



## United States Department of the Interior

### BUREAU OF LAND MANAGEMENT

Colorado State Office  
2850 Youngfield Street  
Lakewood, Colorado 80215-7210

[www.blm.gov/colorado](http://www.blm.gov/colorado)



In Reply Refer To:  
7250 (CO-932)

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on Sunbutter Creek, located in Water Division 6.

**Location and Land Status.** Sunbutter 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 Sunbutter 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.** Sunbutter 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. Sunbutter 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 Sunbutter Creek supports a self-sustaining populations of Colorado River Cutthroat Trout. The BLM has collected fin clip samples for analysis to determine the genetic purity of the population. **(Tom – do we have results back yet?)** Macroinvertebrate surveys indicated abundant populations of stonefly and caddisfly. **(Tom – do we have results back yet from the bug lab?)**

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 | 0.92 cfs                                                     | 1.76 cfs                                                     |
| 06/15/2018 #2      | 0.80 cfs       | 7.67 feet | 0.61 cfs                                                     | Out of range                                                 |
| Averages:          |                |           | 0.73 cfs                                                     | 1.76 cfs                                                     |

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.

0.7 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 USGS 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 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,

Brian St. George  
Deputy State Director  
Resources and Fire

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

# Little Snake Field Office

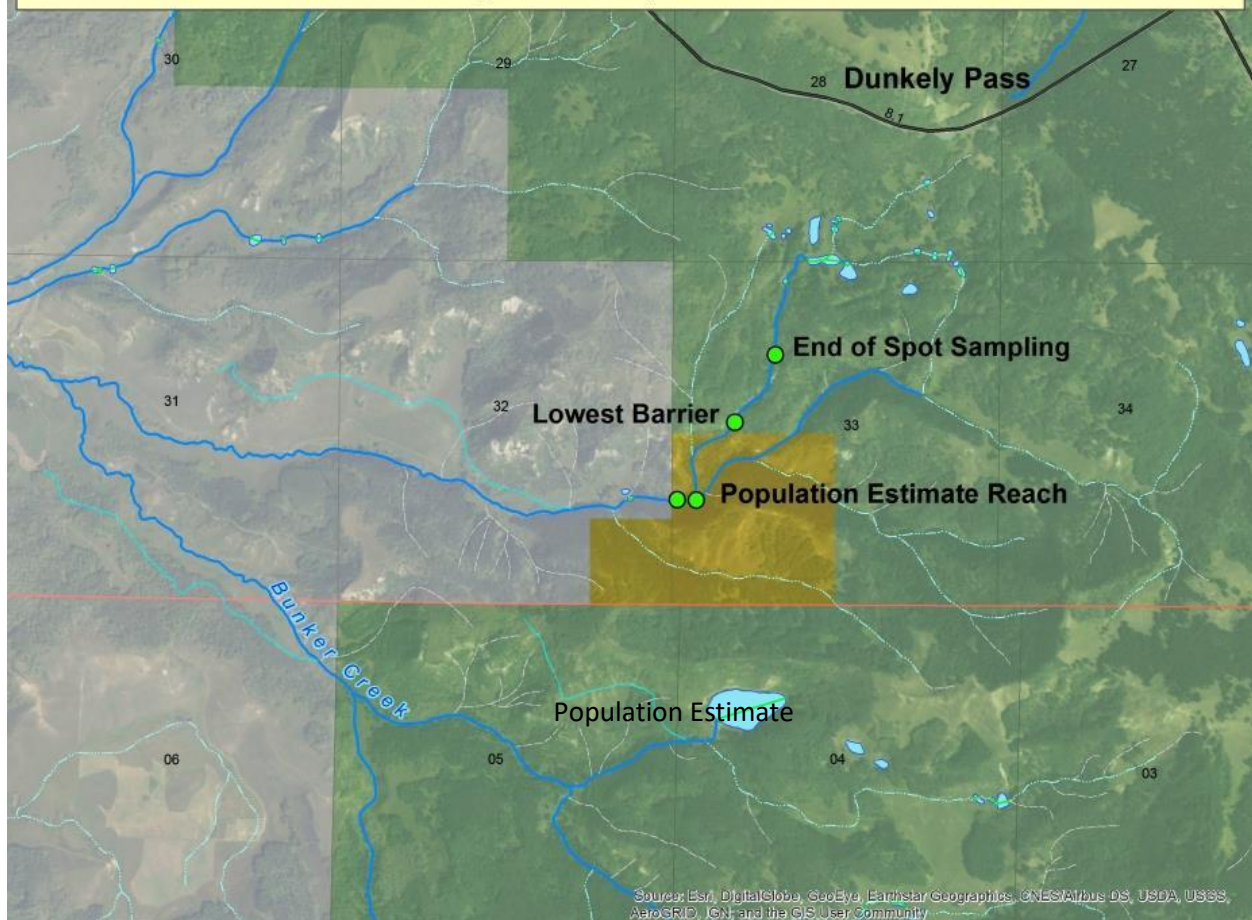
## Stream Sampling August 2016

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

### Introduction:

An unnamed tributary to Bunker Creek (“Sunbutter” Creek) located west of Yampa, Colorado and south of Dunkely Pass, on BLM lands managed by the Little Snake Field Office was sampled on August 24, 2016. 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 Sample Site 8-24-2016 T 3 N, R 87 W, Section 33







**"Sunbutter" Creek - Colorado River Cutthroat Trout**



**"Sunbutter" 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:

“Sunbutter” 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 **sample reach contains 12 adult fish ( $\geq 135\text{mm}$ ) + or – 1 fish at the 95% confidence interval, and 211 adult fish ( $\geq 135\text{mm}$ ) + 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, marestalk, 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 and warm water temperatures do not appear to be a limiting factor on this stream. A temperature probe would help better inform temperature ranges and seasonal variations.

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

| #  | 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.





# FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER  
CONSERVATION BOARD

## LOCATION INFORMATION

|                                                             |                                 |                             |
|-------------------------------------------------------------|---------------------------------|-----------------------------|
| STREAM NAME: <u>Sunbutter Creek</u>                         |                                 | CROSS-SECTION NO.: <u>1</u> |
| CROSS-SECTION LOCATION: <u>At BLM-private boundary</u>      |                                 |                             |
| DATE: <u>9-27-17</u> OBSERVERS: <u>R. Smith, E. Scherff</u> |                                 |                             |
| GAL<br>SCRIPTION                                            | 1/4 SECTION: <u>SW</u>          | SECTION: <u>33</u>          |
| COUNTY: <u>Rio Blanco</u>                                   | WATERSHED: <u>Williams Fork</u> | TOWNSHIP: <u>30 N/S</u>     |
| WATER DIVISION: <u>6</u>                                    |                                 | RANGE: <u>87 E/W</u>        |
| USGS: <u>40° 11' 7.54" N</u>                                |                                 | PM: <u>6:15</u>             |
| USFS: <u>107° 10' 29.89" W</u>                              |                                 | DOW WATER CODE: <u>none</u> |

## SUPPLEMENTAL DATA

|                                                                   |                                       |
|-------------------------------------------------------------------|---------------------------------------|
| IS TAPE SECTION SAME AS<br>PREVIOUS SECTION: <u>YES/NO</u>        | METER TYPE: <u>M-M</u>                |
| ITER NUMBER: _____                                                | DATE RATED: _____                     |
| CALIB/SPIN: _____ sec                                             | TAPE WEIGHT: <u>surveyed</u> lbs/foot |
| CHANNEL BED MATERIAL SIZE RANGE: <u>gravel to 1-foot boulders</u> | TAPE TENSION: <u>surveyed</u> lbs     |
| PHOTOGRAPHS TAKEN: <u>YES/NO</u>                                  | NUMBER OF PHOTOGRAPHS: <u>3</u>       |

## CHANNEL PROFILE DATA

| STATION                         | DISTANCE<br>FROM TAPE (ft) | ROD READING (ft) |
|---------------------------------|----------------------------|------------------|
| ① Tape @ Stake LB               | 0.0                        | <u>surveyed</u>  |
| ② Tape @ Stake RB               | 0.0                        | <u>surveyed</u>  |
| ③ WS @ Tape LB/RB               | 0.0                        | <u>6.25/6.25</u> |
| ④ WS Upstream                   | <u>11.8</u>                | <u>5.56</u>      |
| ⑤ WS Downstream                 | <u>10.0</u>                | <u>6.46</u>      |
| SLOPE: <u>0.9 / 21.8 = .041</u> |                            |                  |

SKETCH

LEGEND:

Stake (X)

Station (1)

Photo (1)

Direction of Flow (→)

## AQUATIC SAMPLING SUMMARY

| STREAM ELECTROFISHED: <u>YES/NO</u>                                              | DISTANCE ELECTROFISHED: _____ ft | FISH CAUGHT: YES/NO | WATER CHEMISTRY SAMPLED: <u>YES/NO</u> |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|----------------------------------------------------------------------------------|----------------------------------|---------------------|----------------------------------------|---|---|---|---|---|---|----|----|----|----|----|----|-----|-------|
| LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.) |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
| SPECIES (FILL IN)                                                                | 1                                | 2                   | 3                                      | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | >15 | TOTAL |
|                                                                                  |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|                                                                                  |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|                                                                                  |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|                                                                                  |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
| AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:            |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
| <u>mayfly, caddisfly, stonefly</u>                                               |                                  |                     |                                        |   |   |   |   |   |   |    |    |    |    |    |    |     |       |

## COMMENTS

|                                           |
|-------------------------------------------|
| <u>Dogwood - Alder - Spruce - Aspen -</u> |
|                                           |
|                                           |
|                                           |

### DISCHARGE/CROSS SECTION NOTES

[illegible]



### 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:

TAPE WT: 0.0106 lbs / ft  
 TENSION: 99999 lbs

SLOPE: 0.025 ft / ft

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

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

| GL=1                   | FEATURE | DIST  | VERT<br>DEPTH | WATER<br>DEPTH | VEL  | A    | Q    | Tape to<br>Water |
|------------------------|---------|-------|---------------|----------------|------|------|------|------------------|
| Total Data Points = 28 |         |       |               |                |      |      |      |                  |
| 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             |
|                        | G       | 8.70  | 4.97          |                |      | 0.00 | 0.00 | 0.00             |
|                        |         | 8.80  | 4.46          |                |      | 0.00 | 0.00 | 0.00             |
|                        | LS      | 9.30  | 4.83          |                |      | 0.00 | 0.00 | 0.00             |
|                        |         | 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

\*\*\* 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: Sunbutter Creek  
 XS LOCATION: 150' upstr fr BLM-private boundary  
 XS NUMBER: 2

# DATA POINTS= 28

VALUES COMPUTED FROM RAW FIELD DATA

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

| WETTED<br>PERIM. | WATER<br>DEPTH | AREA<br>(Am) | Q<br>(Qm) | % Q<br>CELL |
|------------------|----------------|--------------|-----------|-------------|
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.21             | 0.05           | 0.01         | 0.00      | 0.0%        |
| 0.20             | 0.05           | 0.01         | 0.00      | 0.1%        |
| 0.21             | 0.10           | 0.02         | 0.00      | 0.9%        |
| 0.21             | 0.15           | 0.03         | 0.00      | 0.7%        |
| 0.21             | 0.20           | 0.04         | 0.00      | 0.9%        |
| 0.20             | 0.20           | 0.04         | 0.01      | 3.4%        |
| 0.20             | 0.20           | 0.04         | 0.03      | 8.0%        |
| 0.21             | 0.15           | 0.03         | 0.02      | 6.7%        |
| 0.20             | 0.15           | 0.03         | 0.02      | 6.5%        |
| 0.21             | 0.20           | 0.04         | 0.04      | 12.5%       |
| 0.21             | 0.25           | 0.05         | 0.04      | 13.0%       |
| 0.21             | 0.20           | 0.04         | 0.04      | 13.3%       |
| 0.20             | 0.20           | 0.04         | 0.05      | 14.7%       |
| 0.20             | 0.20           | 0.04         | 0.04      | 12.0%       |
| 0.21             | 0.15           | 0.03         | 0.01      | 4.4%        |
| 0.20             | 0.15           | 0.02         | 0.01      | 2.8%        |
| 0.18             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |

TOTALS -----

3.44 0.25 0.51 0.33 100.0%  
 (Max.)

Manning's n = 0.1040  
 Hydraulic Radius= 0.1491701



STREAM NAME: Sunbutter Creek  
 XS LOCATION: 150' upstr fr BLM-private boundary  
 XS NUMBER: 2

WATER LINE COMPARISON TABLE

| WATER<br>LINE | MEAS<br>AREA | COMP<br>AREA | AREA<br>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

STREAM NAME: Sunbutter Creek  
 XS LOCATION: 150' upstr fr 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<br>WATER<br>(FT) | TOP<br>WIDTH<br>(FT) | AVG.<br>DEPTH<br>(FT) | MAX.<br>DEPTH<br>(FT) | AREA<br>(SQ FT) | WETTED<br>PERIM.<br>(FT) | PERCENT<br>WET PERIM<br>(%) | HYDR<br>RADIUS<br>(FT) | FLOW<br>(CFS) | AVG.<br>VELOCITY<br>(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                         |

STREAM NAME: Sunbutter Creek  
XS LOCATION: 150' upstr fr BLM-private boundary  
XS NUMBER: 2

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:  
=====

| FLOW (CFS) | PERIOD |
|------------|--------|
| =====      | =====  |
| _____      | _____  |
| _____      | _____  |
| _____      | _____  |
| _____      | _____  |

RATIONALE FOR RECOMMENDATION:  
=====

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

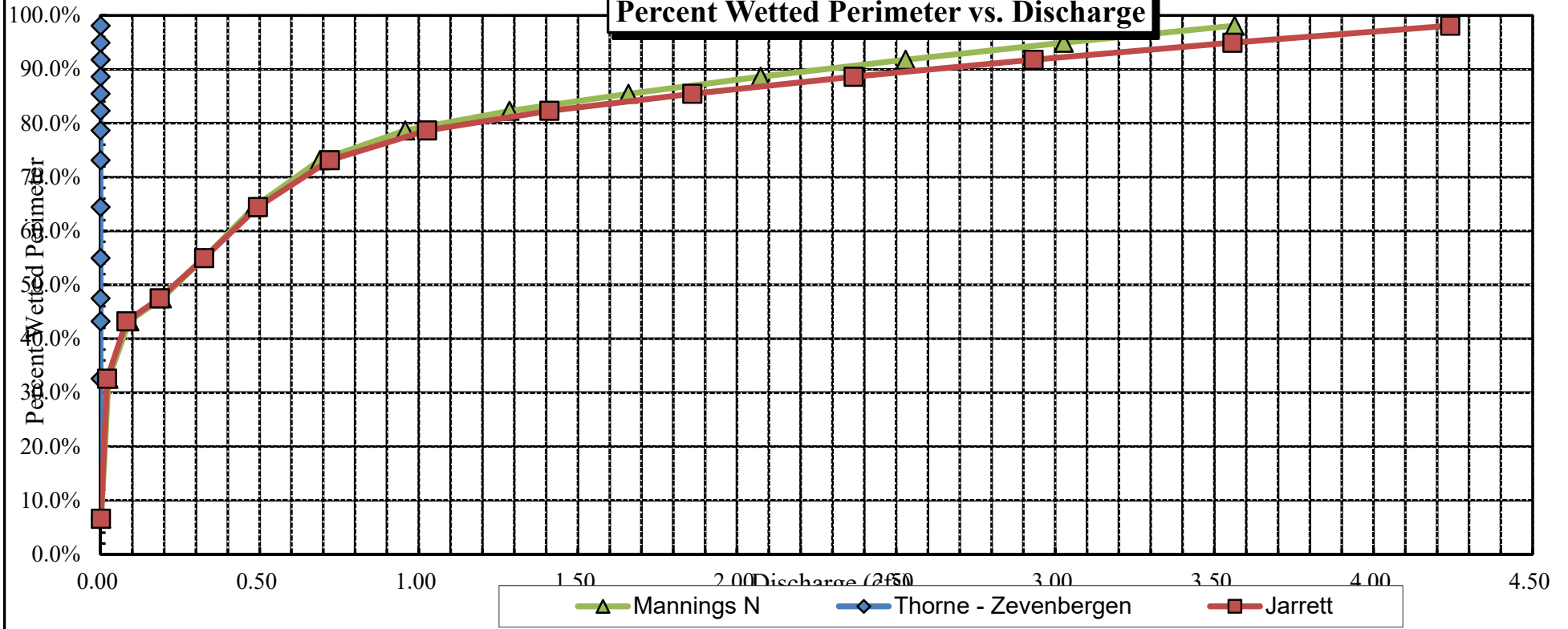
## CROSS SECTION DATA ANALYSIS



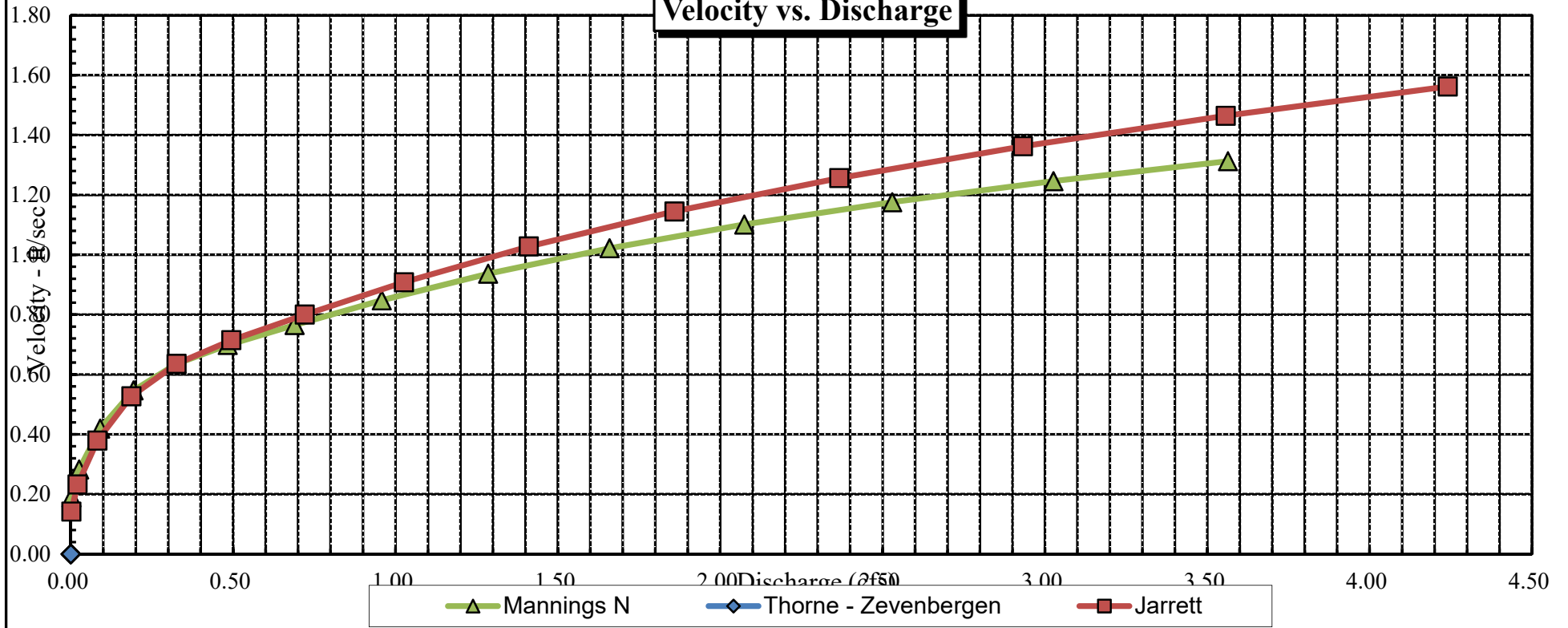


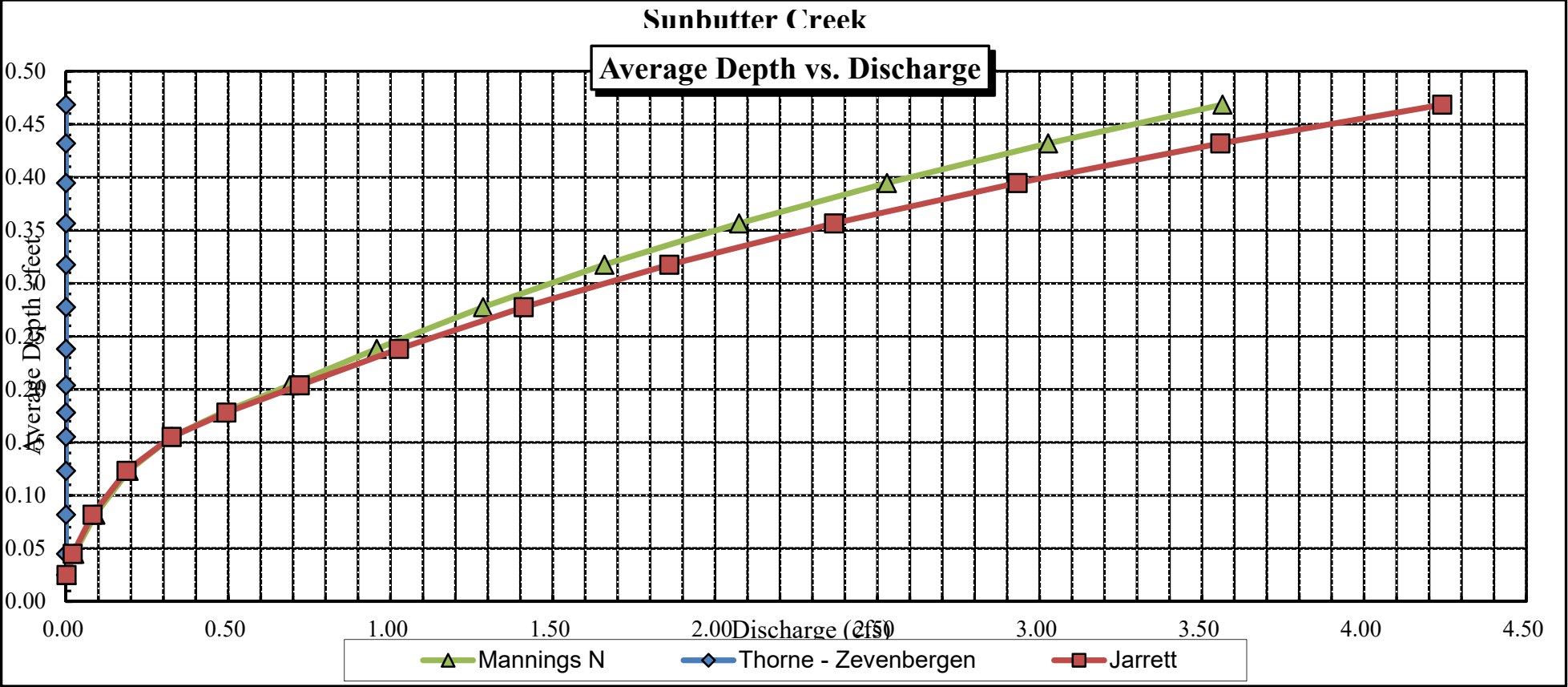
# Sunbutter Creek

Percent Wetted Perimeter vs. Discharge



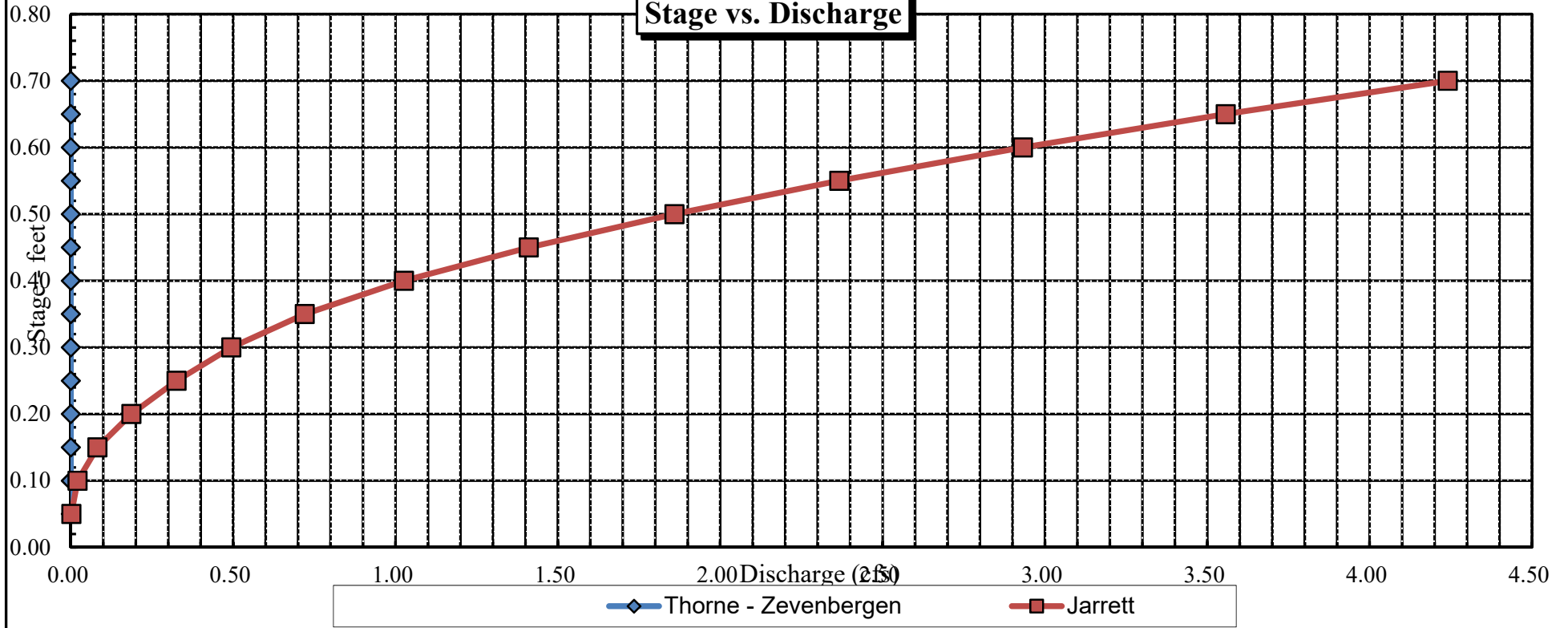
Sunbutter Creek  
Velocity vs. Discharge





# Sunbutter Creek

## Stage vs. Discharge





COLORADO WATER  
CONSERVATION BOARD

# FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



## LOCATION INFORMATION

|                                                                                |                                        |                             |
|--------------------------------------------------------------------------------|----------------------------------------|-----------------------------|
| STREAM NAME: <u>Sunbutter Creek</u>                                            |                                        | CROSS-SECTION NO.: <u>2</u> |
| CROSS-SECTION LOCATION: <u>Approx. 150' upstream from BLM-private boundary</u> |                                        |                             |
| DATE: <u>9-27-17</u>                                                           | OBSERVERS: <u>R. Smith, E. Scherff</u> |                             |
| GAL. DESCRIPTION: <u>SW</u>                                                    | SECTION: <u>33</u>                     | TOWNSHIP: <u>30 N/S</u>     |
| COUNTY: <u>Rio Blanco</u>                                                      | WATERSHED: <u>Williams Fork</u>        | RANGE: <u>87 E/W</u>        |
| WATER DIVISION: <u>6</u>                                                       |                                        | PM: <u>Sixth</u>            |
| DOW WATER CODE: <u>none</u>                                                    |                                        |                             |
| USGS: <u>40° 11' 7.22" N</u>                                                   |                                        |                             |
| USFS: <u>107° 10' 28.56" W</u>                                                 |                                        |                             |

## SUPPLEMENTAL DATA

|                                                                   |                                       |
|-------------------------------------------------------------------|---------------------------------------|
| IS TAPE SECTION SAME AS PREVIOUS SECTION: <u>YES</u>              | METER TYPE: <u>M-M</u>                |
| METER NUMBER: _____                                               | DATE RATED: _____                     |
| CALIB/SPIN: _____ sec                                             | TAPE WEIGHT: <u>surveyed</u> lbs/foot |
| TAPE TENSION: <u>surveyed</u> lbs                                 |                                       |
| CHANNEL BED MATERIAL SIZE RANGE: <u>gravel to 1-foot boulders</u> | PHOTOGRAPHS TAKEN: <u>YES</u>         |
| NUMBER OF PHOTOGRAPHS: <u>3</u>                                   |                                       |

## CHANNEL PROFILE DATA

| STATION           | DISTANCE FROM TAPE (ft)   | ROD READING (ft) |
|-------------------|---------------------------|------------------|
| ① Tape @ Stake LB | 0.0                       | <u>surveyed</u>  |
| ② Tape @ Stake RB | 0.0                       | <u>surveyed</u>  |
| ③ WS @ Tape LB/RB | 0.0                       | <u>5.45/5.45</u> |
| ④ WS Upstream     | <u>7.2</u>                | <u>5.34</u>      |
| ⑤ WS Downstream   | <u>11.7</u>               | <u>5.79</u>      |
| SLOPE             | <u>0.45 / 18.3 = .025</u> |                  |

SKETCH

LEGEND:

Stake (X)

Station (1)

Photo (1)

Direction of Flow (arrows)

## AQUATIC SAMPLING SUMMARY

| STREAM ELECTROFISHED: <u>YES</u>                                                 | DISTANCE ELECTROFISHED: _____ ft | FISH CAUGHT: YES/NO | WATER CHEMISTRY SAMPLED: <u>YES</u> |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|----------------------------------------------------------------------------------|----------------------------------|---------------------|-------------------------------------|---|---|---|---|---|---|----|----|----|----|----|----|-----|-------|
| LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.) |                                  |                     |                                     |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
| SPECIES (FILL IN)                                                                | 1                                | 2                   | 3                                   | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | >15 | TOTAL |
|                                                                                  |                                  |                     |                                     |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|                                                                                  |                                  |                     |                                     |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
|                                                                                  |                                  |                     |                                     |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
| AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:            |                                  |                     |                                     |   |   |   |   |   |   |    |    |    |    |    |    |     |       |
| <u>mayfly, caddisfly, stonefly</u>                                               |                                  |                     |                                     |   |   |   |   |   |   |    |    |    |    |    |    |     |       |

## COMMENTS

|  |
|--|
|  |
|  |
|  |
|  |
|  |



### DISCHARGE/CROSS SECTION NOTES

Sunbutter

2

DATE \_\_\_\_\_

DATE. 9-27-17

SHEET \_\_\_\_ OF \_\_\_\_

EDGE OF WATER LOOKING DOWNSTREAM:  
(0.0 AT STAKE)

LEFT / RIGHT

Gage Reading:

\_\_\_\_\_!

TIME:

1:00 pm

| Features           | Stake (S)<br>Grassline (G)<br>Waterline (W)<br>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)        |                  | Area (ft <sup>2</sup> ) | Discharge (cfs) |
|--------------------|---------------------------------------------------------|----------------------------------|------------------------|------------------------------------------|----------------------------|---------------------------|-------------|------------|--------------------------|------------------|-------------------------|-----------------|
|                    |                                                         |                                  |                        |                                          |                            |                           |             |            | At Point                 | Mean in Vertical |                         |                 |
| RS                 |                                                         | 0.0                              |                        | 3.91                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 1.0                              |                        | 4.33                                     |                            |                           |             |            |                          |                  |                         |                 |
| G                  |                                                         | 1.5                              |                        | 4.78                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 2.5                              |                        | 4.77                                     |                            |                           |             |            |                          |                  |                         |                 |
| RW                 |                                                         | 3.4                              |                        | 5.36                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 4.0                              |                        | 5.45                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 4.2                              |                        | 5.5                                      | 0.05                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 4.4                              |                        | 5.5                                      | 0.05                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 4.6                              |                        | 5.55                                     | 0.10                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 4.8                              |                        | 5.60                                     | 0.15                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 5.0                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 5.2                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 5.4                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 5.6                              |                        | 5.6                                      | 0.15                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 5.8                              |                        | 5.6                                      | 0.15                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 6.0                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 6.2                              |                        | 5.7                                      | 0.25                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 6.4                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 6.6                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 6.8                              |                        | 5.65                                     | 0.20                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 7.0                              |                        | 5.60                                     | 0.15                       |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 7.2                              |                        | 5.60                                     | 0.15                       |                           |             |            |                          |                  |                         |                 |
| LW                 |                                                         | 7.3                              |                        | 5.45                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 8.1                              |                        | 5.29                                     |                            |                           |             |            |                          |                  |                         |                 |
| G                  |                                                         | 8.7                              |                        | 4.97                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 8.8                              |                        | 4.46                                     |                            |                           |             |            |                          |                  |                         |                 |
| LS                 |                                                         | 9.3                              |                        | 4.83                                     |                            |                           |             |            |                          |                  |                         |                 |
|                    |                                                         | 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: 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:

TAPE WT: 0.0106 lbs / ft  
 TENSION: 99999 lbs

SLOPE: 0.041 ft / ft

GL=1 FEATURE

| VERT                   | WATER |       |      |      |      |      |      |      | Tape to |
|------------------------|-------|-------|------|------|------|------|------|------|---------|
| DIST                   | DEPTH | DEPTH | VEL  | A    | Q    |      |      |      | Water   |
| Total Data Points = 24 |       |       |      |      |      |      |      |      |         |
| 1                      | RS    | 0.00  | 5.15 |      |      | 0.00 | 0.00 | 0.00 |         |
|                        | 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 |         |

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

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

|        |      |      |
|--------|------|------|
| 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

\*\*\* 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: 0.041

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<br>DEPTH | WATER<br>DEPTH | VEL  |
|---------|------|---------------|----------------|------|
| RS      | 0.00 | 5.15          |                |      |
| 1 G     | 0.50 | 5.61          |                |      |
|         | 1.30 | 6.07          |                |      |
| RW      | 1.80 | 6.25          | 0.00           | 0.00 |
|         | 2.00 | 6.30          | 0.05           | 0.02 |
|         | 2.20 | 6.30          | 0.05           | 0.14 |
|         | 2.40 | 6.35          | 0.10           | 0.41 |
|         | 2.60 | 6.35          | 0.10           | 0.85 |
|         | 2.80 | 6.35          | 0.10           | 0.79 |
|         | 3.00 | 6.40          | 0.15           | 1.28 |
|         | 3.20 | 6.40          | 0.15           | 0.80 |
|         | 3.40 | 6.40          | 0.15           | 1.13 |
|         | 3.60 | 6.40          | 0.15           | 1.28 |
|         | 3.80 | 6.40          | 0.15           | 1.29 |
|         | 4.00 | 6.45          | 0.20           | 0.99 |
|         | 4.20 | 6.45          | 0.20           | 0.66 |
|         | 4.40 | 6.45          | 0.20           | 0.25 |
|         | 4.60 | 6.35          | 0.10           | 0.16 |
| LW      | 4.80 | 6.30          | 0.05           | 0.00 |
|         | 5.00 | 6.25          | 0.00           | 0.00 |
|         | 6.00 | 6.06          |                |      |
|         | 7.00 | 5.76          |                |      |
| 1 G     | 8.00 | 5.55          |                |      |
| LS      | 9.00 | 5.40          |                |      |

| WETTED<br>PERIM. | WATER<br>DEPTH | AREA<br>(Am) | Q<br>(Qm) | % Q<br>CELL |
|------------------|----------------|--------------|-----------|-------------|
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.21             | 0.05           | 0.01         | 0.00      | 0.1%        |
| 0.20             | 0.05           | 0.01         | 0.00      | 0.5%        |
| 0.21             | 0.10           | 0.02         | 0.01      | 2.8%        |
| 0.20             | 0.10           | 0.02         | 0.02      | 5.8%        |
| 0.20             | 0.10           | 0.02         | 0.02      | 5.4%        |
| 0.21             | 0.15           | 0.03         | 0.04      | 13.0%       |
| 0.20             | 0.15           | 0.03         | 0.02      | 8.1%        |
| 0.20             | 0.15           | 0.03         | 0.03      | 11.5%       |
| 0.20             | 0.15           | 0.03         | 0.04      | 13.0%       |
| 0.20             | 0.15           | 0.03         | 0.04      | 13.1%       |
| 0.21             | 0.20           | 0.04         | 0.04      | 13.4%       |
| 0.20             | 0.20           | 0.04         | 0.03      | 8.9%        |
| 0.20             | 0.20           | 0.04         | 0.01      | 3.4%        |
| 0.22             | 0.10           | 0.02         | 0.00      | 1.1%        |
| 0.21             | 0.05           | 0.01         | 0.00      | 0.0%        |
| 0.21             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |

TOTALS -----

3.26 0.2 0.38 0.30 100.0%  
 (Max.)

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<br>LINE | MEAS<br>AREA | COMP<br>AREA | AREA<br>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<br>WATER<br>(FT) | TOP<br>WIDTH<br>(FT) | AVG.<br>DEPTH<br>(FT) | MAX.<br>DEPTH<br>(FT) | AREA<br>(SQ FT) | WETTED<br>PERIM.<br>(FT) | PERCENT<br>WET PERIM<br>(%) | HYDR<br>RADIUS<br>(FT) | FLOW<br>(CFS) | AVG.<br>VELOCITY<br>(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:  
=====

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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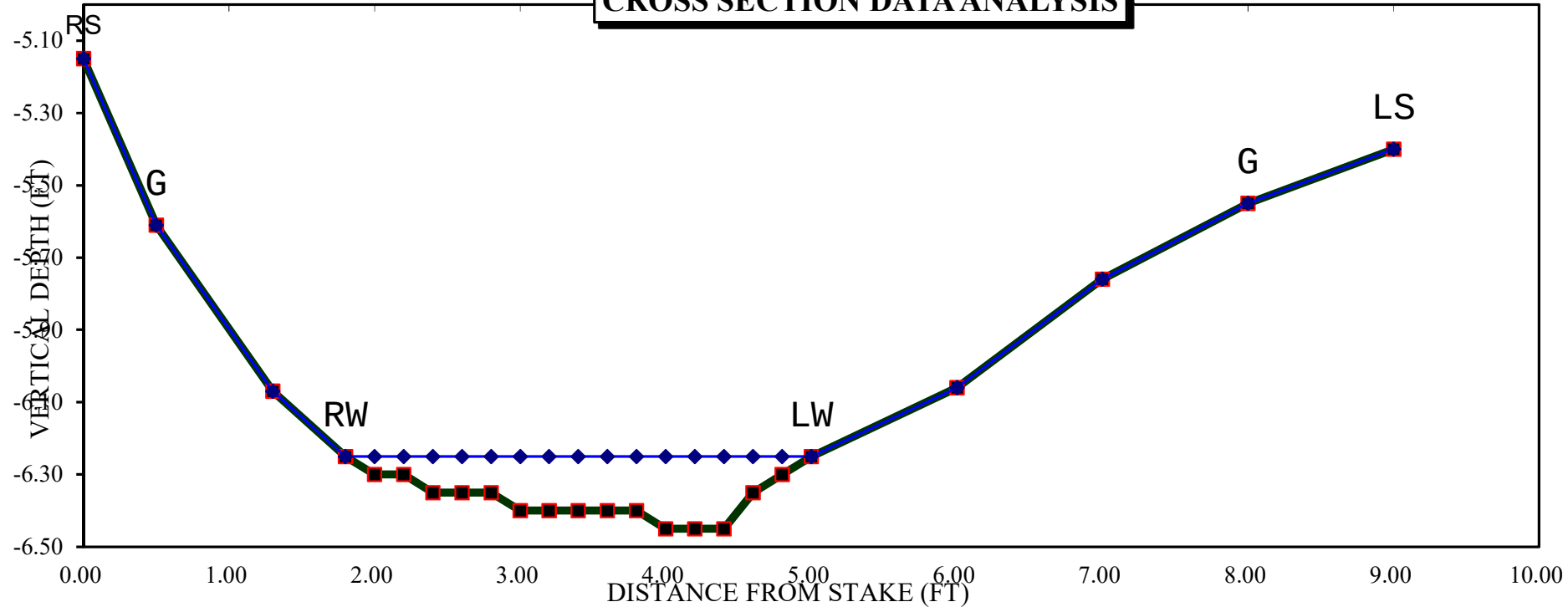
\_\_\_\_\_

\_\_\_\_\_

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

# Sunbutter Creek

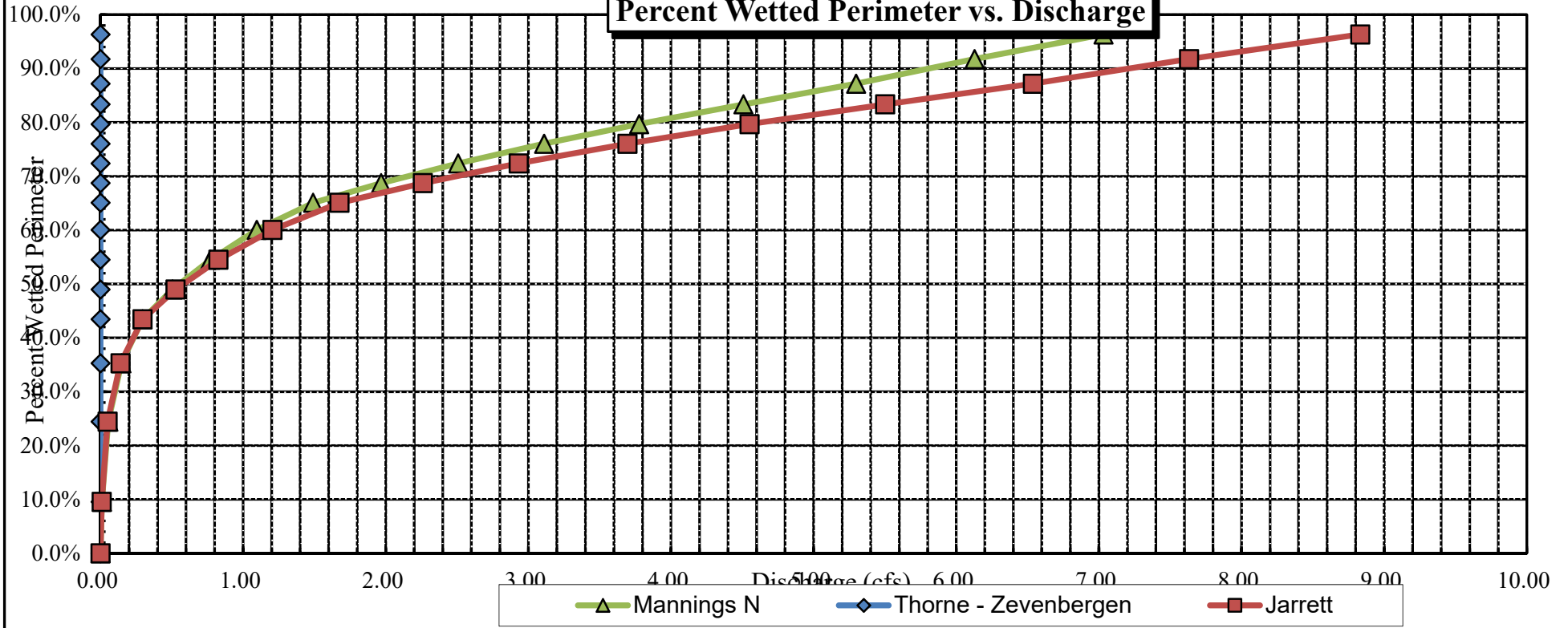
## CROSS SECTION DATA ANALYSIS

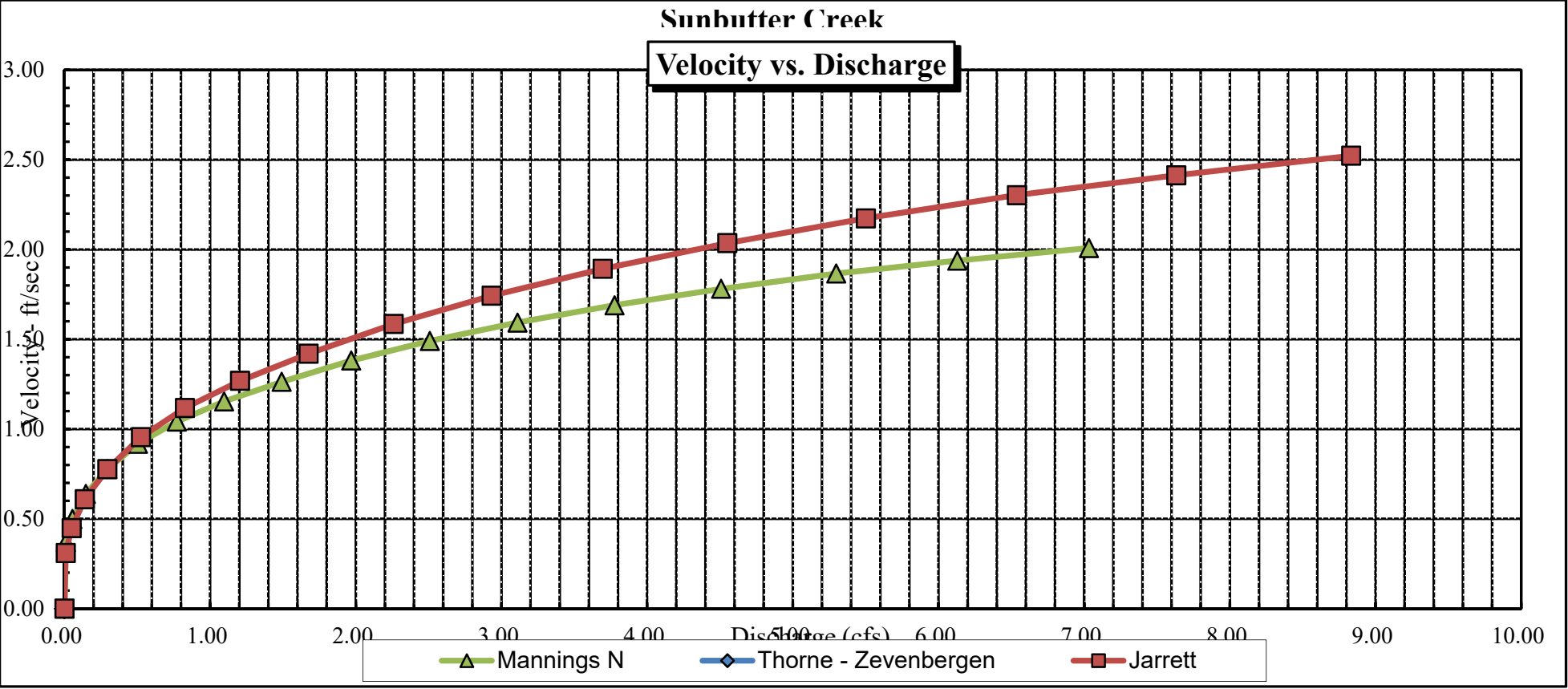


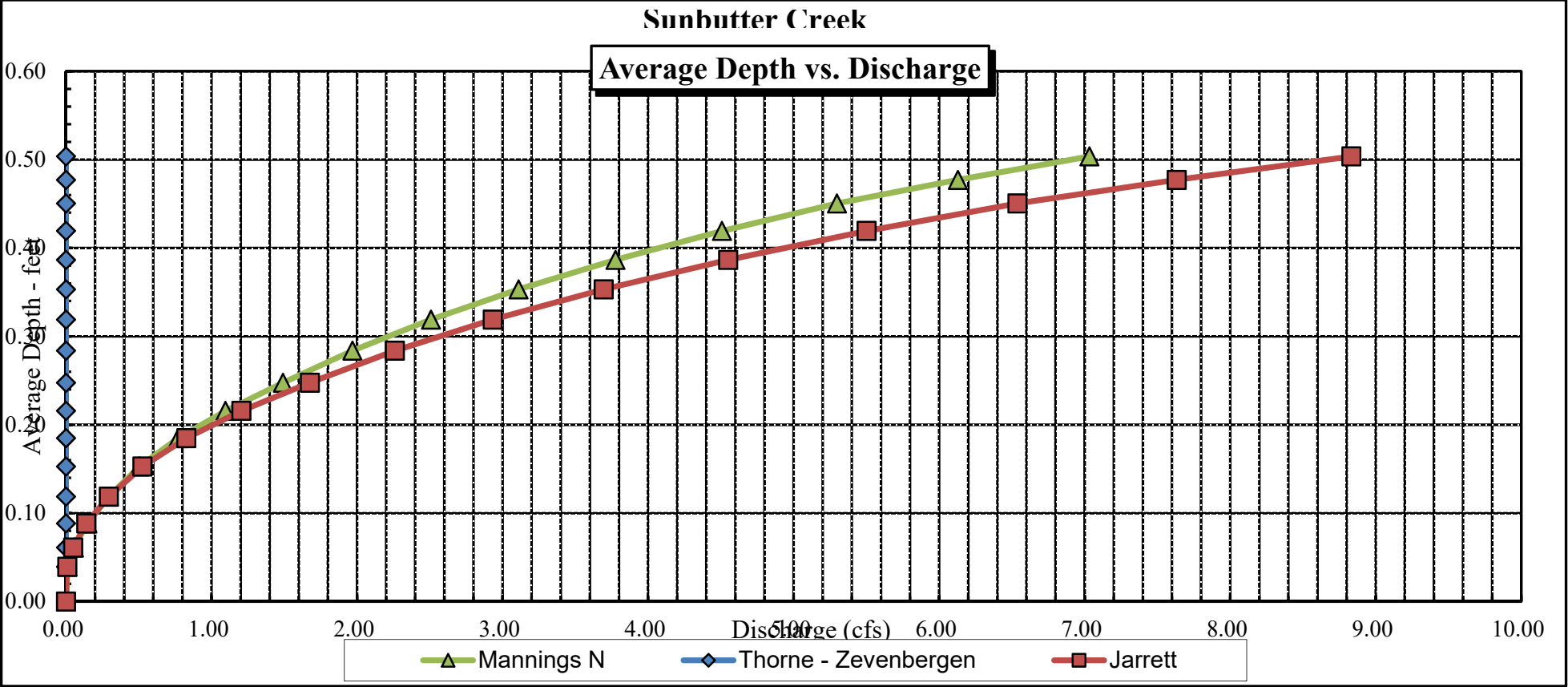
Channel Bottom Computed Water Line

# Sunbutter Creek

Percent Wetted Perimeter vs. Discharge



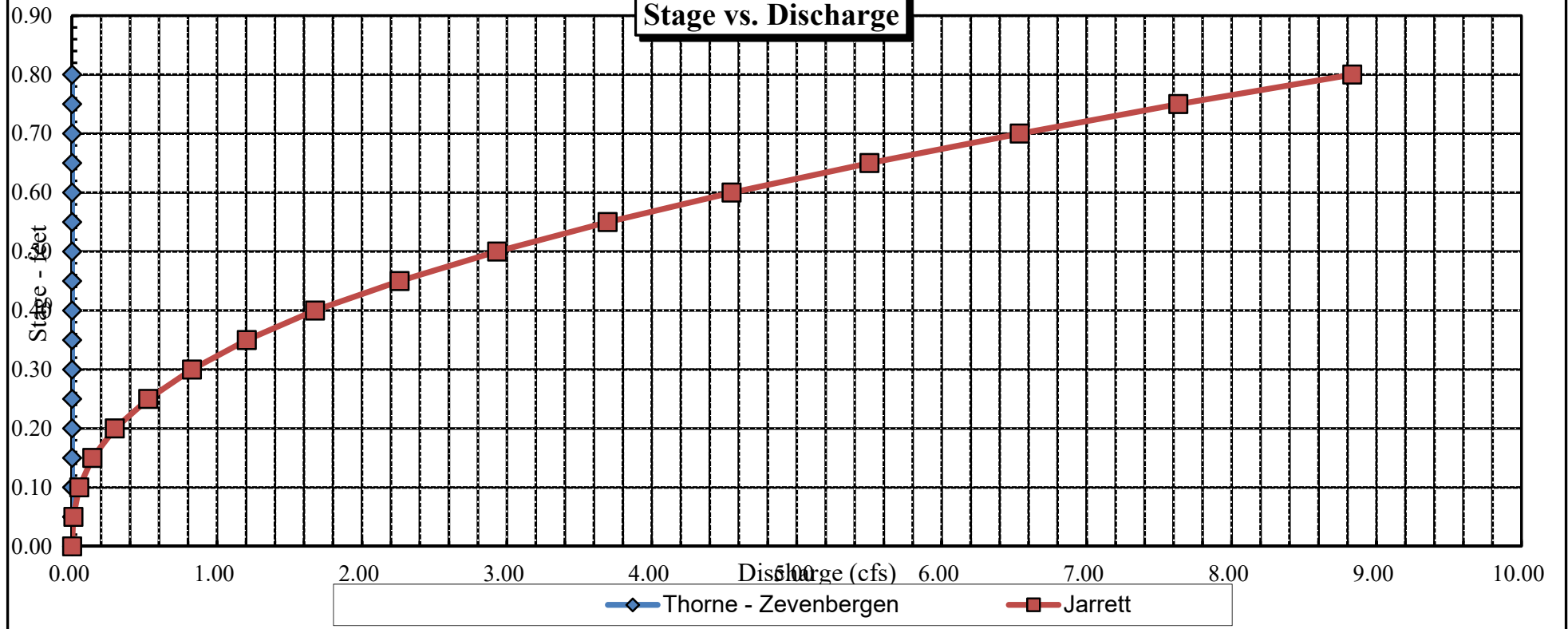






# Sunbutter Creek

## Stage vs. Discharge





# FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER  
CONSERVATION BOARD

## LOCATION INFORMATION

|                                                          |                                        |                             |                             |
|----------------------------------------------------------|----------------------------------------|-----------------------------|-----------------------------|
| STREAM NAME: <u>Sunbutter Creek</u>                      |                                        | CROSS-SECTION NO.: <u>1</u> |                             |
| CROSS-SECTION LOCATION: <u>A2 BLM - Private Boundary</u> |                                        |                             |                             |
| DATE: <u>6-15-18</u>                                     | OBSERVERS: <u>R. Smith, E. Schorff</u> |                             |                             |
| LEGAL DESCRIPTION                                        | % SECTION: <u>SW</u>                   | SECTION: <u>33</u>          | TOWNSHIP: <u>30 N/S</u>     |
|                                                          |                                        | RANGE: <u>87 E/W</u>        | PM: <u>6th</u>              |
| COUNTY: <u>Rio Blanco</u>                                | WATERSHED: <u>Williams Fork</u>        | WATER DIVISION: <u>6</u>    | DOW WATER CODE: <u>none</u> |
| MAP(S):                                                  | USGS: <u>GPS</u>                       | <u>314855</u>               |                             |
|                                                          | USFS: <u>Zone 13</u>                   | <u>4450610</u>              |                             |

## SUPPLEMENTAL DATA

|                                                                                                           |                                                                                  |                                 |                                       |                                   |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------|---------------------------------------|-----------------------------------|
| SAG TAPE SECTION SAME AS DISCHARGE SECTION: <input checked="" type="radio"/> YES <input type="radio"/> NO | METER TYPE: <u>N-N</u>                                                           |                                 |                                       |                                   |
| METER NUMBER:                                                                                             | DATE RATED:                                                                      | CALIB/SPIN: _____ sec           | TAPE WEIGHT: <u>surveyed</u> lbs/foot | TAPE TENSION: <u>surveyed</u> lbs |
| CHANNEL BED MATERIAL SIZE RANGE: <u>gravel to 1-foot boulders</u>                                         | PHOTOGRAPHS TAKEN: <input checked="" type="radio"/> YES <input type="radio"/> NO | NUMBER OF PHOTOGRAPHS: <u>3</u> |                                       |                                   |

## CHANNEL PROFILE DATA

| STATION           | DISTANCE FROM TAPE (ft)   | ROD READING (ft) |
|-------------------|---------------------------|------------------|
| ⊗ Tape @ Stake LB | 0.0                       | <u>surveyed</u>  |
| ⊗ Tape @ Stake RB | 0.0                       | <u>surveyed</u>  |
| ① WS @ Tape LB/RB | 0.0                       | <u>5.10/5.10</u> |
| ② WS Upstream     | <u>8.5</u>                | <u>4.98</u>      |
| ③ WS Downstream   | <u>11.0</u>               | <u>5.18</u>      |
| SLOPE             | <u>-20 / 19.5 = .0102</u> |                  |

SKETCH

①

LEGEND:

Stake ⊗

Station ①

Photo ①

Direction of Flow →

## AQUATIC SAMPLING SUMMARY

| STREAM ELECTROFISHED: YES <input checked="" type="radio"/> NO                    | DISTANCE ELECTROFISHED: _____ ft | FISH CAUGHT: YES/NO | WATER CHEMISTRY SAMPLED: YES <input checked="" type="radio"/> 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

|                           |
|---------------------------|
| <u>pH = 8.25</u>          |
| <u>Cond = 208</u>         |
| <u>Temp = 13.4°C</u>      |
| <u>Salinity = 0.1 ppt</u> |



## 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)<br>Grassline (G)<br>Waterline (W)<br>Rock (R) | Distance<br>From<br>Initial<br>Point<br>(ft) | Width<br>(ft) | Total<br>Vertical<br>Depth From<br>Tape/Inst<br>(ft) | Water<br>Depth<br>(ft)<br>✓ | Depth<br>of<br>Observation<br>(ft) | Revolutions | Time<br>(sec) | Velocity (ft/sec) |                          | Area<br>(ft <sup>2</sup> ) | Discharge<br>(cfs) |
|--------------------|---------------------------------------------------------|----------------------------------------------|---------------|------------------------------------------------------|-----------------------------|------------------------------------|-------------|---------------|-------------------|--------------------------|----------------------------|--------------------|
|                    |                                                         |                                              |               |                                                      |                             |                                    |             |               | At<br>Point<br>✓  | Mean in<br>Vertical      |                            |                    |
| RS                 |                                                         | 0.0                                          |               | 2.38                                                 |                             |                                    |             |               |                   |                          |                            |                    |
|                    |                                                         | 1.5                                          |               | 3.47                                                 |                             |                                    |             |               |                   |                          |                            |                    |
| G                  |                                                         | 1.6                                          |               | 3.96                                                 |                             |                                    |             |               |                   |                          |                            |                    |
|                    |                                                         | 2.2                                          |               | 5.00                                                 |                             |                                    |             |               |                   |                          |                            |                    |
| R/W                |                                                         | 2.7                                          |               | 5.10                                                 | 0                           |                                    |             |               |                   |                          |                            |                    |
|                    |                                                         | 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                        |                                    |             |               | 1.59              |                          |                            |                    |
|                    |                                                         | 5.4                                          |               | 5.45                                                 | 0.35                        | 0.15                               |             |               | 1.10              | 0.84                     |                            |                    |
|                    |                                                         | 5.7                                          |               | 5.40                                                 | 0.30                        | 0.40                               |             |               | 1.21              | 1.04                     |                            |                    |
|                    |                                                         | 6.0                                          |               | 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              |                          |                            |                    |
|                    |                                                         | 7.9                                          |               | 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                        |                                    |             |               | 0                 |                          |                            |                    |
|                    |                                                         | 9.1                                          |               | 5.15                                                 | 0.05                        |                                    |             |               | 0                 |                          |                            |                    |
|                    |                                                         | 9.4                                          |               | 5.15                                                 | 0.05                        |                                    |             |               | 0                 |                          |                            |                    |
|                    |                                                         | 9.8                                          |               | 5.10                                                 |                             |                                    |             |               |                   |                          |                            |                    |
| LW                 |                                                         | 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:

TAPE WT: 0.0106 lbs / ft  
 TENSION: 99999 lbs

SLOPE: 0.0102 ft / ft

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

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

| GL=1                   | FEATURE | DIST  | VERT<br>DEPTH | WATER<br>DEPTH | VEL  | A    | Q    | Tape to<br>Water |
|------------------------|---------|-------|---------------|----------------|------|------|------|------------------|
| Total Data Points = 33 |         |       |               |                |      |      |      |                  |
| 1                      | RS      | 0.00  | 2.38          |                |      | 0.00 | 0.00 | 0.00             |
|                        |         | 1.50  | 3.47          |                |      | 0.00 | 0.00 | 0.00             |
|                        | 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             |
| 1                      |         | 10.30 | 4.36          |                |      | 0.00 | 0.00 | 0.00             |
|                        |         | 13.00 | 4.34          |                |      | 0.00 | 0.00 | 0.00             |
|                        | 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

\*\*\* 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: 0.0102

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<br>DEPTH | WATER<br>DEPTH | VEL  |
|---------|-------|---------------|----------------|------|
| RS      | 0.00  | 2.38          |                |      |
|         | 1.50  | 3.47          |                |      |
| 1 G     | 1.60  | 3.96          |                |      |
|         | 2.20  | 5.00          |                |      |
| RW      | 2.70  | 5.10          | 0.00           | 0.00 |
|         | 3.00  | 5.20          | 0.10           | 0.23 |
|         | 3.30  | 5.20          | 0.10           | 0.60 |
|         | 3.60  | 5.25          | 0.15           | 0.82 |
|         | 3.90  | 5.20          | 0.10           | 1.16 |
|         | 4.20  | 5.30          | 0.20           | 0.90 |
|         | 4.50  | 5.25          | 0.15           | 0.71 |
|         | 4.80  | 5.45          | 0.35           | 0.65 |
|         | 5.10  | 5.50          | 0.40           | 1.59 |
|         | 5.40  | 5.45          | 0.35           | 1.10 |
|         | 5.50  | 5.25          | 0.15           | 0.84 |
|         | 5.70  | 5.40          | 0.30           | 1.21 |
|         | 5.85  | 5.50          | 0.40           | 1.04 |
|         | 6.00  | 5.30          | 0.20           | 1.03 |
|         | 6.30  | 5.30          | 0.20           | 0.78 |
|         | 6.60  | 5.30          | 0.20           | 0.60 |
|         | 6.90  | 5.25          | 0.15           | 0.52 |
|         | 7.20  | 5.25          | 0.15           | 0.47 |
|         | 7.60  | 5.25          | 0.15           | 0.46 |
|         | 7.90  | 5.25          | 0.15           | 0.37 |
|         | 8.20  | 5.25          | 0.15           | 0.22 |
|         | 8.50  | 5.15          | 0.05           | 0.10 |
|         | 8.80  | 5.15          | 0.05           | 0.00 |
|         | 9.10  | 5.15          | 0.05           | 0.00 |
|         | 9.40  | 5.15          | 0.05           | 0.00 |
| LW      | 9.80  | 5.10          | 0.00           | 0.00 |
|         | 10.30 | 4.36          |                |      |
|         | 13.00 | 4.34          |                |      |
| 1 G     | 15.60 | 3.96          |                |      |

TOTALS -----

| WETTED<br>PERIM. | WATER<br>DEPTH | AREA<br>(Am) | Q<br>(Qm) | % Q<br>CELL |
|------------------|----------------|--------------|-----------|-------------|
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.32             | 0.10           | 0.03         | 0.01      | 0.8%        |
| 0.30             | 0.10           | 0.03         | 0.02      | 2.0%        |
| 0.30             | 0.15           | 0.05         | 0.04      | 4.1%        |
| 0.30             | 0.10           | 0.03         | 0.03      | 3.9%        |
| 0.32             | 0.20           | 0.06         | 0.05      | 6.0%        |
| 0.30             | 0.15           | 0.05         | 0.03      | 3.6%        |
| 0.36             | 0.35           | 0.11         | 0.07      | 7.6%        |
| 0.30             | 0.40           | 0.12         | 0.19      | 21.4%       |
| 0.30             | 0.35           | 0.07         | 0.08      | 8.6%        |
| 0.22             | 0.15           | 0.02         | 0.02      | 2.1%        |
| 0.25             | 0.30           | 0.05         | 0.06      | 7.1%        |
| 0.18             | 0.40           | 0.06         | 0.06      | 7.0%        |
| 0.25             | 0.20           | 0.05         | 0.05      | 5.2%        |
| 0.30             | 0.20           | 0.06         | 0.05      | 5.2%        |
| 0.30             | 0.20           | 0.06         | 0.04      | 4.0%        |
| 0.30             | 0.15           | 0.05         | 0.02      | 2.6%        |
| 0.30             | 0.15           | 0.05         | 0.02      | 2.8%        |
| 0.40             | 0.15           | 0.05         | 0.02      | 2.7%        |
| 0.30             | 0.15           | 0.05         | 0.02      | 1.9%        |
| 0.30             | 0.15           | 0.05         | 0.01      | 1.1%        |
| 0.32             | 0.05           | 0.02         | 0.00      | 0.2%        |
| 0.30             | 0.05           | 0.02         | 0.00      | 0.0%        |
| 0.30             | 0.05           | 0.02         | 0.00      | 0.0%        |
| 0.30             | 0.05           | 0.02         | 0.00      | 0.0%        |
| 0.40             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |

7.54 0.4 1.14 0.89 100.0%  
 (Max.)

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<br>LINE | MEAS<br>AREA | COMP<br>AREA | AREA<br>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<br>WATER<br>(FT) | TOP<br>WIDTH<br>(FT) | AVG.<br>DEPTH<br>(FT) | MAX.<br>DEPTH<br>(FT) | AREA<br>(SQ FT) | WETTED<br>PERIM.<br>(FT) | PERCENT<br>WET PERIM<br>(%) | HYDR<br>RADIUS<br>(FT) | FLOW<br>(CFS) | AVG.<br>VELOCITY<br>(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:  
=====

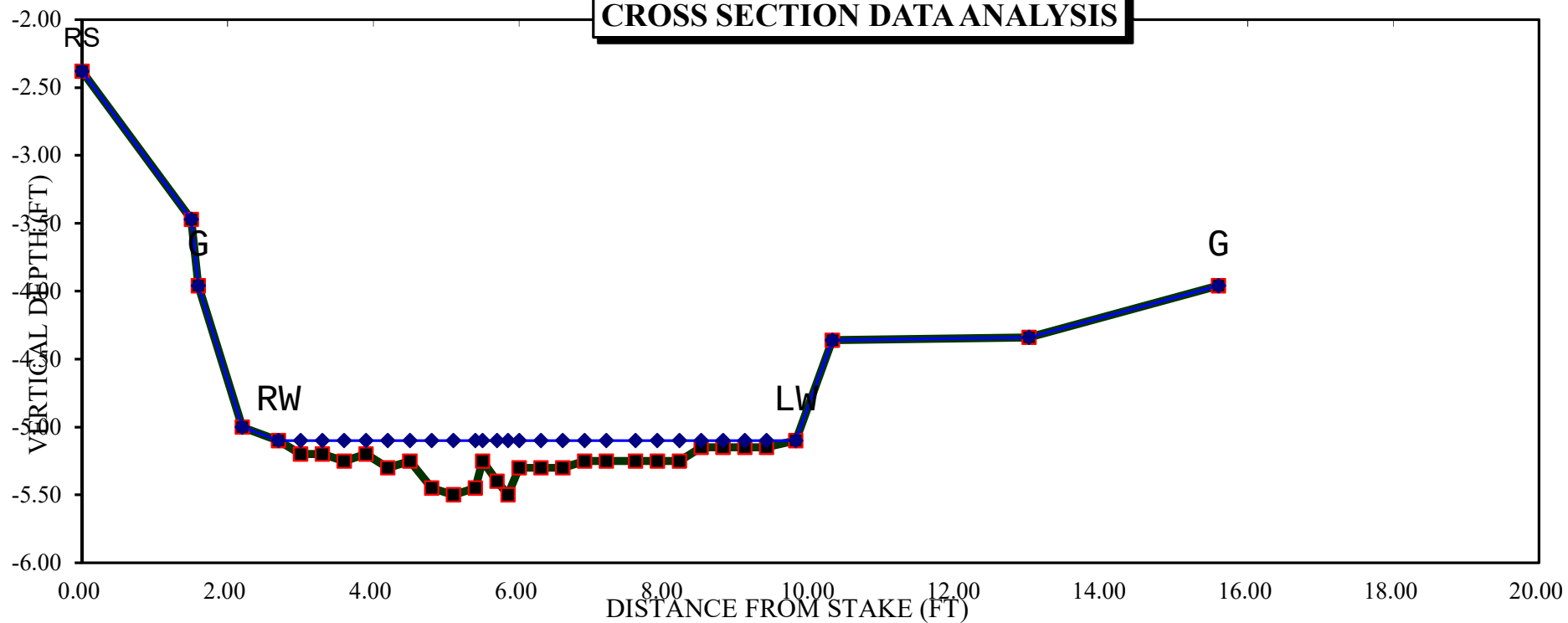
[illegible]

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

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

# Sunbutter Creek

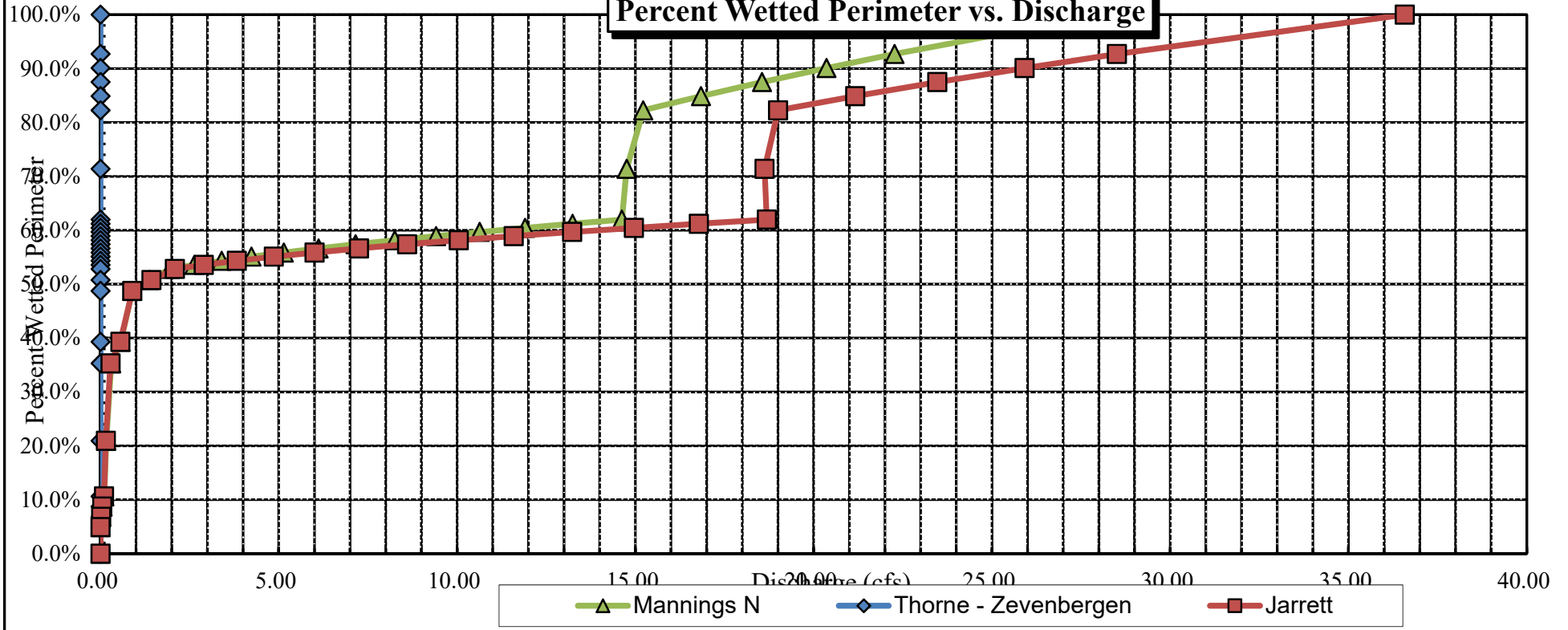
## CROSS SECTION DATA ANALYSIS

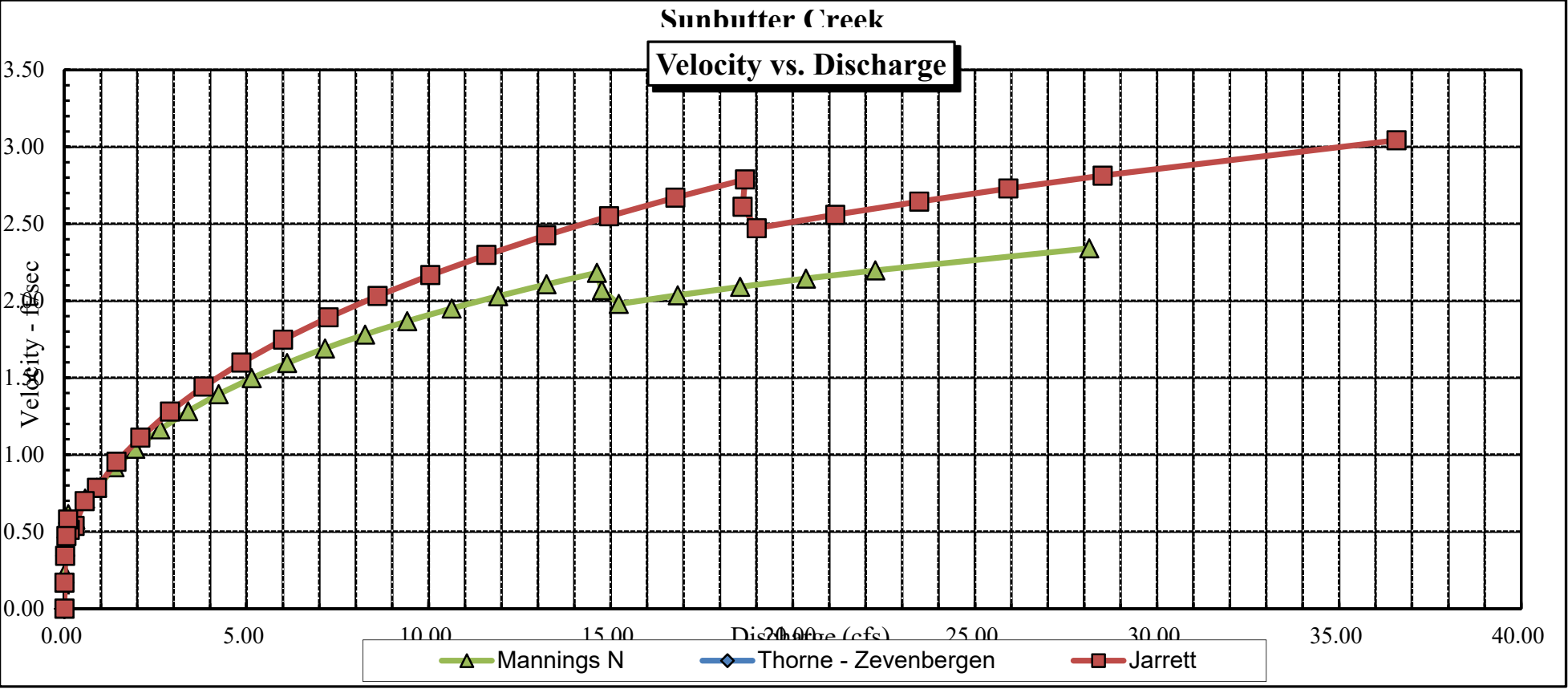


Channel Bottom Computed Water Line

# Sunbutter Creek

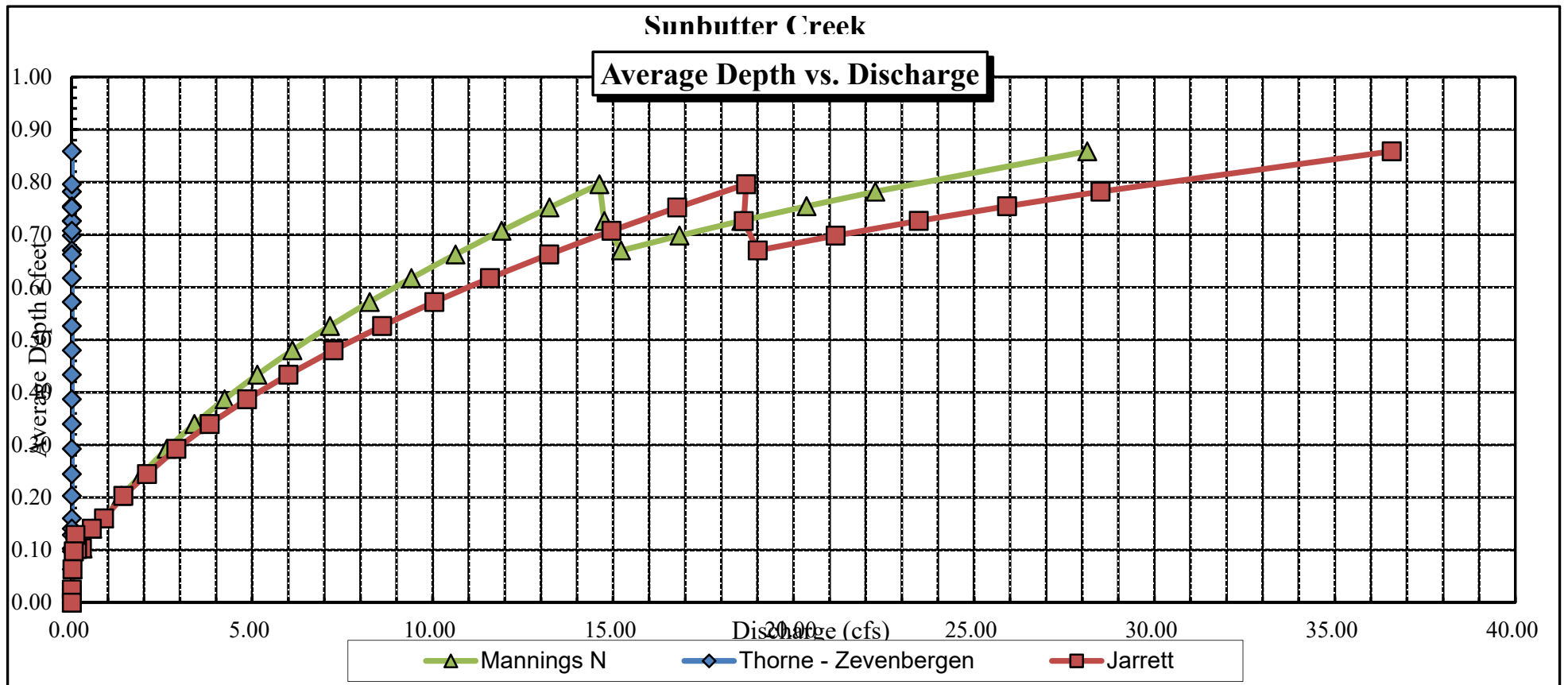
Percent Wetted Perimeter vs. Discharge





# Sunbutter Creek

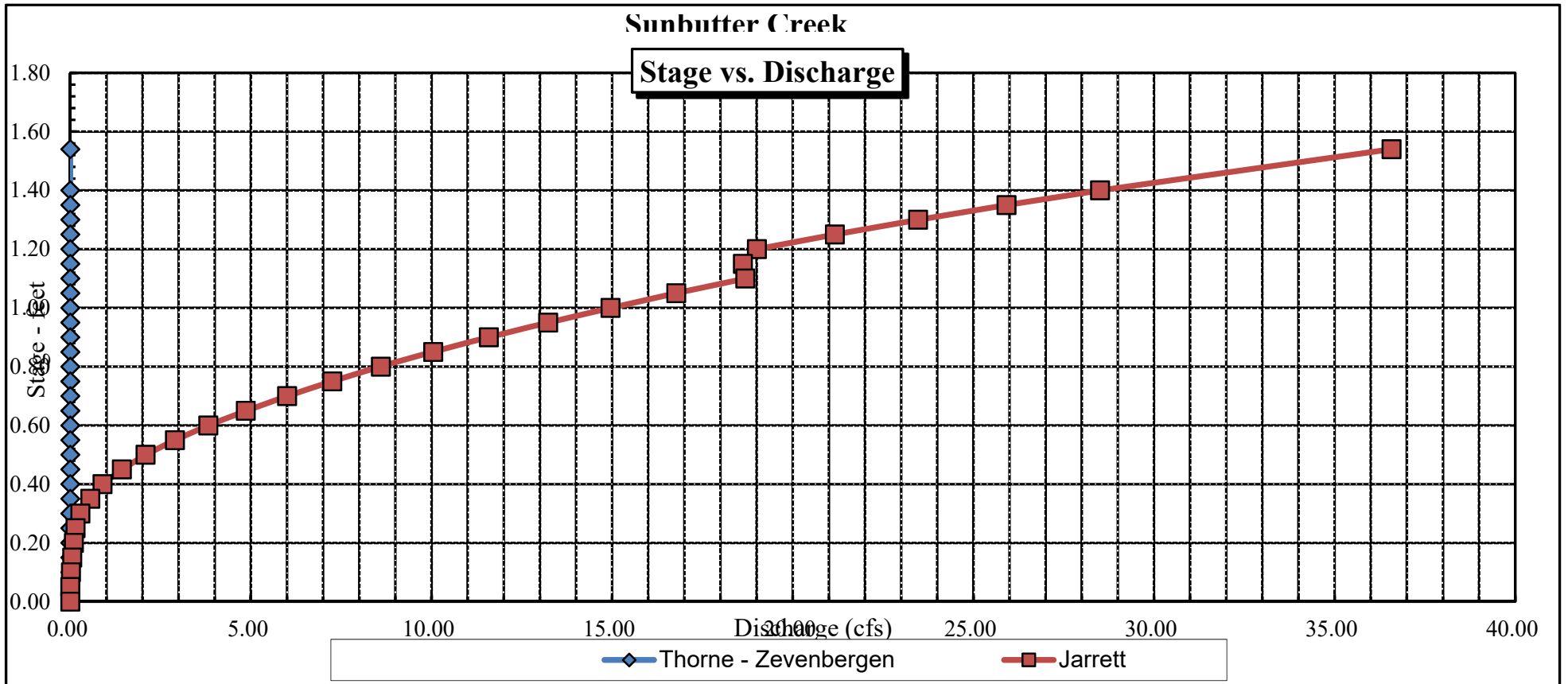
## Average Depth vs. Discharge





# Sunbutter Creek

## Stage vs. Discharge







### DISCHARGE/CROSS SECTION NOTES

[illegible]

### 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:

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<br>DEPTH | WATER<br>DEPTH | VEL  | A    | Q    | Tape to<br>Water |
|------------------------|---------|------|---------------|----------------|------|------|------|------------------|
| Total Data Points = 31 |         |      |               |                |      |      |      |                  |
| 1                      | RS      | 0.00 | 3.70          |                |      | 0.00 | 0.00 | 0.00             |
|                        | 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             |
| 1                      | LW      | 8.70 | 5.20          | 0.00           | 0.00 | 0.00 | 0.00 | 0.00             |
|                        | 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

\*\*\* 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: 0.039

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<br>DEPTH | WATER<br>DEPTH | VEL  |
|---------|------|---------------|----------------|------|
| RS      | 0.00 | 3.70          |                |      |
| 1 G     | 1.30 | 4.18          |                |      |
|         | 1.50 | 4.32          |                |      |
|         | 1.80 | 4.57          |                |      |
|         | 3.20 | 4.80          |                |      |
| RW      | 3.80 | 5.20          | 0.00           | 0.00 |
|         | 4.00 | 5.25          | 0.05           | 0.00 |
|         | 4.20 | 5.35          | 0.15           | 0.00 |
|         | 4.40 | 5.40          | 0.20           | 0.00 |
|         | 4.60 | 5.40          | 0.20           | 0.08 |
|         | 4.80 | 5.40          | 0.20           | 0.10 |
|         | 5.00 | 5.40          | 0.20           | 0.14 |
|         | 5.20 | 5.40          | 0.20           | 0.55 |
|         | 5.40 | 5.45          | 0.25           | 0.63 |
|         | 5.60 | 5.40          | 0.20           | 0.54 |
|         | 5.80 | 5.40          | 0.20           | 0.43 |
|         | 6.00 | 5.40          | 0.20           | 0.60 |
|         | 6.20 | 5.50          | 0.30           | 0.79 |
|         | 6.40 | 5.50          | 0.30           | 0.72 |
|         | 6.60 | 5.50          | 0.30           | 1.31 |
|         | 6.80 | 5.50          | 0.30           | 1.86 |
|         | 7.00 | 5.60          | 0.40           | 1.43 |
|         | 7.20 | 5.60          | 0.40           | 1.20 |
|         | 7.40 | 5.50          | 0.30           | 1.32 |
|         | 7.60 | 5.50          | 0.30           | 0.98 |
|         | 7.80 | 5.55          | 0.35           | 0.56 |
|         | 8.00 | 5.60          | 0.40           | 0.04 |
|         | 8.20 | 5.50          | 0.30           | 0.00 |
|         | 8.40 | 5.35          | 0.15           | 0.00 |
| LW      | 8.70 | 5.20          | 0.00           | 0.00 |
| 1 G     | 9.00 | 4.20          |                |      |

| WETTED<br>PERIM. | WATER<br>DEPTH | AREA<br>(Am) | Q<br>(Qm) | % Q<br>CELL |
|------------------|----------------|--------------|-----------|-------------|
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |
| 0.21             | 0.05           | 0.01         | 0.00      | 0.0%        |
| 0.22             | 0.15           | 0.03         | 0.00      | 0.0%        |
| 0.21             | 0.20           | 0.04         | 0.00      | 0.0%        |
| 0.20             | 0.20           | 0.04         | 0.00      | 0.4%        |
| 0.20             | 0.20           | 0.04         | 0.00      | 0.5%        |
| 0.20             | 0.20           | 0.04         | 0.01      | 0.7%        |
| 0.20             | 0.20           | 0.04         | 0.02      | 2.7%        |
| 0.21             | 0.25           | 0.05         | 0.03      | 3.9%        |
| 0.21             | 0.20           | 0.04         | 0.02      | 2.7%        |
| 0.20             | 0.20           | 0.04         | 0.02      | 2.1%        |
| 0.20             | 0.20           | 0.04         | 0.02      | 3.0%        |
| 0.22             | 0.30           | 0.06         | 0.05      | 5.9%        |
| 0.20             | 0.30           | 0.06         | 0.04      | 5.4%        |
| 0.20             | 0.30           | 0.06         | 0.08      | 9.8%        |
| 0.20             | 0.30           | 0.06         | 0.11      | 13.9%       |
| 0.22             | 0.40           | 0.08         | 0.11      | 14.3%       |
| 0.20             | 0.40           | 0.08         | 0.10      | 12.0%       |
| 0.22             | 0.30           | 0.06         | 0.08      | 9.9%        |
| 0.20             | 0.30           | 0.06         | 0.06      | 7.3%        |
| 0.21             | 0.35           | 0.07         | 0.04      | 4.9%        |
| 0.21             | 0.40           | 0.08         | 0.00      | 0.4%        |
| 0.22             | 0.30           | 0.06         | 0.00      | 0.0%        |
| 0.25             | 0.15           | 0.04         | 0.00      | 0.0%        |
| 0.34             |                | 0.00         | 0.00      | 0.0%        |
| 0.00             |                | 0.00         | 0.00      | 0.0%        |

TOTALS -----

5.14 0.4 1.18 0.80 100.0%  
 (Max.)

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<br>LINE | MEAS<br>AREA | COMP<br>AREA | AREA<br>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<br>WATER<br>(FT) | TOP<br>WIDTH<br>(FT) | AVG.<br>DEPTH<br>(FT) | MAX.<br>DEPTH<br>(FT) | AREA<br>(SQ FT) | WETTED<br>PERIM.<br>(FT) | PERCENT<br>WET PERIM<br>(%) | HYDR<br>RADIUS<br>(FT) | FLOW<br>(CFS) | AVG.<br>VELOCITY<br>(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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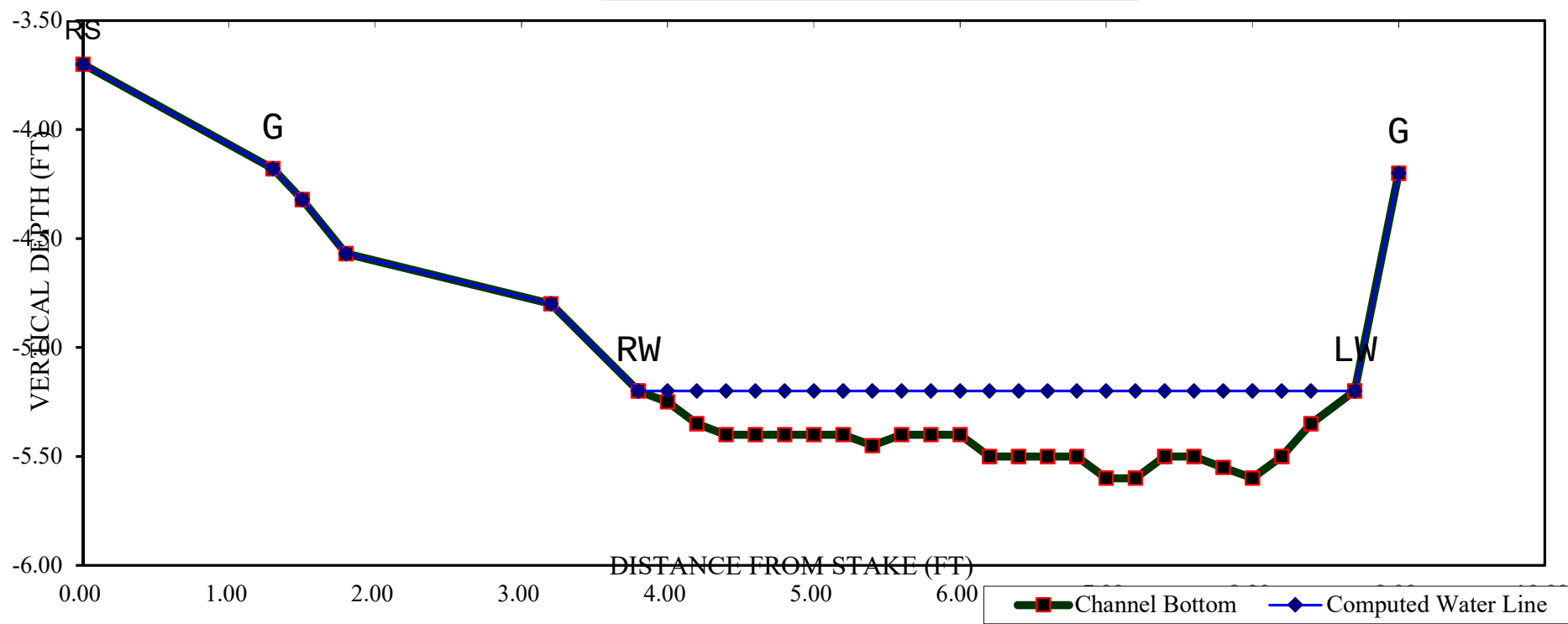
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RECOMMENDATION BY: ..... AGENCY..... DATE:.....  
CWCB REVIEW BY: ..... DATE:.....

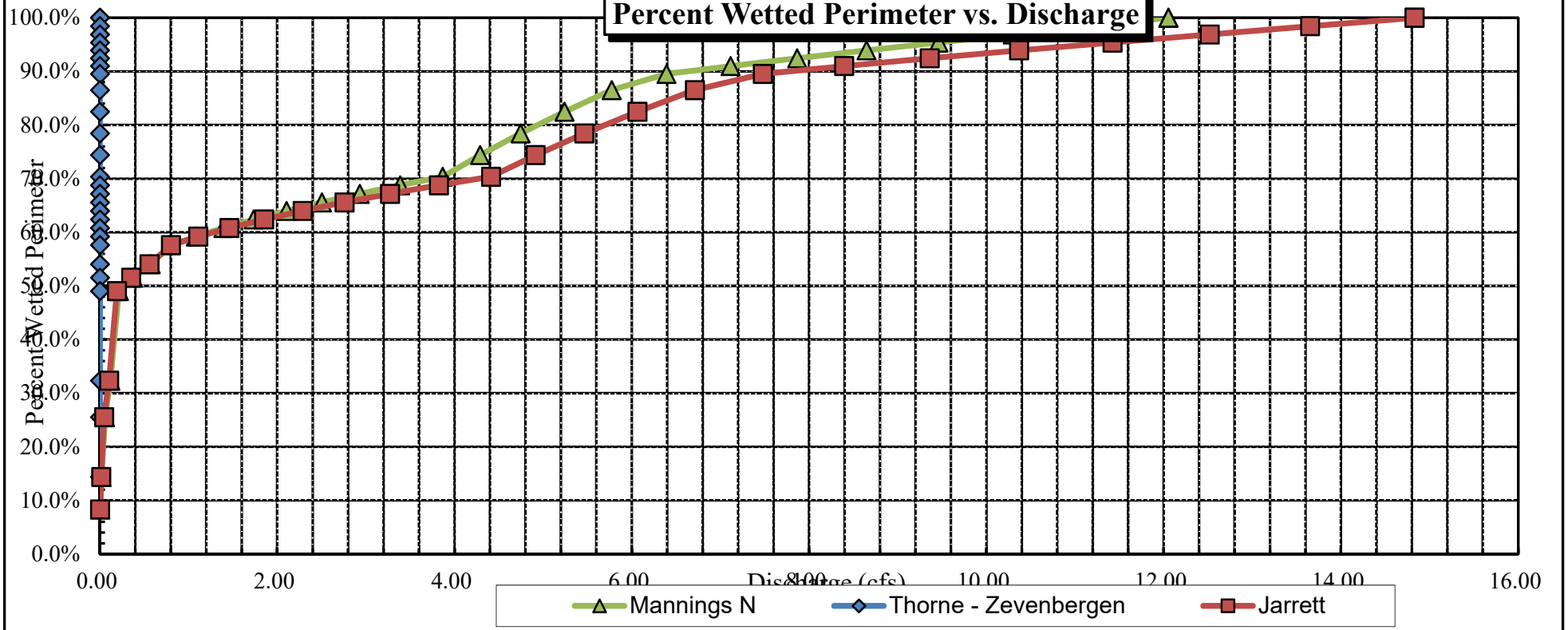
# Sunbutter Creek

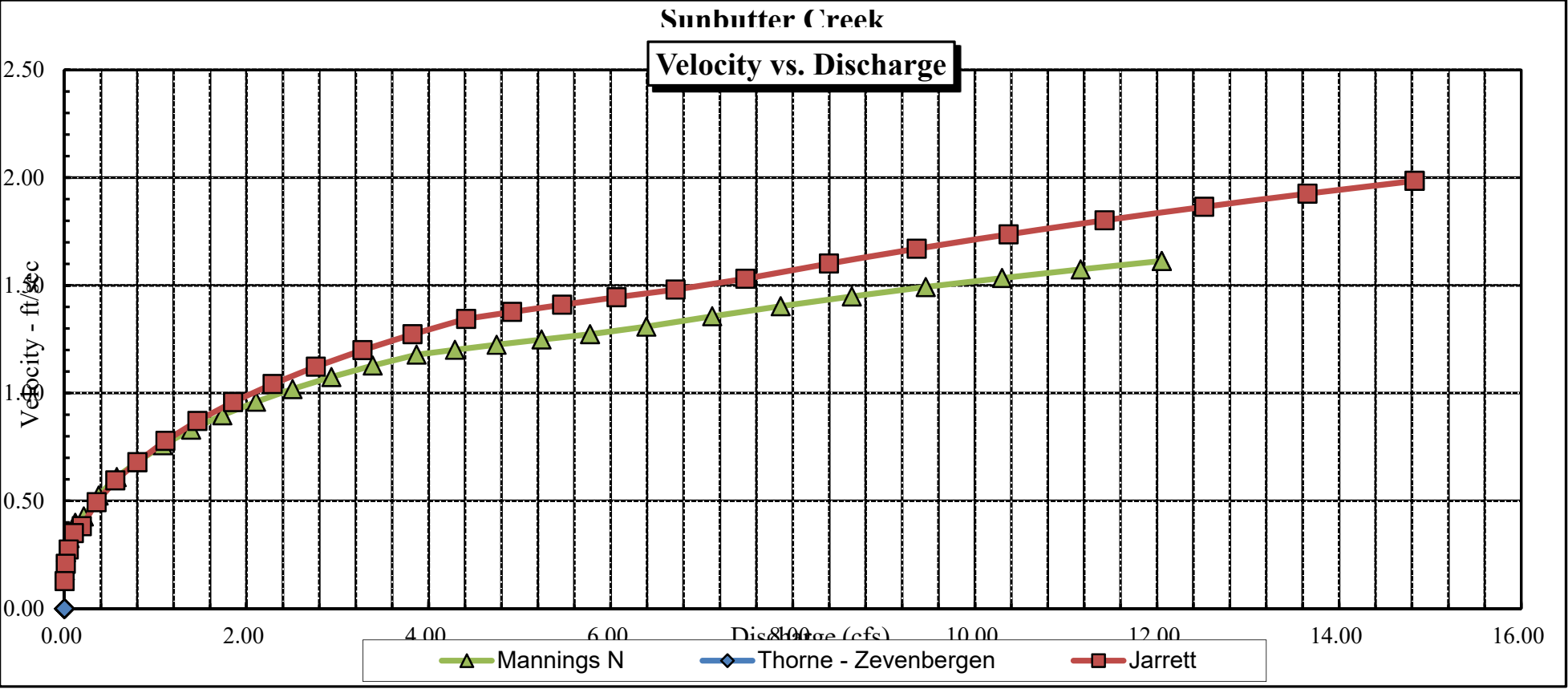
## CROSS SECTION DATA ANALYSIS

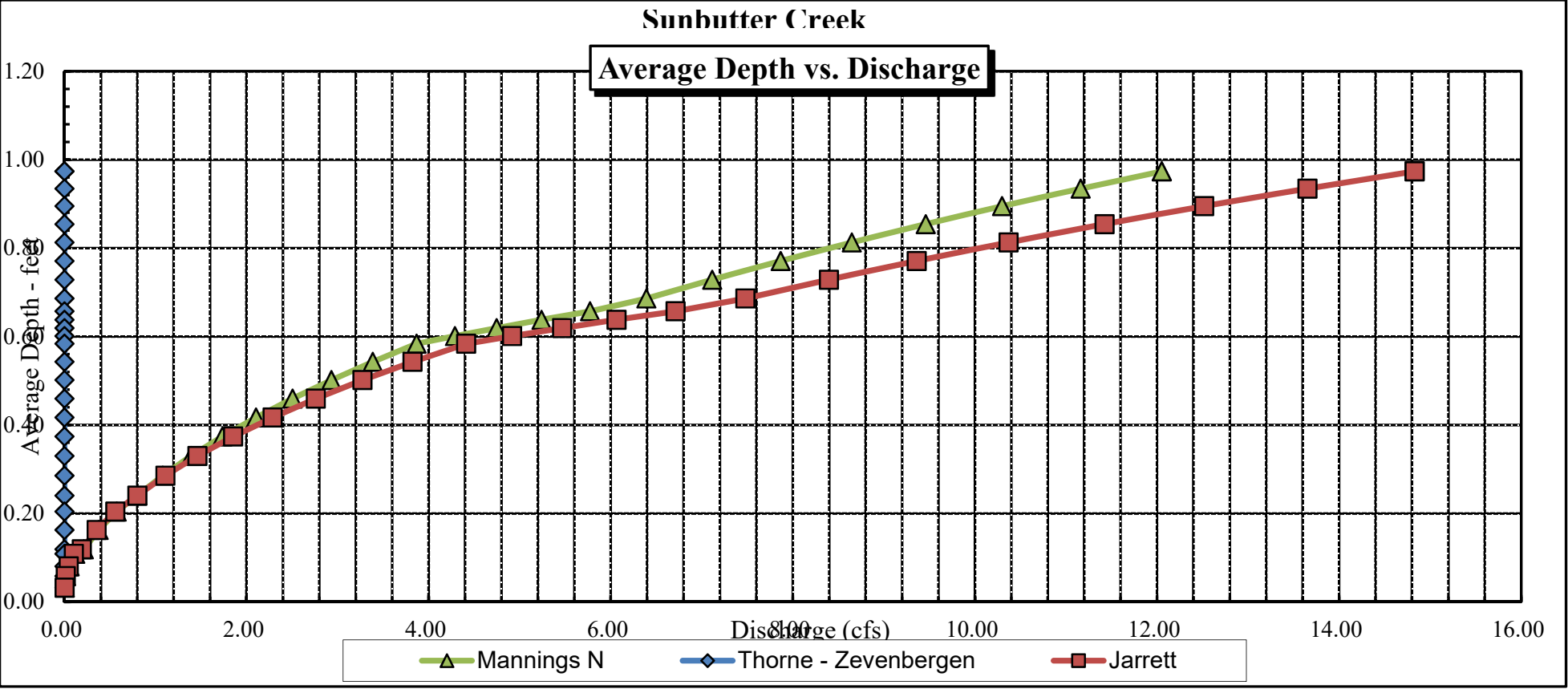


# Sunbutter Creek

Percent Wetted Perimeter vs. Discharge







# Sunbutter Creek

## Stage vs. Discharge

