45	0.95	3.20	100.0%	0.30	0.50	0.53
	4.40	2.68	0.30	0.40	0.82	2.99	93.5%	0.27	0.40	0.50
	4.45	2.51	0.27	0.35	0.69	2.78	86.8%	0.25	0.32	0.46
	4.50	2.34	0.24	0.30	0.56	2.57	80.2%	0.22	0.24	0.43
	4.55	2.17	0.21	0.25	0.45	2.35	73.6%	0.19	0.18	0.39
WL	4.60	1.99	0.17	0.20	0.35	2.13	66.7%	0.16	0.12	0.35
	4.65	1.88	0.13	0.15	0.25	1.99	62.1%	0.13	0.07	0.30
	4.70	1.78	0.09	0.10	0.16	1.84	57.5%	0.09	0.04	0.23
	4.75	1.68	0.04	0.05	0.07	1.70	53.0%	0.04	0.01	0.14
	4.80	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.12	cfs
CALCULATED FLOW (Qc)=	0.12	cfs
(Qm-Qc)/Qm * 100 =	-0.5	%
MEASURED WATERLINE (WLm)=	4.60	ft
CALCULATED WATERLINE (WLc)=	4.60	ft
(WLm-WLc)/WLm * 100 =	-0.1	%
MAX MEASURED DEPTH (Dm)=	0.20	ft
MAX CALCULATED DEPTH (Dc)=	0.20	ft
(Dm-Dc)/Dm * 100	-0.3	%
MEAN VELOCITY=	0.35	ft/sec
MANNING'S N=	0.252	
SLOPE=	0.04	ft/ft
.4 * Qm =	0.0	cfs
2.5 * Qm=	0.3	cfs

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

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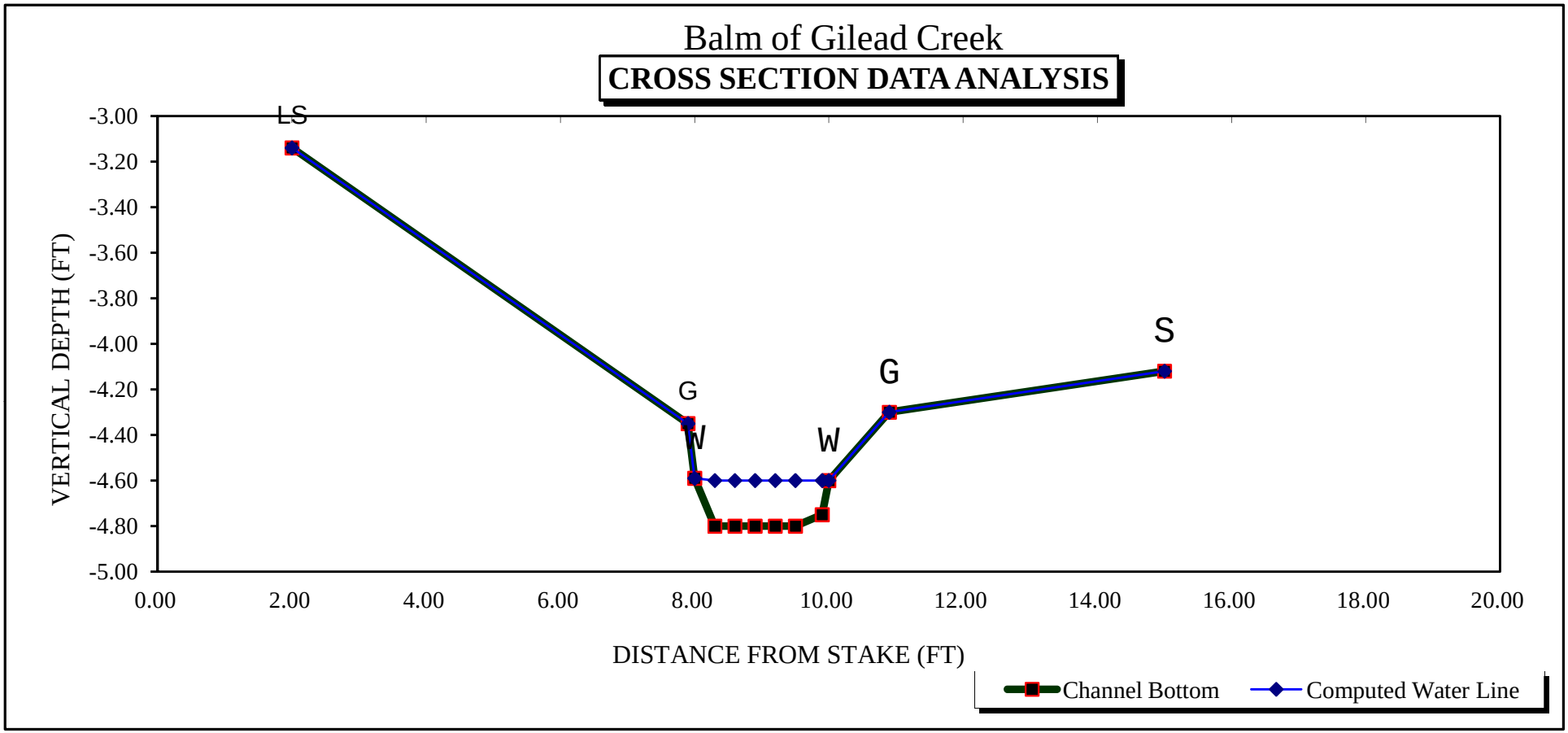
RECOMMENDATION BY: …………………...………..…….............................. AGENCY..………………………......……....…....……....... DATE:......…...….......……………

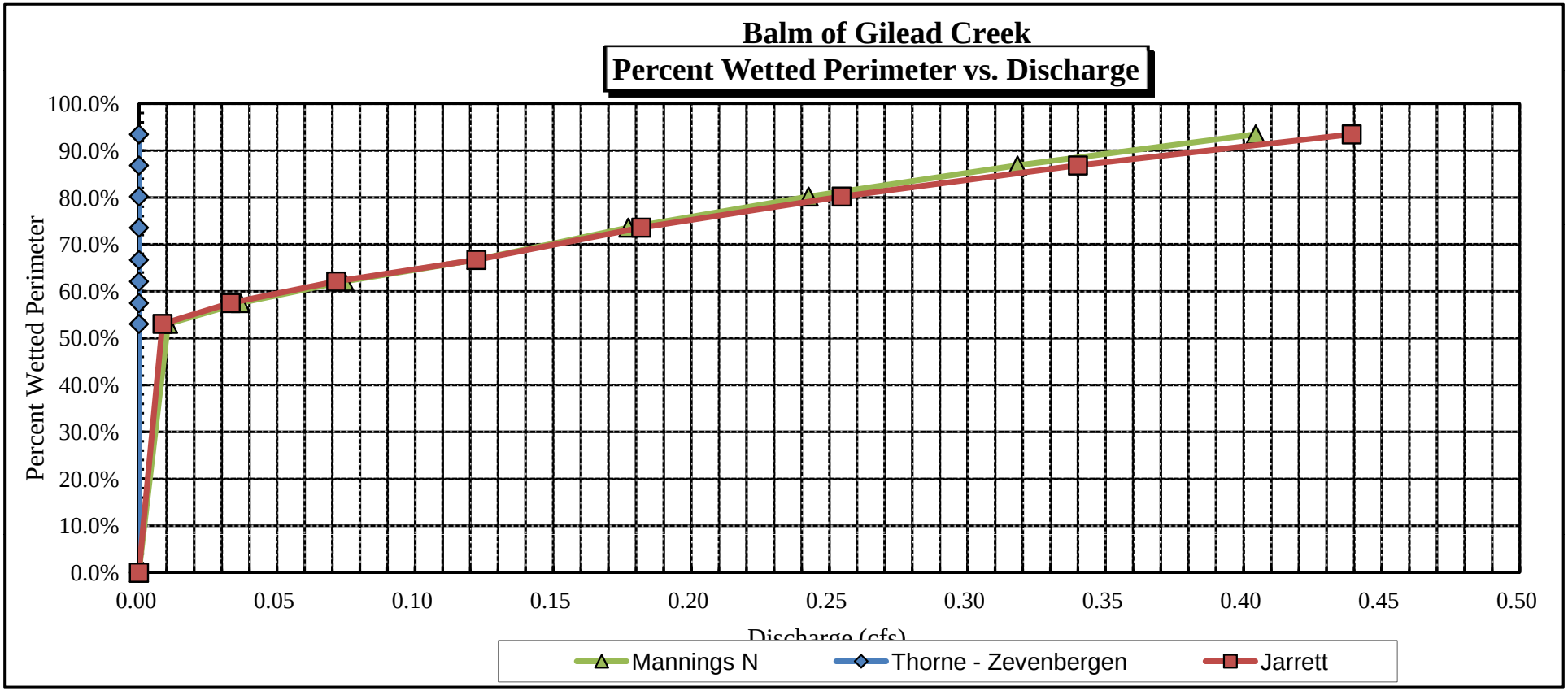
CWCB REVIEW BY: ..…………………………....……………………………………………………...…............ DATE:.................….…………...…

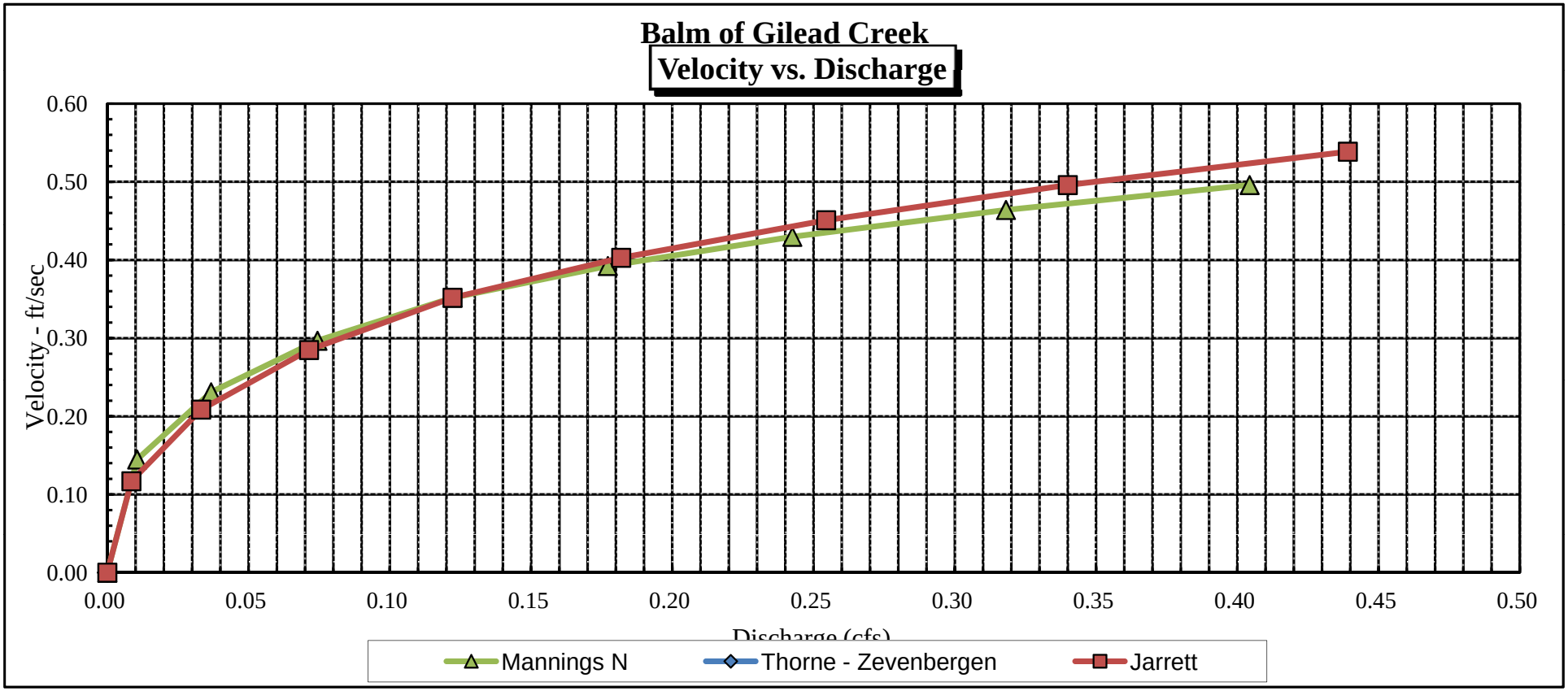
STREAM NAME: Balm of Gilead Creek
XS LOCATION: 250 yds d/s from USFS-BLM boundary
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

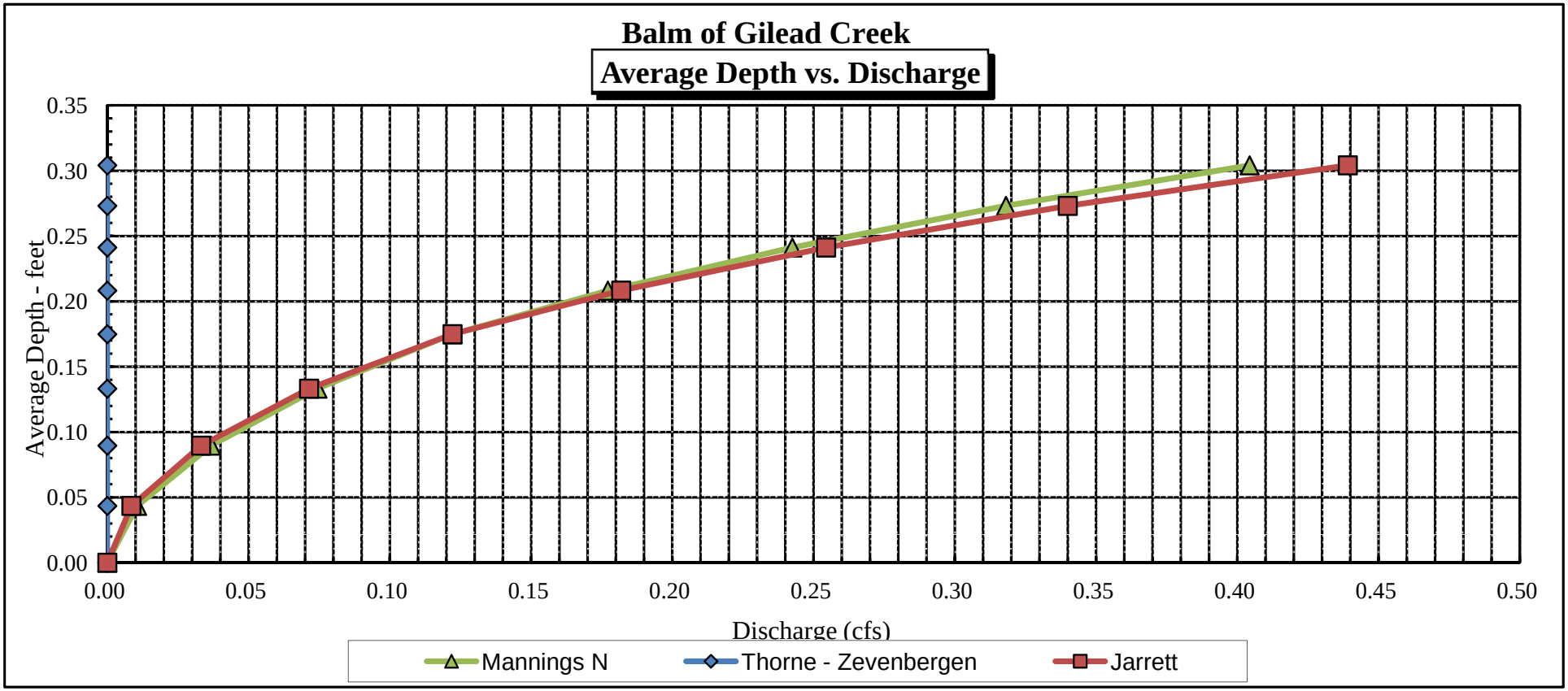
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

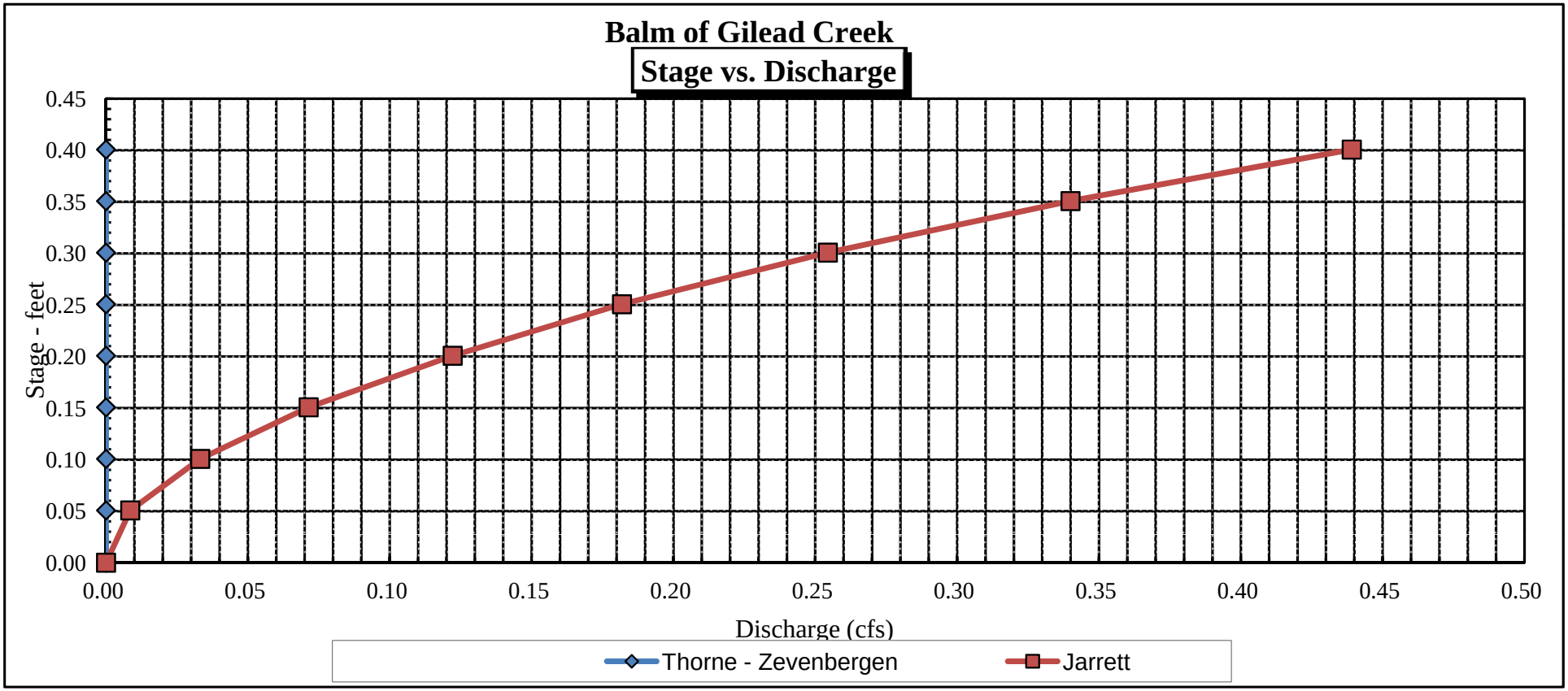
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.35	2.85	0.33	0.45	0.95	3.20	100.0%	0.30	0.55	0.58
	4.40	2.68	0.30	0.40	0.82	2.99	93.5%	0.27	0.44	0.54
	4.45	2.51	0.27	0.35	0.69	2.78	86.8%	0.25	0.34	0.50
	4.50	2.34	0.24	0.30	0.56	2.57	80.2%	0.22	0.25	0.45
	4.55	2.17	0.21	0.25	0.45	2.35	73.6%	0.19	0.18	0.40
WL	4.60	1.99	0.17	0.20	0.35	2.13	66.7%	0.16	0.12	0.35
	4.65	1.88	0.13	0.15	0.25	1.99	62.1%	0.13	0.07	0.28
	4.70	1.78	0.09	0.10	0.16	1.84	57.5%	0.09	0.03	0.21
	4.75	1.68	0.04	0.05	0.07	1.70	53.0%	0.04	0.01	0.12
	4.80	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


Balm of Gilead Creek
CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
S
-3.00
-3.20
-3.40
-3.60
-3.80
-4.00
-4.20
-4.40
-4.60
-4.80
-5.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Balm of Gilead Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Balm of Gilead Creek
Velocity vs. Discharge
Velocity - ft/sec
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Balm of Gilead Creek
Average Depth vs. Discharge
Average Depth - feet
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Balm of Gilead Creek
Stage vs. Discharge
Stage - feet
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
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:	Balm of Gilead Creek
XS LOCATION:	0.25 mile d/s fron BLM/USFS border
XS NUMBER:	2
DATE:	19-May-14
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	26
TWP:	13S
RANGE:	73W
PM:	Sixth
COUNTY:	Park
WATERSHED:	South Platte
DIVISION:	1
DOW CODE:	32223
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:	0.025

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

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

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s fron BLM/USFS border
XS NUMBER: 2

DATA POINTS= 16

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	4.37			0.00		0.00	0.00	0.0%
1	G	1.10	4.37			0.00		0.00	0.00	0.0%
	W	2.00	4.75	0.00	0.00	0.00		0.00	0.00	0.0%
		2.30	5.02	0.27	0.37	0.40	0.27	0.08	0.03	12.5%
		2.60	4.93	0.18	0.35	0.31	0.18	0.05	0.02	7.9%
		2.90	4.94	0.19	0.80	0.30	0.19	0.06	0.05	19.1%
		3.20	4.93	0.18	0.80	0.30	0.18	0.05	0.04	18.1%
		3.50	4.92	0.17	0.63	0.30	0.17	0.05	0.03	13.4%
		3.80	4.90	0.15	0.68	0.30	0.15	0.05	0.03	12.8%
		4.10	4.85	0.10	0.30	0.30	0.10	0.03	0.01	3.8%
		4.40	4.88	0.13	0.34	0.30	0.13	0.04	0.01	5.5%
		4.70	4.90	0.15	0.37	0.30	0.15	0.05	0.02	7.0%
	W	5.00	4.75	0.00	0.00	0.34		0.00	0.00	0.0%
1	G	5.20	4.41			0.00		0.00	0.00	0.0%
		6.60	4.21			0.00		0.00	0.00	0.0%
	RS	9.30	4.15			0.00		0.00	0.00	0.0%
	TOTALS ----------					3.16	0.27 (Max.)	0.46	0.24	100.0%

Manning's n = 0.1232
Hydraulic Radius= 0.14431776

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s fron BLM/USFS border
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.46	0.46	0.0%
4.50	0.46	1.30	184.7%
4.52	0.46	1.22	168.5%
4.54	0.46	1.15	152.5%
4.56	0.46	1.08	136.7%
4.58	0.46	1.01	121.2%
4.60	0.46	0.94	106.0%
4.62	0.46	0.87	91.0%
4.64	0.46	0.80	76.3%
4.66	0.46	0.74	61.8%
4.68	0.46	0.67	47.6%
4.70	0.46	0.61	33.7%
4.71	0.46	0.58	26.8%
4.72	0.46	0.55	20.0%
4.73	0.46	0.52	13.3%
4.74	0.46	0.49	6.6%
4.75	0.46	0.46	0.0%
4.76	0.46	0.43	-6.5%
4.77	0.46	0.40	-13.0%
4.78	0.46	0.37	-19.4%
4.79	0.46	0.34	-25.8%
4.80	0.46	0.31	-32.0%
4.82	0.46	0.25	-44.4%
4.84	0.46	0.20	-56.4%
4.86	0.46	0.15	-68.1%
4.88	0.46	0.10	-78.2%
4.90	0.46	0.06	-86.4%
4.92	0.46	0.03	-92.9%
4.94	0.46	0.01	-96.9%
4.96	0.46	0.01	-98.2%
4.98	0.46	0.00	-99.2%
5.00	0.46	0.00	-99.8%

WATERLINE AT ZERO
AREA ERROR = 4.750

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s fron BLM/USFS border
XS NUMBER: 2 Constant Manning's n

STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
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	4.41	4.01	0.41	0.61	1.65	4.43	100.0%	0.37	1.62	0.99
	4.45	3.89	0.38	0.57	1.49	4.28	96.6%	0.35	1.41	0.94
	4.50	3.74	0.35	0.52	1.30	4.09	92.4%	0.32	1.15	0.89
	4.55	3.59	0.31	0.47	1.12	3.91	88.2%	0.29	0.92	0.83
	4.60	3.44	0.27	0.42	0.94	3.72	84.0%	0.25	0.72	0.76
	4.65	3.30	0.23	0.37	0.77	3.53	79.8%	0.22	0.53	0.69
	4.70	3.15	0.19	0.32	0.61	3.35	75.6%	0.18	0.37	0.61
WL	4.75	3.00	0.15	0.27	0.46	3.16	71.4%	0.14	0.24	0.52
	4.80	2.84	0.11	0.22	0.31	2.97	67.1%	0.10	0.13	0.42
	4.85	2.69	0.06	0.17	0.17	2.79	62.9%	0.06	0.05	0.30
	4.90	1.63	0.04	0.12	0.06	1.69	38.2%	0.04	0.01	0.21
	4.95	0.31	0.03	0.07	0.01	0.35	7.9%	0.03	0.00	0.19
	5.00	0.09	0.01	0.02	0.00	0.10	2.2%	0.01	0.00	0.08

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s fron BLM/USFS border
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.24	cfs
CALCULATED FLOW (Qc)=	0.24	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.75	ft
CALCULATED WATERLINE (WLc)=	4.75	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.27	ft
MAX CALCULATED DEPTH (Dc)=	0.27	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.52	ft/sec
MANNING'S N=	0.123	
SLOPE=	0.025	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.6	cfs

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

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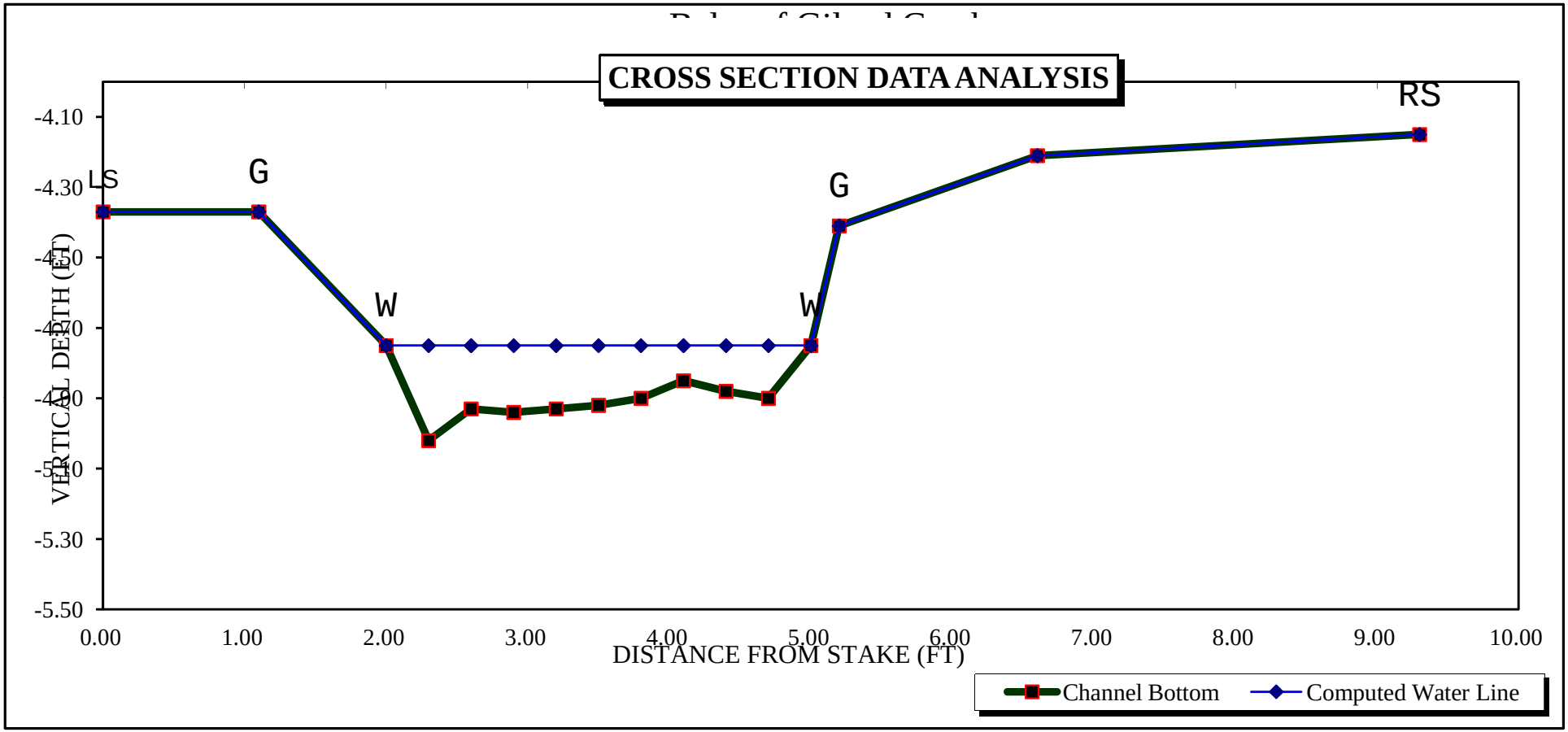
RECOMMENDATION BY: ……………………...……….…….............................. AGENCY...……………………….....…….....…...……...... DATE:......…...…......……………

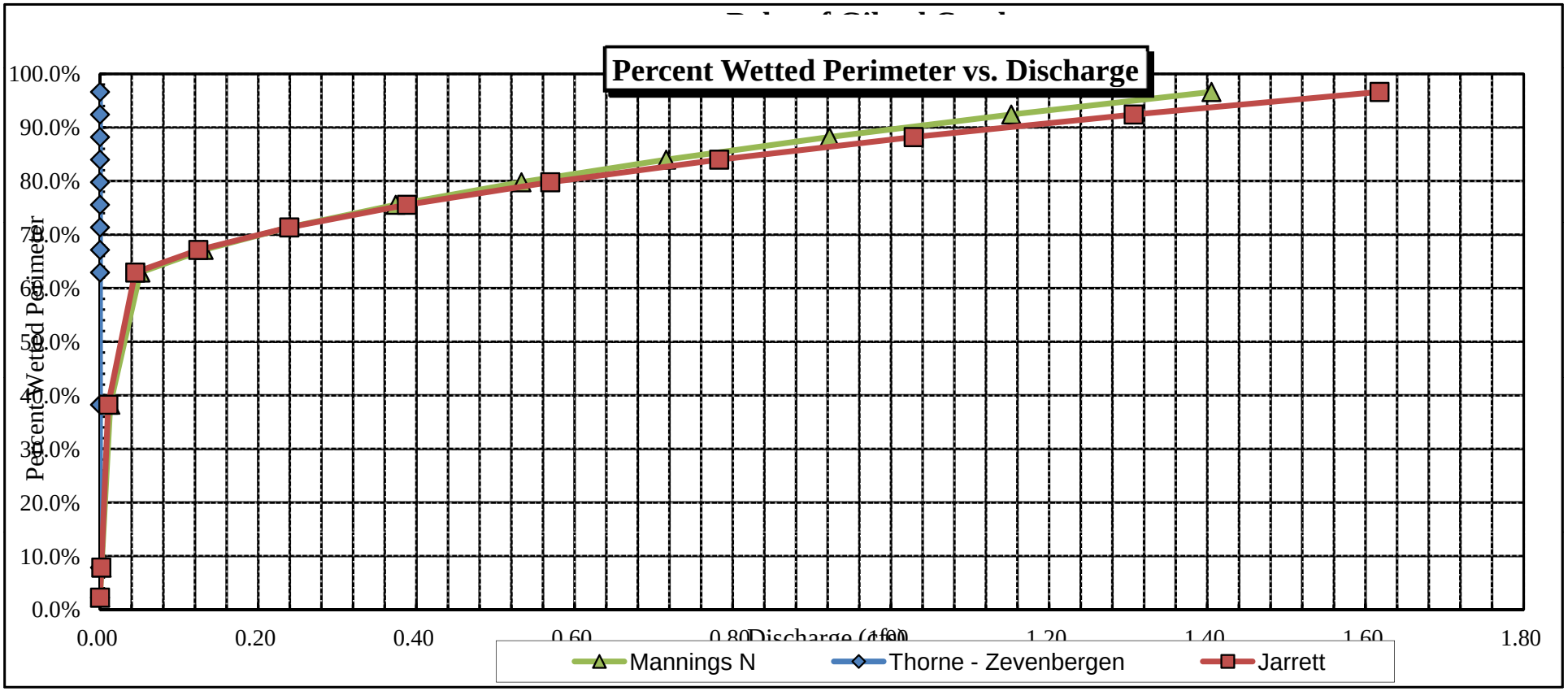
CWCB REVIEW BY: ..……………………………....………………………………………………………...…............. DATE:.................…………….....…

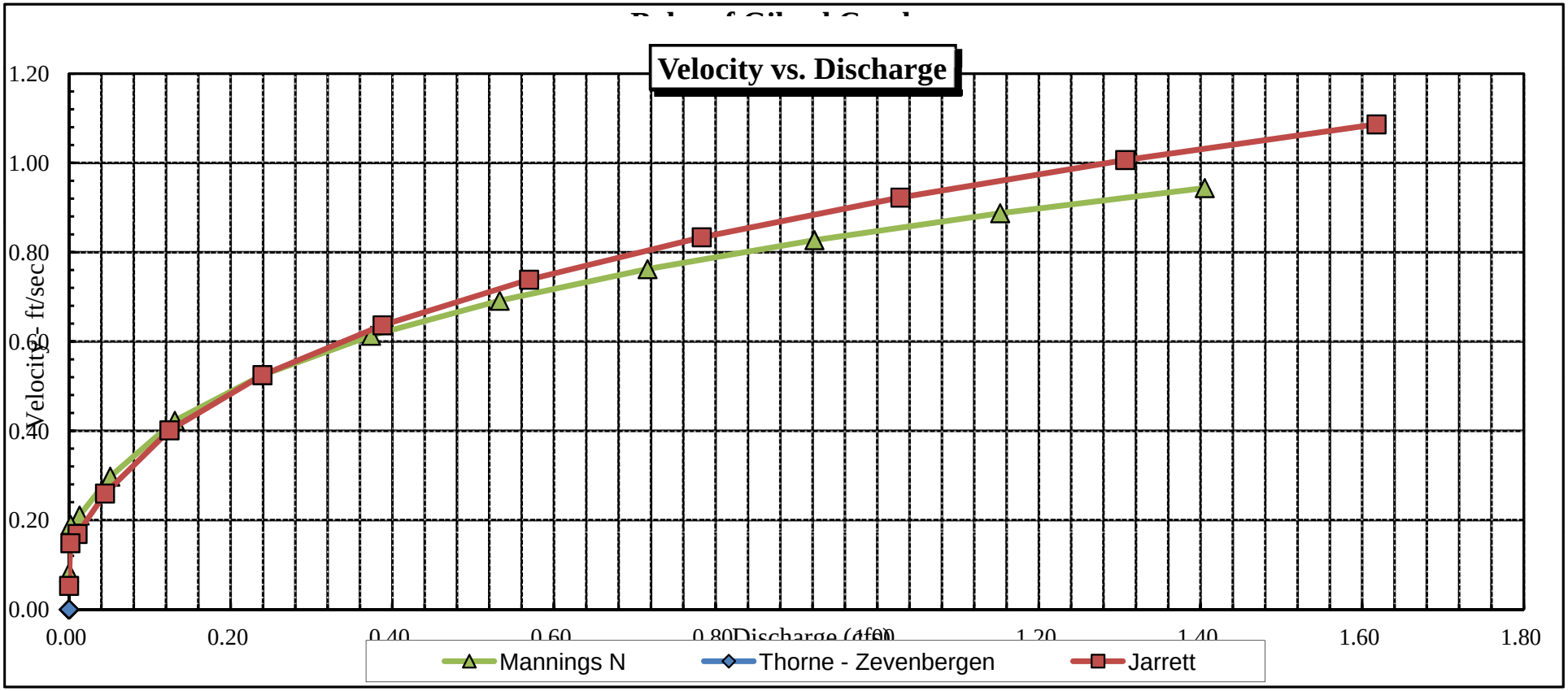
STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s fron BLM/USFS border
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

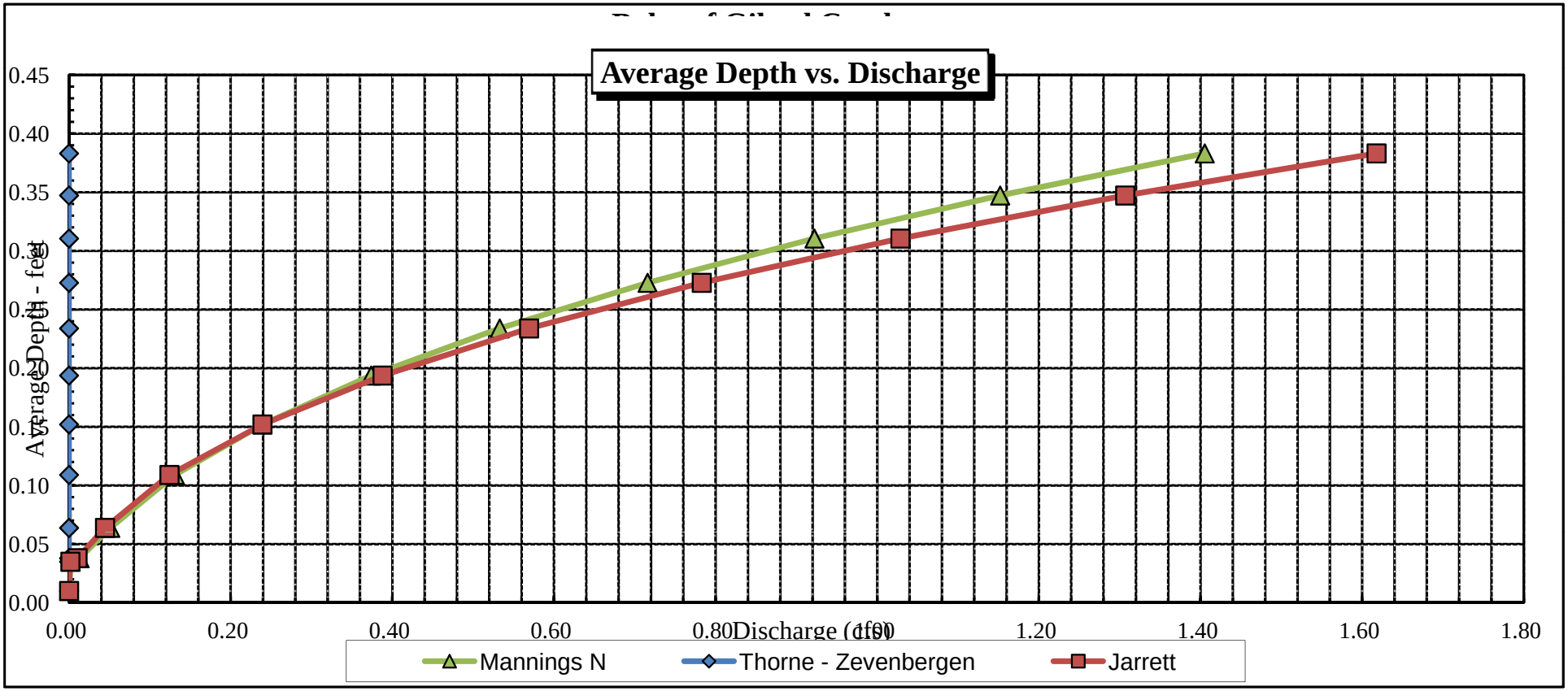
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

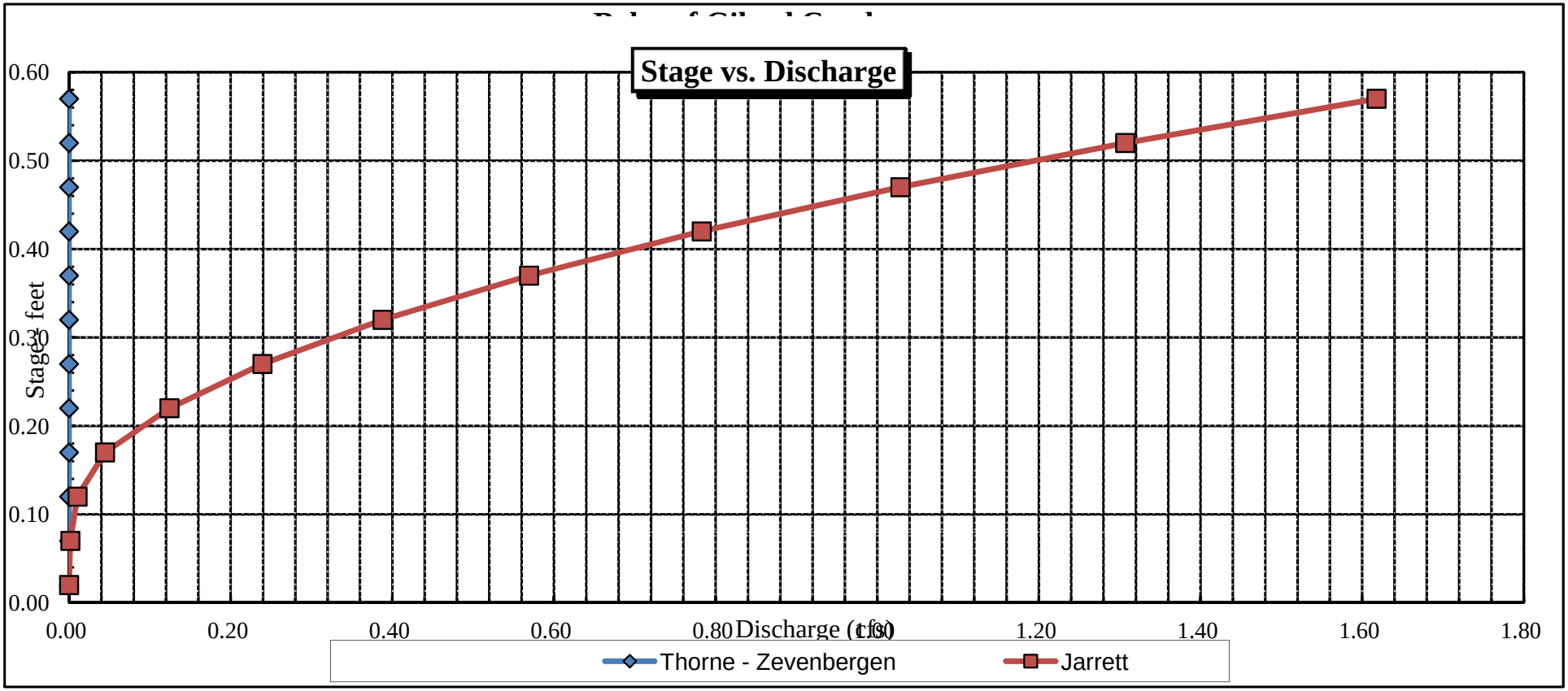
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.41	4.01	0.41	0.61	1.65	4.43	100.0%	0.37	1.89	1.15
	4.45	3.89	0.38	0.57	1.49	4.28	96.6%	0.35	1.62	1.09
	4.50	3.74	0.35	0.52	1.30	4.09	92.4%	0.32	1.31	1.01
	4.55	3.59	0.31	0.47	1.12	3.91	88.2%	0.29	1.03	0.92
	4.60	3.44	0.27	0.42	0.94	3.72	84.0%	0.25	0.78	0.83
	4.65	3.30	0.23	0.37	0.77	3.53	79.8%	0.22	0.57	0.74
	4.70	3.15	0.19	0.32	0.61	3.35	75.6%	0.18	0.39	0.64
WL	4.75	3.00	0.15	0.27	0.46	3.16	71.4%	0.14	0.24	0.52
	4.80	2.84	0.11	0.22	0.31	2.97	67.1%	0.10	0.12	0.40
	4.85	2.69	0.06	0.17	0.17	2.79	62.9%	0.06	0.04	0.26
	4.90	1.63	0.04	0.12	0.06	1.69	38.2%	0.04	0.01	0.17
	4.95	0.31	0.03	0.07	0.01	0.35	7.9%	0.03	0.00	0.15
	5.00	0.09	0.01	0.02	0.00	0.10	2.2%	0.01	0.00	0.05


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-4.10
-4.30
-4.50
-4.70
-4.90
-5.10
-5.30
-5.50
VERTICAL DEPTH (FT)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Velocity - ft/sec
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
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:	Balm of Gilead Creek
XS LOCATION:	0.25 mile d/s from BLM-USFS border
XS NUMBER:	1
DATE:	19-May-14
OBSERVERS:	R. Smith, D. Gilbert
1/4 SEC:	SW
SECTION:	26
TWP:	13S
RANGE:	73W
PM:	Sixth
COUNTY:	Park
WATERSHED:	South Platte
DIVISION:	1
DOW CODE:	32223
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:	0.025

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s from BLM-USFS border
XS NUMBER: 1

DATA POINTS= 16

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	4.61			0.00		0.00	0.00	0.0%
		1.30	4.71			0.00		0.00	0.00	0.0%
1	G	2.40	4.84			0.00		0.00	0.00	0.0%
		2.80	5.10			0.00		0.00	0.00	0.0%
	W	3.10	5.15	0.00	0.00	0.00		0.00	0.00	0.0%
		3.40	5.34	0.21	0.20	0.36	0.21	0.06	0.01	5.3%
		3.70	5.43	0.28	0.55	0.31	0.28	0.08	0.05	19.4%
		4.00	5.45	0.30	0.93	0.30	0.30	0.09	0.08	35.2%
		4.30	5.38	0.23	0.77	0.31	0.23	0.07	0.05	22.4%
		4.60	5.39	0.24	0.30	0.30	0.24	0.07	0.02	9.1%
		4.90	5.36	0.21	0.20	0.30	0.21	0.06	0.01	5.3%
		5.20	5.38	0.23	0.17	0.30	0.23	0.05	0.01	3.3%
	W	5.30	5.15	0.00	0.00	0.25		0.00	0.00	0.0%
		6.00	5.02			0.00		0.00	0.00	0.0%
1	G	6.80	4.80			0.00		0.00	0.00	0.0%
	RS	9.30	4.46			0.00		0.00	0.00	0.0%
	TOTALS ----------					2.43	0.3 (Max.)	0.49	0.24	100.0%

Manning's n = 0.1649
Hydraulic Radius= 0.20039777

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s from BLM-USFS border
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.49	0.48	-1.2%
4.90	0.49	1.28	163.9%
4.92	0.49	1.21	147.9%
4.94	0.49	1.13	132.3%
4.96	0.49	1.06	117.2%
4.98	0.49	0.99	102.5%
5.00	0.49	0.92	88.2%
5.02	0.49	0.85	74.3%
5.04	0.49	0.78	61.0%
5.06	0.49	0.72	48.2%
5.08	0.49	0.66	35.9%
5.10	0.49	0.61	24.3%
5.11	0.49	0.58	18.7%
5.12	0.49	0.55	13.4%
5.13	0.49	0.53	8.3%
5.14	0.49	0.50	3.4%
5.15	0.49	0.48	-1.2%
5.16	0.49	0.46	-5.7%
5.17	0.49	0.44	-10.2%
5.18	0.49	0.42	-14.6%
5.19	0.49	0.39	-19.0%
5.20	0.49	0.37	-23.3%
5.22	0.49	0.33	-31.8%
5.24	0.49	0.29	-40.2%
5.26	0.49	0.25	-48.4%
5.28	0.49	0.21	-56.5%
5.30	0.49	0.17	-64.3%
5.32	0.49	0.14	-72.1%
5.34	0.49	0.10	-79.6%
5.36	0.49	0.06	-86.9%
5.38	0.49	0.03	-92.9%
5.40	0.49	0.02	-96.1%

WATERLINE AT ZERO
AREA ERROR = 5.147

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s from BLM-USFS border
XS NUMBER: 1 Constant Manning's n

STAGING TABLE *GL* = lowest Grassline elevation corrected for sag
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	4.84	4.25	0.36	0.61	1.53	4.60	100.0%	0.33	1.05	0.68
	4.85	4.22	0.36	0.60	1.50	4.56	99.1%	0.33	1.02	0.68
	4.90	3.96	0.33	0.55	1.30	4.28	93.0%	0.30	0.83	0.64
	4.95	3.70	0.30	0.50	1.10	4.00	86.9%	0.28	0.67	0.60
	5.00	3.44	0.27	0.45	0.93	3.72	80.8%	0.25	0.52	0.56
	5.05	3.13	0.24	0.40	0.76	3.39	73.7%	0.22	0.40	0.53
	5.10	2.79	0.22	0.35	0.61	3.03	65.8%	0.20	0.30	0.49
WL	5.15	2.23	0.22	0.30	0.49	2.46	53.5%	0.20	0.24	0.48
	5.20	2.10	0.18	0.25	0.38	2.29	49.8%	0.17	0.16	0.43
	5.25	2.00	0.14	0.20	0.28	2.14	46.5%	0.13	0.10	0.36
	5.30	1.90	0.09	0.15	0.18	1.99	43.3%	0.09	0.05	0.29
	5.35	1.79	0.05	0.10	0.09	1.83	39.9%	0.05	0.02	0.19
	5.40	0.63	0.03	0.05	0.02	0.65	14.0%	0.03	0.00	0.14
	5.45	0.05	0.00	0.00	0.00	0.05	1.1%	0.00	0.00	0.02

STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s from BLM-USFS border
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.24	cfs
CALCULATED FLOW (Qc)=	0.24	cfs
(Qm-Qc)/Qm * 100 =	0.9	%
MEASURED WATERLINE (WLm)=	5.15	ft
CALCULATED WATERLINE (WLc)=	5.15	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.30	ft
(Dm-Dc)/Dm * 100	-0.9	%
MEAN VELOCITY=	0.48	ft/sec
MANNING'S N=	0.165	
SLOPE=	0.025	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.6	cfs

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

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

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

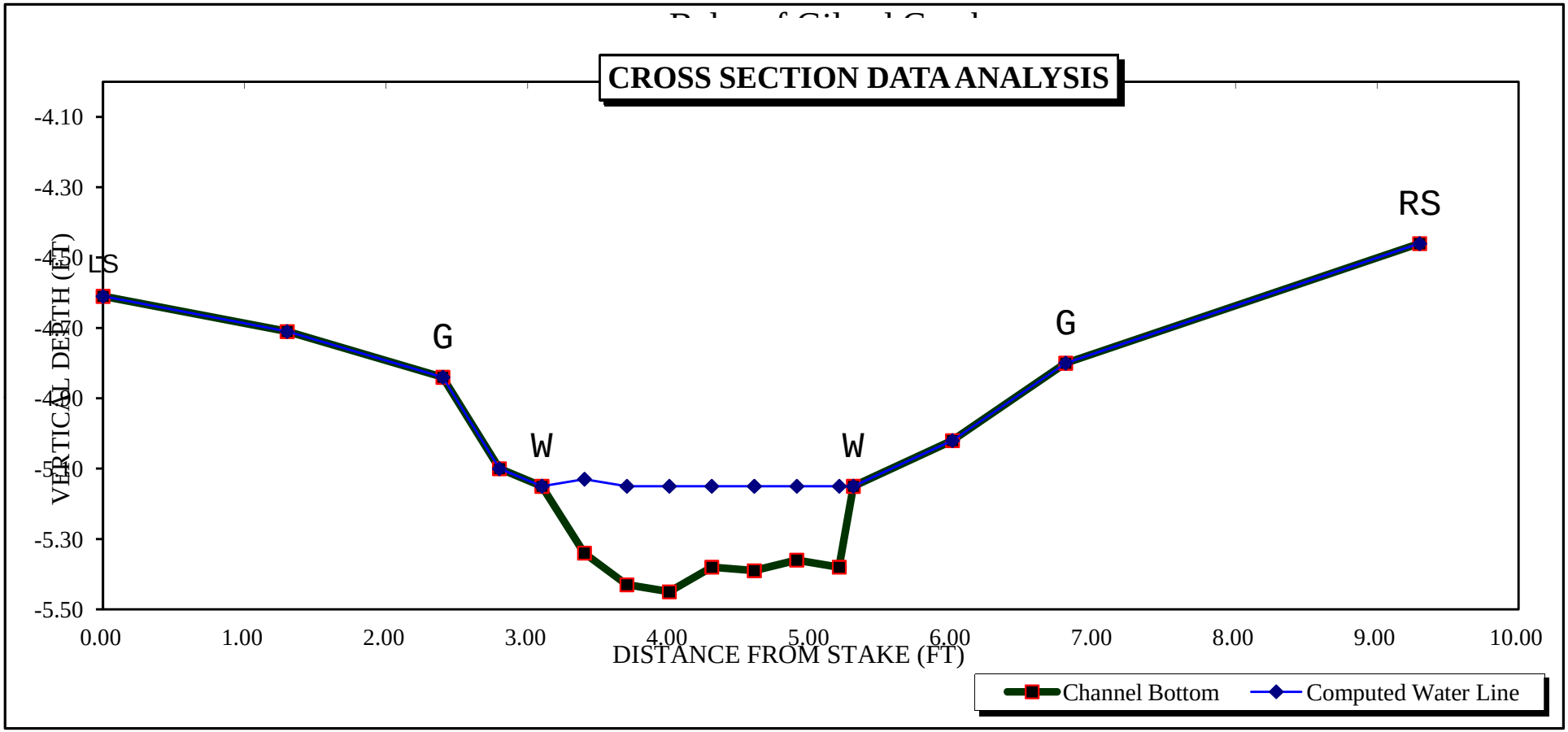
RECOMMENDATION BY: ………………...………..……............................... AGENCY...……………………......…....…...….….…...... DATE:......…...…......……………

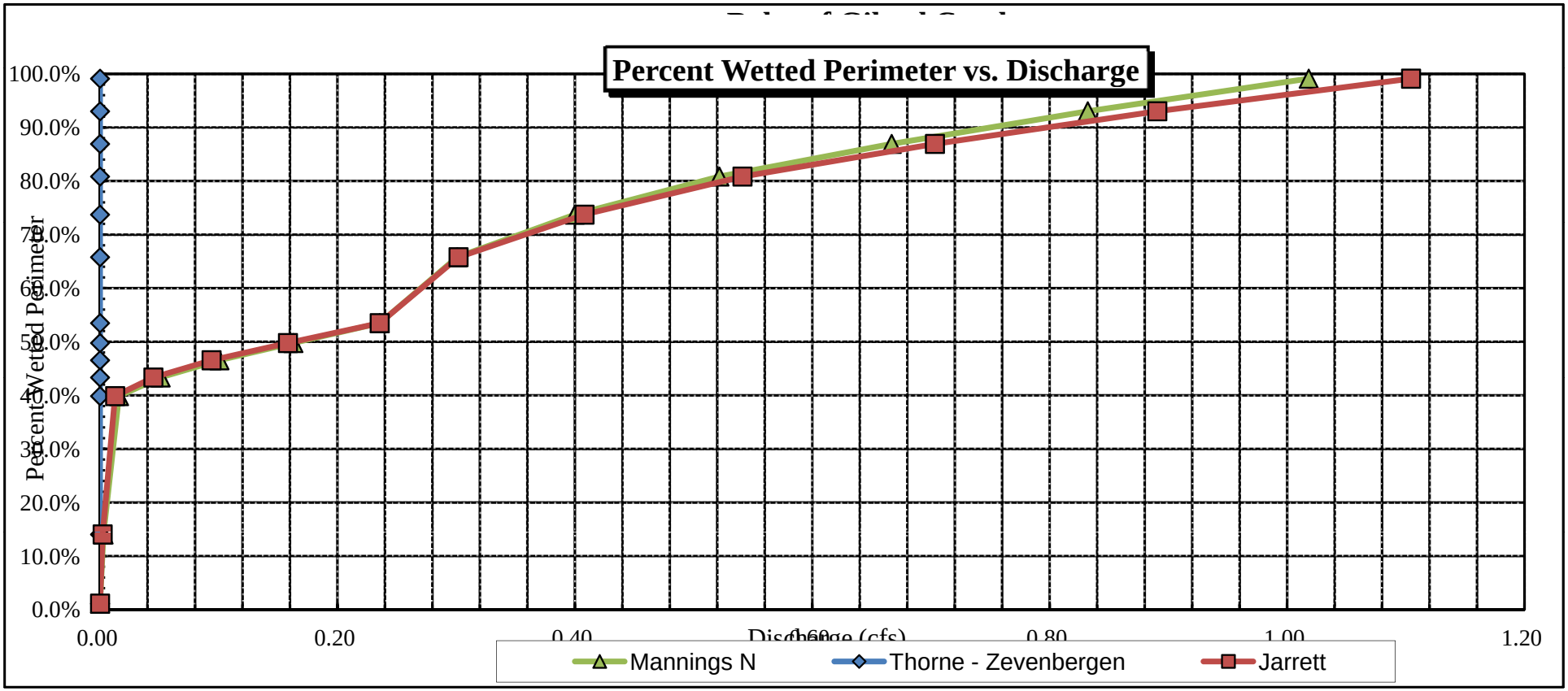
CWCB REVIEW BY: ..……………………….....………………………………………………...…............. DATE:.................…………….....…

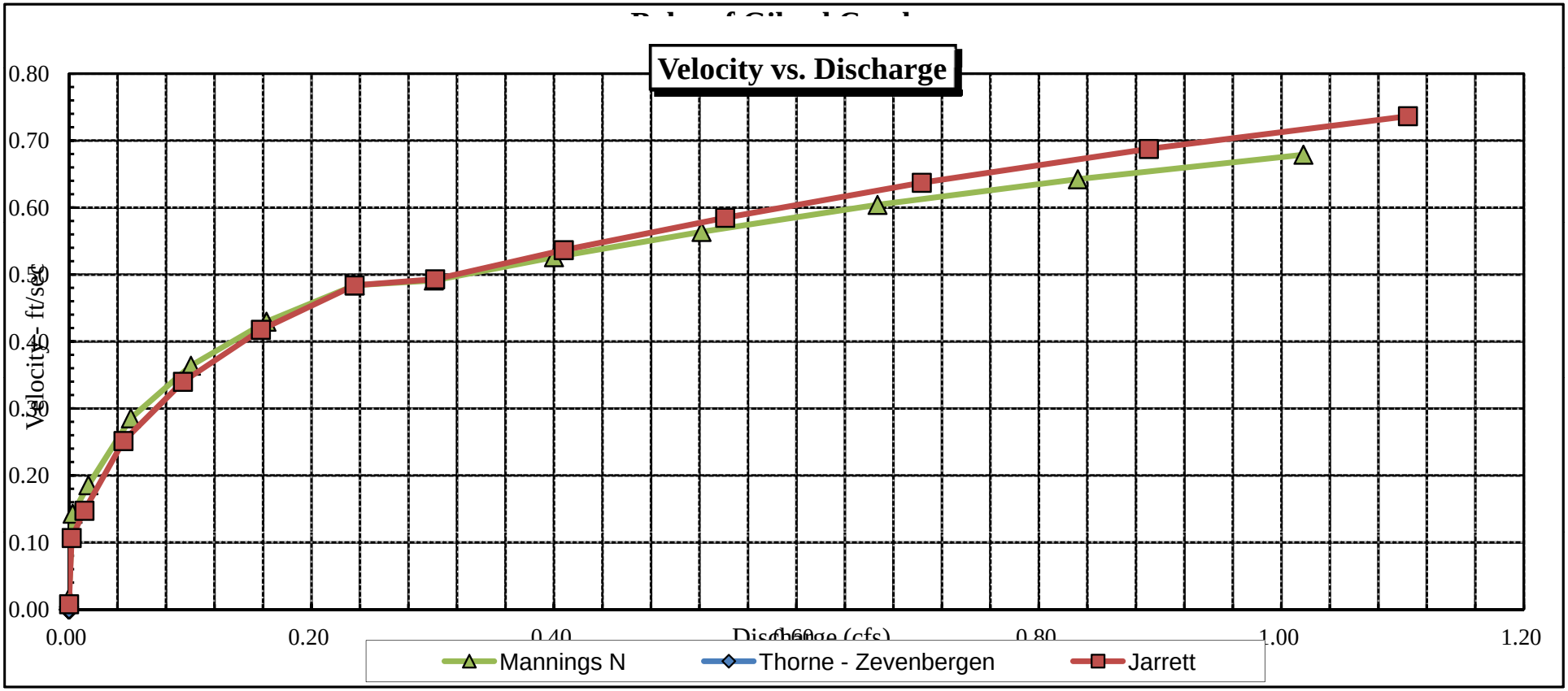
STREAM NAME: Balm of Gilead Creek
XS LOCATION: 0.25 mile d/s from BLM-USFS border
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

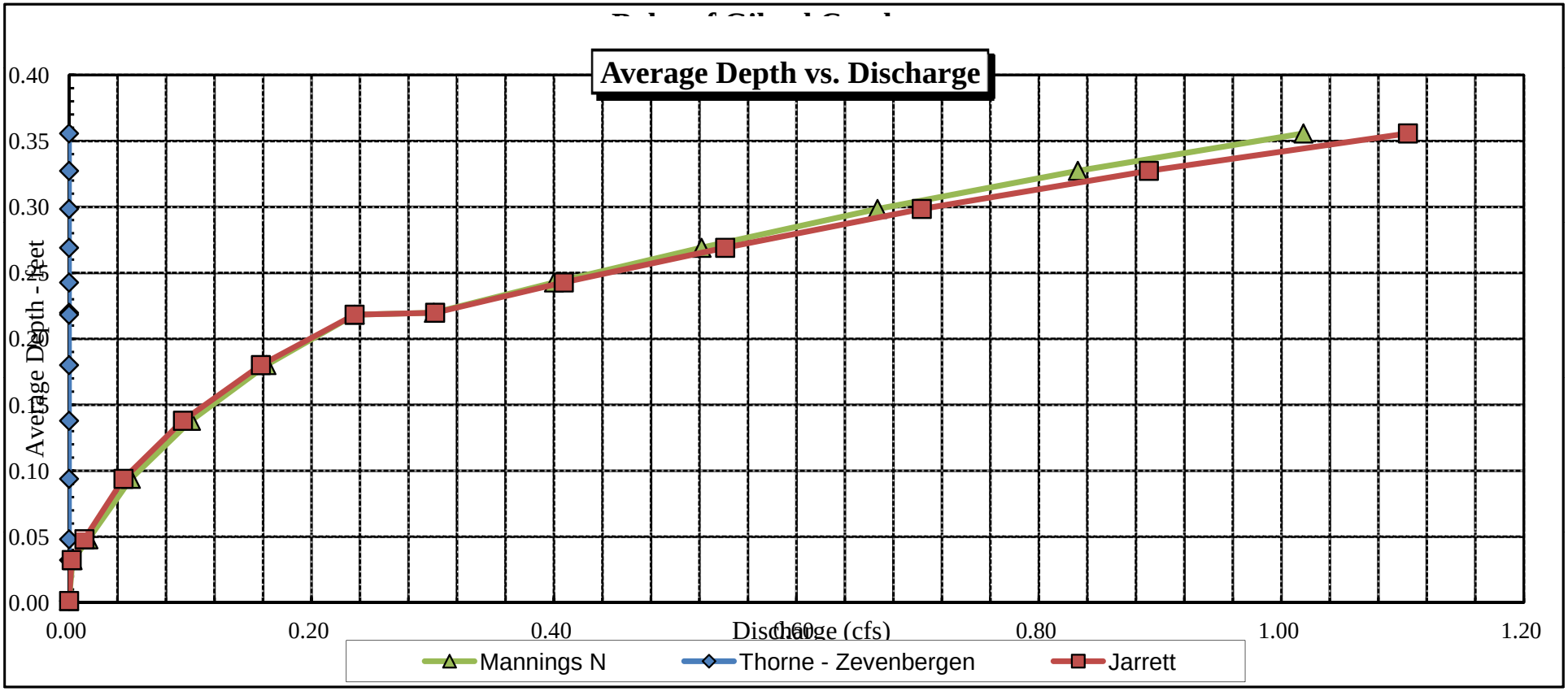
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

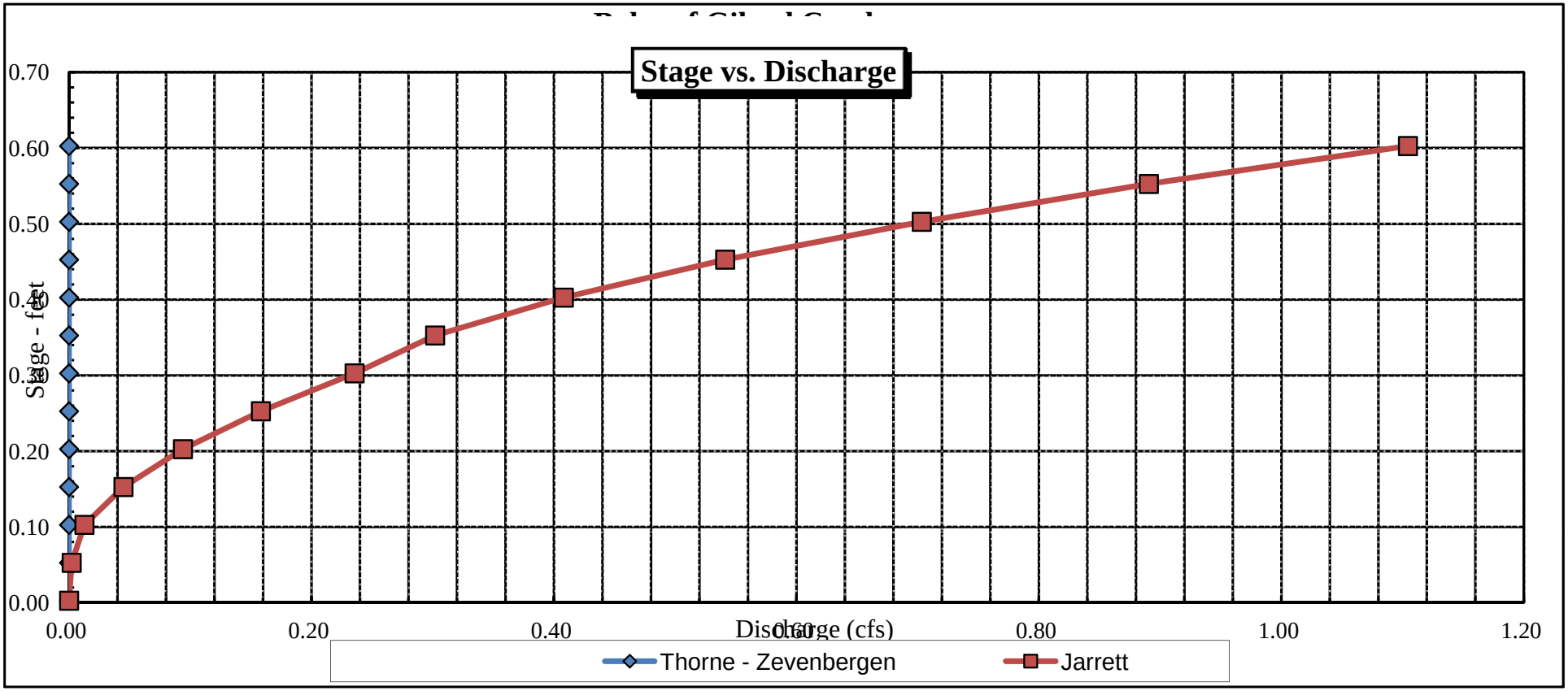
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.84	4.25	0.36	0.61	1.53	4.60	100.0%	0.33	1.14	0.74
	4.85	4.22	0.36	0.60	1.50	4.56	99.1%	0.33	1.10	0.74
	4.90	3.96	0.33	0.55	1.30	4.28	93.0%	0.30	0.89	0.69
	4.95	3.70	0.30	0.50	1.10	4.00	86.9%	0.28	0.70	0.64
	5.00	3.44	0.27	0.45	0.93	3.72	80.8%	0.25	0.54	0.58
	5.05	3.13	0.24	0.40	0.76	3.39	73.7%	0.22	0.41	0.54
	5.10	2.79	0.22	0.35	0.61	3.03	65.8%	0.20	0.30	0.49
WL	5.15	2.23	0.22	0.30	0.49	2.46	53.5%	0.20	0.24	0.48
	5.20	2.10	0.18	0.25	0.38	2.29	49.8%	0.17	0.16	0.42
	5.25	2.00	0.14	0.20	0.28	2.14	46.5%	0.13	0.09	0.34
	5.30	1.90	0.09	0.15	0.18	1.99	43.3%	0.09	0.04	0.25
	5.35	1.79	0.05	0.10	0.09	1.83	39.9%	0.05	0.01	0.15
	5.40	0.63	0.03	0.05	0.02	0.65	14.0%	0.03	0.00	0.11
	5.45	0.05	0.00	0.00	0.00	0.05	1.1%	0.00	0.00	0.01


CROSS SECTION DATA ANALYSIS
-4.10
-4.30
-4.50
-4.70
-4.90
-5.10
-5.30
-5.50
VERTICAL DEPTH (FT)
LS
G
W
W
G
RS
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


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
0.20
0.40
0.60
0.80
1.00
1.20
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - Feet
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Balm of Gilead Creek | CROSS-SECTION NO.: 2

CROSS-SECTION LOCATION: 250 yds. d/s from USFS-BLM boundary

DATE: 8-17-09 | OBSERVERS: R. Smith, J. Backstrand, D. Gilbert

LEGAL DESCRIPTION | ¼ SECTION: SW | SECTION: 26 | TOWNSHIP: 13 N/S | RANGE: 73 E/W | PM: 6th

COUNTY: Park | WATERSHED: South Platte | WATER DIVISION: 1 | DOW WATER CODE: 32223

MAP(S): USGS: GPS 13S 453610 9,000

USFS: 4304507 Fd.

SUPPLEMENTAL DATA

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

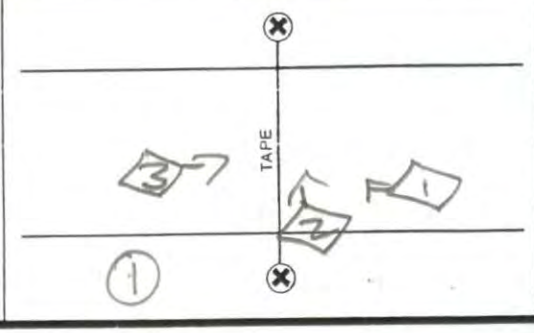
METER NUMBER: | DATE RATED: | CALIB/SPIN: _____ sec | TAPE WEIGHT: surveyed lbs/foot | TAPE TENSION: surveyed lbs

CHANNEL BED MATERIAL SIZE RANGE: 4" cobbles to 2' boulders | PHOTOGRAPHS TAKEN (YES)/NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.34 / 5.34
② WS Upstream	10.0	5.24
③ WS Downstream	10.0	5.84
SLOPE	0.6 / 20.0 = 0.03	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

TDS = 230
pH = 8.4
Temp = 14°C

Diversion on creek is inoperable, - not used.
Fish sighted.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Balm of Gilead Creek	CROSS-SECTION NO.: 2	DATE: 8-17-09	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 5:10 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser-vation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	2.0		4.68								
G	8.4		4.98								
W	8.5		5.34								
	9.0		5.45	0.10				0.66			
	9.3		5.55	0.2				0.42			
	9.6		5.55	0.2				0.57			
	9.9		5.50	0.15				0.54			
	10.2		5.55	0.2				0.22			
W	10.75		5.34								
G	10.3		5.10								
RS	13.4		5.01								
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: Balm of Gilead Creek						CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: 250 yds. d/s from USFS-BLM boundary							
DATE: 8-17-09	OBSERVERS: R. Smith, D. Gilbert, J. Backstrand						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 26	TOWNSHIP: 13 N/S	RANGE: 73 E/W	PM: 6th		
COUNTY: Park	WATERSHED: South Platte	WATER DIVISION: 1	DOW WATER CODE: 36223				
MAP(S): USGS:	GPS 13S 453610	9,000 ft,					
USFS:	4304507						

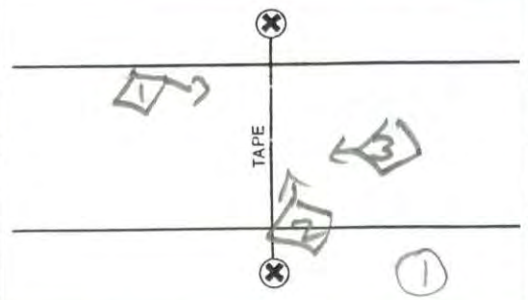
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	4.59 / 4.60
② WS Upstream	10.0	4.12
③ WS Downstream	10.0	5.02
SLOPE	.8 / 20.0 = 0.04	

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:

caddisfly, stonefly, mayfly

COMMENTS

TDS = 230
PH = 8.4
Temp = 14° C

Riparian = cottonwood, aspen, cinquefoil, alder, birch rushes

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Balm of Gilead Creek	CROSS-SECTION NO.: 1	DATE: 8-17-09	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 4:30 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	2.0		3.14								
G	7.9		4.35								
W	8.0		4.59								
	8.3		~~4.80~~	~~0.2~~				0.2			
	8.6		4.80	0.2				0.11			
	8.9		4.80	0.2				0.20			
	9.2		4.80	0.2				0.49			
	9.5		4.80	0.2				0.65			
	9.9		4.75	0.15				0.43			
W	10.0		4.60								
G	10.9		4.30								
RS	15.0		4.12								
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: Balm of Gilead Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 1/4 mile downstream from BLM-USFS border						
DATE: 5-19-14	OBSERVERS: R. Smith, D. Gilbert					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 26	TOWNSHIP: 13 N/S	RANGE: 73 E/W	PM: 6th	
COUNTY: Park	WATERSHED: South Platte	WATER DIVISION: 1	DOW WATER CODE: 32223			
MAP(S): USGS:						
USFS:						

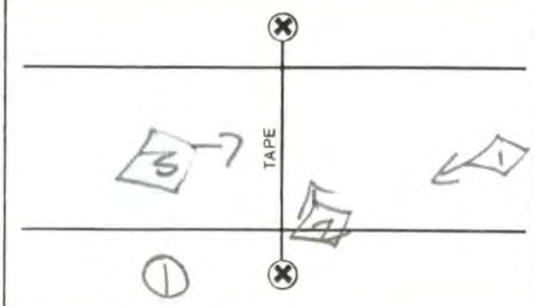
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-H			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4" cobbles to gravel	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	surveyed
② WS Upstream	20.0'	4.18
③ WS Downstream	20.0'	5.20
SLOPE	1.02 / 40.0' = 0.025	

SKETCH



AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly, black fly

COMMENTS

Willow-Alder-Cinquefoil Riparian

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Balm of Gilead Creek	CROSS-SECTION NO.: 1	DATE: 5-19-14	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME:

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		4.37								
G	1.1		4.37								
W	2.0		4.75	Ø							
	2.3		5.02	.27				0.37			
	2.6		4.93	.18				0.35			
	2.9		4.94	.19				0.80			
	3.2		4.93	.18				0.80			
	3.5		4.92	.17				0.63			
	3.8		4.90	.15				0.68			
	4.1		4.85	.10				0.30			
	4.4		4.88	.13				0.34			
	4.7		4.90	.15				0.37			
	5.0		4.75	Ø							
G	5.2		4.41								
	6.6		4.21								
RS	9.3		4.15								
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: Balm of Gilead Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 1/4 mile downstream from BLM - USFS border						
DATE: 5-19-14	OBSERVERS: R. Smith, D. Gilbert					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 26	TOWNSHIP: 13 N/S	RANGE: 73 E/W	PM: 6th	
COUNTY: Park	WATERSHED: South Platte	WATER DIVISION: 1	DOW WATER CODE: 32723			
MAP(S): USGS:	GPS Zone 13 S 0453720					
USFS:	4304653					

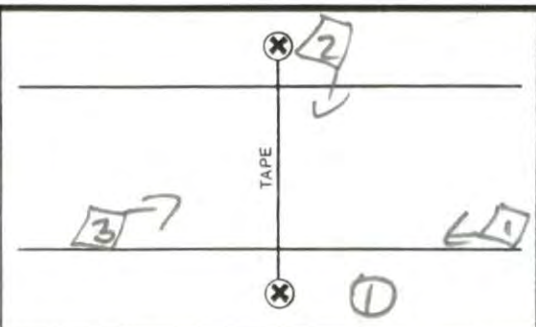
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 4" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	surveyed
② WS Upstream	39.0'	4.16
③ WS Downstream	1.0'	5.20
SLOPE	1.02/40.0	0.025

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:
mayfly, caddisfly, stonefly, blackfly

COMMENTS

Ph = 8.1
Cond = 300
Temp = 18°C
Salinity = 0.1 ppd

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Balm of Gilead Creek	CROSS-SECTION NO. 2	DATE 5-19-14	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME 2:15 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.61								
	1.3		4.71								
G	2.4		4.84								
	2.8		5.10								
W	3.1		5.15								
	3.4		5.34	.21				0.20			
	3.7		5.43	.28				0.55			
	4.0		5.45	.30				0.93			
	4.3		5.38	.23				0.77			
	4.6		5.39	.34				0.30			
	4.9		5.36	.21				0.20			
	5.2		5.38	.23				0.17			
W	5.3		5.15								
	6.0		5.02								
G	6.8		4.80								
RS	9.3		4.46								
TOTALS:											

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