United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7210
www.blm.gov/colorado

In Reply Refer To:
7250 (CO-932)

DEC 0 4 2019

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 an unnamed tributary to Bunker Creek, located in Water Division 6.

Location and Land Status. The unnamed tributary to Bunker Creek originates near Dunckley Pass and flows into Bunker Creek approximately 21 miles south of the community of Hayden. This recommendation addresses only the portion of the unnamed tributary of Bunker Creek from the headwaters, located in Section 34, T3N R87W, to the headgate of Bunker Ditch, located in the NW ¼ SE ¼, Section 32, T3N R78W. The BLM manages 0.4 miles of this 2.4 mile reach, the U.S Forest Service manages approximately 1.7 miles, and approximately 0.3 miles are in private ownership.

Biological Summary. The unnamed tributary to Bunker Creek is a cold water, very high gradient stream. The top portion of reach flows through narrow, bedrock-controlled valleys where very little migration of the stream channel occurs. The bottom part of the reach flows through alluvium in a broader valley, and the stream channel has demonstrated migration over time. The creek has large substrate, with boulders up to one foot in diameter. The large substrate and steep gradient provide fish habitat consisting primarily of pools separated by large drops, with few riffles. Water quality is excellent for supporting salmonid fish species.

Fish surveys indicate that the unnamed tributary to Bunker Creek supports a core conservation population of blue lineage (Yampa River and White River basin lineage) Colorado River Cutthroat Trout. Macroinvertebrate surveys indicated abundant populations of stonefly and caddisfly.

The creek also supports a vigorous riparian community comprised of alder, maple, spruce, and dogwood. The riparian community provides ample cover and shading for the creek and contributes to substantial bank stability.

R2Cross Analysis. The BLM collected the following R2Cross data:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/27/2017 #1	0.30 cfs	7.21 feet	0.68 cfs	Out of range
09/27/2017 #2	0.33 cfs	5.89 feet	0.69 cfs	Out of range
06/15/2018 #1	0.89 cfs	14.0 feet	1.38 cfs	1.76 cfs
06/15/2018 #2	0.80 cfs	7.67 feet	0.57 cfs	Out of range
		Averages:	0.83 cfs	1.76 cfs

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

> 1.75 cubic feet per second is recommended during the snowmelt runoff period from May 1 to July 31. This recommendation is driven by the average velocity criteria. Given the small amount of riffle habitat in this reach, it is important to provide velocities that are suitable for spawning trout.
>
> 0.8 cubic feet per second is recommended during late summer and fall, from August 1 to November 30. This recommendation is driven by the average depth criteria. This flow rate will maintain sufficient physical habitat in the creek for the fish population to complete important parts of their life cycle before cold temperatures reduce fish activity for the winter.
>
> 0.4 cubic feet per second is recommended during the cold temperature period of the year from December 1 through April 30. This recommendation is driven by limited water availability. This flow rate should prevent complete icing of the numerous pools in this reach, allowing the fish population to overwinter.

Water Availability. The BLM recommends relying upon Streamstats to estimate water availability because this creek has not been historically gaged. Additional water availability information may be available by reviewing U.S. Geological Survey Gage 09248500 (East Fork of Williams Fork near Willow Creek) and by reviewing historical diversion records for Bunker Ditch and Bunker Ditch No. 2.

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

Relationship to Land Management Plans. The BLM land use plan calls for managing this creek to support riparian, wildlife, and water quality values and to continue meeting land health standards. Establishing an instream flow water right would assist in meeting these objectives.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with the BLM's draft recommendation in February 2019. 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,

Megan Gilbert

Megan Gilbert
Deputy State Director, Resources (Acting)

Cc: Eric Scherff, Little Snake Field Office
Bruce Sillitoe, Little Snake Field Office
Northwest District Manager

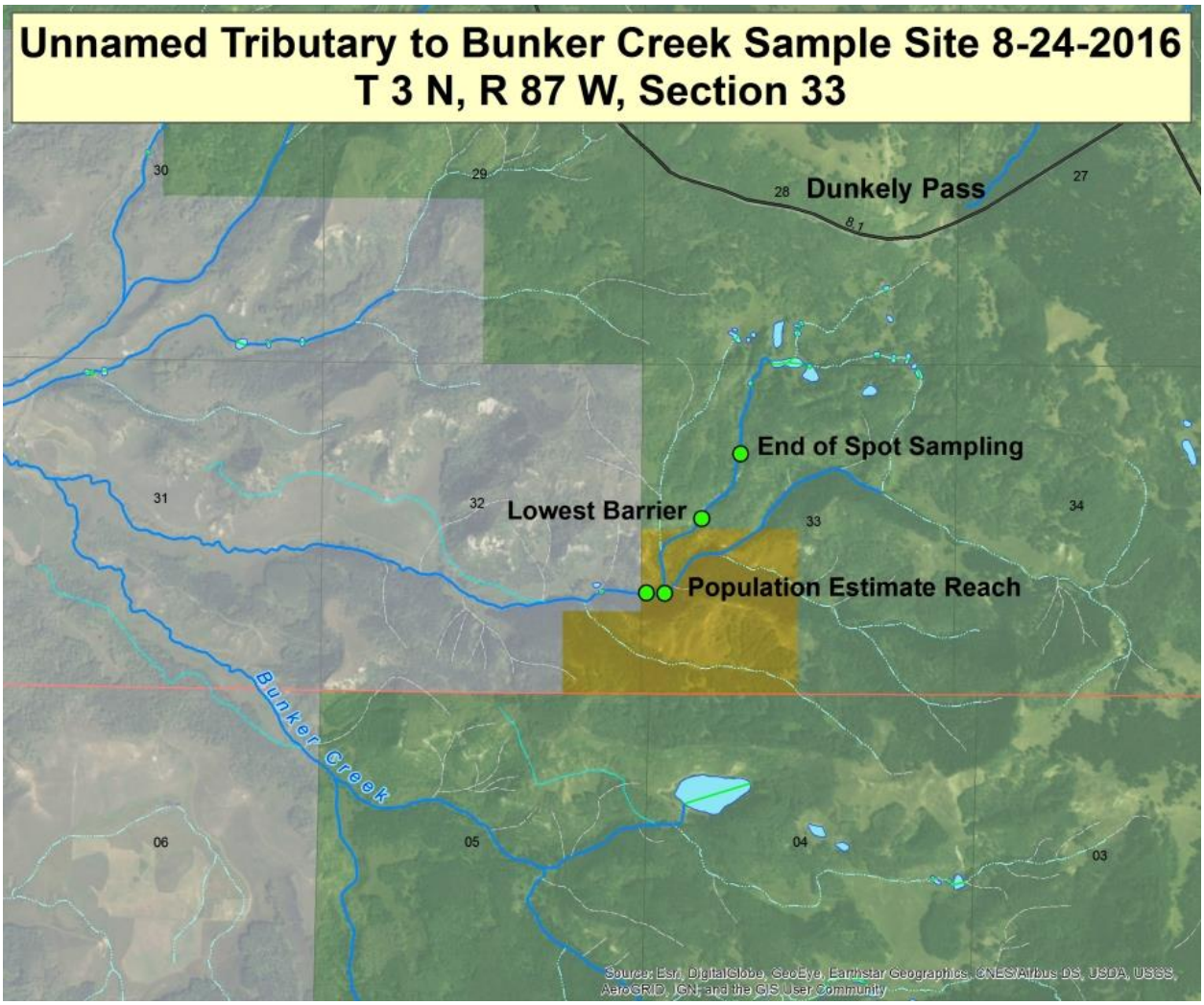
Little Snake Field Office

Stream Sampling August 2016

Unnamed Tributary to Bunker Creek - Water Code: N/A

Introduction:

An unnamed tributary to Bunker Creek located west of Yampa, Colorado and south of Dunkley Pass, on BLM lands managed by the Little Snake Field Office was sampled on August 24, 2016. A small reach on U.S. Forest Service lands was also sampled as part of the effort. This unnamed stream is tributary to Bunker Creek in the East Fork Williams Fork drainage. Sampling was conducted to determine fishery status and species composition and if occupied, conduct a population estimate. One backpack shocker was used to sample a 300 foot stream reach and based on the presence of cutthroat trout; a two pass removal population estimate was conducted at one site. Personnel present were Tom Fresques and Nate Higginson, BLM.



Unnamed Tributary to Bunker Creek - Colorado River Cutthroat Trout

Unnamed Tributary to Bunker Creek - representative stream habitat – good dense canopy cover

First of several natural fish barriers in a ~0.15 mile reach located on USFS lands

Discussion:

Unnamed tributary to Bunker Creek is a small perennial stream. This stream was sampled because it was noted as perennial in the National Hydrography Dataset and is tributary to a known conservation population of Colorado River Cutthroat Trout in Bunker Creek. Sampling determined that the stream contains a population of Colorado River Cutthroat Trout. This is a new population that was not previously documented. The stream has two perennial forks and a population estimate was completed below and up to the confluence of the two forks. Based on sampling, the 300-foot sample reach contains 12 adult fish (≥135mm) + or – 1 fish at the 95% confidence interval, and 211 adult fish (≥135mm) + or – 13 fish per stream mile at the 95% confidence interval. Five age classes of cutthroat trout were noted including several young-of-year (see full data sheet at the end of this report). No other fish were seen or collected although mottled sculpin and perhaps speckled dace and mountain sucker would not have been surprising to see.

Riparian vegetation is lush and dense and is comprised primarily of an overstory canopy of blue spruce, sub alpine fir, and aspen. The understory is comprised of alder, Rocky Mountain maple, willow, sedge, marestail, and currant. Vegetation provides excellent stream shading and cover.

Stream habitats are comprised of a good mix of riffles, small runs, and relatively deep (1'-2') pools. Stream substrates are comprised of a mix of large rock and boulder, cobble, and small rock with good clean gravels. There is no evidence of excessive sediment loading problems.

The water temperature was 48.1°F at the time of sampling (2 pm) and warm water temperatures do not appear to be a limiting factor on this stream. A temperature probe would help identify temperature extremes that may limit the fish population.

The smaller of the two forks had very limited flow but was walked a short distance to look at habitat. Presumed Colorado River Cutthroat Trout young-of-year were noted approximately 75 feet upstream of the confluence in this fork, but no additional sampling was conducted in this fork.

The larger of the two forks was spot sampled up to the point where a series of natural barriers were noted. Spot sampling documented cutthroat trout up to the lower most barrier but not above it or the other barriers based on limited spot sampling that occurred for approximately 0.2 miles above the upper-most natural barrier. Flow and habitat did not appear to be a limiting factor to upstream fish occupation above the barrier reach in the short amount of USFS habitat sampled.

Recommendations:

- Based on the presence of cutthroat trout, fin clips should be obtained and analyzed to determine lineage, genetic purity, and conservation value of this population
- Work with CPW and USFS to better define the upper distribution of fish in the smaller fork as well as the lower distribution limits of the population above the confluence with Bunker Creek
- Place a temperature probe in the stream
- Collect a macroinvertebrate sample on the stream

STREAM SURVEY FISH SAMPLING FORM 2016

WATER Unnamed Tributary to Bunker Creek DATE 8/24/2016 GEAR BPEF -1
STATION # 1 CREW Fresques, Higginson LOCATION
Start: 13T X: 0314892 Y: 4450618
End: 13T X: 0314981 Y: 4450617
Lowest Barrier: 13T X: 315163 Y: 4450983

#	Pass	species	length	weight		species	length	weight	Pass
1	1	CRN	243	122		CRN	136	25	2
2	1	CRN	169	45		CRN	129	17	2
3	1	CRN	162	38		CRN	118	12	2
4	1	CRN	171	44		CRN	103	9	2
5	1	CRN	163	44		CRN	106	11	2
6	1	CRN	96	8					
7	1	CRN	173	51					
8	1	CRN	140	24					
9	1	CRN	148	30					
10	1	CRN	142	29					
11	1	CRN	164	44					
12	1	CRN	94	7					
13	1	CRN	133	20					
14	1	CRN	166	41					
15	1	CRN	107	11					
16	1	CRN	106	9					
17	1	CRN	101	10					
18	1	CRN	108	12					
19	1	CRN	114	15					
20	1	CRN	98	8					
21	1	CRN	105	12					
22	1	CRN	105	10					
23	1	CRN	34						
24	1	CRN	96	7					
25	1	CRN	39						

H2O Temp: 48.1°F Sample Reach: 300 ft. Stream Widths: ~6ft
Conductivity: 461 µS Shocker settings: 350V

~ 6ft ave.

Little Snake Field Office
Stream Sampling July and September 2017

Unnamed Tributary to Bunker Creek (**Sunbutter Creek**) – Water Code: N/A

Introduction:
Sunbutter Creek, located south of Dunckley Pass, on public lands managed by the Little Snake Field Office, was visited on July 18, and September 27, 2017. Sunbutter Creek was first sampled in 2016 and a resident Cutthroat Trout population was discovered. Sunbutter Creek is tributary to Bunker Creek. The site visit on July 18th was conducted to collect a macroinvertebrate sample and place a temperature probe into the stream. The September 27th visit was a cooperative sampling effort with personnel from the Routt National Forest, to collect fin clips from resident cutthroat for genetic analysis. Sampling was conducted by Tom Fresques and Austin Wenke, BLM, and USFS Fish Biologist Rick Henderson's Crew.
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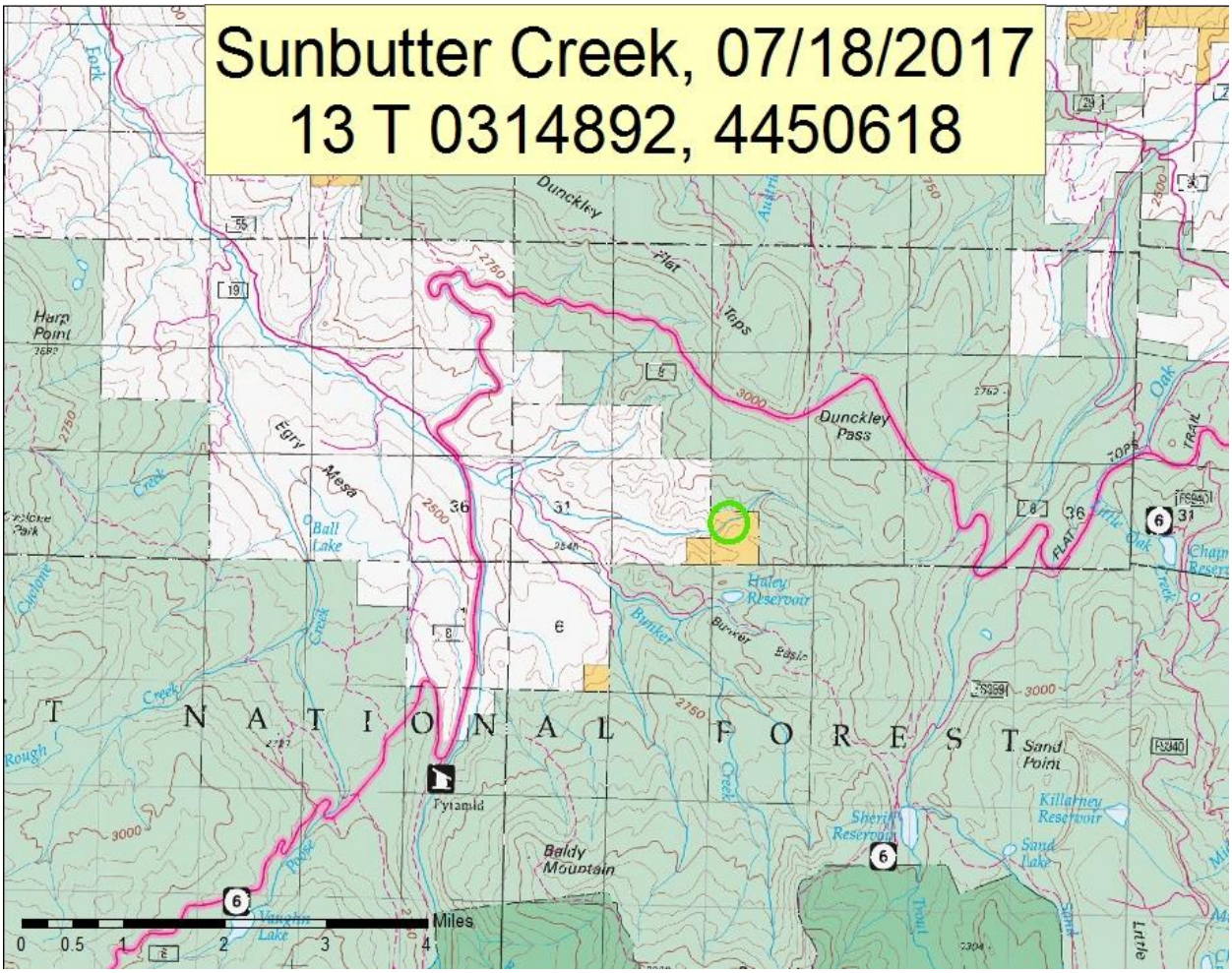


Invertebrate sample being taken in a riffle

Location of the data logger placed in Sunbutter Creek (07/2017)

Resident Cutthroat post fin clip

Discussion:
Sunbutter Creek contains a resident population of Colorado River Cutthroat Trout that prior to 2016 had not been documented. To determine the conservation value of the population, fin clips were collected this year in order to conduct genetics testing to determine lineage, genetic purity, and any uniqueness. During this sampling effort a total of 25 fin clips were collected following established protocols. The USFS Crew went back in later in the fall of 2017 and collected an additional 4 fin clips from higher up in the eastern most tributary stream. The Crew also identified a natural in-channel barrier to upstream fish movement located approximately 150 meters upstream of the confluence in this eastern tributary. The 29 fin tissue samples have been submitted for genetic testing but results have yet to be obtained.

A macroinvertebrate sample was collected to help inform stream health and productivity and serve as baseline data. The invertebrate sample was conducted in a 500ft reach, and one composite sample comprised of 8 riffles ($8ft^2$) using a Surber Sampler was collected. The composite sample was sent to BLM's National Aquatic Monitoring Center at Utah State University for processing and analysis. Results should be back in the spring of 2018.

A temperature probe was launched and placed in the stream at the lowest BLM point to collect stream temperature data and further inform stream health and serve as baseline information. The logger will collect temperature data at 20 minute intervals and should collect ~1.7 years of continuous data. This data will be downloaded and analyzed most likely in the summer of 2019.

Land uses in the stream vicinity appear limited. No livestock sign was noted in the area and no human uses other than some recreational use (hunting) were apparent. The riparian area along the stream is diverse, robust, and provides excellent stream shading and cover.

Recommendations:

- Await genetic results and discuss with CPW and USFS and share with LSFO staff
- Obtain temperature data in the fall of 2018 or summer of 2019 and then analyze and summarize
- Continue to work with LSFO and CSO staff on instream flow recommendation for this stream
- Determine any other data needs for this stream and continue to periodically monitor the fishery to begin to obtain some population trend data
- Consider investigating the fishery status of the tributary located to the south of Sunbutter Creek on BLM land that joins Sunbutter Creek on private lands below the BLM reach

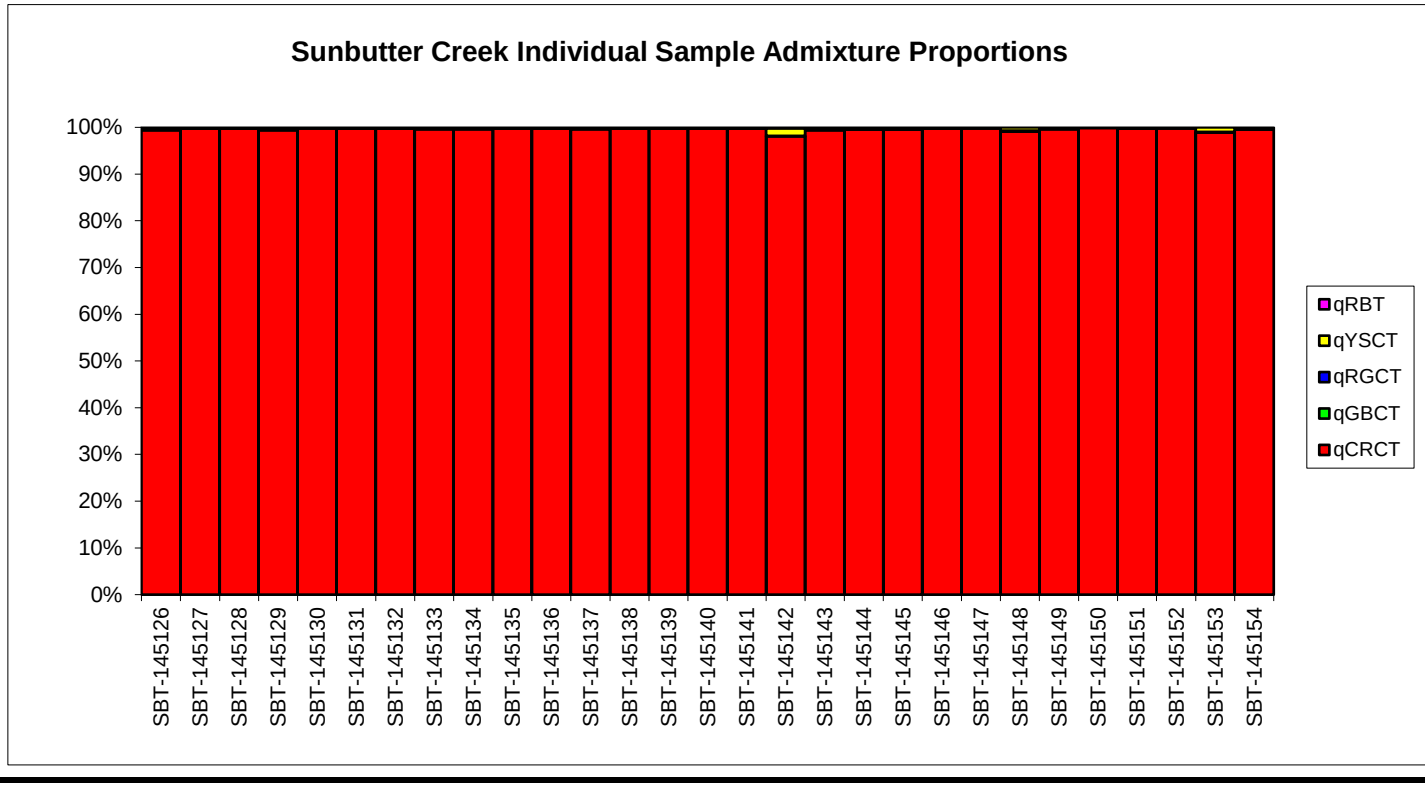
Sunbutter Creek Cutthroat Trout AFLP Analysis

CD Batch	Source	Date Received	Number of samples submitted	Pisces 3 Letter Code	Population / Location	Water Code	Pisces sample numbers
22976	CDOW/KR	10/23/2017	29	SBT	Sunbutter Creek	Not Provided	145126-145154

Sunbutter Creek Species Admixture Proportions
(STRUCTURE q values)

	qCRCT	qGBCT	qRGCT	qYSCT	qRBT
Population Average q	1.00	0.00	0.00	0.00	0.00

Number of samples scored:	0



Comments:

Sunbutter Creek Individual Sample Admixture Proportions
(STRUCTURE q values)

Sample	qCRCT	qGBCT	qRGCT	qYSCT	qRBT
SBT-145126	1.00	0.00	0.00	0.00	0.00
SBT-145127	1.00	0.00	0.00	0.00	0.00
SBT-145128	1.00	0.00	0.00	0.00	0.00
SBT-145129	1.00	0.00	0.00	0.00	0.00
SBT-145130	1.00	0.00	0.00	0.00	0.00
SBT-145131	1.00	0.00	0.00	0.00	0.00
SBT-145132	1.00	0.00	0.00	0.00	0.00
SBT-145133	1.00	0.00	0.00	0.00	0.00
SBT-145134	1.00	0.00	0.00	0.00	0.00
SBT-145135	1.00	0.00	0.00	0.00	0.00
SBT-145136	1.00	0.00	0.00	0.00	0.00
SBT-145137	1.00	0.00	0.00	0.00	0.00
SBT-145138	1.00	0.00	0.00	0.00	0.00
SBT-145139	1.00	0.00	0.00	0.00	0.00
SBT-145140	1.00	0.00	0.00	0.00	0.00
SBT-145141	1.00	0.00	0.00	0.00	0.00
SBT-145142	0.98	0.00	0.00	0.02	0.00
SBT-145143	1.00	0.00	0.00	0.00	0.00
SBT-145144	0.99	0.00	0.00	0.00	0.00
SBT-145145	1.00	0.00	0.00	0.00	0.00
SBT-145146	1.00	0.00	0.00	0.00	0.00
SBT-145147	1.00	0.00	0.00	0.00	0.00
SBT-145148	0.99	0.00	0.00	0.01	0.00
SBT-145149	1.00	0.00	0.00	0.00	0.00
SBT-145150	1.00	0.00	0.00	0.00	0.00
SBT-145151	1.00	0.00	0.00	0.00	0.00
SBT-145152	1.00	0.00	0.00	0.00	0.00
SBT-145153	0.99	0.00	0.00	0.01	0.00
SBT-145154	1.00	0.00	0.00	0.00	0.00
Population Average q	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**
Lower 95% CL	***0.99***	***0.00***	***0.00***	***0.00***	***0.00***
Upper 95% CL	***1.00***	***0.00***	***0.00***	***0.00***	***0.00***

Report Prepared by: ***Patrick Power 3-22-18***

Sample	qCRCT	qGBCT	qRGCT	qYSCT	qCRR
SBT-145126	0.995	0.001	0.001	0.003	0.001
SBT-145127	0.997	0.001	0.001	0.001	0
SBT-145128	0.997	0.001	0.002	0	0
SBT-145129	0.995	0.003	0.001	0.001	0.001
SBT-145130	0.997	0.001	0.001	0	0
SBT-145131	0.997	0.001	0.001	0.001	0
SBT-145132	0.998	0.001	0.001	0.001	0
SBT-145133	0.996	0.001	0.002	0.001	0
SBT-145134	0.997	0.001	0.001	0.001	0.001
SBT-145135	0.998	0.001	0.001	0	0.001
SBT-145136	0.996	0.001	0.002	0	0
SBT-145137	0.996	0.001	0.001	0.001	0.001
SBT-145138	0.997	0.001	0.001	0.001	0
SBT-145139	0.998	0.001	0.001	0.001	0
SBT-145140	0.997	0.001	0.001	0.001	0
SBT-145141	0.996	0.001	0	0.002	0
SBT-145142	0.981	0	0.001	0.016	0.002
SBT-145143	0.995	0.003	0.001	0.001	0.001
SBT-145144	0.993	0.001	0	0.004	0
SBT-145145	0.996	0	0.001	0.003	0.001
SBT-145146	0.997	0.001	0.001	0.001	0
SBT-145147	0.997	0.001	0.001	0	0
SBT-145148	0.991	0.001	0.001	0.007	0
SBT-145149	0.995	0	0.001	0.002	0.001
SBT-145150	0.998	0	0.001	0	0
SBT-145151	0.996	0.001	0.001	0.001	0
SBT-145152	0.997	0.001	0.001	0	0
SBT-145153	0.988	0.001	0	0.01	0
SBT-145154	0.995	0.002	0.001	0.001	0.001
Population Average q	1	0	0	0	0
Lower 95% CL	0.99	0	0	0	0
Upper 95% CL	1	0	0	0	0

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Sunbutter Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: At BLM - Private Boundary						
DATE: 6-15-18	OBSERVERS: R. Smith, E. Scherff					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 33	TOWNSHIP: 3 N/S	RANGE: 87 E/W	PM: 6th	
COUNTY: Rio Blanco	WATERSHED: Williams Fork		WATER DIVISION: 6		DOW WATER CODE: none	
MAP(S): USGS:			GPS	314855		
USFS:			Zone 13	4450610		

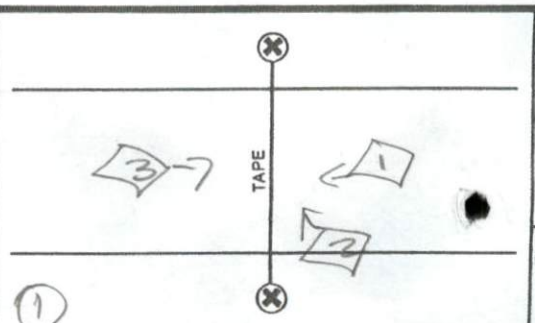
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: N-N			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 1-foot 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	5.10/5.10
② WS Upstream	8.5	4.98
③ WS Downstream	11.0	5.18
SLOPE	.20 / 19.5 = .0102	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

pH = 8.25
Cond = 208
Temp = 13.4° C
Salinity = 0.1 ppt

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Sunbutter Creek | CROSS-SECTION NO.: 1 | DATE: 6-15-18 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 10:15 am

Features (Stake (S) Grassline (G) Waterline (W) Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft) ✓	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point ✓	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		2.38								
	1.5		3.47								
G	1.6		3.96								
	2.2		5.00								
RW	2.7		5.10	Ø							
	3.0		5.2	0.10				0.23			
	3.3		5.2	0.10				0.60			
	3.6		5.25	0.15				0.82			
	3.9		5.2	0.10				1.16			
	4.2		5.3	0.20				0.90			
	4.5		5.25	0.15				0.71			
	4.8		5.45	0.35				0.65			
	5.1		5.5	0.40				0.59			
	5.4	5.5	5.45	0.35	0.15			1.10	0.84		
	5.7	5.85	5.40	0.30	0.40			1.21	1.04		
	6.0	5.2	5.3	0.20				1.03			
	6.3		5.3	0.20				0.78			
	6.6		5.3	0.20				0.60			
	6.9		5.25	0.15				0.52			
	7.2		5.25	0.15				0.47			
	7.6		5.25	0.15				0.46			
	7.8										
	7.9		5.25	0.15				0.37			
	8.2		5.25	0.15				0.22			
	8.5		5.15	0.05				0.10			
	8.8		5.15	0.05				Ø			
	9.1		5.15	0.05				Ø			
	9.4		5.15	0.05				Ø			
	[illegible]										
LW	9.8		5.10								
	10.3		4.36								
	13.0		4.34								
G	15.6		3.96								
LS	16.0		3.55								
TOTALS:											

End of Measurement | Time: 10:45 | Gage Reading: _____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME:	Sunbutter Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	1
DATE:	6/15/2018
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork River
DIVISION:	6
DOW CODE:	none
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.0102 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 33

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	RS	0.00	2.38			0.00	0.00	0.00
		1.50	3.47			0.00	0.00	0.00
1	G	1.60	3.96			0.00	0.00	0.00
		2.20	5.00			0.00	0.00	0.00
	RW	2.70	5.10	0.00	0.00	0.00	0.00	0.00
		3.00	5.20	0.10	0.23	0.03	0.01	5.10
		3.30	5.20	0.10	0.60	0.03	0.02	5.10
		3.60	5.25	0.15	0.82	0.05	0.04	5.10
		3.90	5.20	0.10	1.16	0.03	0.03	5.10
		4.20	5.30	0.20	0.90	0.06	0.05	5.10
		4.50	5.25	0.15	0.71	0.05	0.03	5.10
		4.80	5.45	0.35	0.65	0.11	0.07	5.10
		5.10	5.50	0.40	1.59	0.12	0.19	5.10
		5.40	5.45	0.35	1.10	0.07	0.08	5.10
		5.50	5.25	0.15	0.84	0.02	0.02	5.10
		5.70	5.40	0.30	1.21	0.05	0.06	5.10
		5.85	5.50	0.40	1.04	0.06	0.06	5.10
		6.00	5.30	0.20	1.03	0.05	0.05	5.10
		6.30	5.30	0.20	0.78	0.06	0.05	5.10
		6.60	5.30	0.20	0.60	0.06	0.04	5.10
		6.90	5.25	0.15	0.52	0.05	0.02	5.10
		7.20	5.25	0.15	0.47	0.05	0.02	5.10
		7.60	5.25	0.15	0.46	0.05	0.02	5.10
		7.90	5.25	0.15	0.37	0.05	0.02	5.10
		8.20	5.25	0.15	0.22	0.05	0.01	5.10
		8.50	5.15	0.05	0.10	0.02	0.00	5.10
		8.80	5.15	0.05	0.00	0.02	0.00	5.10
		9.10	5.15	0.05	0.00	0.02	0.00	5.10
		9.40	5.15	0.05	0.00	0.02	0.00	5.10
	LW	9.80	5.10	0.00	0.00	0.00	0.00	0.00
		10.30	4.36			0.00	0.00	0.00
		13.00	4.34			0.00	0.00	0.00
1	G	15.60	3.96			0.00	0.00	0.00
					Totals	1.14	0.89	

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

LOCATION INFORMATION

STREAM NAME:	Sunbutter Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	1
DATE:	15-Jun-18
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork River
DIVISION:	6
DOW CODE:	none
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:	0.0102

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

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

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 1

DATA POINTS= 33

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
RS	0.00	2.38			0.00		0.00	0.00	0.0%
	1.50	3.47			0.00		0.00	0.00	0.0%
1 G	1.60	3.96			0.00		0.00	0.00	0.0%
	2.20	5.00			0.00		0.00	0.00	0.0%
RW	2.70	5.10	0.00	0.00	0.00		0.00	0.00	0.0%
	3.00	5.20	0.10	0.23	0.32	0.10	0.03	0.01	0.8%
	3.30	5.20	0.10	0.60	0.30	0.10	0.03	0.02	2.0%
	3.60	5.25	0.15	0.82	0.30	0.15	0.05	0.04	4.1%
	3.90	5.20	0.10	1.16	0.30	0.10	0.03	0.03	3.9%
	4.20	5.30	0.20	0.90	0.32	0.20	0.06	0.05	6.0%
	4.50	5.25	0.15	0.71	0.30	0.15	0.05	0.03	3.6%
	4.80	5.45	0.35	0.65	0.36	0.35	0.11	0.07	7.6%
	5.10	5.50	0.40	1.59	0.30	0.40	0.12	0.19	21.4%
	5.40	5.45	0.35	1.10	0.30	0.35	0.07	0.08	8.6%
	5.50	5.25	0.15	0.84	0.22	0.15	0.02	0.02	2.1%
	5.70	5.40	0.30	1.21	0.25	0.30	0.05	0.06	7.1%
	5.85	5.50	0.40	1.04	0.18	0.40	0.06	0.06	7.0%
	6.00	5.30	0.20	1.03	0.25	0.20	0.05	0.05	5.2%
	6.30	5.30	0.20	0.78	0.30	0.20	0.06	0.05	5.2%
	6.60	5.30	0.20	0.60	0.30	0.20	0.06	0.04	4.0%
	6.90	5.25	0.15	0.52	0.30	0.15	0.05	0.02	2.6%
	7.20	5.25	0.15	0.47	0.30	0.15	0.05	0.02	2.8%
	7.60	5.25	0.15	0.46	0.40	0.15	0.05	0.02	2.7%
	7.90	5.25	0.15	0.37	0.30	0.15	0.05	0.02	1.9%
	8.20	5.25	0.15	0.22	0.30	0.15	0.05	0.01	1.1%
	8.50	5.15	0.05	0.10	0.32	0.05	0.02	0.00	0.2%
	8.80	5.15	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
	9.10	5.15	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
	9.40	5.15	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
LW	9.80	5.10	0.00	0.00	0.40		0.00	0.00	0.0%
	10.30	4.36			0.00		0.00	0.00	0.0%
	13.00	4.34			0.00		0.00	0.00	0.0%
1 G	15.60	3.96			0.00		0.00	0.00	0.0%
TOTALS ----------					7.54	0.4 (Max.)	1.14	0.89	100.0%

Manning's n = 0.0542
Hydraulic Radius= 0.15084077

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.14	1.14	0.0%
4.85	1.14	3.04	167.3%
4.87	1.14	2.88	153.5%
4.89	1.14	2.73	139.7%
4.91	1.14	2.57	126.0%
4.93	1.14	2.42	112.4%
4.95	1.14	2.26	98.8%
4.97	1.14	2.11	85.2%
4.99	1.14	1.95	71.7%
5.01	1.14	1.80	58.2%
5.03	1.14	1.65	44.9%
5.05	1.14	1.50	31.8%
5.06	1.14	1.43	25.4%
5.07	1.14	1.35	19.0%
5.08	1.14	1.28	12.6%
5.09	1.14	1.21	6.3%
5.10	1.14	1.14	0.0%
5.11	1.14	1.07	-6.2%
5.12	1.14	1.00	-12.3%
5.13	1.14	0.93	-18.3%
5.14	1.14	0.86	-24.2%
5.15	1.14	0.80	-30.0%
5.17	1.14	0.68	-39.8%
5.19	1.14	0.58	-49.4%
5.21	1.14	0.47	-58.5%
5.23	1.14	0.38	-66.8%
5.25	1.14	0.29	-74.4%
5.27	1.14	0.24	-79.1%
5.29	1.14	0.19	-83.1%
5.31	1.14	0.16	-86.1%
5.33	1.14	0.13	-88.3%
5.35	1.14	0.11	-90.3%

WATERLINE AT ZERO
AREA ERROR = 5.100

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private 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	3.96	14.00	0.86	1.54	12.02	15.47	100.0%	0.78	28.14	2.34
	4.10	12.96	0.78	1.40	10.13	14.34	92.7%	0.71	22.27	2.20
	4.15	12.59	0.75	1.35	9.49	13.94	90.1%	0.68	20.36	2.14
	4.20	12.22	0.73	1.30	8.87	13.54	87.5%	0.66	18.55	2.09
	4.25	11.85	0.70	1.25	8.27	13.13	84.9%	0.63	16.84	2.04
	4.30	11.48	0.67	1.20	7.69	12.73	82.3%	0.60	15.22	1.98
	4.35	9.82	0.73	1.15	7.13	11.04	71.4%	0.65	14.76	2.07
	4.40	8.42	0.80	1.10	6.70	9.59	62.0%	0.70	14.62	2.18
	4.45	8.36	0.75	1.05	6.28	9.47	61.2%	0.66	13.24	2.11
	4.50	8.29	0.71	1.00	5.87	9.35	60.4%	0.63	11.91	2.03
	4.55	8.23	0.66	0.95	5.45	9.23	59.7%	0.59	10.63	1.95
	4.60	8.17	0.62	0.90	5.04	9.12	58.9%	0.55	9.41	1.87
	4.65	8.11	0.57	0.85	4.64	9.00	58.2%	0.52	8.25	1.78
	4.70	8.04	0.53	0.80	4.23	8.88	57.4%	0.48	7.15	1.69
	4.75	7.98	0.48	0.75	3.83	8.76	56.6%	0.44	6.12	1.60
	4.80	7.92	0.43	0.70	3.43	8.64	55.9%	0.40	5.14	1.50
	4.85	7.86	0.39	0.65	3.04	8.53	55.1%	0.36	4.23	1.39
	4.90	7.79	0.34	0.60	2.65	8.41	54.3%	0.32	3.40	1.28
	4.95	7.73	0.29	0.55	2.26	8.29	53.6%	0.27	2.63	1.16
	5.00	7.67	0.24	0.50	1.88	8.17	52.8%	0.23	1.95	1.04
	5.05	7.38	0.20	0.45	1.50	7.86	50.8%	0.19	1.38	0.92
WL	5.10	7.10	0.16	0.40	1.14	7.54	48.7%	0.15	0.89	0.78
	5.15	5.65	0.14	0.35	0.80	6.08	39.3%	0.13	0.57	0.71
	5.20	5.05	0.10	0.30	0.52	5.46	35.3%	0.10	0.30	0.58
	5.25	2.85	0.10	0.25	0.29	3.24	20.9%	0.09	0.16	0.56
	5.30	1.33	0.13	0.20	0.17	1.64	10.6%	0.10	0.11	0.61
	5.35	1.13	0.10	0.15	0.11	1.35	8.7%	0.08	0.06	0.52
	5.40	0.93	0.06	0.10	0.06	1.06	6.8%	0.06	0.02	0.40
	5.45	0.71	0.02	0.05	0.02	0.76	4.9%	0.02	0.00	0.23
	5.50	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.89	cfs
CALCULATED FLOW (Qc)=	0.89	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.10	ft
CALCULATED WATERLINE (WLc)=	5.10	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=	0.78	ft/sec
MANNING'S N=	0.054	
SLOPE=	0.0102	ft/ft
.4 * Qm =	0.4	cfs
2.5 * Qm=	2.2	cfs

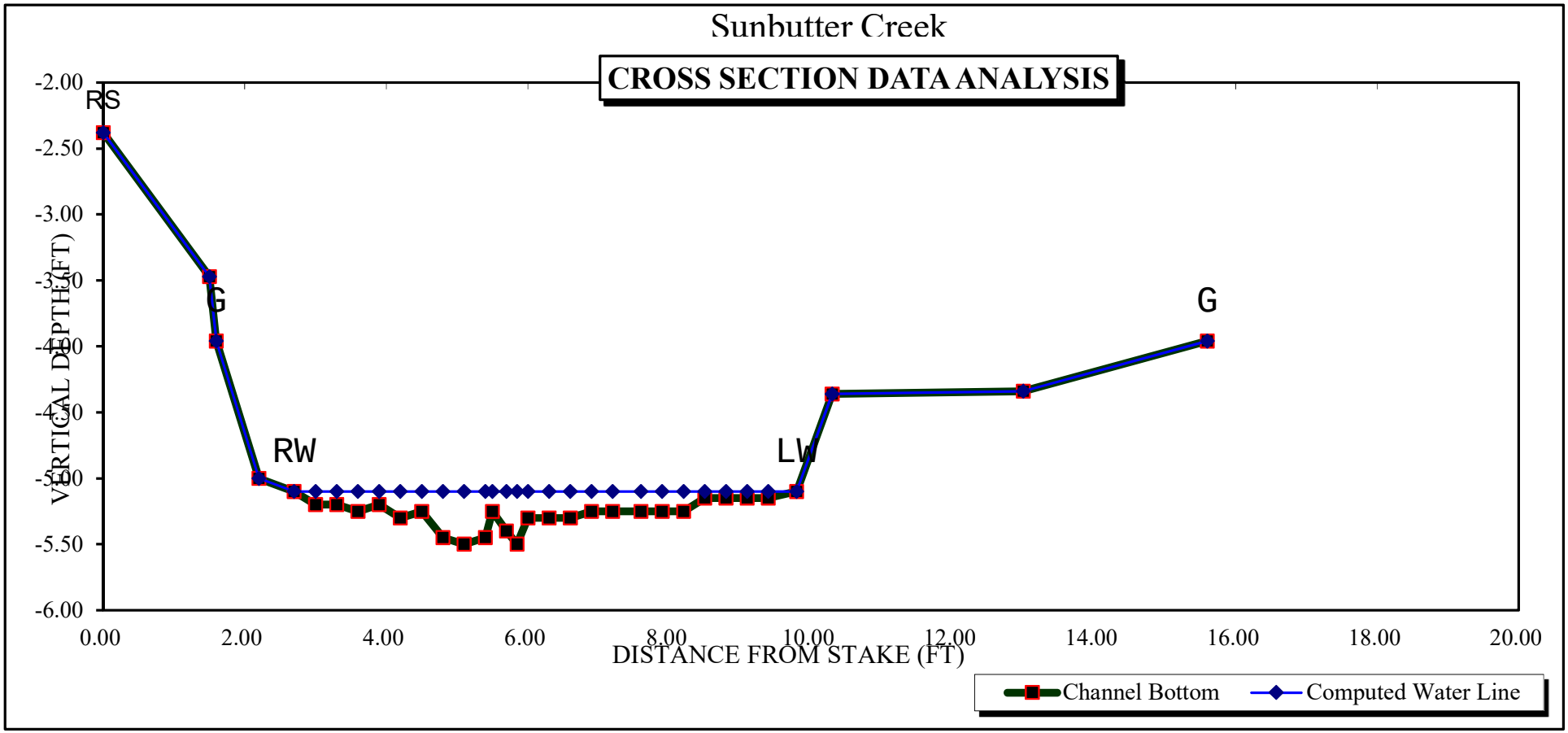
RECOMMENDED INSTREAM FLOW:
============================

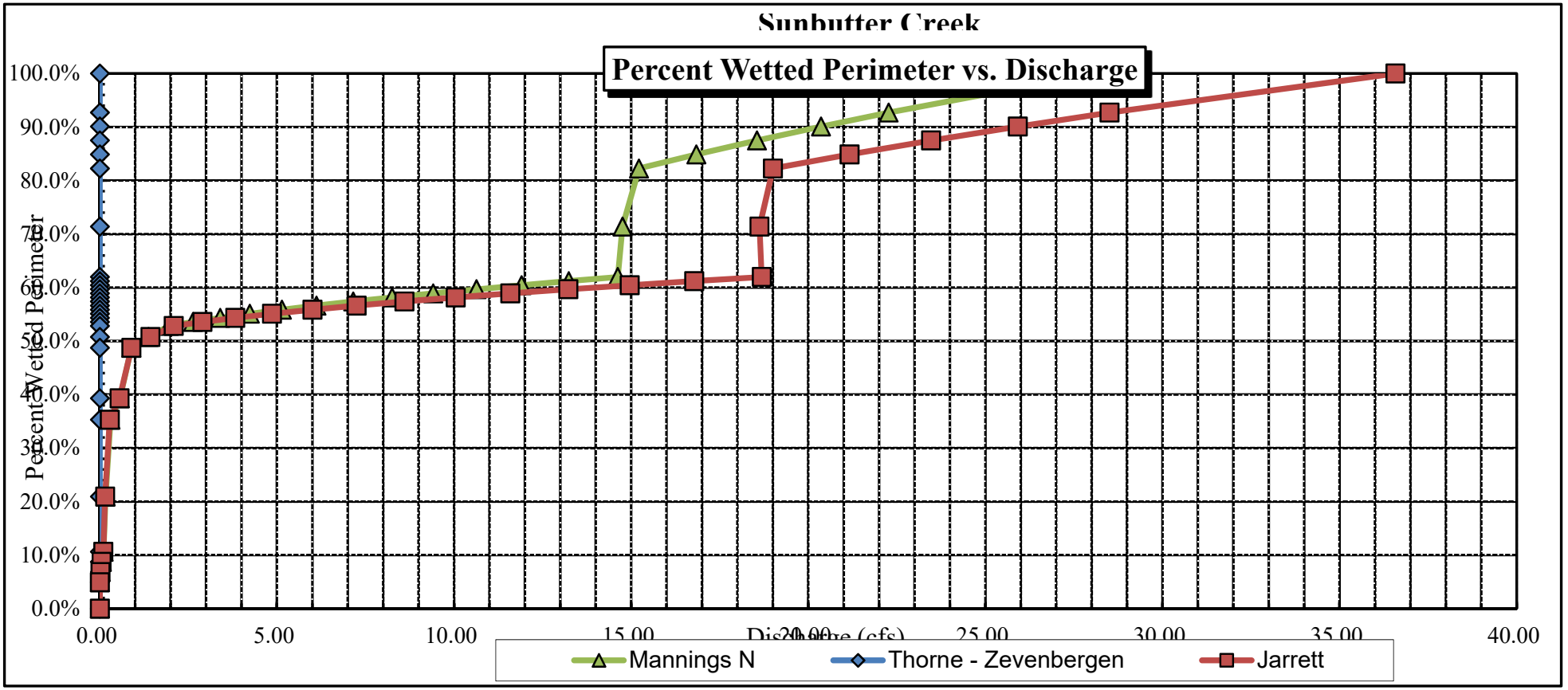
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

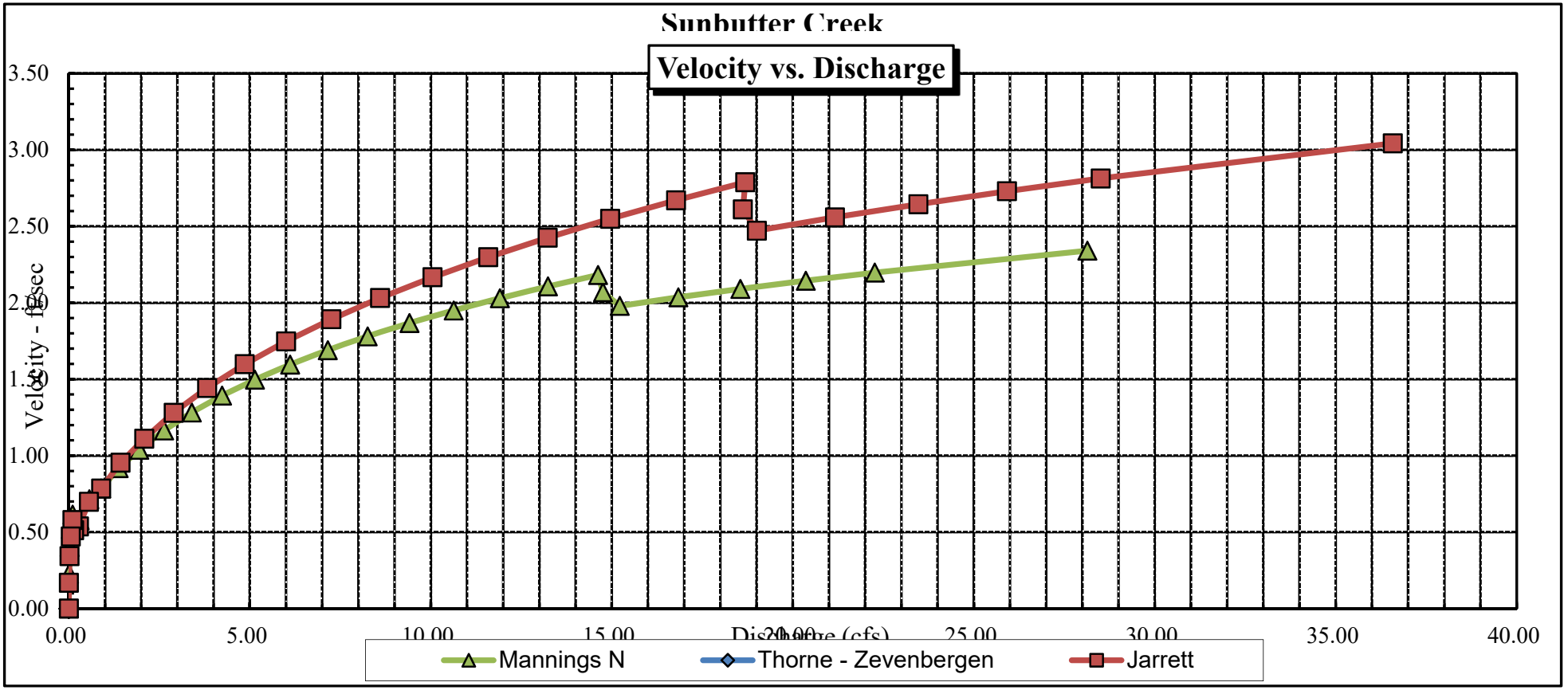
RATIONALE FOR RECOMMENDATION:
============================

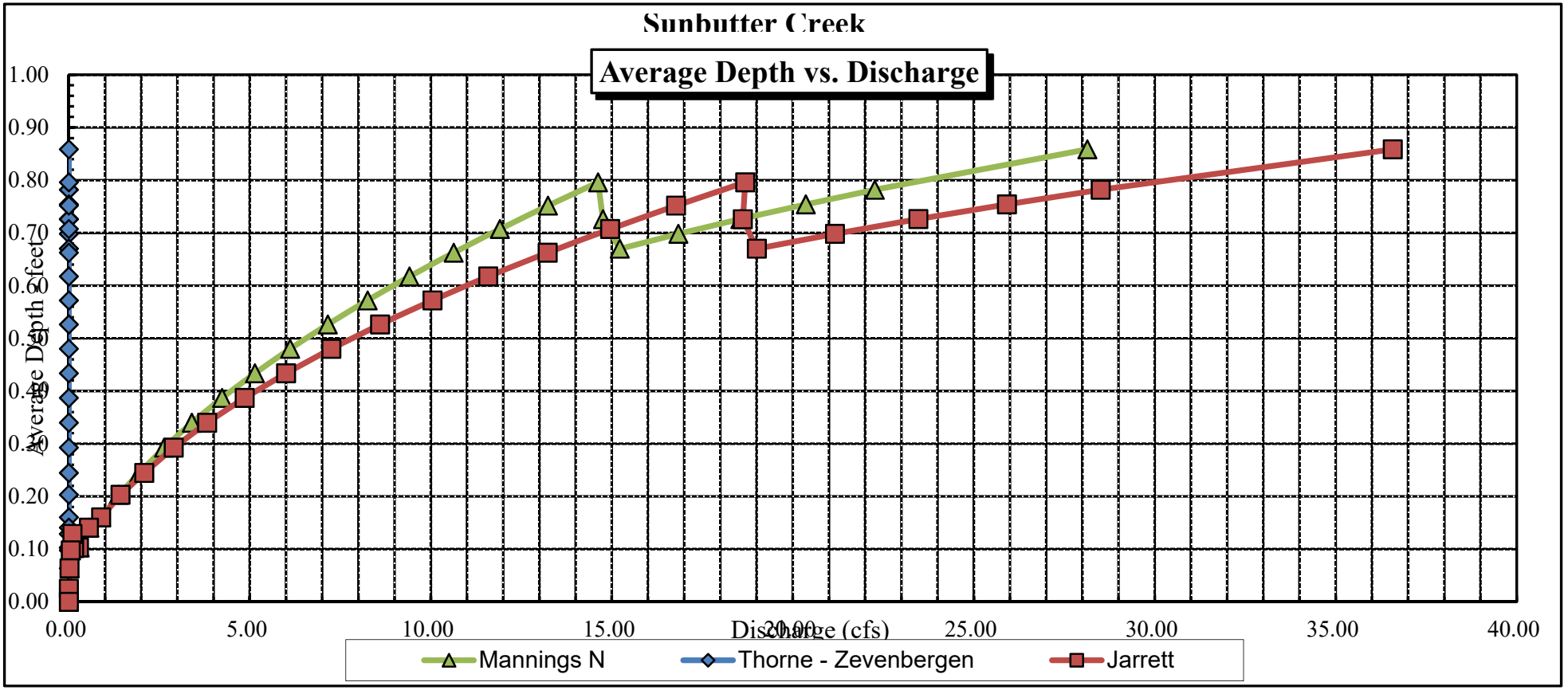
RECOMMENDATION BY: ……………….………..……............................ AGENCY..……………………….....…....…...…....... DATE:.......…...….......……………

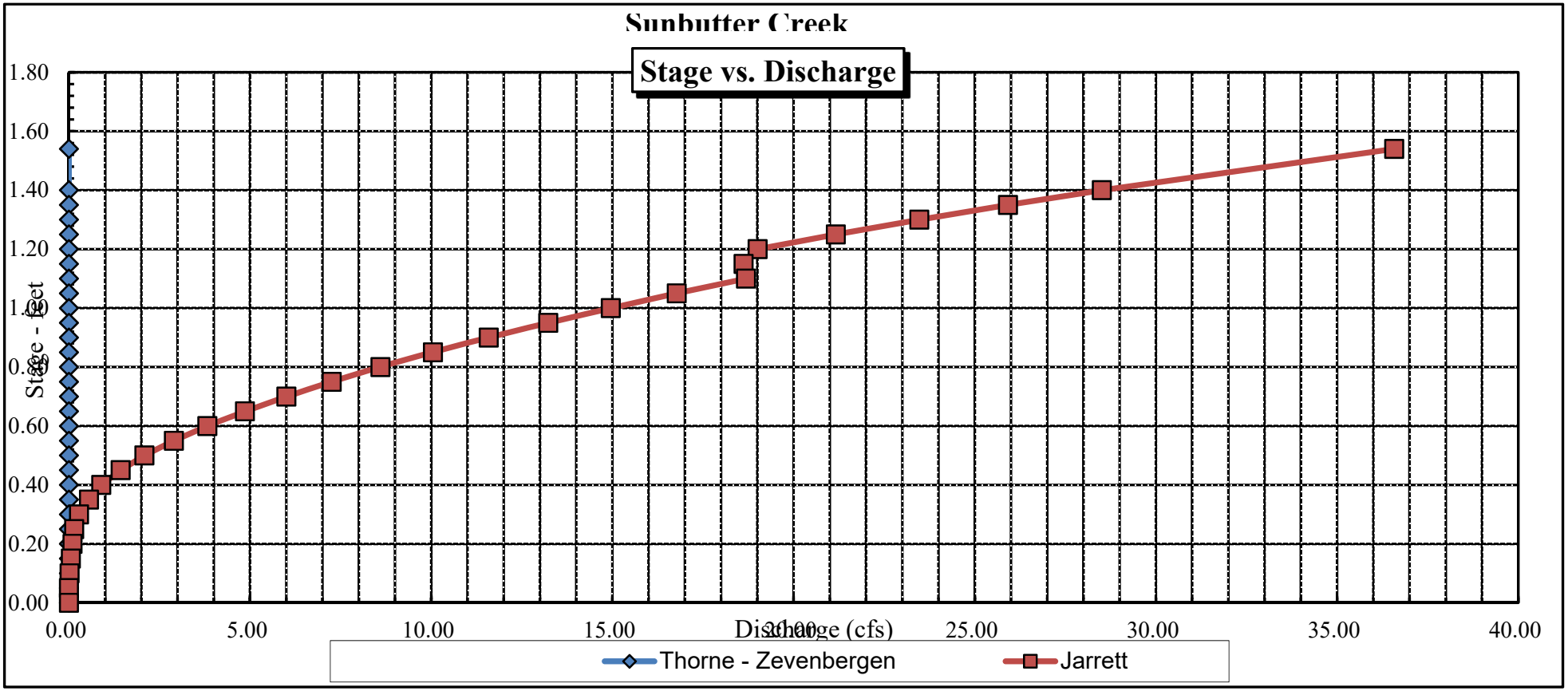
CWCB REVIEW BY: ..…………………………....………………………………………………...….............. DATE:..................……………...…


Sunbutter Creek
CROSS SECTION DATA ANALYSIS
RS
G
RW
LW
G
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
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


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


Sunbutter Creek
Velocity vs. Discharge
Velocity - ft/sec
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Average Depth vs. Discharge
Average Depth (feet)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
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
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO WATER CONSERVATION BOARD

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Sunbutter Creek						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: At BLM - private boundary ↓							
DATE: 6-15-16	OBSERVERS: R. Smith, E. Scherff						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 33	TOWNSHIP: 3 N/S	RANGE: 87 E/W	PM: 6th		
COUNTY: Rio Blanco	WATERSHED: Williams Fork	WATER DIVISION: 6	DOW WATER CODE: none				
MAP(S): USGS:			GPS 315154	Zone 13			
USFS:			4450601				

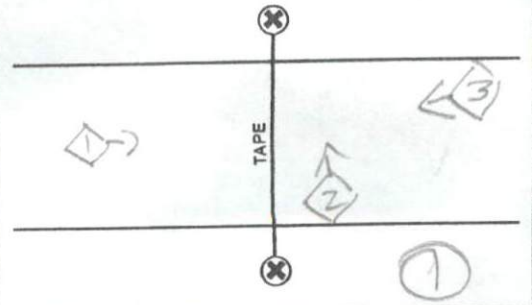
SUPPLEMENTAL DATA

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 1-foot 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	5.2/5.2
2 WS Upstream	8.0	4.99
3 WS Downstream	12.4	5.60
SLOPE	0.69 / 20.4 = .039	

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 - abundant, stonefly

COMMENTS

Riparian = alder, maple, spruce, dogwood

Zone 13

Cross Mtn. Ranch Pond 1 (Upper) = 314440 4450599

Bunker Ditch #2 - 1.33 cfs (Lower) 313068 4450830

diverting at 1.33 cfs on measurement device

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Sunbutter Creek | CROSS-SECTION NO.: 2 | DATE: 6-15-18 | SHEET ___ OF ___

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

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		3.70								
G	1.3		4.18								
	1.5		4.32								
	1.8		4.57								
	3.2		4.80								
RW	3.8		5.20								
	4.0		5.25	0.05				Ø			
	4.2		5.35	0.15				Ø			
	4.4		5.4	0.20				Ø			
	4.6		5.4	0.20				0.08			
	4.8		5.4	0.20				0.10			
	5.0		5.4	0.20				0.14			
	5.2		5.4	0.20				0.55			
	5.4		5.45	0.25				0.63			
	5.6		5.4	0.20				0.54			
	5.8		5.4	0.20				0.43			
	6.0		5.4	0.20				0.60			
	6.2		5.5	0.30				0.79			
	6.4		5.5	0.30				0.72			
	6.6		5.5	0.30				1.31			
	6.8		5.5	0.30				1.86			
	7.0		5.6	0.40				1.45			
	7.2		5.6	0.40				1.20			
	7.4		5.5	0.30				1.32			
	7.6		5.5	0.30				0.98			
	7.8		5.65	0.35				0.56			
	8.0		5.60	0.40				0.04			
	8.2		5.50	0.30				Ø			
	8.4		5.35	0.15				Ø			
LW	8.7		5.20								
G	9.0		4.20								
LS	9.6		3.78								
TOTALS:											

End of Measurement | Time: 11:20 | Gage Reading: _____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME:	Sunbutter Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	2
DATE:	6/15/2018
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork River
DIVISION:	6
DOW CODE:	none
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.039 ft / ft

CHECKED BY:.....DATE.....

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 31					
	RS	0.00	3.70			0.00	0.00	0.00
1	G	1.30	4.18			0.00	0.00	0.00
		1.50	4.32			0.00	0.00	0.00
		1.80	4.57			0.00	0.00	0.00
		3.20	4.80			0.00	0.00	0.00
	RW	3.80	5.20	0.00	0.00	0.00	0.00	0.00
		4.00	5.25	0.05	0.00	0.01	0.00	5.20
		4.20	5.35	0.15	0.00	0.03	0.00	5.20
		4.40	5.40	0.20	0.00	0.04	0.00	5.20
		4.60	5.40	0.20	0.08	0.04	0.00	5.20
		4.80	5.40	0.20	0.10	0.04	0.00	5.20
		5.00	5.40	0.20	0.14	0.04	0.01	5.20
		5.20	5.40	0.20	0.55	0.04	0.02	5.20
		5.40	5.45	0.25	0.63	0.05	0.03	5.20
		5.60	5.40	0.20	0.54	0.04	0.02	5.20
		5.80	5.40	0.20	0.43	0.04	0.02	5.20
		6.00	5.40	0.20	0.60	0.04	0.02	5.20
		6.20	5.50	0.30	0.79	0.06	0.05	5.20
		6.40	5.50	0.30	0.72	0.06	0.04	5.20
		6.60	5.50	0.30	1.31	0.06	0.08	5.20
		6.80	5.50	0.30	1.86	0.06	0.11	5.20
		7.00	5.60	0.40	1.43	0.08	0.11	5.20
		7.20	5.60	0.40	1.20	0.08	0.10	5.20
		7.40	5.50	0.30	1.32	0.06	0.08	5.20
		7.60	5.50	0.30	0.98	0.06	0.06	5.20
		7.80	5.55	0.35	0.56	0.07	0.04	5.20
		8.00	5.60	0.40	0.04	0.08	0.00	5.20
		8.20	5.50	0.30	0.00	0.06	0.00	5.20
		8.40	5.35	0.15	0.00	0.04	0.00	5.20
	LW	8.70	5.20	0.00	0.00	0.00	0.00	0.00
1	G	9.00	4.20			0.00	0.00	0.00
					Totals	1.18	0.80	

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

LOCATION INFORMATION

STREAM NAME:	Sunbutter Creek
XS LOCATION:	At BLM-private boundary
XS NUMBER:	2
DATE:	15-Jun-18
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork River
DIVISION:	6
DOW CODE:	none
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:	0.039

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

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

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

DATA POINTS= 31

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	3.70			0.00		0.00	0.00	0.0%
1 G	1.30	4.18			0.00		0.00	0.00	0.0%
	1.50	4.32			0.00		0.00	0.00	0.0%
	1.80	4.57			0.00		0.00	0.00	0.0%
	3.20	4.80			0.00		0.00	0.00	0.0%
RW	3.80	5.20	0.00	0.00	0.00		0.00	0.00	0.0%
	4.00	5.25	0.05	0.00	0.21	0.05	0.01	0.00	0.0%
	4.20	5.35	0.15	0.00	0.22	0.15	0.03	0.00	0.0%
	4.40	5.40	0.20	0.00	0.21	0.20	0.04	0.00	0.0%
	4.60	5.40	0.20	0.08	0.20	0.20	0.04	0.00	0.4%
	4.80	5.40	0.20	0.10	0.20	0.20	0.04	0.00	0.5%
	5.00	5.40	0.20	0.14	0.20	0.20	0.04	0.01	0.7%
	5.20	5.40	0.20	0.55	0.20	0.20	0.04	0.02	2.7%
	5.40	5.45	0.25	0.63	0.21	0.25	0.05	0.03	3.9%
	5.60	5.40	0.20	0.54	0.21	0.20	0.04	0.02	2.7%
	5.80	5.40	0.20	0.43	0.20	0.20	0.04	0.02	2.1%
	6.00	5.40	0.20	0.60	0.20	0.20	0.04	0.02	3.0%
	6.20	5.50	0.30	0.79	0.22	0.30	0.06	0.05	5.9%
	6.40	5.50	0.30	0.72	0.20	0.30	0.06	0.04	5.4%
	6.60	5.50	0.30	1.31	0.20	0.30	0.06	0.08	9.8%
	6.80	5.50	0.30	1.86	0.20	0.30	0.06	0.11	13.9%
	7.00	5.60	0.40	1.43	0.22	0.40	0.08	0.11	14.3%
	7.20	5.60	0.40	1.20	0.20	0.40	0.08	0.10	12.0%
	7.40	5.50	0.30	1.32	0.22	0.30	0.06	0.08	9.9%
	7.60	5.50	0.30	0.98	0.20	0.30	0.06	0.06	7.3%
	7.80	5.55	0.35	0.56	0.21	0.35	0.07	0.04	4.9%
	8.00	5.60	0.40	0.04	0.21	0.40	0.08	0.00	0.4%
	8.20	5.50	0.30	0.00	0.22	0.30	0.06	0.00	0.0%
	8.40	5.35	0.15	0.00	0.25	0.15	0.04	0.00	0.0%
LW	8.70	5.20	0.00	0.00	0.34		0.00	0.00	0.0%
1 G	9.00	4.20			0.00		0.00	0.00	0.0%
TOTALS ----------					5.14	0.4 (Max.)	1.18	0.80	100.0%

Manning's n = 0.1616
Hydraulic Radius= 0.22906885

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.18	1.18	0.0%
4.95	1.18	2.46	108.8%
4.97	1.18	2.35	99.8%
4.99	1.18	2.25	90.8%
5.01	1.18	2.14	81.8%
5.03	1.18	2.04	73.0%
5.05	1.18	1.93	64.1%
5.07	1.18	1.83	55.4%
5.09	1.18	1.73	46.7%
5.11	1.18	1.63	38.1%
5.13	1.18	1.52	29.5%
5.15	1.18	1.42	21.0%
5.16	1.18	1.37	16.8%
5.17	1.18	1.33	12.6%
5.18	1.18	1.28	8.4%
5.19	1.18	1.23	4.2%
5.20	1.18	1.18	0.0%
5.21	1.18	1.13	-4.1%
5.22	1.18	1.08	-8.2%
5.23	1.18	1.03	-12.3%
5.24	1.18	0.99	-16.2%
5.25	1.18	0.94	-20.2%
5.27	1.18	0.85	-27.9%
5.29	1.18	0.76	-35.5%
5.31	1.18	0.67	-43.0%
5.33	1.18	0.58	-50.3%
5.35	1.18	0.50	-57.5%
5.37	1.18	0.42	-64.6%
5.39	1.18	0.34	-71.4%
5.41	1.18	0.27	-77.1%
5.43	1.18	0.22	-81.3%
5.45	1.18	0.17	-85.2%

WATERLINE AT ZERO
AREA ERROR = 5.200

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
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	4.20	7.67	0.97	1.40	7.47	8.92	100.0%	0.84	12.05	1.61
	4.20	7.67	0.97	1.40	7.47	8.92	100.0%	0.84	12.05	1.61
	4.25	7.59	0.93	1.35	7.09	8.79	98.4%	0.81	11.16	1.57
	4.30	7.50	0.89	1.30	6.71	8.65	96.9%	0.78	10.30	1.53
	4.35	7.42	0.85	1.25	6.34	8.51	95.4%	0.74	9.46	1.49
	4.40	7.34	0.81	1.20	5.97	8.38	93.9%	0.71	8.65	1.45
	4.45	7.27	0.77	1.15	5.60	8.25	92.5%	0.68	7.87	1.40
	4.50	7.19	0.73	1.10	5.24	8.12	91.0%	0.65	7.11	1.36
	4.55	7.12	0.69	1.05	4.89	7.99	89.5%	0.61	6.39	1.31
	4.60	6.90	0.66	1.00	4.53	7.72	86.5%	0.59	5.77	1.27
	4.65	6.58	0.64	0.95	4.20	7.36	82.5%	0.57	5.24	1.25
	4.70	6.26	0.62	0.90	3.88	7.00	78.4%	0.55	4.75	1.22
	4.75	5.94	0.60	0.85	3.57	6.64	74.4%	0.54	4.29	1.20
	4.80	5.62	0.58	0.80	3.28	6.28	70.4%	0.52	3.87	1.18
	4.85	5.53	0.54	0.75	3.00	6.14	68.8%	0.49	3.39	1.13
	4.90	5.44	0.50	0.70	2.73	5.99	67.2%	0.46	2.93	1.07
	4.95	5.35	0.46	0.65	2.46	5.85	65.6%	0.42	2.51	1.02
	5.00	5.26	0.42	0.60	2.19	5.71	64.0%	0.38	2.11	0.96
	5.05	5.17	0.37	0.55	1.93	5.57	62.4%	0.35	1.73	0.90
	5.10	5.08	0.33	0.50	1.68	5.43	60.8%	0.31	1.39	0.83
	5.15	4.99	0.29	0.45	1.42	5.28	59.2%	0.27	1.08	0.76
WL	5.20	4.90	0.24	0.40	1.18	5.14	57.6%	0.23	0.80	0.68
	5.25	4.60	0.20	0.35	0.94	4.82	54.0%	0.19	0.57	0.61
	5.30	4.40	0.16	0.30	0.72	4.60	51.5%	0.16	0.38	0.53
	5.35	4.20	0.12	0.25	0.50	4.38	49.0%	0.11	0.21	0.43
	5.40	2.73	0.11	0.20	0.30	2.89	32.3%	0.10	0.12	0.40
	5.45	2.17	0.08	0.15	0.17	2.28	25.5%	0.08	0.06	0.33
	5.50	1.20	0.06	0.10	0.07	1.28	14.4%	0.05	0.02	0.26
	5.55	0.70	0.03	0.05	0.02	0.74	8.3%	0.03	0.00	0.18

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-private boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.80	cfs
CALCULATED FLOW (Qc)=	0.80	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.20	ft
CALCULATED WATERLINE (WLc)=	5.20	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=	0.68	ft/sec
MANNING'S N=	0.162	
SLOPE=	0.039	ft/ft
.4 * Qm =	0.3	cfs
2.5 * Qm=	2.0	cfs

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

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

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

_____
_____
_____
_____
_____
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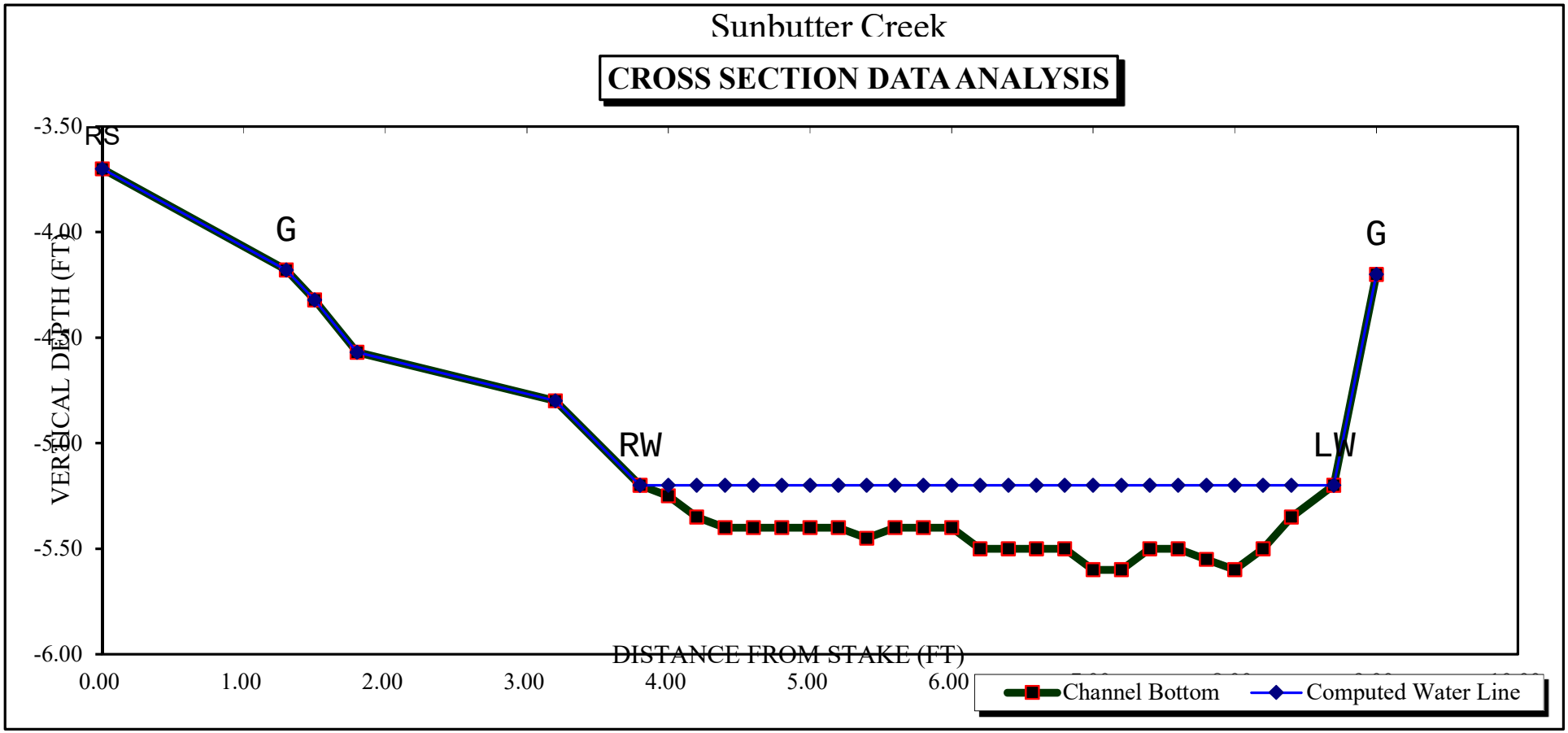
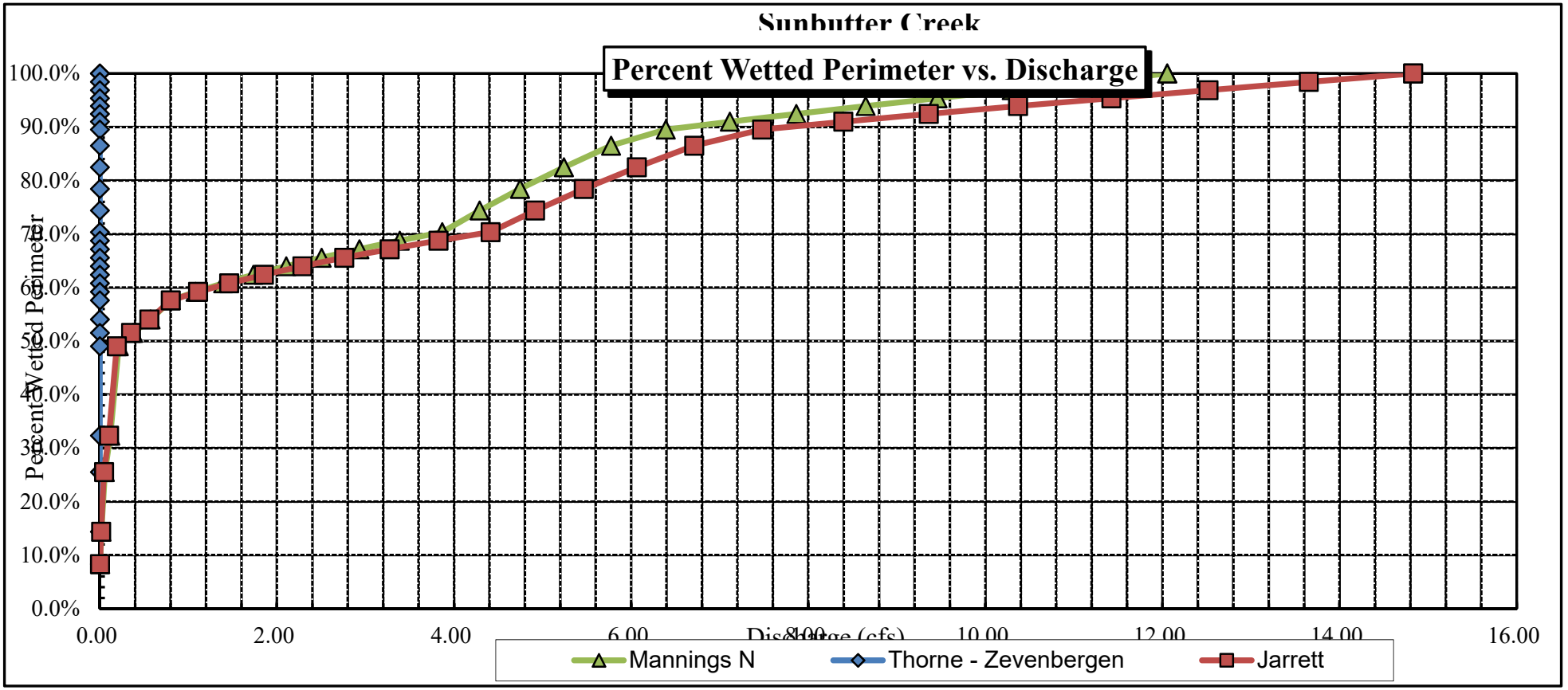
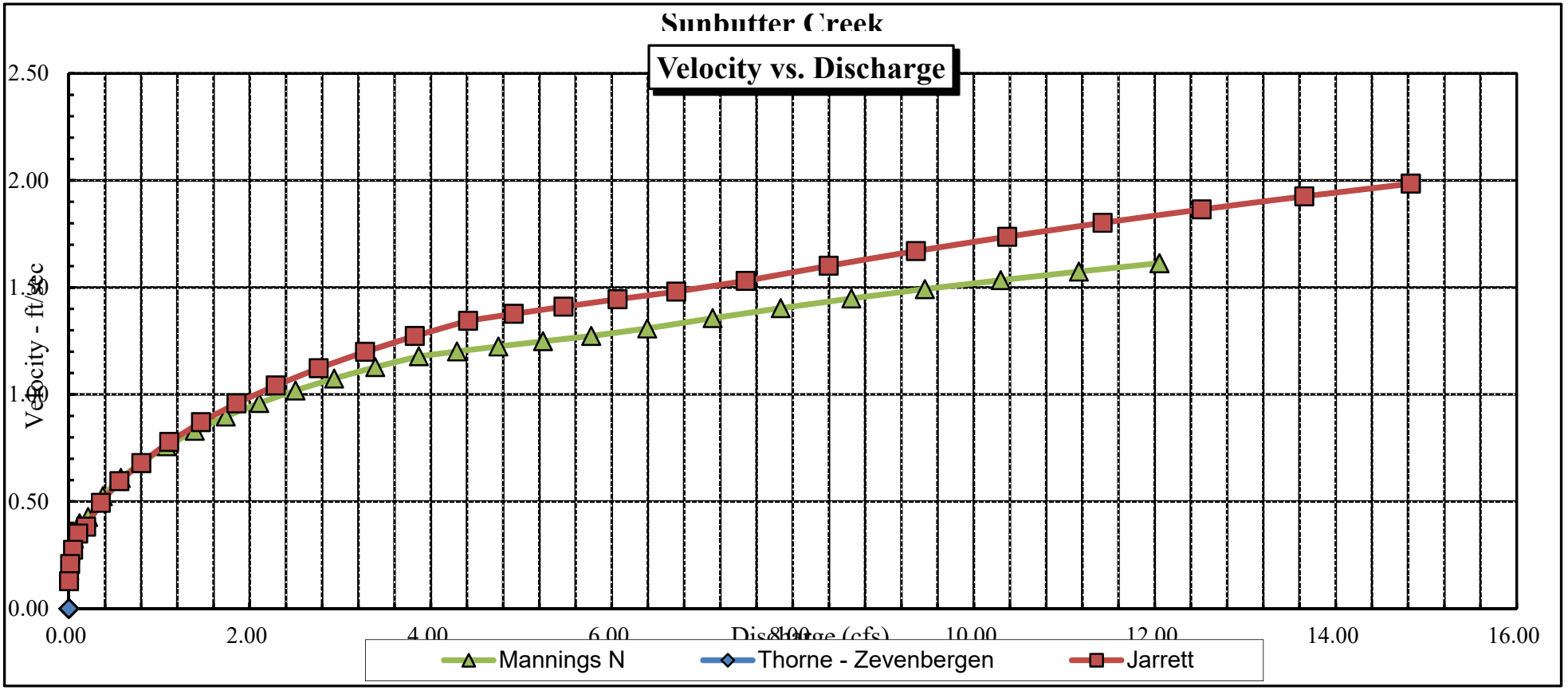
_____

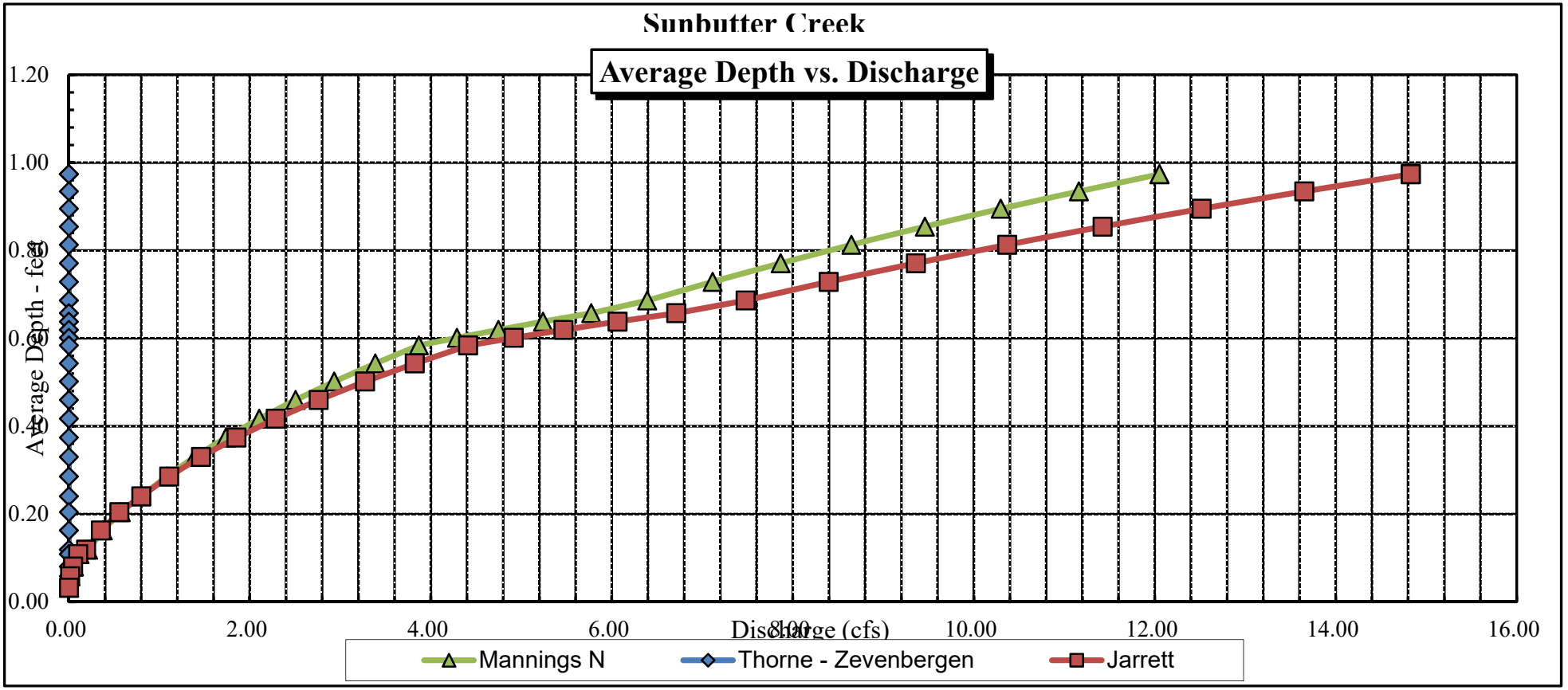
RECOMMENDATION BY: …….. AGENCY…….. DATE:……

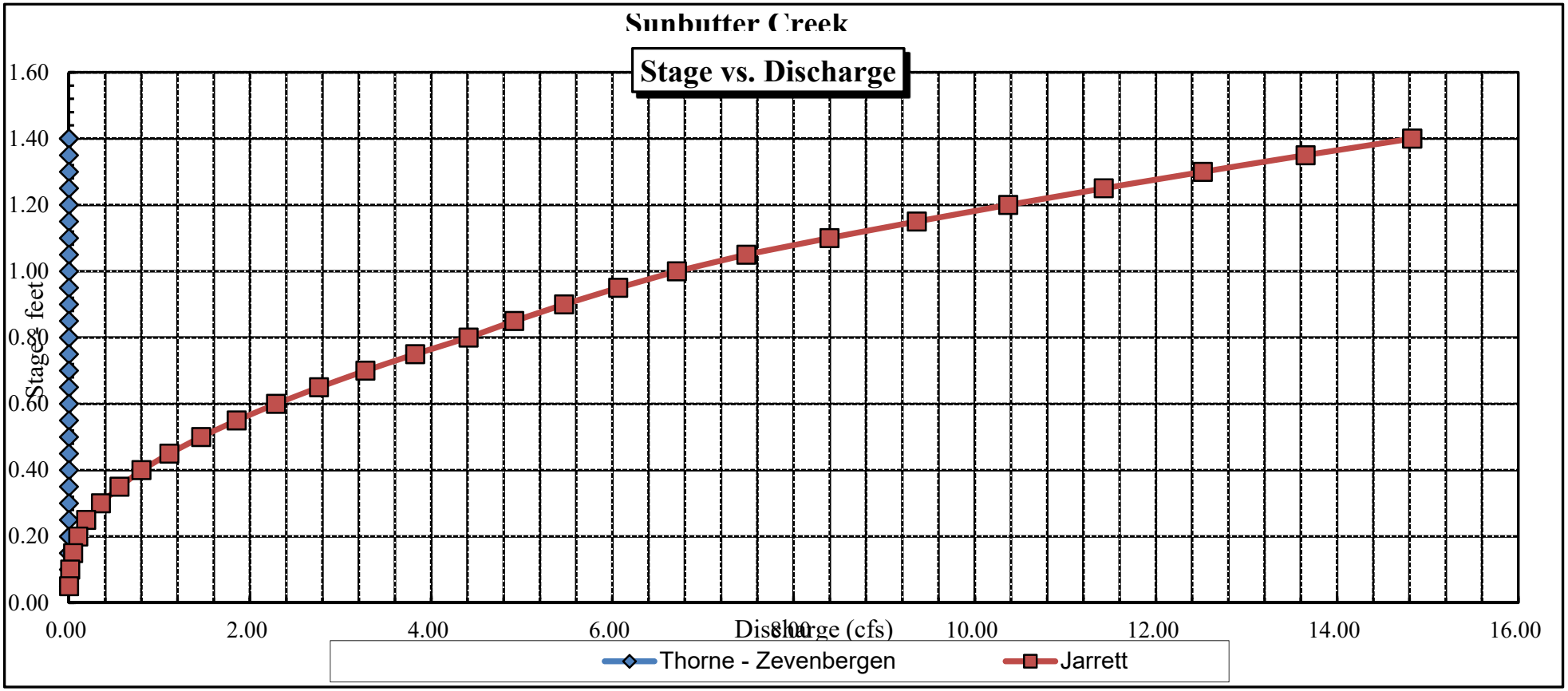
CWCB REVIEW BY: …….. DATE:……


Sunbutter Creek
CROSS SECTION DATA ANALYSIS
RS
G
RW
LW
G
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
VERTICAL DEPTH (FT)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Sunbutter Creek
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
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
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Stage vs. Discharge
Stage - feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Sunbutter Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: At BLM-private boundary						
DATE: 9-27-17	OBSERVERS: R. Smith, E. Scherff					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 33	TOWNSHIP: 3 N/S	RANGE: 87 E/W	PM: 6th	
COUNTY: Rio Blanco	WATERSHED: Williams Fork	WATER DIVISION: 6	DOW WATER CODE: none			
MAP(S): USGS:			40° 11' 7.54" N			
USFS:			107° 10' 29.89" W			

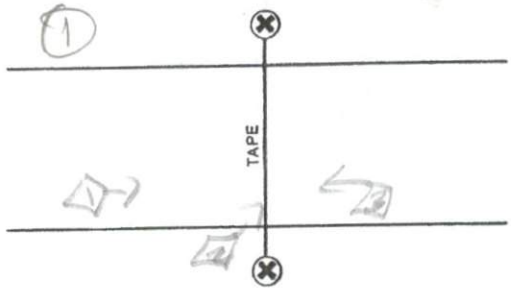
SUPPLEMENTAL DATA

LOG TAPE SECTION SAME AS DISCHARGE SECTION: (YES / NO)	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: suveyed ____ lbs/foot	TAPE TENSION: suveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 1-foot boulders	PHOTOGRAPHS TAKEN: (YES/NO)	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(1) Tape @ Stake LB	0.0	suveyed
(1) Tape @ Stake RB	0.0	suveyed
( ) WS @ Tape LB/RB	0.0	6.25/6.25
( ) WS Upstream	16.8	5.56
( ) WS Downstream	10.0	6.46
SLOPE	0.9 / 21.8 = .041	

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

Dogwood - Alder - Spruce riparian

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Sunbutter Creek | CROSS-SECTION NO.: 1 | DATE: 9-27-17 | SHEET ___ OF ___

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

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		5.15								
G	0.5		5.61								
	1.3		6.07								
LW	1.8		6.25								
	2		6.3	.05				0.02			
	2.2		6.3	.05				0.14			
	2.4		6.35	.1				0.41			
	2.6		6.35	.1				0.85			
	2.8		6.35	.1				0.79			
	3.0		6.40	.15				1.28			
	3.2		6.40	.15				0.80			
	3.4		6.40	.15				1.13			
	3.6		6.40	.15				1.28			
	3.8		6.40	.15				1.29			
	4.0		6.45	.20				0.99			
	4.2		6.45	.20				0.66			
	4.4		6.45	.2				0.25			
	4.6		6.35	.1				0.16			
	4.8		6.3	.05				0			
LW	5.0		6.25								
	6.0		6.06								
	7.0		5.76								
G	8.0		5.55								
LS	9.0		5.40								
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	Sunbutter Creek
XS LOCATION:	At BLM-Private boundary
XS NUMBER:	1
DATE:	9/27/2017
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork
DIVISION:	6
DOW CODE:	none
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.041 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 24

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	RS	0.00	5.15			0.00	0.00	0.00
1	G	0.50	5.61			0.00	0.00	0.00
		1.30	6.07			0.00	0.00	0.00
	RW	1.80	6.25	0.00	0.00	0.00	0.00	0.00
		2.00	6.30	0.05	0.02	0.01	0.00	6.25
		2.20	6.30	0.05	0.14	0.01	0.00	6.25
		2.40	6.35	0.10	0.41	0.02	0.01	6.25
		2.60	6.35	0.10	0.85	0.02	0.02	6.25
		2.80	6.35	0.10	0.79	0.02	0.02	6.25
		3.00	6.40	0.15	1.28	0.03	0.04	6.25
		3.20	6.40	0.15	0.80	0.03	0.02	6.25
		3.40	6.40	0.15	1.13	0.03	0.03	6.25
		3.60	6.40	0.15	1.28	0.03	0.04	6.25
		3.80	6.40	0.15	1.29	0.03	0.04	6.25
		4.00	6.45	0.20	0.99	0.04	0.04	6.25
		4.20	6.45	0.20	0.66	0.04	0.03	6.25
		4.40	6.45	0.20	0.25	0.04	0.01	6.25
		4.60	6.35	0.10	0.16	0.02	0.00	6.25
		4.80	6.30	0.05	0.00	0.01	0.00	6.25
	LW	5.00	6.25	0.00	0.00	0.00	0.00	0.00
		6.00	6.06			0.00	0.00	0.00
		7.00	5.76			0.00	0.00	0.00
1	G	8.00	5.55			0.00	0.00	0.00
	LS	9.00	5.40			0.00	0.00	0.00

Totals	0.38	0.30

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

LOCATION INFORMATION

STREAM NAME:	Sunbutter Creek
XS LOCATION:	At BLM-Private boundary
XS NUMBER:	1
DATE:	27-Sep-17
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork
DIVISION:	6
DOW CODE:	none
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:	0.041

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

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

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1

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
	RS	0.00	5.15			0.00		0.00	0.00	0.0%
1	G	0.50	5.61			0.00		0.00	0.00	0.0%
		1.30	6.07			0.00		0.00	0.00	0.0%
	RW	1.80	6.25	0.00	0.00	0.00		0.00	0.00	0.0%
		2.00	6.30	0.05	0.02	0.21	0.05	0.01	0.00	0.1%
		2.20	6.30	0.05	0.14	0.20	0.05	0.01	0.00	0.5%
		2.40	6.35	0.10	0.41	0.21	0.10	0.02	0.01	2.8%
		2.60	6.35	0.10	0.85	0.20	0.10	0.02	0.02	5.8%
		2.80	6.35	0.10	0.79	0.20	0.10	0.02	0.02	5.4%
		3.00	6.40	0.15	1.28	0.21	0.15	0.03	0.04	13.0%
		3.20	6.40	0.15	0.80	0.20	0.15	0.03	0.02	8.1%
		3.40	6.40	0.15	1.13	0.20	0.15	0.03	0.03	11.5%
		3.60	6.40	0.15	1.28	0.20	0.15	0.03	0.04	13.0%
		3.80	6.40	0.15	1.29	0.20	0.15	0.03	0.04	13.1%
		4.00	6.45	0.20	0.99	0.21	0.20	0.04	0.04	13.4%
		4.20	6.45	0.20	0.66	0.20	0.20	0.04	0.03	8.9%
		4.40	6.45	0.20	0.25	0.20	0.20	0.04	0.01	3.4%
		4.60	6.35	0.10	0.16	0.22	0.10	0.02	0.00	1.1%
		4.80	6.30	0.05	0.00	0.21	0.05	0.01	0.00	0.0%
	LW	5.00	6.25	0.00	0.00	0.21		0.00	0.00	0.0%
		6.00	6.06			0.00		0.00	0.00	0.0%
		7.00	5.76			0.00		0.00	0.00	0.0%
1	G	8.00	5.55			0.00		0.00	0.00	0.0%
	LS	9.00	5.40			0.00		0.00	0.00	0.0%
	TOTALS ----------					3.26	0.2 (Max.)	0.38	0.30	100.0%

Manning's n = 0.0924
Hydraulic Radius= 0.11654517

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.38	0.38	0.0%
6.00	0.38	1.43	275.1%
6.02	0.38	1.33	248.9%
6.04	0.38	1.23	223.3%
6.06	0.38	1.13	198.2%
6.08	0.38	1.04	173.7%
6.10	0.38	0.95	150.1%
6.12	0.38	0.86	127.4%
6.14	0.38	0.78	105.4%
6.16	0.38	0.70	84.4%
6.18	0.38	0.62	64.1%
6.20	0.38	0.55	44.8%
6.21	0.38	0.51	35.4%
6.22	0.38	0.48	26.2%
6.23	0.38	0.45	17.3%
6.24	0.38	0.41	8.5%
6.25	0.38	0.38	0.0%
6.26	0.38	0.35	-8.3%
6.27	0.38	0.32	-16.4%
6.28	0.38	0.29	-24.3%
6.29	0.38	0.26	-32.0%
6.30	0.38	0.23	-39.5%
6.32	0.38	0.18	-52.7%
6.34	0.38	0.13	-65.2%
6.36	0.38	0.09	-75.7%
6.38	0.38	0.06	-84.6%
6.40	0.38	0.03	-92.8%
6.42	0.38	0.01	-96.1%
6.44	0.38	0.00	-98.9%
6.46	0.38	0.00	-100.0%
6.48	0.38	0.00	-100.0%
6.50	0.38	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 6.250

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-Private 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	5.61	7.21	0.52	0.84	3.79	7.51	100.0%	0.50	7.81	2.06
	5.65	6.95	0.50	0.80	3.50	7.23	96.3%	0.48	7.03	2.01
	5.70	6.63	0.48	0.75	3.16	6.89	91.8%	0.46	6.13	1.94
	5.75	6.30	0.45	0.70	2.84	6.54	87.2%	0.43	5.30	1.87
	5.80	6.04	0.42	0.65	2.53	6.26	83.3%	0.40	4.51	1.78
	5.85	5.78	0.39	0.60	2.24	5.98	79.7%	0.37	3.78	1.69
	5.90	5.53	0.35	0.55	1.95	5.71	76.0%	0.34	3.11	1.59
	5.95	5.28	0.32	0.50	1.68	5.43	72.4%	0.31	2.51	1.49
	6.00	5.02	0.28	0.45	1.43	5.16	68.7%	0.28	1.97	1.38
	6.05	4.77	0.25	0.40	1.18	4.88	65.1%	0.24	1.49	1.26
	6.10	4.41	0.22	0.35	0.95	4.51	60.0%	0.21	1.10	1.15
	6.15	4.00	0.18	0.30	0.74	4.09	54.5%	0.18	0.77	1.04
	6.20	3.60	0.15	0.25	0.55	3.68	49.0%	0.15	0.50	0.92
WL	6.25	3.20	0.12	0.20	0.38	3.26	43.4%	0.12	0.30	0.78
	6.30	2.60	0.09	0.15	0.23	2.65	35.3%	0.09	0.15	0.64
	6.35	1.80	0.06	0.10	0.11	1.84	24.5%	0.06	0.05	0.50
	6.40	0.70	0.04	0.05	0.03	0.72	9.6%	0.04	0.01	0.37
	6.45	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Sunbutter Creek
XS LOCATION: At BLM-Private boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.30	cfs
CALCULATED FLOW (Qc)=	0.30	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.25	ft
CALCULATED WATERLINE (WLc)=	6.25	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.20	ft
MAX CALCULATED DEPTH (Dc)=	0.20	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.78	ft/sec
MANNING'S N=	0.092	
SLOPE=	0.041	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.7	cfs

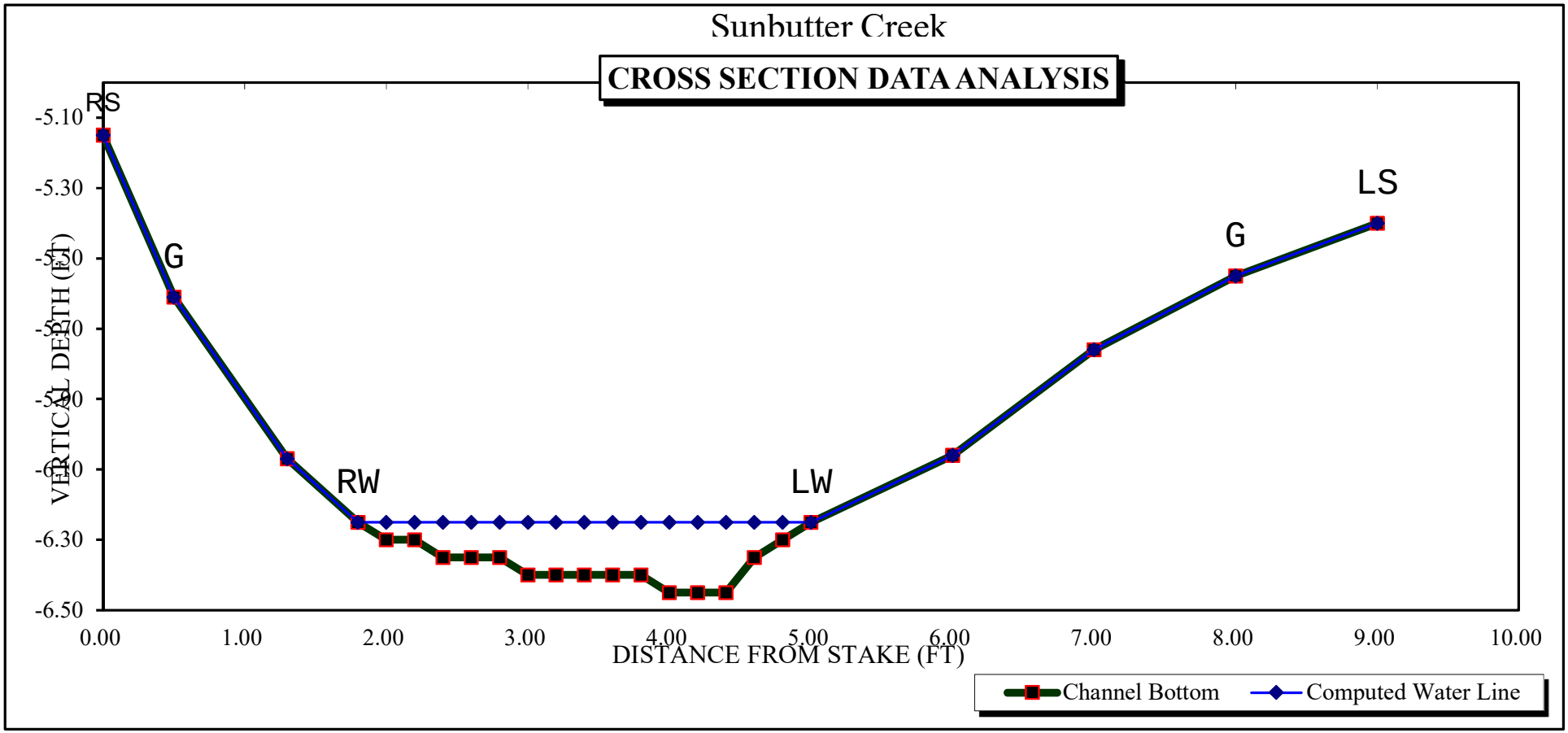
RECOMMENDED INSTREAM FLOW:
=============================

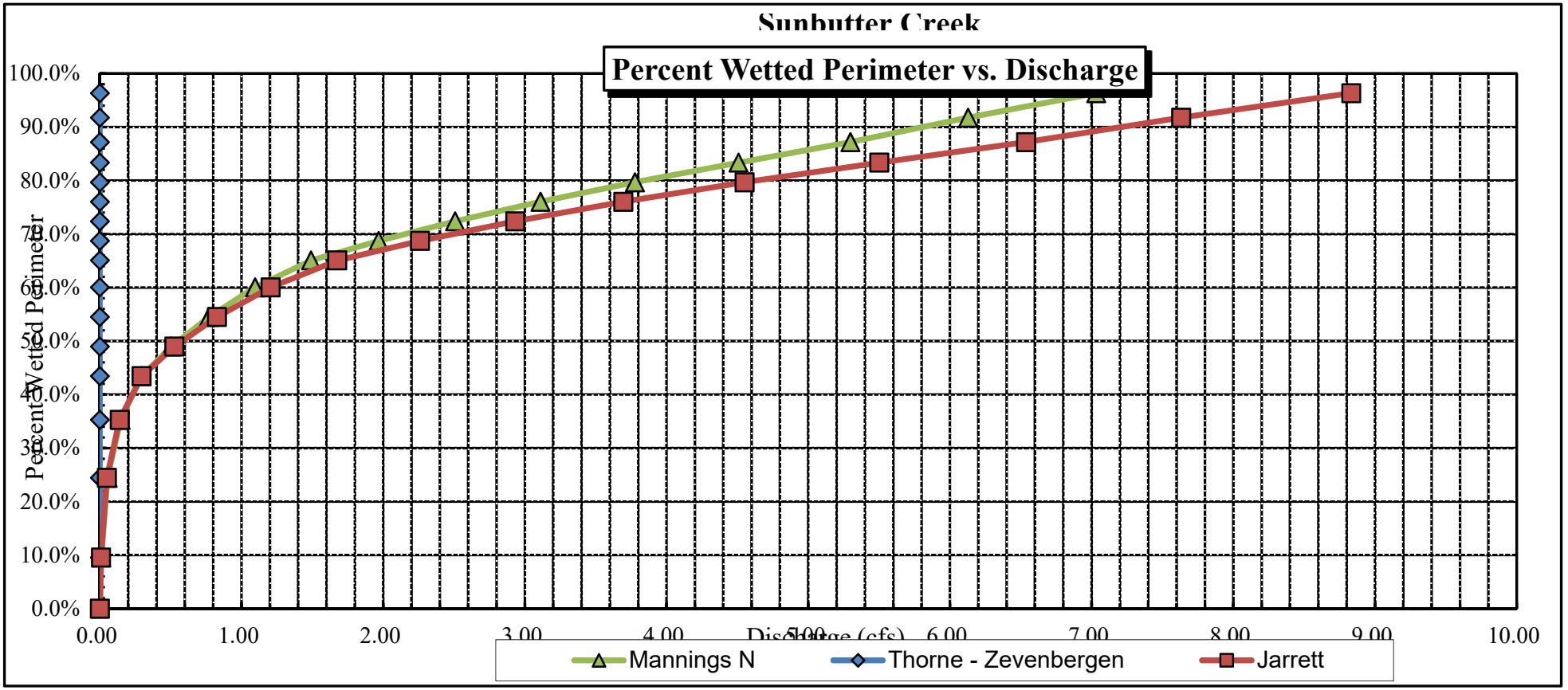
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

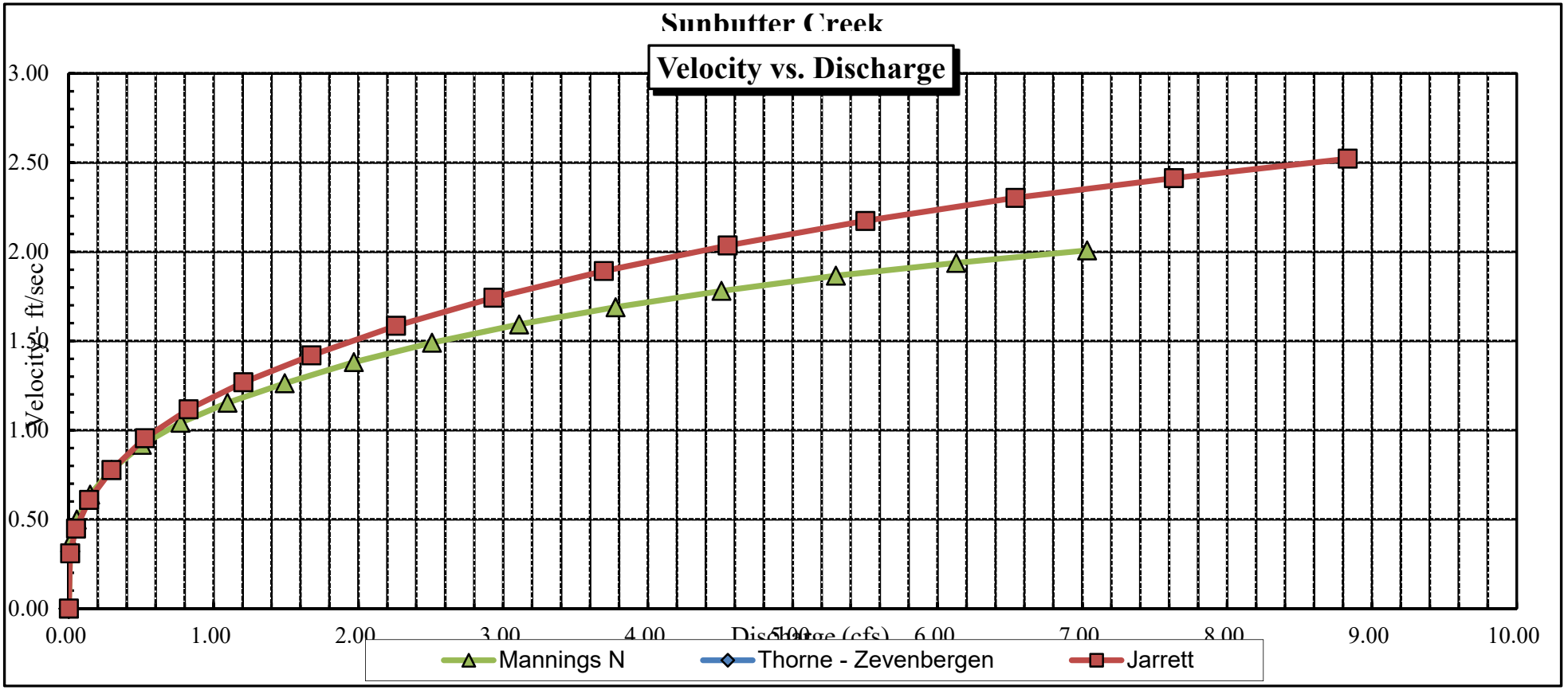
RATIONALE FOR RECOMMENDATION:
=============================

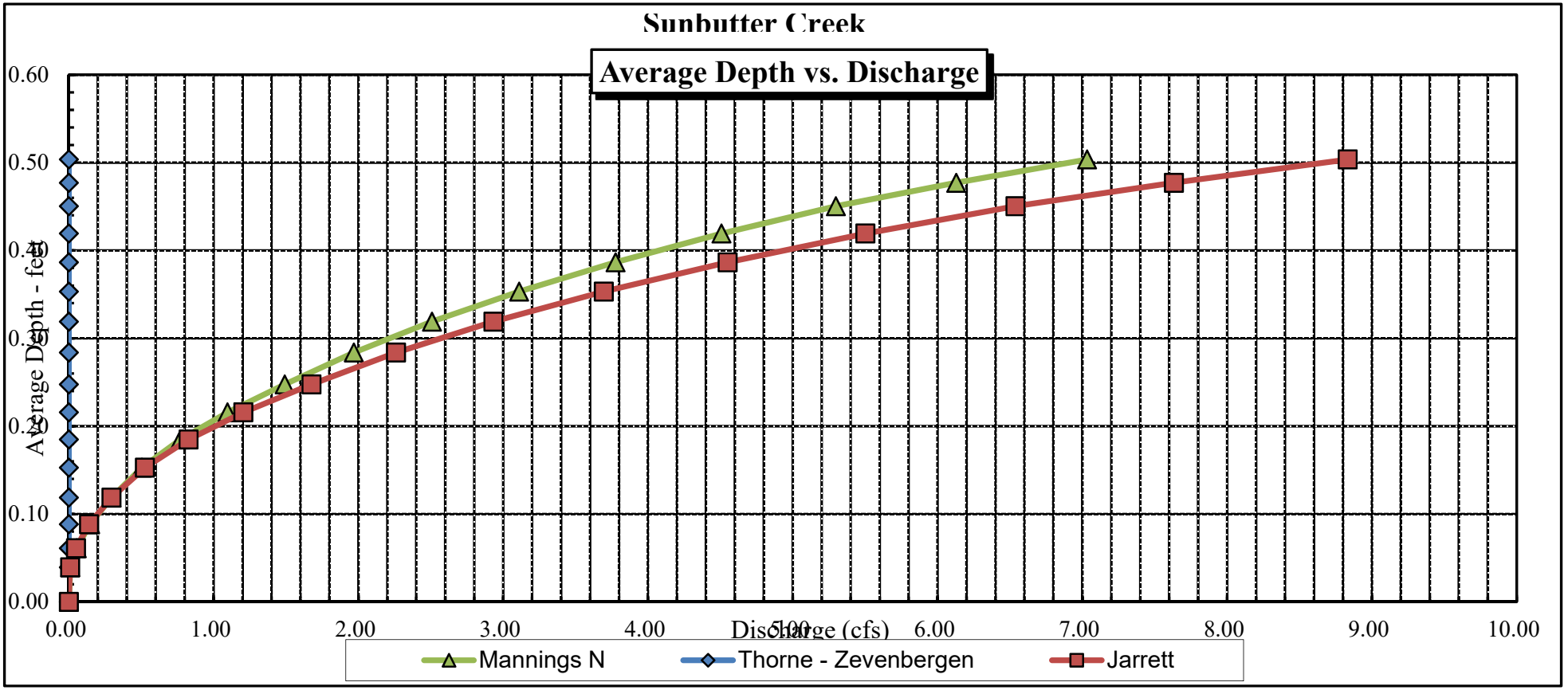
RECOMMENDATION BY: ………………...………..……............................... AGENCY..………………………......……...…....…........ DATE:.......…...…......……………

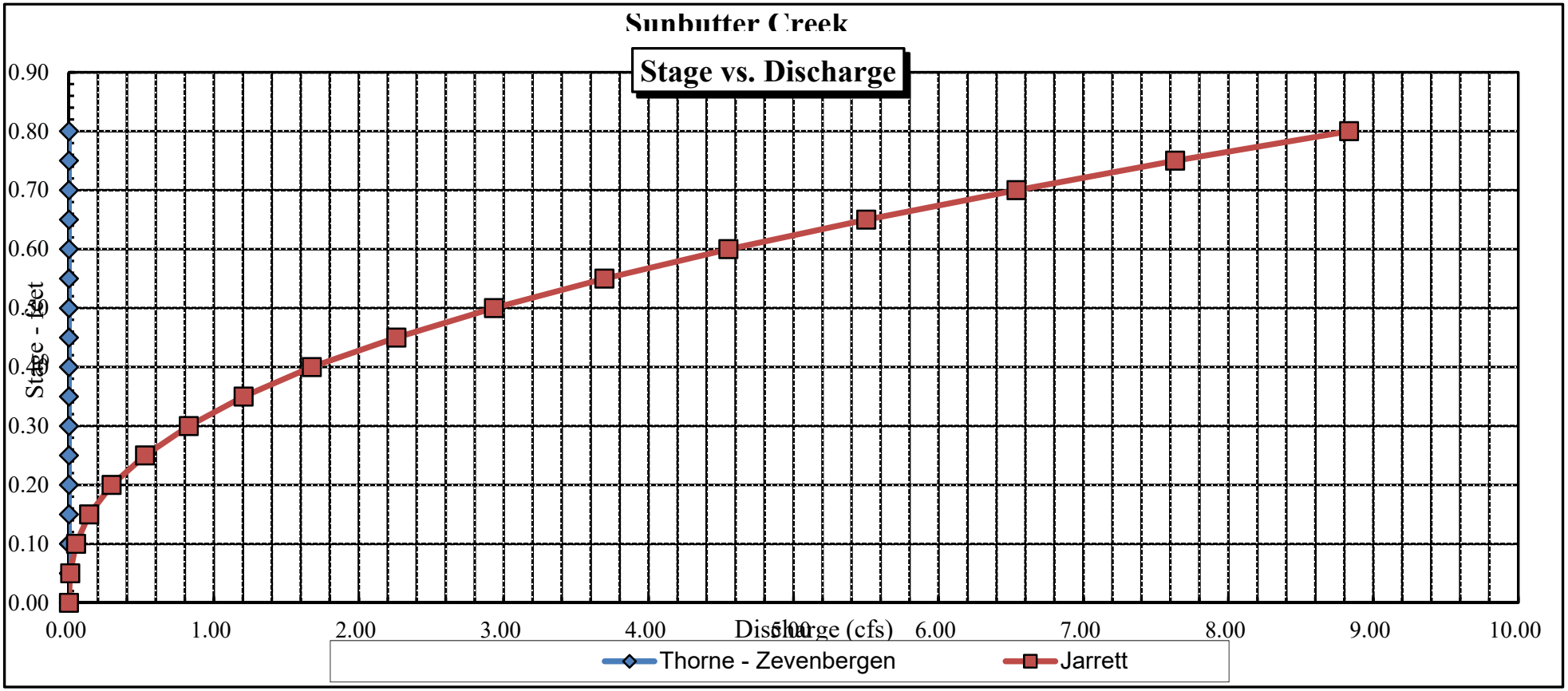
CWCB REVIEW BY: ..…………………………....…………………………………………………...….............. DATE:.................………………...…


Sunbutter Creek
CROSS SECTION DATA ANALYSIS
RS
G
RW
LW
G
LS
-5.10
-5.30
-6.30
-6.50
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
VERTICAL DEPTH (FT)
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Sunbutter 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
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Velocity vs. Discharge
Velocity - ft/sec
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Average Depth vs. Discharge
Average Depth - feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Stage vs. Discharge
Stage - feet
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO WATER CONSERVATION BOARD

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Sunbutter Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 150' upstream from BLM-private boundary						
DATE: 9-27-17	OBSERVERS: R. Smith, E. Schertz					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 33	TOWNSHIP: 3(N)/S	RANGE: 87 E/W	PM: Sixth	
COUNTY: Rio Blanco	WATERSHED: Williams Fork	WATER DIVISION: 6	DOW WATER CODE: none			
MAP(S): USGS:			40° 11' 7.22" N			
USFS:			107° 10' 28.56" W			

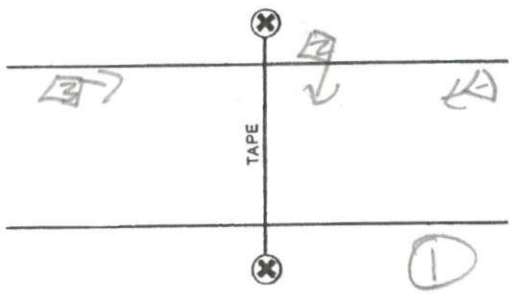
SUPPLEMENTAL DATA

STAGE 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 1-foot boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(2) Tape @ Stake LB	0.0	surveyed
(2) Tape @ Stake RB	0.0	surveyed
( ) WS @ Tape LB/RB	0.0	5.45/5.45
( ) WS Upstream	7.2	5.34
( ) WS Downstream	11.1	5.79
SLOPE	0.45 / 18.3 = .025	

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

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Sunbutter | CROSS-SECTION NO.: 2 | DATE: 9-27-17 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 1:00 pm.

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		3.91								
	1.0		4.33								
G	1.5		4.78								
	2.5		4.77								
	3.4		5.36								
RW	4.0		5.45								
	4.2		5.5	0.05				0			
	4.4		5.5	0.05				0.03			
	4.6		5.55	0.10				0.14			
	4.8		5.60	0.15				0.08			
	5.0		5.65	0.20				0.07			
	5.2		5.65	0.20				0.28			
	5.4		5.65	0.20				0.65			
	5.6		5.60	0.15				0.73			
	5.8		5.60	0.15				0.71			
	6.0		5.65	0.20				1.02			
	6.2		5.7	0.25				0.85			
	6.4		5.65	0.20				1.08			
	6.6		5.65	0.20				1.20			
	6.8		5.65	0.20				0.98			
	7.0		5.60	0.15				0.48			
	7.2		5.60	0.15				0.40			
LW	7.3		5.45								
	8.1		5.29								
G	8.7		4.97								
	8.9		4.46								
	9.3		4.83								
LS	10.0		3.70								
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	Sunbutter Creek
XS LOCATION:	150' upstr fr BLM-private boundary
XS NUMBER:	2
DATE:	9/27/2017
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	T3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork
DIVISION:	6
DOW CODE:	none
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.025 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 28

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
1	RS	0.00	3.91			0.00	0.00	0.00
		1.00	4.33			0.00	0.00	0.00
	G	1.50	4.78			0.00	0.00	0.00
		2.50	4.77			0.00	0.00	0.00
	RW	3.40	5.36			0.00	0.00	0.00
		4.00	5.45	0.00	0.00	0.00	0.00	0.00
		4.20	5.50	0.05	0.00	0.01	0.00	5.45
		4.40	5.50	0.05	0.03	0.01	0.00	5.45
		4.60	5.55	0.10	0.14	0.02	0.00	5.45
		4.80	5.60	0.15	0.08	0.03	0.00	5.45
		5.00	5.65	0.20	0.07	0.04	0.00	5.45
		5.20	5.65	0.20	0.28	0.04	0.01	5.45
		5.40	5.65	0.20	0.65	0.04	0.03	5.45
		5.60	5.60	0.15	0.73	0.03	0.02	5.45
		5.80	5.60	0.15	0.71	0.03	0.02	5.45
		6.00	5.65	0.20	1.02	0.04	0.04	5.45
		6.20	5.70	0.25	0.85	0.05	0.04	5.45
		6.40	5.65	0.20	1.08	0.04	0.04	5.45
		6.60	5.65	0.20	1.20	0.04	0.05	5.45
		6.80	5.65	0.20	0.98	0.04	0.04	5.45
		7.00	5.60	0.15	0.48	0.03	0.01	5.45
		7.20	5.60	0.15	0.40	0.02	0.01	5.45
	LW	7.30	5.45	0.00	0.00	0.00	0.00	0.00
		8.10	5.29			0.00	0.00	0.00
1	G	8.70	4.97			0.00	0.00	0.00
		8.80	4.46			0.00	0.00	0.00
		9.30	4.83			0.00	0.00	0.00
	LS	10.00	3.70			0.00	0.00	0.00
					Totals	0.51	0.33	

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

LOCATION INFORMATION

STREAM NAME:	Sunbutter Creek
XS LOCATION:	150' upstr fr BLM-private boundary
XS NUMBER:	2
DATE:	27-Sep-17
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	SW
SECTION:	33
TWP:	T3N
RANGE:	87W
PM:	Sixth
COUNTY:	Rio Blanco
WATERSHED:	Williams Fork
DIVISION:	6
DOW CODE:	none
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:	0.025

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

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

STREAM NAME: Sunbutter Creek
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XS NUMBER: 2

DATA POINTS= 28

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	RS	0.00	3.91			0.00		0.00	0.00	0.0%
		1.00	4.33			0.00		0.00	0.00	0.0%
	G	1.50	4.78			0.00		0.00	0.00	0.0%
		2.50	4.77			0.00		0.00	0.00	0.0%
	RW	3.40	5.36			0.00		0.00	0.00	0.0%
		4.00	5.45	0.00	0.00	0.00		0.00	0.00	0.0%
		4.20	5.50	0.05	0.00	0.21	0.05	0.01	0.00	0.0%
		4.40	5.50	0.05	0.03	0.20	0.05	0.01	0.00	0.1%
		4.60	5.55	0.10	0.14	0.21	0.10	0.02	0.00	0.9%
		4.80	5.60	0.15	0.08	0.21	0.15	0.03	0.00	0.7%
		5.00	5.65	0.20	0.07	0.21	0.20	0.04	0.00	0.9%
		5.20	5.65	0.20	0.28	0.20	0.20	0.04	0.01	3.4%
		5.40	5.65	0.20	0.65	0.20	0.20	0.04	0.03	8.0%
		5.60	5.60	0.15	0.73	0.21	0.15	0.03	0.02	6.7%
		5.80	5.60	0.15	0.71	0.20	0.15	0.03	0.02	6.5%
		6.00	5.65	0.20	1.02	0.21	0.20	0.04	0.04	12.5%
		6.20	5.70	0.25	0.85	0.21	0.25	0.05	0.04	13.0%
		6.40	5.65	0.20	1.08	0.21	0.20	0.04	0.04	13.3%
		6.60	5.65	0.20	1.20	0.20	0.20	0.04	0.05	14.7%
		6.80	5.65	0.20	0.98	0.20	0.20	0.04	0.04	12.0%
		7.00	5.60	0.15	0.48	0.21	0.15	0.03	0.01	4.4%
		7.20	5.60	0.15	0.40	0.20	0.15	0.02	0.01	2.8%
	LW	7.30	5.45	0.00	0.00	0.18		0.00	0.00	0.0%
		8.10	5.29			0.00		0.00	0.00	0.0%
1	G	8.70	4.97			0.00		0.00	0.00	0.0%
		8.80	4.46			0.00		0.00	0.00	0.0%
		9.30	4.83			0.00		0.00	0.00	0.0%
	LS	10.00	3.70			0.00		0.00	0.00	0.0%
	TOTALS ----------					3.44	0.25 (Max.)	0.51	0.33	100.0%

Manning's n = 0.1040
Hydraulic Radius= 0.1491701

STREAM NAME: Sunbutter Creek
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XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.51	0.51	0.0%
5.20	0.51	1.62	216.8%
5.22	0.51	1.52	197.0%
5.24	0.51	1.42	177.4%
5.26	0.51	1.32	158.1%
5.28	0.51	1.23	139.1%
5.30	0.51	1.13	120.4%
5.32	0.51	1.04	102.1%
5.34	0.51	0.95	84.4%
5.36	0.51	0.86	67.2%
5.38	0.51	0.77	50.7%
5.40	0.51	0.69	35.0%
5.41	0.51	0.65	27.6%
5.42	0.51	0.62	20.3%
5.43	0.51	0.58	13.3%
5.44	0.51	0.55	6.6%
5.45	0.51	0.51	0.0%
5.46	0.51	0.48	-6.4%
5.47	0.51	0.45	-12.7%
5.48	0.51	0.42	-18.9%
5.49	0.51	0.38	-25.0%
5.50	0.51	0.35	-31.1%
5.52	0.51	0.30	-42.1%
5.54	0.51	0.24	-52.7%
5.56	0.51	0.19	-63.0%
5.58	0.51	0.14	-72.9%
5.60	0.51	0.09	-82.4%
5.62	0.51	0.05	-89.6%
5.64	0.51	0.02	-95.6%
5.66	0.51	0.01	-98.8%
5.68	0.51	0.00	-99.7%
5.70	0.51	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 5.450

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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	4.97	5.89	0.49	0.73	2.89	6.25	100.0%	0.46	3.91	1.35
	5.00	5.79	0.47	0.70	2.71	6.13	98.1%	0.44	3.56	1.31
	5.05	5.62	0.43	0.65	2.43	5.93	94.9%	0.41	3.03	1.25
	5.10	5.45	0.39	0.60	2.15	5.74	91.8%	0.38	2.53	1.18
	5.15	5.28	0.36	0.55	1.88	5.54	88.6%	0.34	2.07	1.10
	5.20	5.11	0.32	0.50	1.62	5.34	85.5%	0.30	1.66	1.02
	5.25	4.94	0.28	0.45	1.37	5.14	82.3%	0.27	1.29	0.94
	5.30	4.74	0.24	0.40	1.13	4.92	78.7%	0.23	0.96	0.85
	5.35	4.42	0.20	0.35	0.90	4.57	73.1%	0.20	0.69	0.77
	5.40	3.88	0.18	0.30	0.69	4.03	64.4%	0.17	0.48	0.70
WL	5.45	3.30	0.16	0.25	0.51	3.44	55.0%	0.15	0.33	0.64
	5.50	2.87	0.12	0.20	0.35	2.97	47.5%	0.12	0.19	0.55
	5.55	2.63	0.08	0.15	0.22	2.70	43.3%	0.08	0.09	0.42
	5.60	2.00	0.05	0.10	0.09	2.04	32.6%	0.04	0.03	0.28
	5.65	0.40	0.03	0.05	0.01	0.41	6.6%	0.02	0.00	0.19

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SUMMARY SHEET

MEASURED FLOW (Qm)=	0.33	cfs
CALCULATED FLOW (Qc)=	0.33	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.45	ft
CALCULATED WATERLINE (WLc)=	5.45	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.25	ft
MAX CALCULATED DEPTH (Dc)=	0.25	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.64	ft/sec
MANNING'S N=	0.104	
SLOPE=	0.025	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.8	cfs

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

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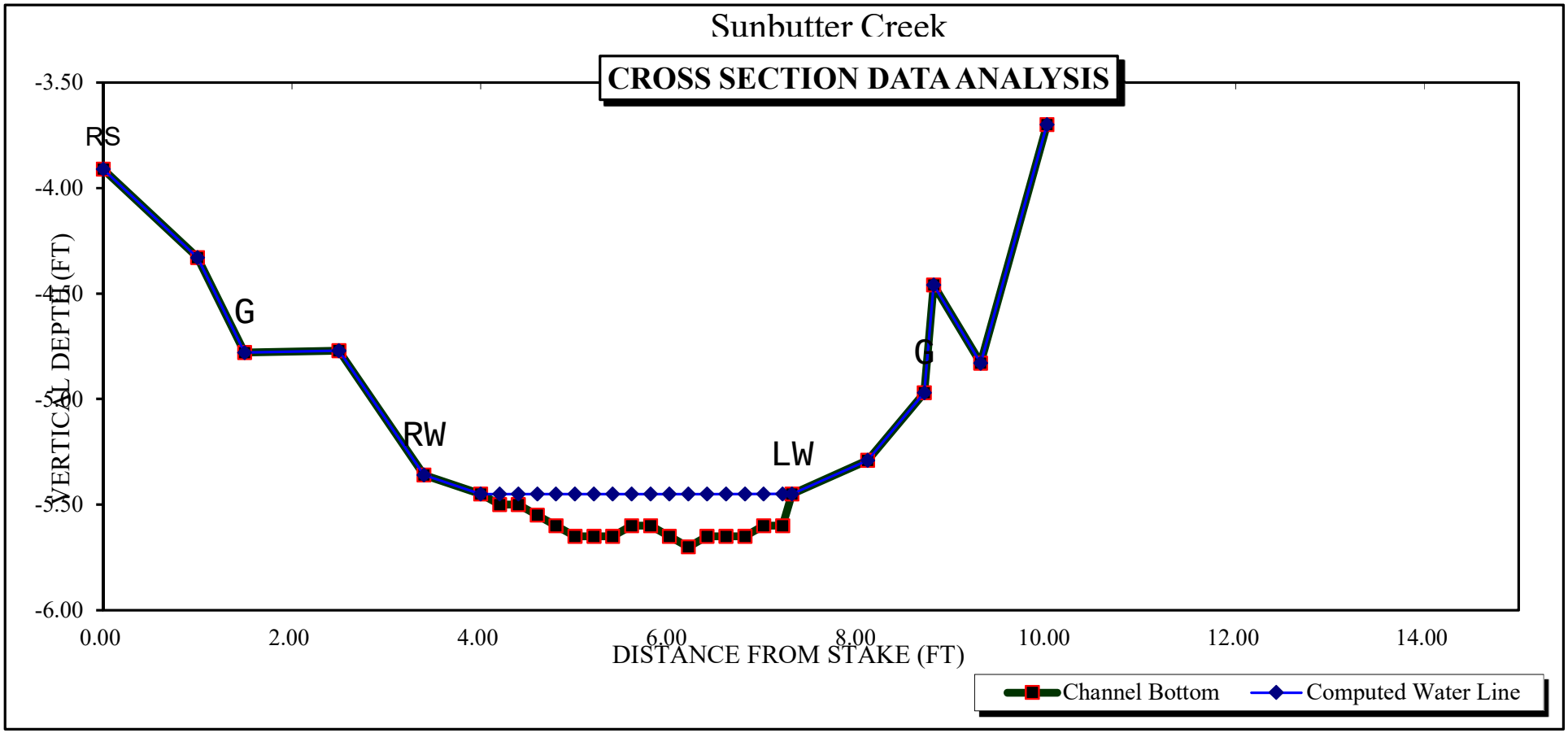
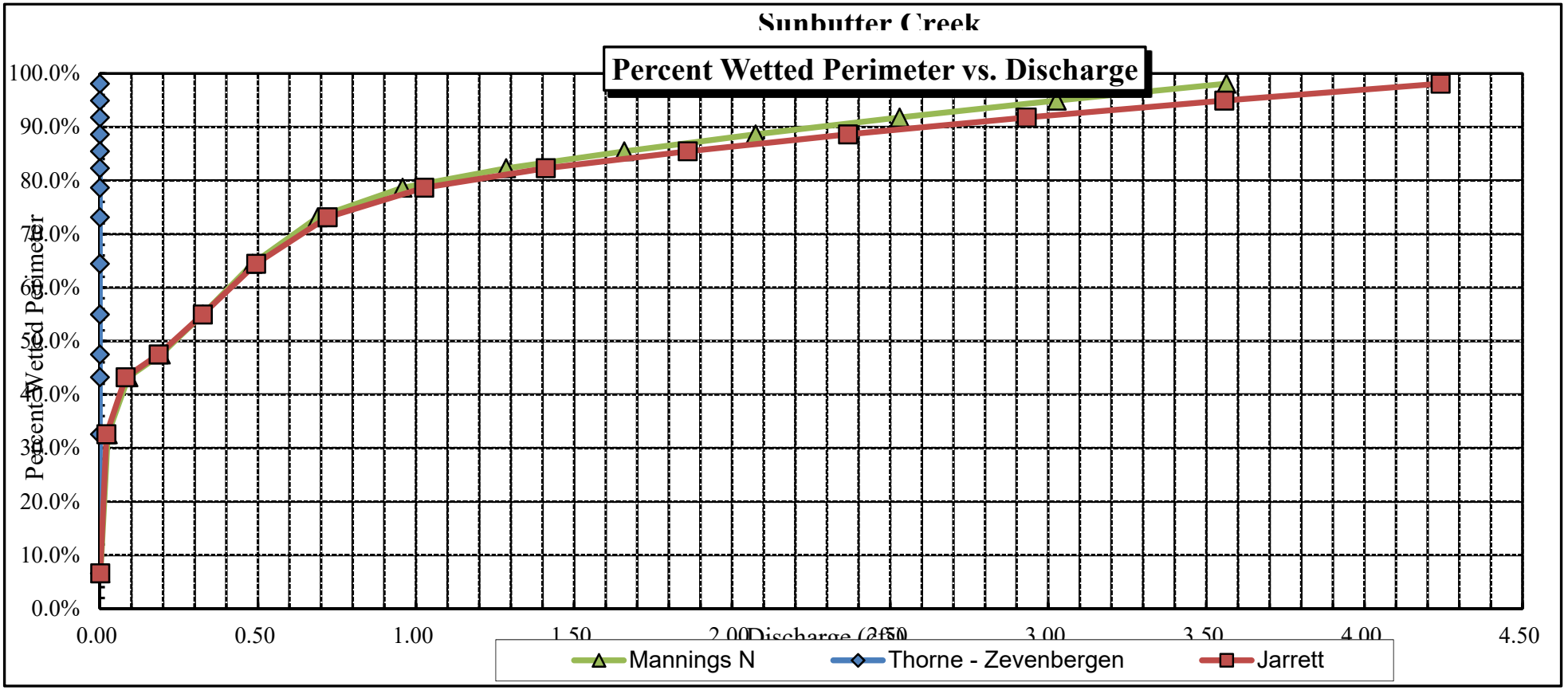
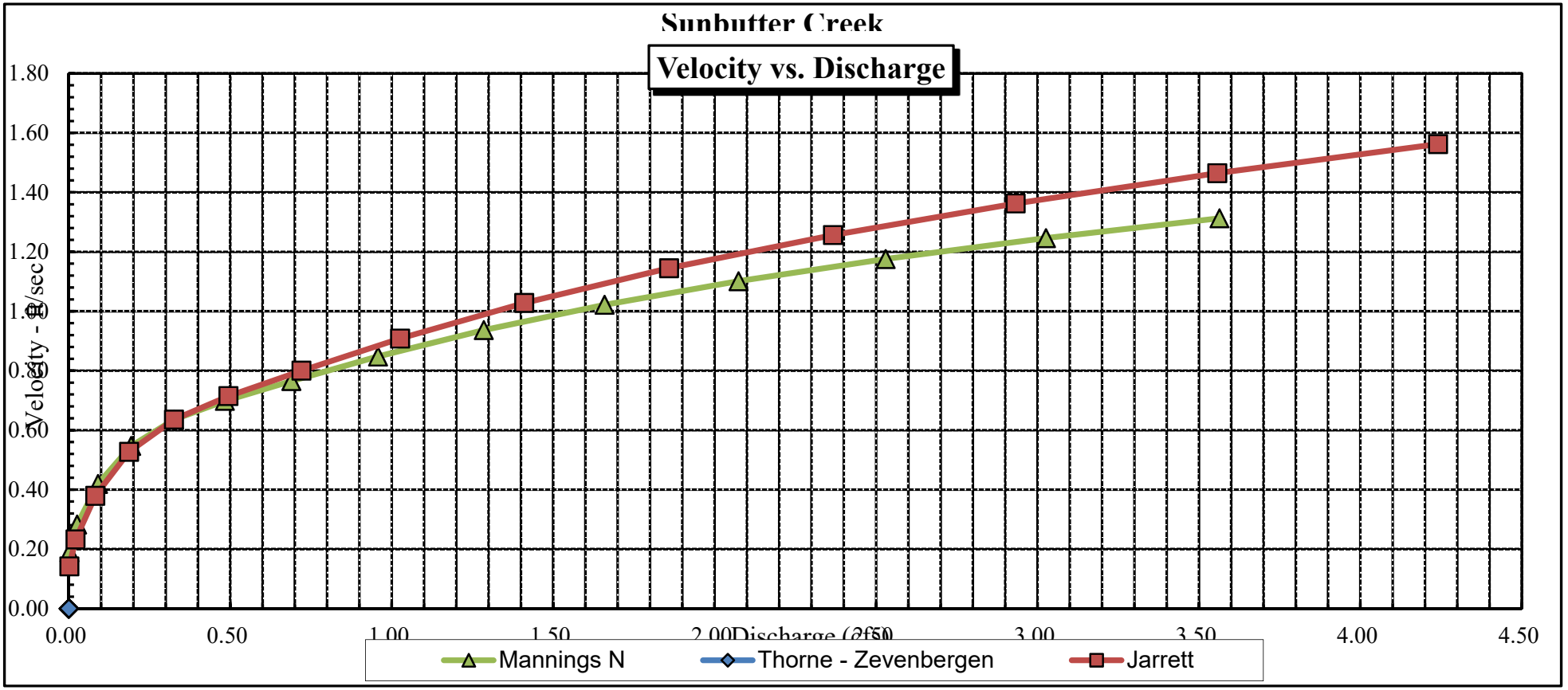
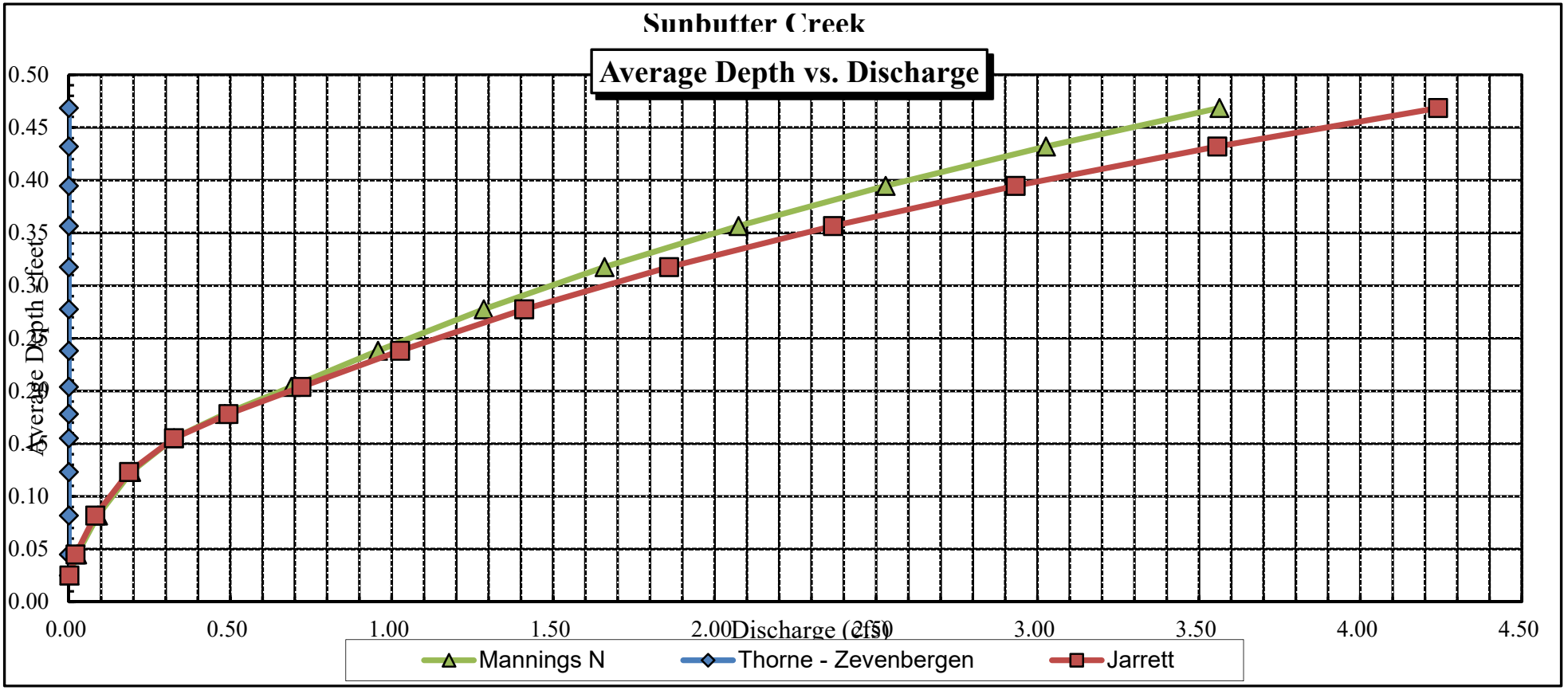
RECOMMENDATION BY: ……………………………………………………… AGENCY……………………………………………… DATE:………………………

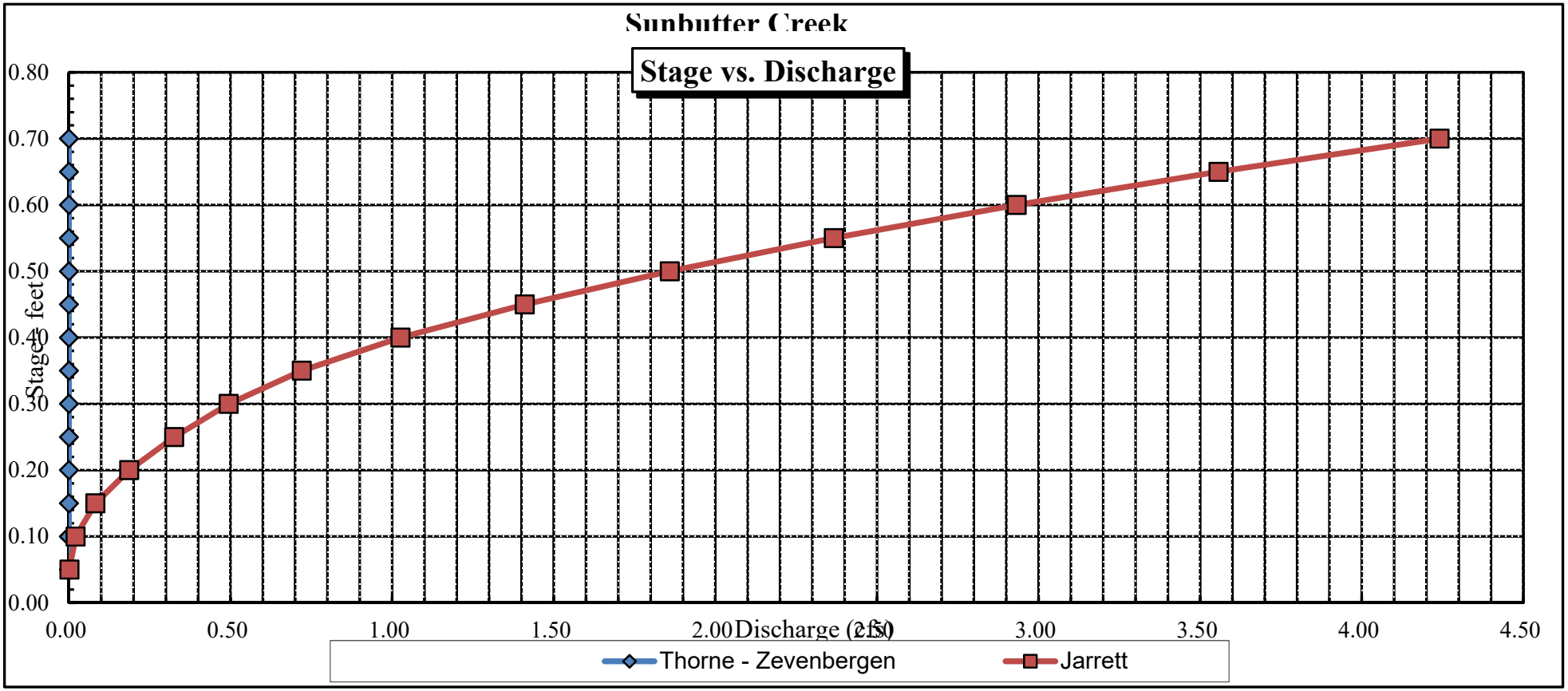
CWCB REVIEW BY: ……… DATE:………………………


Sunbutter Creek
CROSS SECTION DATA ANALYSIS
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
VERTICAL DEPTH (FT)
RS
G
RW
LW
G
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


Sunbutter 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
0.50
1.00
1.50
2.00
3.00
3.50
4.00
4.50
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Velocity vs. Discharge
1.80
1.60
1.40
1.20
0.60
0.40
0.20
0.00
0.00
0.50
4.00
4.50
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Average Depth vs. Discharge
Average Depth (feet)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Sunbutter Creek
Stage vs. Discharge
Stage, feet
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Discharge Measurment Field Visit Data Report *(Filters: Name begins with bunker; Processing Status = Moving Forward;)*

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
6	Bunker Creek		20/6/A-003	07/30/2019	UTMx: 314933 UTMy: 4450603	Sunbutter Creek at BLM boundary near middle of segment	1.0133	1	F	

Discharge Measurement Summary

File Information

File name	Sunbutter Cr_20190730-101254.ft
Start date and time	7/30/2019 9:52 AM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	7/30/2019 9:54:06 AM	End time	7/30/2019 10:11:40 AM
# Stations	17	Avg interval	40
Mean depth	0.352 ft		
Mean velocity	0.5327 ft/s	Total width	5.400 ft
Mean SNR	49 dB	Total area	1.9020 ft²
Mean temp	49.841 °F	Total discharge	1.0133 ft³/s

System Information

Sensor type	Top Setting
Handheld serial number	FT2H1747037
Probe serial number	FT2P1747048
Probe firmware	1.23
Handheld software	1.4

Site Details

Site name	Unnamed trib to Bunker Creek
Site number	001
Operator(s)	JEL
Comment	Spot meas

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.6%	8.7%
Velocity	1.3%	10.1%
Width	0.2%	0.2%
Method	2.8%	
# Stations	3.0%	
Overall	4.5%	13.4%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings

Station discharge caution	5.00	%
Station discharge warning	10.00	%
Maximum depth change	50.00	%
Maximum spacing change	100.00	%

Summary overview

No changes were made to this file
Quality control warnings

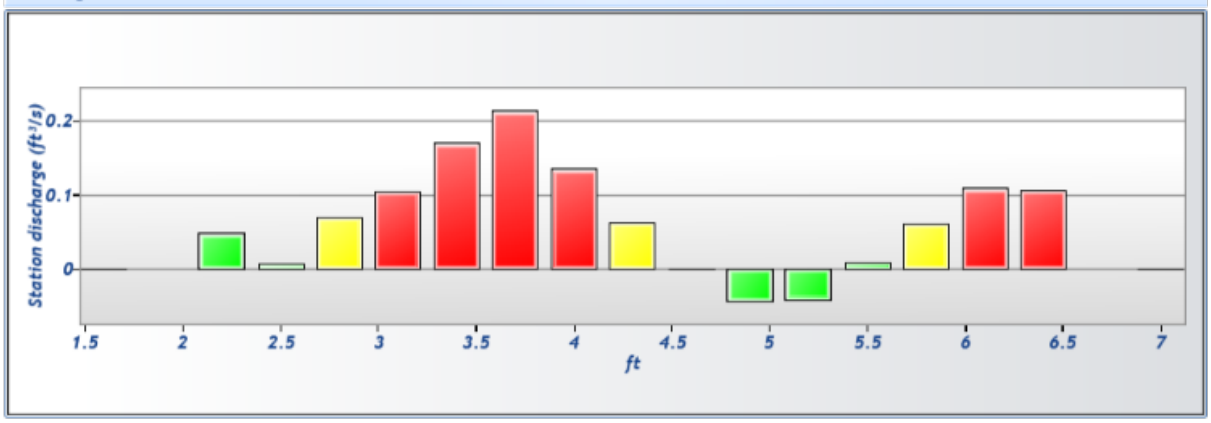
Data Collection Settings

Salinity	0.000	PSS-78
Temperature		°F
Sound speed		ft/s
Mounting correction	0.00	%

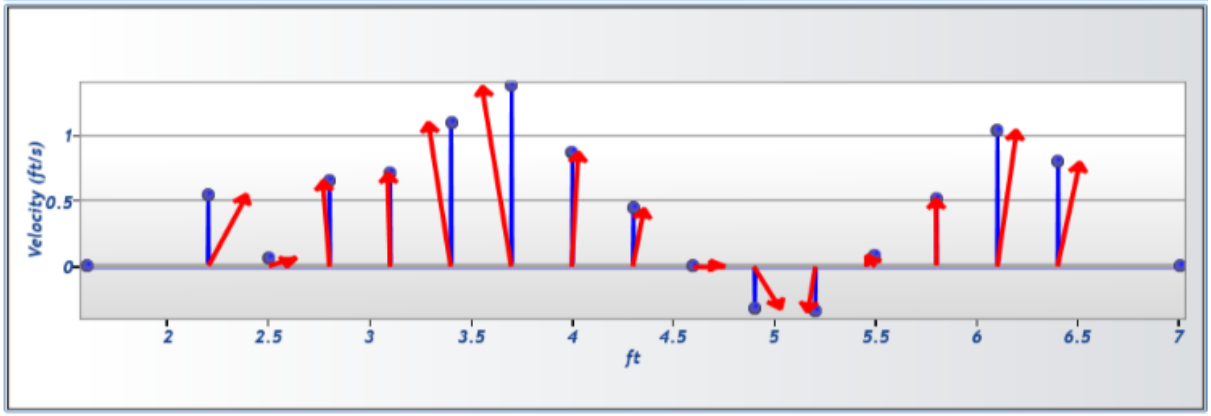
Quality Control Settings

SNR threshold	10	dB
Standard error threshold	0.0328	ft/s
Spike threshold	10.00	%
Maximum velocity angle	20.0	deg
Maximum tilt angle	5.0	deg

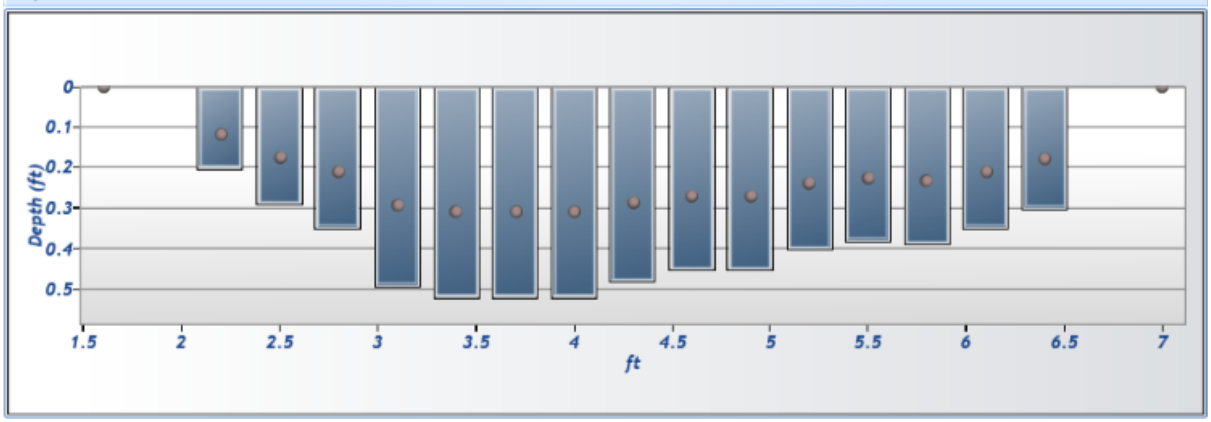
Discharge chart



Velocity chart



Depth chart



Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q	
0	9:54 AM	1.600	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.5442	0.0000	0.0000	0.00	✓
1	9:54 AM	2.200	0.6	0.200	0.6000	0.120	80	0.5442	1.0000	0.5442	0.0900	0.0490	4.83	✓
2	9:56 AM	2.500	0.6	0.290	0.6000	0.174	80	0.0663	1.0000	0.0663	0.0870	0.0058	0.57	✓
3	9:57 AM	2.800	0.6	0.350	0.6000	0.210	80	0.6556	1.0000	0.6556	0.1050	0.0688	6.79	✓
4	9:58 AM	3.100	0.6	0.490	0.6000	0.294	80	0.7141	1.0000	0.7141	0.1470	0.1050	10.36	✓
5	9:59 AM	3.400	0.6	0.520	0.6000	0.312	80	1.0940	1.0000	1.0940	0.1560	0.1707	16.84	✓
6	10:00 AM	3.700	0.6	0.520	0.6000	0.312	80	1.3725	1.0000	1.3725	0.1560	0.2141	21.13	✓
7	10:01 AM	4.000	0.6	0.520	0.6000	0.312	80	0.8685	1.0000	0.8685	0.1560	0.1355	13.37	✓
8	10:03 AM	4.300	0.6	0.480	0.6000	0.288	80	0.4386	1.0000	0.4386	0.1440	0.0632	6.23	✓
9	10:04 AM	4.600	0.6	0.450	0.6000	0.270	80	-0.0020	1.0000	-0.0020	0.1350	-0.0003	-0.03	✓
10	10:05 AM	4.900	0.6	0.450	0.6000	0.270	80	-0.3188	1.0000	-0.3188	0.1350	-0.0430	-4.25	✓
11	10:06 AM	5.200	0.6	0.400	0.6000	0.240	80	-0.3438	1.0000	-0.3438	0.1200	-0.0413	-4.07	✓
12	10:07 AM	5.500	0.6	0.380	0.6000	0.228	80	0.0848	1.0000	0.0848	0.1140	0.0097	0.95	✓
13	10:08 AM	5.800	0.6	0.390	0.6000	0.234	80	0.5161	1.0000	0.5161	0.1170	0.0604	5.96	✓
14	10:09 AM	6.100	0.6	0.350	0.6000	0.210	80	1.0348	1.0000	1.0348	0.1050	0.1087	10.72	✓
15	10:10 AM	6.400	0.6	0.300	0.6000	0.180	80	0.7938	1.0000	0.7938	0.1350	0.1072	10.58	✓
16	10:11 AM	7.000	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.7938	0.0000	0.0000	0.00	✓

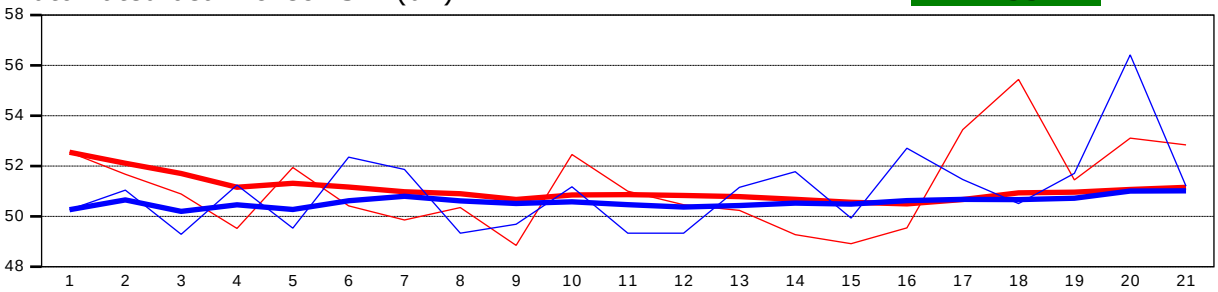
Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings	
1	9:54 AM	2.200	0.6	0.200	0.6000	0.120	Boundary Interference	
2	9:56 AM	2.500	0.6	0.290	0.6000	0.174	Velocity Angle > QC	
4	9:58 AM	3.100	0.6	0.490	0.6000	0.294	High Stn % Discharge	
5	9:59 AM	3.400	0.6	0.520	0.6000	0.312	High Stn % Discharge	
6	10:00 AM	3.700	0.6	0.520	0.6000	0.312	High Stn % Discharge	
7	10:01 AM	4.000	0.6	0.520	0.6000	0.312	Standard Error > QC,High Stn % Discharge	
8	10:03 AM	4.300	0.6	0.480	0.6000	0.288	Standard Error > QC	
10	10:05 AM	4.900	0.6	0.450	0.6000	0.270	Velocity Angle > QC	
11	10:06 AM	5.200	0.6	0.400	0.6000	0.240	Velocity Angle > QC	
12	10:07 AM	5.500	0.6	0.380	0.6000	0.228	Velocity Angle > QC	
14	10:09 AM	6.100	0.6	0.350	0.6000	0.210	High Stn % Discharge	
15	10:10 AM	6.400	0.6	0.300	0.6000	0.180	Standard Error > QC,High Stn % Discharge	

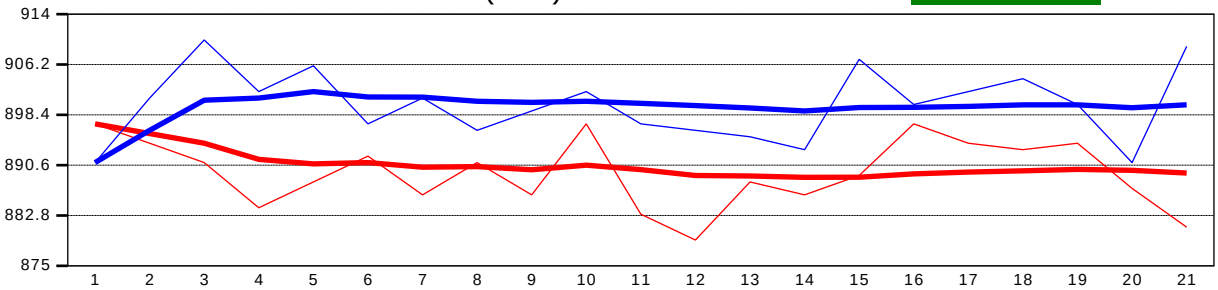
12/12/2019 8:19:29 AM

Automated beam check Start time 7/30/2019 9:53:31 AM

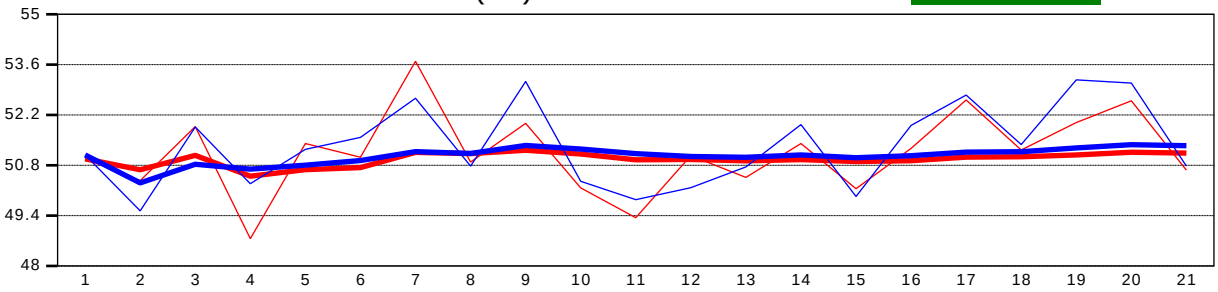
Automated beam check SNR(dB) PASS



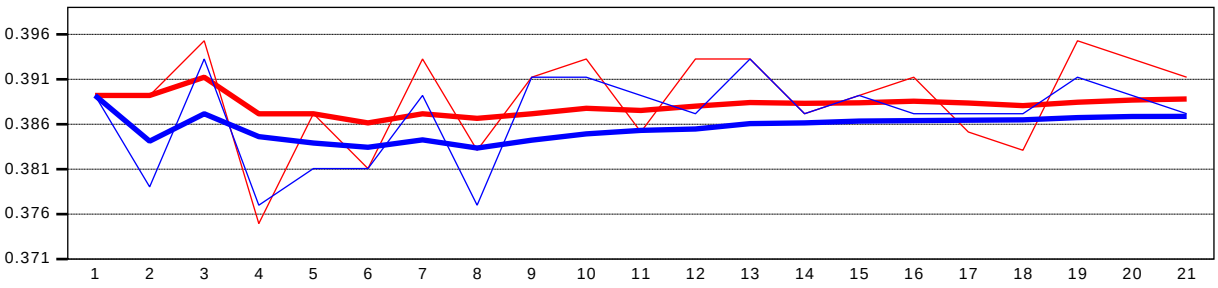
Automated beam check Noise level(cnts) PASS



Automated beam check Peak level(dB) PASS

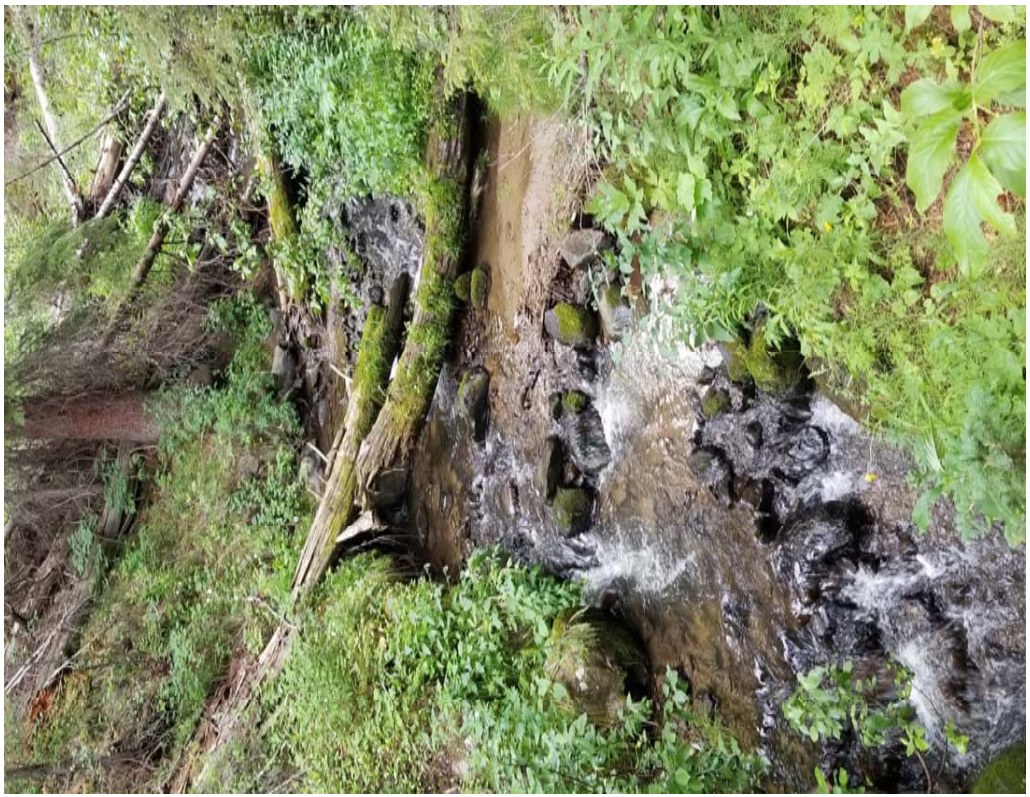


Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings




Bunker
Ditch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3.5
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3.0
2.5
2.0
1.5