United States Department of the Interior

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

In Reply Refer To:
7250 (CO-932)

DEC 0 4 2019

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its recommendation for an instream flow water right on Iowa Gulch, located in Water Division 2.

Location and Land Status. Iowa Gulch originates on the west flank of Mount Sherman approximately six miles southeast of Leadville, and it flows into the Arkansas River four miles southwest of Leadville. This recommendation addresses only the portion of Iowa Gulch that starts at the headwaters and extends downstream to the headgate of the Iowa Gulch Intake in Section 33, T9S R79W, Sixth P.M. The BLM manages 2.53 miles of this reach, and approximately 0.6 miles are in private ownership.

Biological Summary. Iowa Gulch is a cold water, very high gradient stream. The reach that is the subject of this recommendation flows through a valley approximately one half mile in width at the base of Mount Sherman. This portion of Iowa Gulch 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 limited riffles. Water quality is good for supporting salmonid fish species.

Fish surveys indicate that Iowa Gulch supports a self-sustaining population of brook trout below the recommended stream reach. The recommended reach does not presently support a fish population. BLM fish biologists believe that this part of Iowa Gulch does not support fish because of short-term, heavy metal discharges from abandoned mines within the watershed that no longer occur. The BLM believes that current water quality is sufficient to support a fish population and has requested that Colorado Parks and Wildlife consider reintroduction of fish after all historic mine tailings are stabilized.

The BLM conducted aquatic macroinvertebrate surveys during July 2019 to confirm the ability of this stream reach to support aquatic life. The surveys documented nine families of aquatic macroinvertebrates. The results revealed that Iowa Gulch supports higher than average diversity of aquatic macroinvertebrates when compared to other streams in the Southern Rocky Mountain Region. Surveys also found a low number of taxa that are tolerant of poor water quality, which indicates good water quality. Finally, the survey results were also used to calculate a Colorado Department of Public Health and Environment multi-metric score of 59.9, which is well above the water quality attainment threshold of 48 for high mountain streams.

The creek also supports a vigorous riparian community comprised of willows and sedges. The riparian community provides some cover and shading for the creek, and contributes to substantial to bank stability. Extensive beaver activity is also evident.

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)
09/18/2018 #1	1.58 cfs	11.41 feet	1.57 cfs	1.58 cfs
09/18/2018 #2	1.65 cfs	9.23 feet	1.05 cfs	1.80 cfs
		Averages:	1.31 cfs	1.69 cfs

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

> 1.7 cubic feet per second is recommended during the warm weather portion of the year, from snowmelt runoff period from May 1 to September 15. This recommendation is driven by the average depth criteria. Given the small amount of riffle habitat in this reach, it is important to provide depths that are suitable for aquatic macroinvertebrate production, and ultimately for spawning trout when they are reintroduced to the stream.
>
> 1.0 cubic feet per second is recommended from September 16 to 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 insects and a reintroduced fish population to overwinter.

Water Availability. The BLM recommends relying upon Streamstats to estimate water availability because this creek has not been historically gaged. The BLM does not recommend reliance upon stream gages located along the Arkansas River and other nearby Arkansas River tributaries as an indicator of water availability, because those gages are influenced by diversions reservoir operations.

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

Relationship to Land Management Plans. The BLM land use plan calls for managing this creek to support riparian, wildlife, and water quality values and to continue meeting land health standards. Establishing an instream flow water right would assist in meeting these objectives. Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with the BLM's draft recommendation in February 2019. We thank both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Megan Gilbert

Megan Gilbert
Deputy State Director, Resources (Acting)

Cc: David Gilbert, Royal Gorge Field Office
Keith Berger, Royal Gorge Field Office
Cathy Cook, Rocky Mountain District Manager

Combined Summaries

Water **33198** **Iowa Gulch** Date **8/19/2015**

Station **AR4528** **ABT 400 M ABV CROSSING W/ LAKE CO RD 6B**

Drainage **Arkansas River** UtmX **393074** UtmY **4342274** Elevation **10789 ft**

Length **413 ft** Width **10.00 ft** Area **0.09 acre**

Surveyors **Morriah Cowden**

Gear **BPEF** Effort Metric **PASS** Protocol **TWO-PASS REMOVAL**

Proportional Stocking Density and Catch/Unit Effort

Species	Total Catch	Min Cut inch	Max Cut inch	Total used	Proportional Stock Density (%)	Percent Stock Size	Percent Quality Size	Percent Preferred Size	Percent Memorable Size	Percent Trophy Size	Max Length inches
BROOK TROUT	20			20	0.00	30.00					10.04

Mean, Minimum and Maximum Length and Weight

Species	Total Catch	Min cut inch	Max cut inch	Total Used	Length (inches) Mean	Minimum	Maximum	Weight (lb) Mean	Minimum	Maximum
BROOK TROUT	20			20	7.27	5.12	10.04	0.15	0.05	0.35

Relative Abundance and Catch/Unit Effort

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total used	Weight Lbs	Percent Number	Percent Weight	Catch per Unit Effort Number/Effort	Catch per Unit Effort Lbs/Effort
BROOK TROUT	20			20	3.22	100.00	100.00		

Abundance and Biomass

Species	Total Catch	Min.Cut inch	Max.Cut inch	Total Used	Population estimate	Biomass Lbs	Percent Number	Percent Weight	Density estimates Lb/Acre	Density estimates Fish/Acre	Density estimates Fish/Mile
BROOK TROUT	20			20	21	3.22	100.00	100.00	34.01	221.49	268.47

Notes:

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Iowa Gulch						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 150 ft. downstream from confluence with Dyer Gulch						
DATE: 9-18-18	OBSERVERS: R. Smith, J. Thompson, J. Abeles					
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 35	TOWNSHIP: 9 N/S	RANGE: 77 E/W	PM: 6th	
COUNTY: Lake	WATERSHED: Arkansas River	WATER DIVISION: 2	DOW WATER CODE: 33198			
MAP(S): USGS:	Zone 13 396081					
USFS:	4342618					

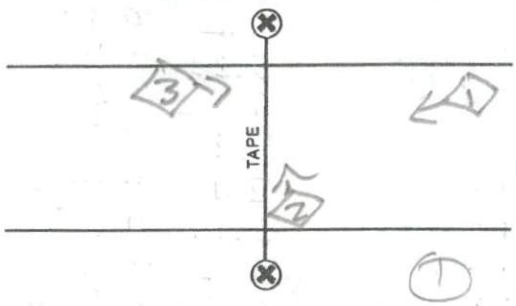
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	7.90 / 7.90
② WS Upstream	16.5	7.86
③ WS Downstream	28.0	8.58
SLOPE	0.72 / 44.5 = .016	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayflies

COMMENTS

Temp = 5.8°C pH = 7.69

Sp. cond. = 171.3 Salinity = 0.1

willow/sedge riparian community - beaver dams just downstream

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
Iowa Gulch	1	9-18-18	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: _____ ft	TIME: 9 am

Features: Stake (S), Grassline (G), Waterline (W), Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft^2)	Discharge (cfs)
								At Point	Mean in Vertical		
RS	0.0		5.18								
	0.7		6.05								
G	1.2		6.42								
	2.2		6.79								
	3.3		7.66								
RW	5.5		7.90								
	5.8		7.95	0.05				0.08			
	6.0		8.0	0.10				0.39			
	6.2		8.1	0.20				1.20			
	6.4		8.15	0.25				0.92			
	6.6		8.15	0.25				1.03			
	6.8		8.20	0.30				1.37			
	7.0		8.20	0.30				1.33			
	7.2		8.20	0.30				1.69			
	7.4		8.25	0.35				1.54			
	7.6		8.3	0.40				1.30			
	7.8		8.3	0.40				1.67			
	8.0		8.2	0.30				1.13			
	8.2		8.25	0.35				1.53			
	8.4		8.2	0.30				1.55			
	8.6		8.2	0.30				1.42			
	8.8		8.1	0.20				1.55			
	9.0		8.15	0.25				1.59			
	9.2		8.15	0.25				1.04			
	9.4		8.15	0.25				1.43			
	9.6		8.15	0.25				1.37			
	9.8		8.10	0.20				0.77			
	10.0		8.05	0.15				1.15			
	10.2		8.05	0.15				1.21			
	10.4		8.0	0.10				1.04			
	10.6		8.0	0.10				0.32			
	10.8		8.0	0.10				0.15			
	11.0		7.95	0.05				0.11			
LW	11.7		7.90								
	12.4		7.40								
G	12.8		6.49								
	13.6		6.09								
LS	14.7		5.49								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Iowa Gulch						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: Approx. 150 ft. downstream from confluence with Dyer Gulch							
DATE: 9-18-18	OBSERVERS: R. Smith, F. Thompson, J. Abeles						
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 35	TOWNSHIP: 9 N/S	RANGE: 79 E/W	PM: 6th		
COUNTY: Lake	WATERSHED: Arkansas	WATER DIVISION: 2	DOW WATER CODE: 33198				
MAP(S): USGS:	Zone 13 396099						
USFS:	4342643						

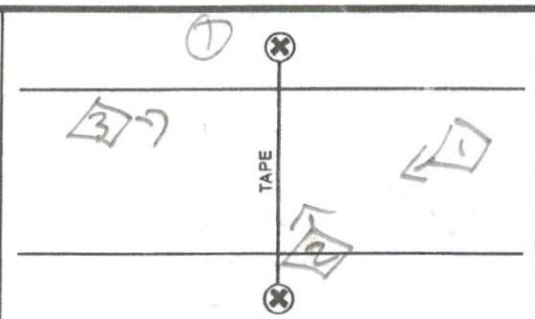
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	6.30 / 6.30
(2) WS Upstream	13.5'	6.05
(3) WS Downstream	8.5	6.79
SLOPE	0.74/22.0 = .034	

SKETCH



AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly

COMMENTS

sedge - willow riparian

water quality same as downstream site

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
Iowa Gulch	2	9-18-18	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 9:30 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		4.27								
	1.5		4.69								
G	1.7		4.91								
	1.9		6.12								
RW	2.5		6.30								
	2.8		6.4	0.10				0.10			
	3.1		6.45	0.15				0.52			
	3.4		6.4	0.10				1.49			
	3.7		6.55	0.25				0.25			
	4.0		6.55	0.25				0.20			
	4.3		6.50	0.20				0.88			
	4.6		6.70	0.40				1.95			
	4.9		6.60	0.35				1.87			
	5.2		6.55	0.25				1.95			
	5.5		6.55	0.25				0.44			
	5.8		6.50	0.20				0.89			
	6.1		6.5	0.20				1.14			
	6.4		6.5	0.20				1.44			
	6.7		6.45	0.15				1.41			
	7.0		6.55	0.25				1.98			
	7.3		6.55	0.25				1.96			
	7.6		6.55	0.25				1.32			
	7.9		6.50	0.20				1.27			
	8.2		6.50	0.20				1.27			
	8.5		6.50	0.20				0.64			
	8.8		6.45	0.15				0.54			
	9.1		6.40	0.10				0.05			
LW	9.9		6.30								
	10.2		5.84								
G	11.0		5.34								
LS	12.0		4.80								
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	Iowa Gulch
XS LOCATION:	150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER:	1
DATE:	9/18/2018
OBSERVERS:	R. Smith, J. Thompson, J. Abeles
1/4 SEC:	NW
SECTION:	35
TWP:	9N
RANGE:	79W
PM:	Sixth
COUNTY:	Lake
WATERSHED:	Arkansas River
DIVISION:	2
DOW CODE:	33198
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.016 ft / ft

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

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 38					
	RS	0.00	5.18			0.00	0.00	0.00
		0.70	6.05			0.00	0.00	0.00
1	G	1.20	6.42			0.00	0.00	0.00
		2.20	6.79			0.00	0.00	0.00
		3.30	7.66			0.00	0.00	0.00
	RW	5.50	7.90	0.00	0.00	0.00	0.00	0.00
		5.80	7.95	0.05	0.08	0.01	0.00	7.90
		6.00	8.00	0.10	0.39	0.02	0.01	7.90
		6.20	8.10	0.20	1.20	0.04	0.05	7.90
		6.40	8.15	0.25	0.92	0.05	0.05	7.90
		6.60	8.15	0.25	1.03	0.05	0.05	7.90
		6.80	8.20	0.30	1.37	0.06	0.08	7.90
		7.00	8.20	0.30	1.33	0.06	0.08	7.90
		7.20	8.20	0.30	1.69	0.06	0.10	7.90
		7.40	8.25	0.35	1.54	0.07	0.11	7.90
		7.60	8.30	0.40	1.30	0.08	0.10	7.90
		7.80	8.30	0.40	1.67	0.08	0.13	7.90
		8.00	8.20	0.30	1.13	0.06	0.07	7.90
		8.20	8.25	0.35	1.53	0.07	0.11	7.90
		8.40	8.20	0.30	1.55	0.06	0.09	7.90
		8.60	8.20	0.30	1.42	0.06	0.09	7.90
		8.80	8.10	0.20	1.55	0.04	0.06	7.90
		9.00	8.15	0.25	1.59	0.05	0.08	7.90
		9.20	8.15	0.25	1.04	0.05	0.05	7.90
		9.40	8.15	0.25	1.43	0.05	0.07	7.90
		9.60	8.15	0.25	1.37	0.05	0.07	7.90
		9.80	8.10	0.20	0.77	0.04	0.03	7.90
		10.00	8.05	0.15	1.15	0.03	0.03	7.90
		10.20	8.05	0.15	1.21	0.03	0.04	7.90
		10.40	8.00	0.10	1.04	0.02	0.02	7.90
		10.60	8.00	0.10	0.32	0.02	0.01	7.90
		10.80	8.00	0.10	0.15	0.02	0.00	7.90
		11.00	7.95	0.05	0.11	0.02	0.00	7.90
	LW	11.70	7.90	0.00	0.00	0.00	0.00	0.00
		12.40	7.40			0.00	0.00	0.00
1	G	12.80	6.49			0.00	0.00	0.00
		13.60	6.09			0.00	0.00	0.00
	LS	14.70	5.49			0.00	0.00	0.00
					Totals	1.26	1.58	

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

LOCATION INFORMATION

STREAM NAME:	Iowa Gulch
XS LOCATION:	150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER:	1
DATE:	18-Sep-18
OBSERVERS:	R. Smith, J. Thompson, J. Abeles
1/4 SEC:	NW
SECTION:	35
TWP:	9N
RANGE:	79W
PM:	Sixth
COUNTY:	Lake
WATERSHED:	Arkansas River
DIVISION:	2
DOW CODE:	33198
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.016

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

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

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER: 1

DATA POINTS= 38

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
RS	0.00	5.18			0.00		0.00	0.00	0.0%
	0.70	6.05			0.00		0.00	0.00	0.0%
1 G	1.20	6.42			0.00		0.00	0.00	0.0%
	2.20	6.79			0.00		0.00	0.00	0.0%
	3.30	7.66			0.00		0.00	0.00	0.0%
RW	5.50	7.90	0.00	0.00	0.00		0.00	0.00	0.0%
	5.80	7.95	0.05	0.08	0.30	0.05	0.01	0.00	0.1%
	6.00	8.00	0.10	0.39	0.21	0.10	0.02	0.01	0.5%
	6.20	8.10	0.20	1.20	0.22	0.20	0.04	0.05	3.0%
	6.40	8.15	0.25	0.92	0.21	0.25	0.05	0.05	2.9%
	6.60	8.15	0.25	1.03	0.20	0.25	0.05	0.05	3.3%
	6.80	8.20	0.30	1.37	0.21	0.30	0.06	0.08	5.2%
	7.00	8.20	0.30	1.33	0.20	0.30	0.06	0.08	5.0%
	7.20	8.20	0.30	1.69	0.20	0.30	0.06	0.10	6.4%
	7.40	8.25	0.35	1.54	0.21	0.35	0.07	0.11	6.8%
	7.60	8.30	0.40	1.30	0.21	0.40	0.08	0.10	6.6%
	7.80	8.30	0.40	1.67	0.20	0.40	0.08	0.13	8.4%
	8.00	8.20	0.30	1.13	0.22	0.30	0.06	0.07	4.3%
	8.20	8.25	0.35	1.53	0.21	0.35	0.07	0.11	6.8%
	8.40	8.20	0.30	1.55	0.21	0.30	0.06	0.09	5.9%
	8.60	8.20	0.30	1.42	0.20	0.30	0.06	0.09	5.4%
	8.80	8.10	0.20	1.55	0.22	0.20	0.04	0.06	3.9%
	9.00	8.15	0.25	1.59	0.21	0.25	0.05	0.08	5.0%
	9.20	8.15	0.25	1.04	0.20	0.25	0.05	0.05	3.3%
	9.40	8.15	0.25	1.43	0.20	0.25	0.05	0.07	4.5%
	9.60	8.15	0.25	1.37	0.20	0.25	0.05	0.07	4.3%
	9.80	8.10	0.20	0.77	0.21	0.20	0.04	0.03	1.9%
	10.00	8.05	0.15	1.15	0.21	0.15	0.03	0.03	2.2%
	10.20	8.05	0.15	1.21	0.20	0.15	0.03	0.04	2.3%
	10.40	8.00	0.10	1.04	0.21	0.10	0.02	0.02	1.3%
	10.60	8.00	0.10	0.32	0.20	0.10	0.02	0.01	0.4%
	10.80	8.00	0.10	0.15	0.20	0.10	0.02	0.00	0.2%
	11.00	7.95	0.05	0.11	0.21	0.05	0.02	0.00	0.2%
LW	11.70	7.90	0.00	0.00	0.70		0.00	0.00	0.0%
	12.40	7.40			0.00		0.00	0.00	0.0%
1 G	12.80	6.49			0.00		0.00	0.00	0.0%
	13.60	6.09			0.00		0.00	0.00	0.0%
LS	14.70	5.49			0.00		0.00	0.00	0.0%
TOTALS ----------					6.35	0.4 (Max.)	1.26	1.58	100.0%

Manning's n = 0.0505
Hydraulic Radius= 0.19761896

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.26	1.26	0.0%
7.65	1.26	3.13	149.8%
7.67	1.26	2.96	135.9%
7.69	1.26	2.79	122.3%
7.71	1.26	2.62	109.1%
7.73	1.26	2.46	96.2%
7.75	1.26	2.30	83.6%
7.77	1.26	2.15	71.3%
7.79	1.26	2.00	59.4%
7.81	1.26	1.86	47.9%
7.83	1.26	1.71	36.6%
7.85	1.26	1.58	25.8%
7.86	1.26	1.51	20.4%
7.87	1.26	1.45	15.2%
7.88	1.26	1.38	10.0%
7.89	1.26	1.32	5.0%
7.90	1.26	1.26	0.0%
7.91	1.26	1.19	-4.9%
7.92	1.26	1.14	-9.6%
7.93	1.26	1.08	-14.1%
7.94	1.26	1.02	-18.5%
7.95	1.26	0.97	-22.7%
7.97	1.26	0.87	-30.9%
7.99	1.26	0.77	-38.8%
8.01	1.26	0.68	-46.1%
8.03	1.26	0.59	-52.9%
8.05	1.26	0.51	-59.6%
8.07	1.26	0.43	-65.7%
8.09	1.26	0.36	-71.6%
8.11	1.26	0.28	-77.3%
8.13	1.26	0.22	-82.6%
8.15	1.26	0.16	-87.5%

WATERLINE AT ZERO
AREA ERROR = 7.900

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.49	11.41	1.29	1.81	14.76	12.68	100.0%	1.16	60.74	4.12
	6.90	10.28	1.01	1.40	10.34	11.20	88.3%	0.92	36.46	3.53
	6.95	10.20	0.96	1.35	9.82	11.06	87.2%	0.89	33.77	3.44
	7.00	10.11	0.92	1.30	9.32	10.92	86.1%	0.85	31.17	3.35
	7.05	10.03	0.88	1.25	8.81	10.79	85.1%	0.82	28.65	3.25
	7.10	9.94	0.84	1.20	8.31	10.65	84.0%	0.78	26.22	3.15
	7.15	9.85	0.79	1.15	7.82	10.52	82.9%	0.74	23.87	3.05
	7.20	9.77	0.75	1.10	7.33	10.38	81.9%	0.71	21.61	2.95
	7.25	9.68	0.71	1.05	6.84	10.25	80.8%	0.67	19.44	2.84
	7.30	9.60	0.66	1.00	6.36	10.11	79.7%	0.63	17.37	2.73
	7.35	9.51	0.62	0.95	5.88	9.98	78.7%	0.59	15.39	2.62
	7.40	9.43	0.57	0.90	5.41	9.84	77.6%	0.55	13.50	2.50
	7.45	9.30	0.53	0.85	4.94	9.68	76.3%	0.51	11.74	2.38
	7.50	9.16	0.49	0.80	4.48	9.51	75.0%	0.47	10.09	2.25
	7.55	9.03	0.45	0.75	4.02	9.34	73.7%	0.43	8.54	2.12
	7.60	8.90	0.40	0.70	3.58	9.18	72.3%	0.39	7.10	1.98
	7.65	8.76	0.36	0.65	3.13	9.01	71.0%	0.35	5.77	1.84
	7.70	8.31	0.33	0.60	2.71	8.54	67.3%	0.32	4.68	1.73
	7.75	7.78	0.30	0.55	2.30	7.99	63.0%	0.29	3.74	1.62
	7.80	7.26	0.27	0.50	1.93	7.44	58.7%	0.26	2.91	1.51
	7.85	6.73	0.23	0.45	1.58	6.90	54.4%	0.23	2.20	1.39
WL	7.90	6.20	0.20	0.40	1.25	6.35	50.1%	0.20	1.58	1.26
	7.95	5.20	0.19	0.35	0.97	5.34	42.1%	0.18	1.16	1.19
	8.00	4.40	0.16	0.30	0.72	4.53	35.7%	0.16	0.79	1.09
	8.05	3.90	0.13	0.25	0.51	4.01	31.6%	0.13	0.48	0.94
	8.10	3.60	0.09	0.20	0.32	3.70	29.1%	0.09	0.23	0.73
	8.15	2.10	0.08	0.15	0.16	2.17	17.1%	0.07	0.10	0.65
	8.20	1.20	0.05	0.10	0.06	1.25	9.8%	0.05	0.03	0.49
	8.25	0.50	0.04	0.05	0.02	0.52	4.1%	0.03	0.01	0.39
	8.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnstr fr conf w Dyer Gulch
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.58	cfs
CALCULATED FLOW (Qc)=	1.58	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.90	ft
CALCULATED WATERLINE (WLc)=	7.90	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=	1.26	ft/sec
MANNING'S N=	0.051	
SLOPE=	0.016	ft/ft
.4 * Qm =	0.6	cfs
2.5 * Qm=	4.0	cfs

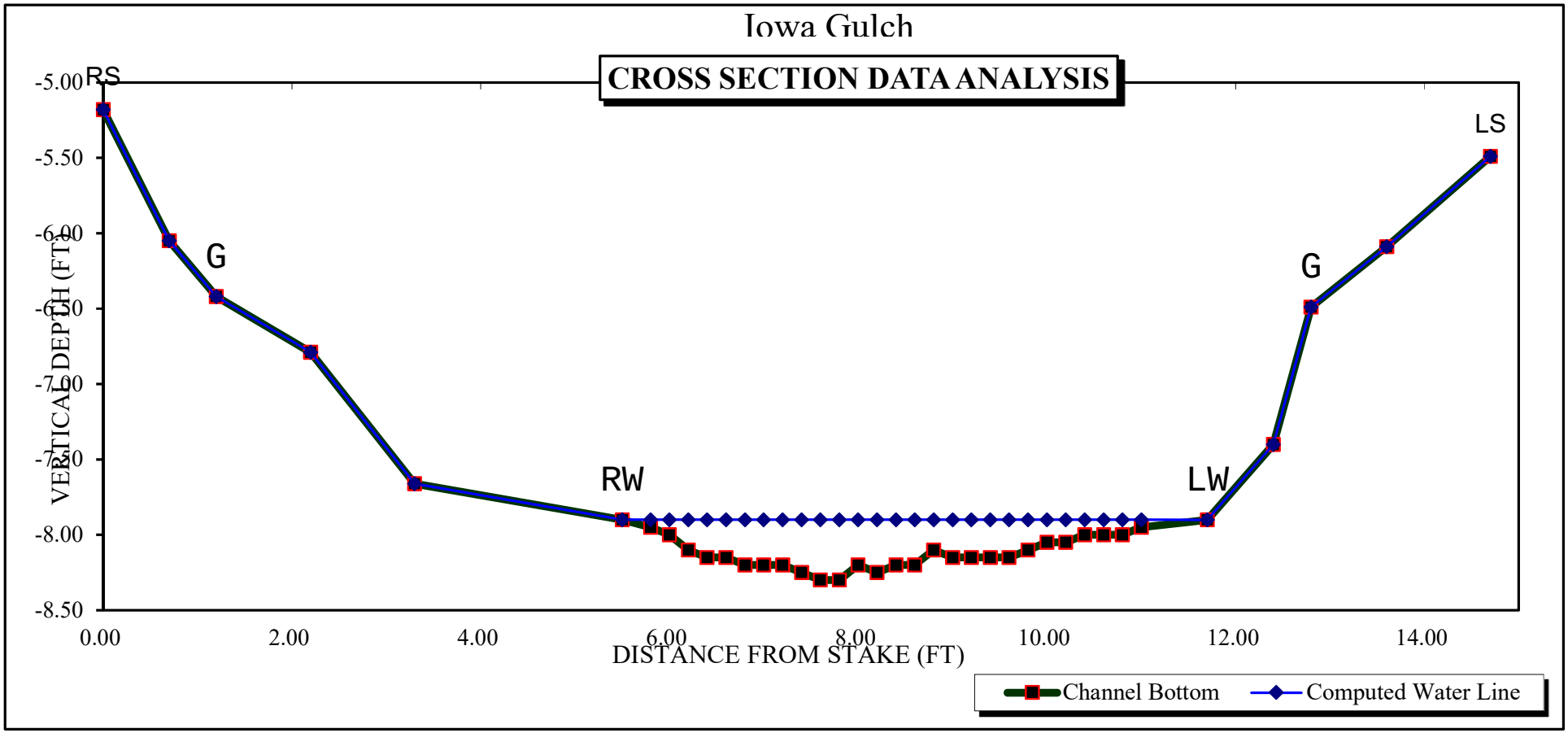
RECOMMENDED INSTREAM FLOW:
==========

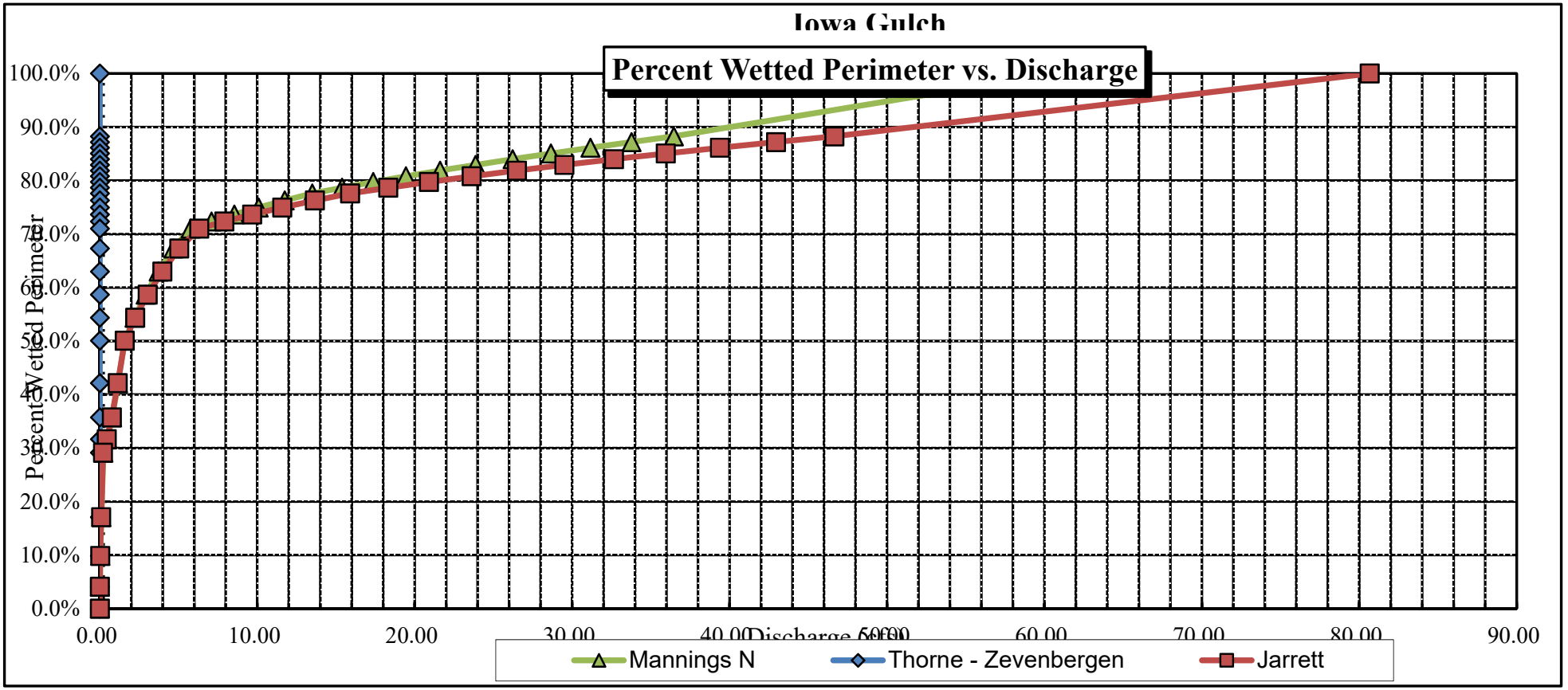
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

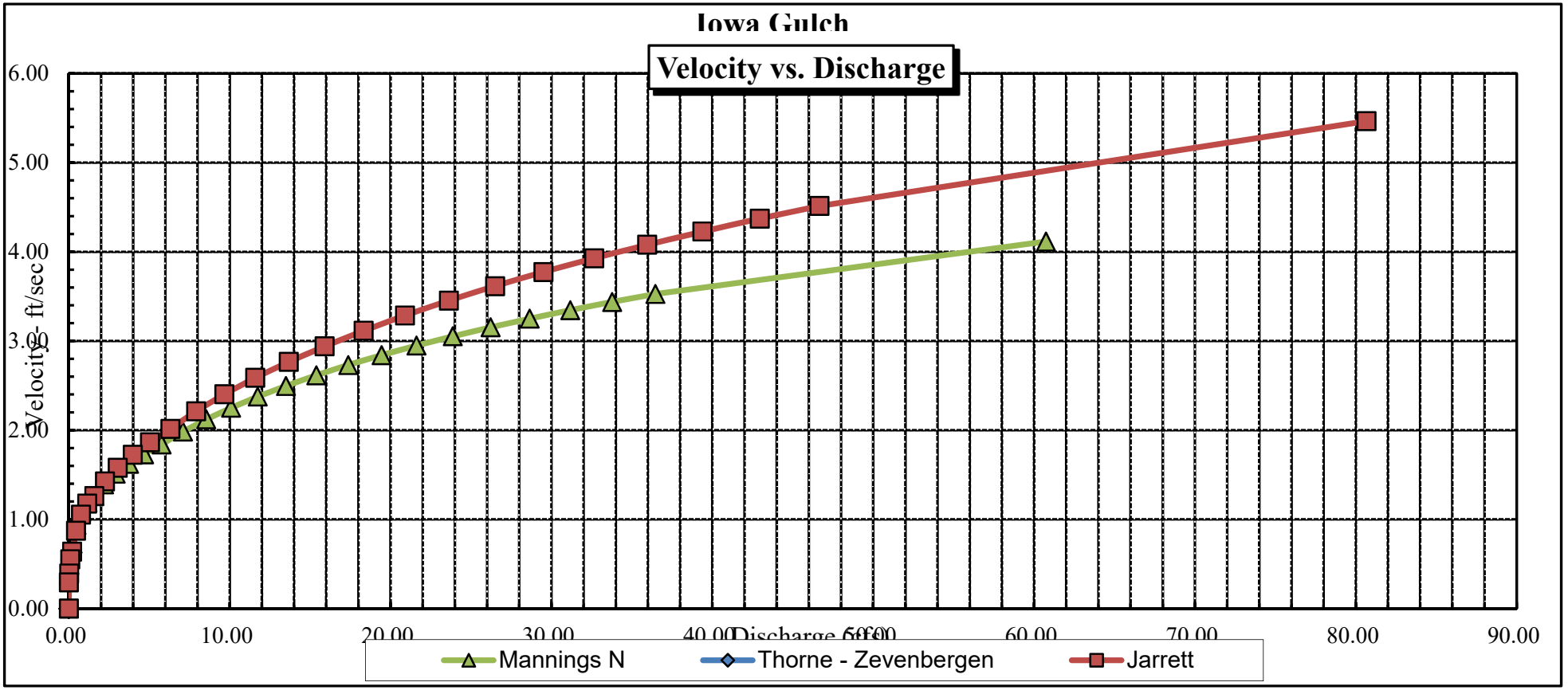
RATIONALE FOR RECOMMENDATION:
==========

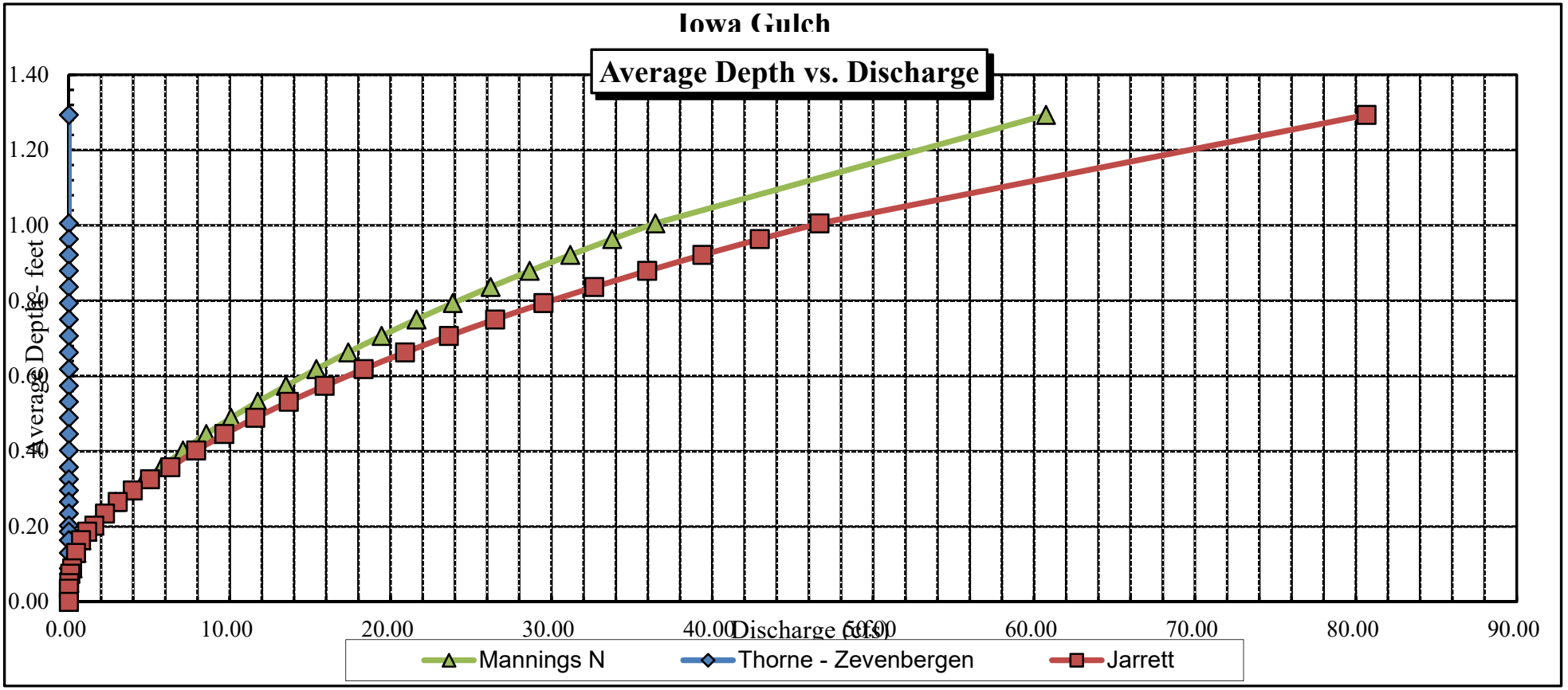
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

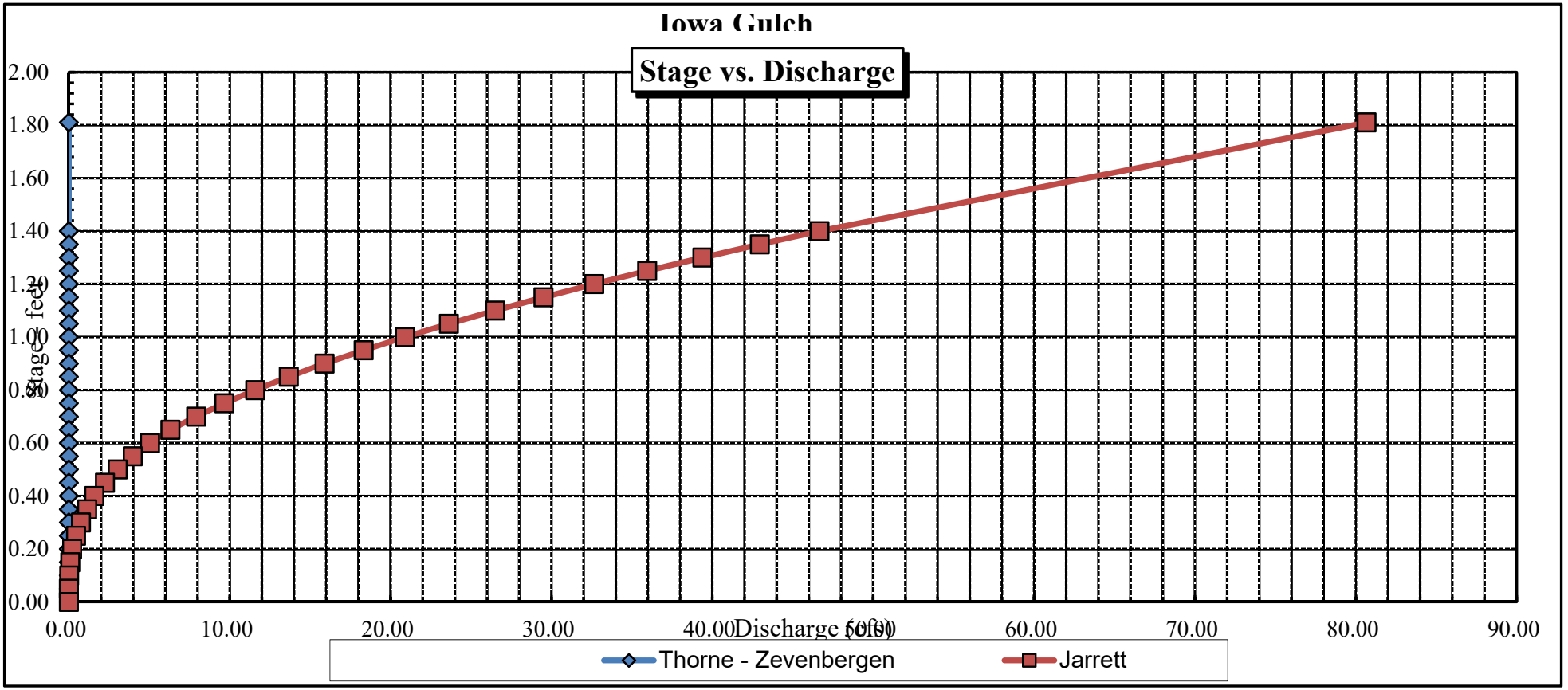
CWCB REVIEW BY: ..... DATE:.....


Iowa Gulch
CROSS SECTION DATA ANALYSIS
RS
G
RW
LW
G
LS
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Iowa Gulch
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
10.00
20.00
30.00
40.00
60.00
70.00
80.00
90.00
Mannings N
Thorne - Zevenbergen
Jarrett


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


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


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

Data Input & Proofing

STREAM NAME:	Iowa Gulch
XS LOCATION:	150 ft dwnst fr conf w Dyer Gulch
XS NUMBER:	2
DATE:	9/18/2018
OBSERVERS:	R. Smith, J. Thompson, J. Abeles
1/4 SEC:	NW
SECTION:	35
TWP:	9N
RANGE:	79W
PM:	Sixth
COUNTY:	Lake
WATERSHED:	Arkansas
DIVISION:	2
DOW CODE:	33198
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.034 ft / ft

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

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
			Total Data Points = 31					
	RS	0.00	4.27			0.00	0.00	0.00
		1.50	4.69			0.00	0.00	0.00
1	G	1.70	4.91			0.00	0.00	0.00
		1.90	6.12			0.00	0.00	0.00
	RW	2.50	6.30	0.00	0.00	0.00	0.00	0.00
		2.80	6.40	0.10	0.10	0.03	0.00	6.30
		3.10	6.45	0.15	0.52	0.05	0.02	6.30
		3.40	6.40	0.10	1.49	0.03	0.04	6.30
		3.70	6.55	0.25	0.25	0.08	0.02	6.30
		4.00	6.55	0.25	0.20	0.08	0.02	6.30
		4.30	6.50	0.20	0.88	0.06	0.05	6.30
		4.60	6.70	0.40	1.95	0.12	0.23	6.30
		4.90	6.65	0.35	1.87	0.11	0.20	6.30
		5.20	6.55	0.25	1.95	0.08	0.15	6.30
		5.50	6.55	0.25	0.44	0.08	0.03	6.30
		5.80	6.50	0.20	0.89	0.06	0.05	6.30
		6.10	6.50	0.20	1.14	0.06	0.07	6.30
		6.40	6.50	0.20	1.44	0.06	0.09	6.30
		6.70	6.45	0.16	1.41	0.05	0.07	6.29
		7.00	6.55	0.25	1.98	0.08	0.15	6.30
		7.30	6.55	0.25	1.96	0.08	0.15	6.30
		7.60	6.55	0.25	1.32	0.08	0.10	6.30
		7.90	6.50	0.20	1.27	0.06	0.08	6.30
		8.20	6.50	0.20	1.27	0.06	0.08	6.30
		8.50	6.50	0.20	0.64	0.06	0.04	6.30
		8.80	6.45	0.15	0.54	0.05	0.02	6.30
		9.10	6.40	0.10	0.05	0.06	0.00	6.30
	LW	9.90	6.30	0.00	0.00	0.00	0.00	0.00
		10.20	5.84			0.00	0.00	0.00
1	G	11.00	5.34			0.00	0.00	0.00
	LS	12.00	4.80			0.00	0.00	0.00
					Totals	1.42	1.65	

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

LOCATION INFORMATION

STREAM NAME:	Iowa Gulch
XS LOCATION:	150 ft dwnst fr conf w Dyer Gulch
XS NUMBER:	2
DATE:	18-Sep-18
OBSERVERS:	R. Smith, J. Thompson, J. Abeles
1/4 SEC:	NW
SECTION:	35
TWP:	9N
RANGE:	79W
PM:	Sixth
COUNTY:	Lake
WATERSHED:	Arkansas
DIVISION:	2
DOW CODE:	33198
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.034

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

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

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
XS NUMBER: 2

DATA POINTS= 31

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	4.27			0.00		0.00	0.00	0.0%
		1.50	4.69			0.00		0.00	0.00	0.0%
1	G	1.70	4.91			0.00		0.00	0.00	0.0%
		1.90	6.12			0.00		0.00	0.00	0.0%
	RW	2.50	6.30	0.00	0.00	0.00		0.00	0.00	0.0%
		2.80	6.40	0.10	0.10	0.32	0.10	0.03	0.00	0.2%
		3.10	6.45	0.15	0.52	0.30	0.15	0.05	0.02	1.4%
		3.40	6.40	0.10	1.49	0.30	0.10	0.03	0.04	2.7%
		3.70	6.55	0.25	0.25	0.34	0.25	0.08	0.02	1.1%
		4.00	6.55	0.25	0.20	0.30	0.25	0.08	0.02	0.9%
		4.30	6.50	0.20	0.88	0.30	0.20	0.06	0.05	3.2%
		4.60	6.70	0.40	1.95	0.36	0.40	0.12	0.23	14.1%
		4.90	6.65	0.35	1.87	0.30	0.35	0.11	0.20	11.9%
		5.20	6.55	0.25	1.95	0.32	0.25	0.08	0.15	8.8%
		5.50	6.55	0.25	0.44	0.30	0.25	0.08	0.03	2.0%
		5.80	6.50	0.20	0.89	0.30	0.20	0.06	0.05	3.2%
		6.10	6.50	0.20	1.14	0.30	0.20	0.06	0.07	4.1%
		6.40	6.50	0.20	1.44	0.30	0.20	0.06	0.09	5.2%
		6.70	6.45	0.16	1.41	0.30	0.16	0.05	0.07	4.0%
		7.00	6.55	0.25	1.98	0.32	0.25	0.08	0.15	9.0%
		7.30	6.55	0.25	1.96	0.30	0.25	0.08	0.15	8.9%
		7.60	6.55	0.25	1.32	0.30	0.25	0.08	0.10	6.0%
		7.90	6.50	0.20	1.27	0.30	0.20	0.06	0.08	4.6%
		8.20	6.50	0.20	1.27	0.30	0.20	0.06	0.08	4.6%
		8.50	6.50	0.20	0.64	0.30	0.20	0.06	0.04	2.3%
		8.80	6.45	0.15	0.54	0.30	0.15	0.05	0.02	1.5%
		9.10	6.40	0.10	0.05	0.30	0.10	0.06	0.00	0.2%
	LW	9.90	6.30	0.00	0.00	0.81		0.00	0.00	0.0%
		10.20	5.84			0.00		0.00	0.00	0.0%
1	G	11.00	5.34			0.00		0.00	0.00	0.0%
	LS	12.00	4.80			0.00		0.00	0.00	0.0%
	TOTALS ----------					7.59	0.4 (Max.)	1.42	1.65	100.0%

Manning's n = 0.0771
Hydraulic Radius= 0.1873719

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.42	1.42	-0.1%
6.05	1.42	3.39	138.2%
6.07	1.42	3.22	126.7%
6.09	1.42	3.06	115.3%
6.11	1.42	2.90	103.8%
6.13	1.42	2.74	92.4%
6.15	1.42	2.57	81.1%
6.17	1.42	2.42	69.9%
6.19	1.42	2.26	58.8%
6.21	1.42	2.10	47.9%
6.23	1.42	1.95	37.0%
6.25	1.42	1.79	26.2%
6.26	1.42	1.72	20.9%
6.27	1.42	1.64	15.6%
6.28	1.42	1.57	10.3%
6.29	1.42	1.49	5.1%
6.30	1.42	1.42	-0.1%
6.31	1.42	1.35	-5.3%
6.32	1.42	1.27	-10.4%
6.33	1.42	1.20	-15.4%
6.34	1.42	1.13	-20.3%
6.35	1.42	1.06	-25.2%
6.37	1.42	0.93	-34.7%
6.39	1.42	0.80	-43.8%
6.41	1.42	0.67	-52.7%
6.43	1.42	0.56	-61.0%
6.45	1.42	0.45	-68.7%
6.47	1.42	0.34	-75.9%
6.49	1.42	0.25	-82.7%
6.51	1.42	0.17	-88.0%
6.53	1.42	0.11	-91.9%
6.55	1.42	0.07	-95.1%

WATERLINE AT ZERO
AREA ERROR = 6.300

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
XS NUMBER: 2

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.34	9.23	1.03	1.36	9.52	10.50	100.0%	0.91	31.66	3.33
	5.35	9.21	1.02	1.35	9.43	10.47	99.7%	0.90	31.22	3.31
	5.40	9.12	0.98	1.30	8.97	10.32	98.3%	0.87	29.00	3.23
	5.45	9.04	0.94	1.25	8.51	10.18	97.0%	0.84	26.84	3.15
	5.50	8.95	0.90	1.20	8.06	10.03	95.6%	0.80	24.76	3.07
	5.55	8.86	0.86	1.15	7.62	9.89	94.2%	0.77	22.74	2.99
	5.60	8.77	0.82	1.10	7.18	9.74	92.8%	0.74	20.80	2.90
	5.65	8.68	0.78	1.05	6.74	9.60	91.4%	0.70	18.92	2.81
	5.70	8.59	0.73	1.00	6.31	9.45	90.1%	0.67	17.12	2.71
	5.75	8.51	0.69	0.95	5.88	9.31	88.7%	0.63	15.39	2.62
	5.80	8.42	0.65	0.90	5.46	9.16	87.3%	0.60	13.73	2.51
	5.85	8.34	0.60	0.85	5.04	9.03	86.0%	0.56	12.14	2.41
	5.90	8.30	0.56	0.80	4.62	8.92	84.9%	0.52	10.60	2.29
	5.95	8.26	0.51	0.75	4.21	8.81	83.9%	0.48	9.15	2.17
	6.00	8.22	0.46	0.70	3.80	8.69	82.8%	0.44	7.77	2.05
	6.05	8.17	0.41	0.65	3.39	8.58	81.8%	0.39	6.48	1.91
	6.10	8.13	0.37	0.60	2.98	8.47	80.7%	0.35	5.28	1.77
	6.15	8.00	0.32	0.55	2.58	8.29	79.0%	0.31	4.20	1.63
	6.20	7.80	0.28	0.50	2.18	8.06	76.7%	0.27	3.24	1.49
	6.25	7.60	0.24	0.45	1.80	7.82	74.5%	0.23	2.39	1.33
WL	6.30	7.40	0.19	0.40	1.42	7.59	72.3%	0.19	1.65	1.16
	6.35	6.85	0.16	0.35	1.07	7.03	67.0%	0.15	1.08	1.01
	6.40	6.30	0.12	0.30	0.74	6.47	61.6%	0.11	0.61	0.83
	6.45	5.30	0.08	0.25	0.45	5.45	51.9%	0.08	0.30	0.67
	6.50	3.26	0.06	0.20	0.20	3.37	32.1%	0.06	0.11	0.54
	6.55	0.83	0.08	0.15	0.07	0.89	8.5%	0.08	0.05	0.65
	6.60	0.60	0.06	0.10	0.03	0.64	6.1%	0.05	0.02	0.50
	6.65	0.38	0.03	0.05	0.01	0.40	3.8%	0.02	0.00	0.29
	6.70	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Iowa Gulch
XS LOCATION: 150 ft dwnst fr conf w Dyer Gulch
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.65	cfs
CALCULATED FLOW (Qc)=	1.65	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.30	ft
CALCULATED WATERLINE (WLc)=	6.30	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	-0.1	%
MEAN VELOCITY=	1.16	ft/sec
MANNING'S N=	0.077	
SLOPE=	0.034	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.1	cfs

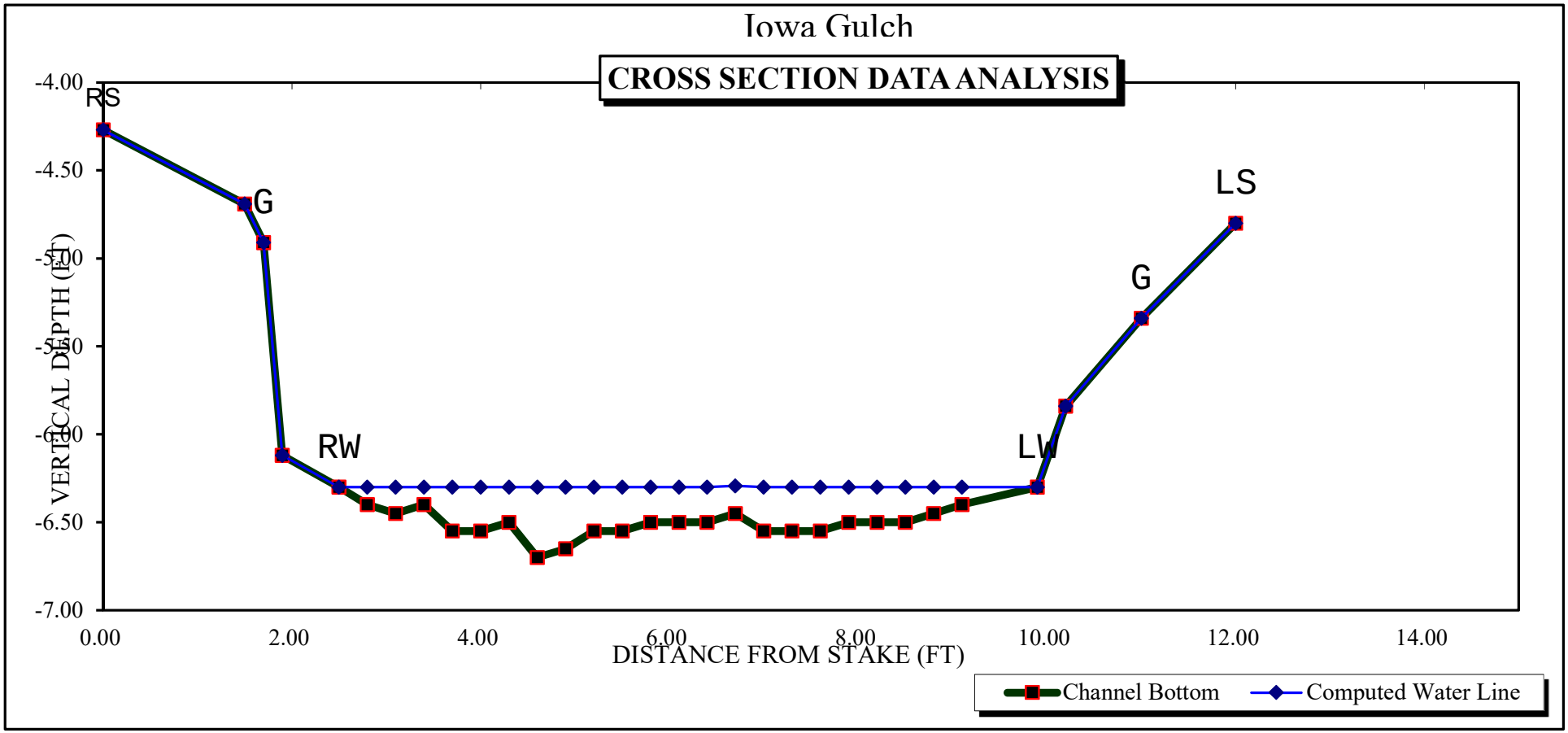
RECOMMENDED INSTREAM FLOW:
============================

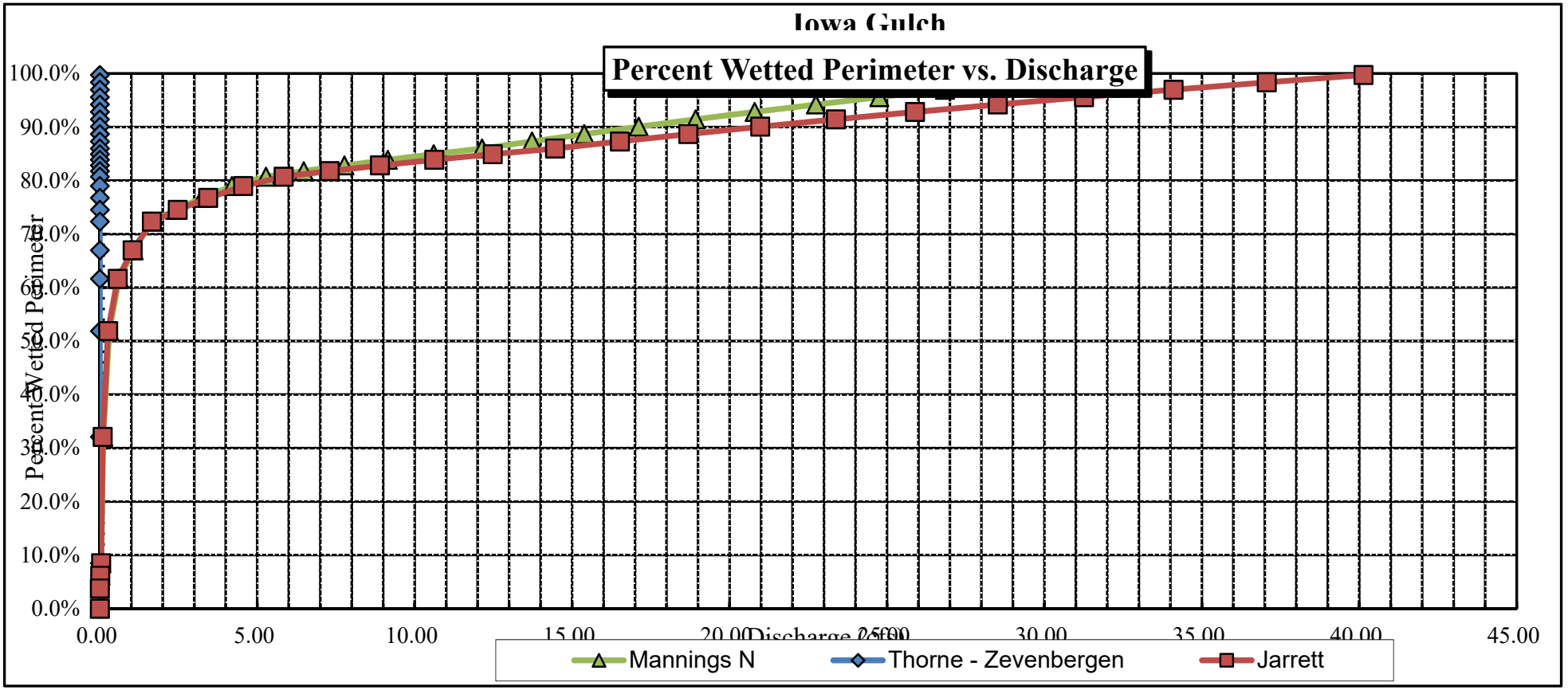
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

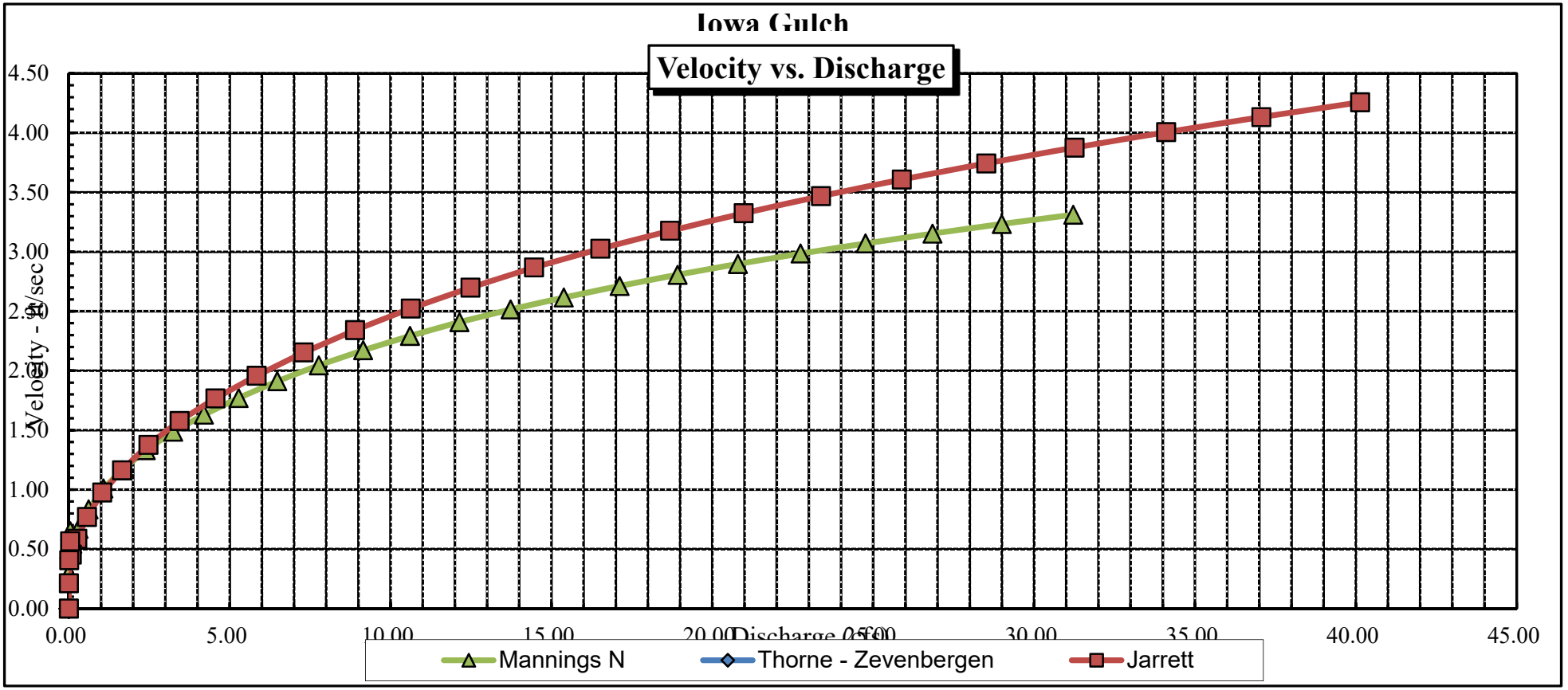
RATIONALE FOR RECOMMENDATION:
============================

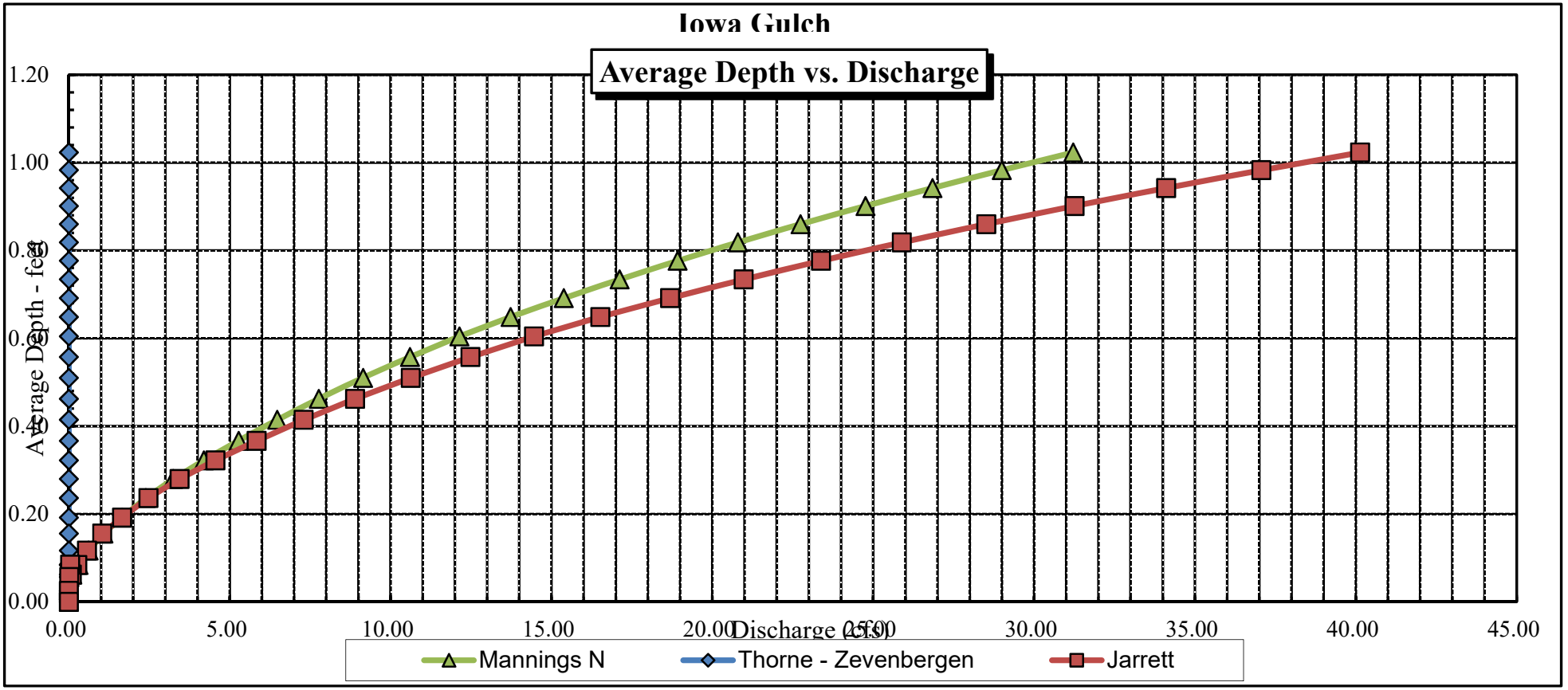
RECOMMENDATION BY: ………………...……...…….............................. AGENCY..……………………......…....…....…....... DATE:.......…...….....……………

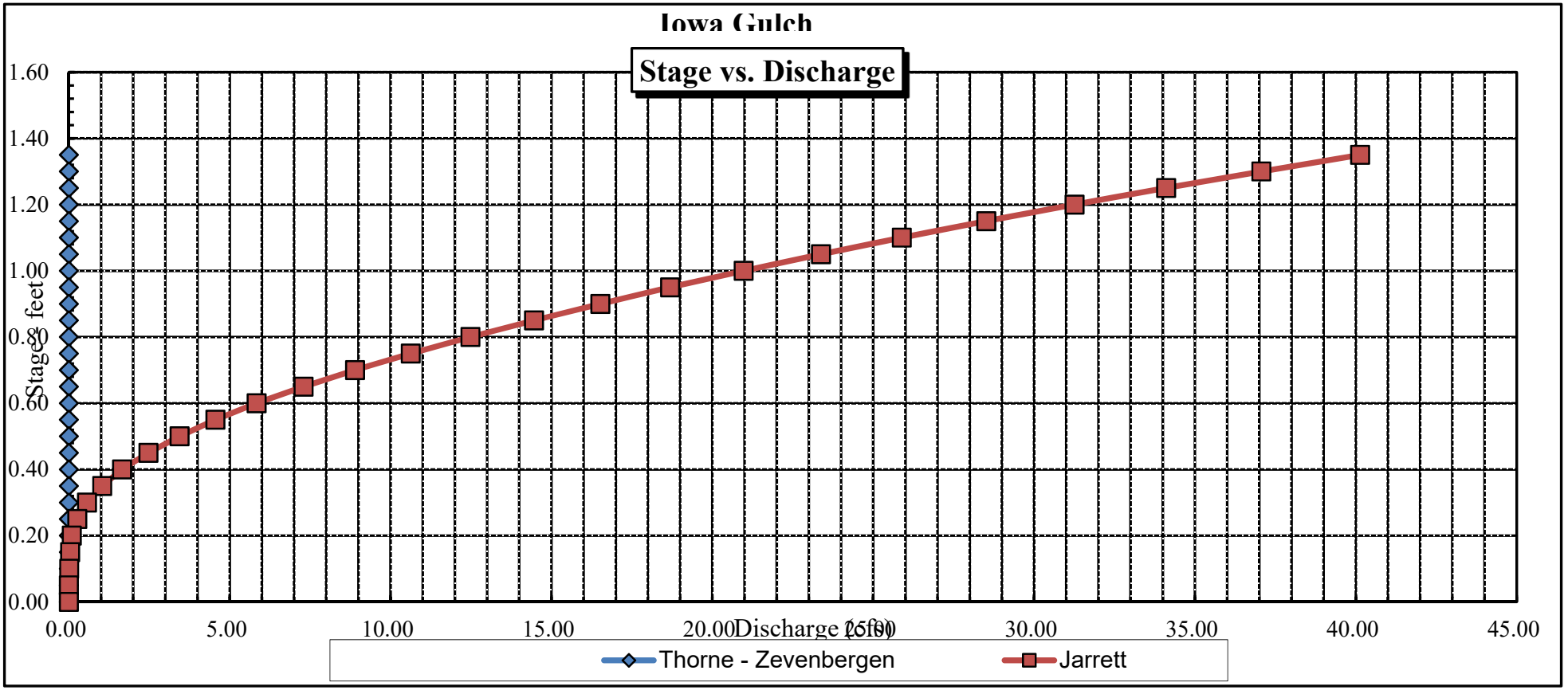
CWCB REVIEW BY: ..…………………………....………………………………………………...…............. DATE:.................……………...…


Iowa Gulch
CROSS SECTION DATA ANALYSIS
RS
G
RW
LW
G
LS
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Iowa Gulch
Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
5.00
10.00
15.00
20.00
30.00
35.00
40.00
45.00
Mannings N
Thorne - Zevenbergen
Jarrett


Iowa Gulch
Velocity vs. Discharge
Velocity - ft/sec
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
5.00
10.00
15.00
20.00
30.00
35.00
40.00
45.00
Mannings N
Thorne - Zevenbergen
Jarrett


Iowa Gulch
Average Depth vs. Discharge
Average Depth - feet
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Iowa Gulch
Stage vs. Discharge
Stage - feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO
Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203

Iowa Gulch CWCB Temporary Streamgage

Location: 13N 396795 4342403

Installation date: 7/18/2019

Equipment: Onset Hobo MX2001 water level logger, staff gage

Description: The streamgage consists of a data logger and pressure transducer protected in a 2 inch PVC pipe, secured to the bank with a t-post fence post. The pressure transducer measured water level on 15 minute intervals in a large pool formed by boulders with a stable natural hydraulic control. A co-located staff gage was used as a secondary water level measurement device.

Discharge Measurment Field Visit Data Report *(Filters: Name begins with Iowa Gulch;)*

Div	Name	CWCB Case Number	Segment ID	Meas. Date	UTM	Location	Flow Amount (cfs)	Meas #	Rating	Station ID
2	Iowa Gulch		20/2/A-002	07/18/2019	UTMx: 396799 UTMy: 4342401	Iowa Gulch approx 20 ft US of temp gage	13.2832	1	F	IOWAGLD2
2	Iowa Gulch		20/2/A-002	08/13/2019	UTMx: 396795 UTMy: 4342403	Iowa Gulch temp gage - 30ft US of gage	5.06	2	F	IOWAGLD2
2	Iowa Gulch		20/2/A-002	10/09/2019	UTMx: 396795 UTMy: 4342403	Iowa Gulch 40ft DS of gage	0.793	3	F	IOWAGLD2

Discharge Measurement Summary

File Information

File name	lowagld2_20190718-131031.ft
Start date and time	7/18/2019 12:39 PM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	7/18/2019 12:41:10 PM	End time	7/18/2019 1:08:39 PM
# Stations	19	Avg interval	40
Mean depth	0.541 ft		
Mean velocity	2.9567 ft/s	Total width	8.300 ft
Mean SNR	47 dB	Total area	4.4925 ft²
Mean temp	43.143 °F	Total discharge	13.2832 ft³/s

System Information

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

Site Details

Site name	lowagld2
Site number	1
Operator(s)	Kas
Comment	

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.4%	4.0%
Velocity	0.7%	3.6%
Width	0.1%	0.1%
Method	2.0%	
# Stations	2.6%	
Overall	3.5%	5.4%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings

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

Summary overview

No changes were made to this file
Quality control warnings

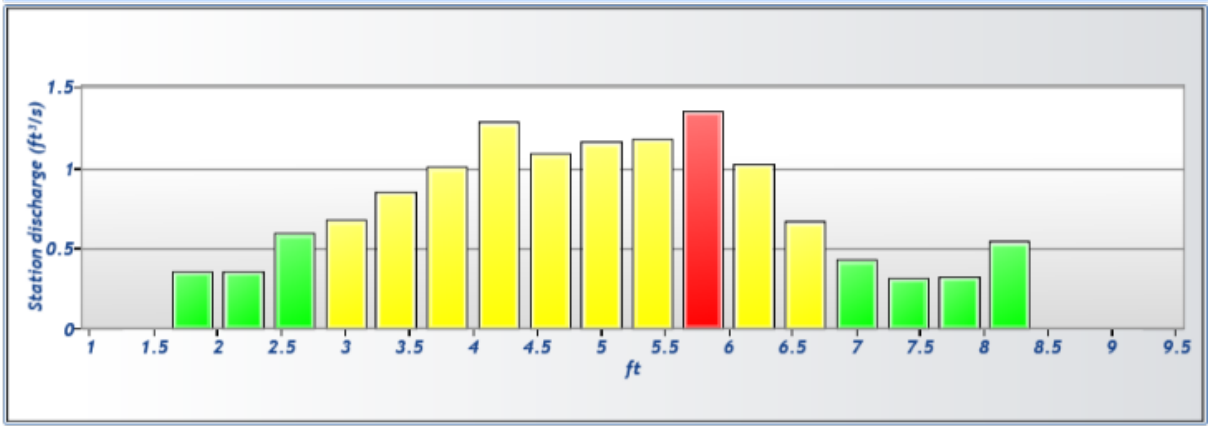
Data Collection Settings

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

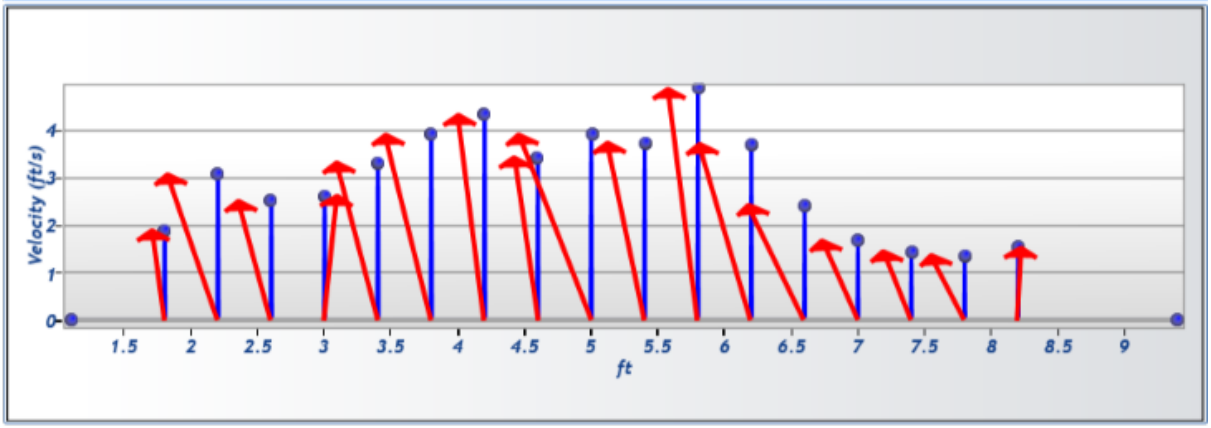
Quality Control Settings

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

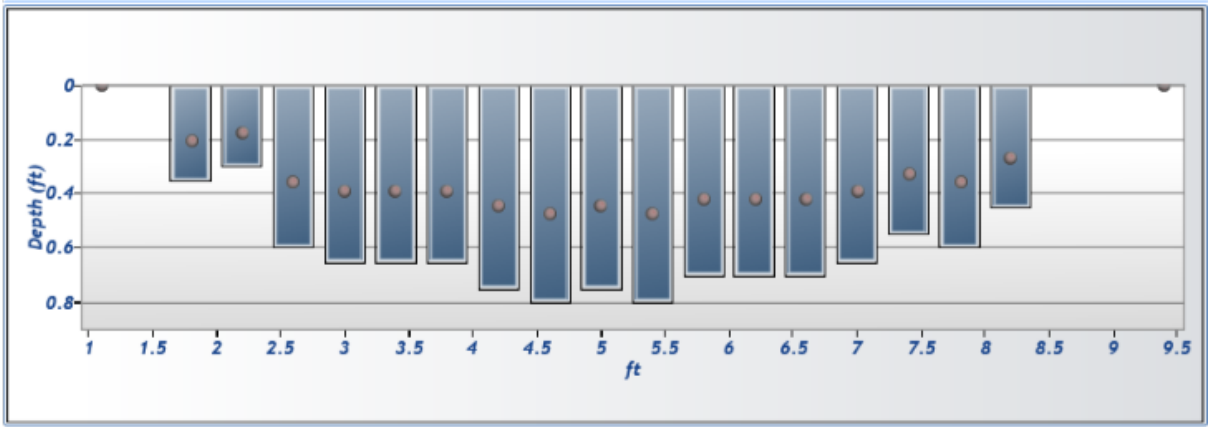
Discharge chart



Velocity chart



Depth chart



Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q		
0	12:41 PM	1.100	None	0.000	0.0000	0.000	0	0.0000	1.0000	1.8773	0.0000	0.0000	0.00	✓	
1	12:41 PM	1.800	0.6	0.350	0.6000	0.210	80	1.8773	1.0000	1.8773	0.1925	0.3614	2.72	✓	
2	12:43 PM	2.200	0.6	0.300	0.6000	0.180	80	3.0425	1.0000	3.0425	0.1200	0.3651	2.75	✓	
3	12:45 PM	2.600	0.6	0.600	0.6000	0.360	80	2.4943	1.0000	2.4943	0.2400	0.5986	4.51	✓	
4	12:46 PM	3.000	0.6	0.650	0.6000	0.390	80	2.6148	1.0000	2.6148	0.2600	0.6799	5.12	✓	
5	12:48 PM	3.400	0.6	0.650	0.6000	0.390	80	3.2919	1.0000	3.2919	0.2600	0.8559	6.44	✓	
6	12:49 PM	3.800	0.6	0.650	0.6000	0.390	80	3.8763	1.0000	3.8763	0.2600	1.0078	7.59	✓	
7	12:51 PM	4.200	0.6	0.750	0.6000	0.450	80	4.3061	1.0000	4.3061	0.3000	1.2918	9.73	✓	
8	12:52 PM	4.600	0.6	0.800	0.6000	0.480	80	3.4036	1.0000	3.4036	0.3200	1.0892	8.20	✓	
9	12:54 PM	5.000	0.6	0.750	0.6000	0.450	80	3.8852	1.0000	3.8852	0.3000	1.1656	8.77	✓	
10	12:55 PM	5.400	0.6	0.800	0.6000	0.480	80	3.7148	1.0000	3.7148	0.3200	1.1887	8.95	✓	
11	12:58 PM	5.800	0.6	0.700	0.6000	0.420	80	4.8515	1.0000	4.8515	0.2800	1.3584	10.23	✓	
12	12:59 PM	6.200	0.6	0.700	0.6000	0.420	80	3.6761	1.0000	3.6761	0.2800	1.0293	7.75	✓	
13	1:01 PM	6.600	0.6	0.700	0.6000	0.420	80	2.4046	1.0000	2.4046	0.2800	0.6733	5.07	✓	
14	1:02 PM	7.000	0.6	0.650	0.6000	0.390	80	1.6553	1.0000	1.6553	0.2600	0.4304	3.24	✓	
15	1:03 PM	7.400	0.6	0.550	0.6000	0.330	80	1.4336	1.0000	1.4336	0.2200	0.3154	2.37	✓	
16	1:05 PM	7.800	0.6	0.600	0.6000	0.360	80	1.3536	1.0000	1.3536	0.2400	0.3249	2.45	✓	
17	1:07 PM	8.200	0.6	0.450	0.6000	0.270	80	1.5210	1.0000	1.5210	0.3600	0.5476	4.12	✓	
18	1:08 PM	9.400	None	0.000	0.0000	0.000	0	0.0000	1.0000	1.5210	0.0000	0.0000	0.00	✓	

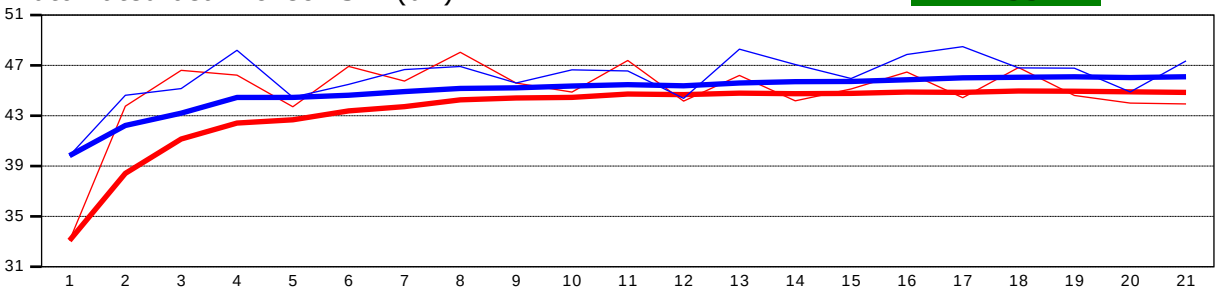
Quality control warnings

Sti#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings	
1	12:41 PM	1.800	0.6	0.350	0.6000	0.210	Standard Error > QC	
2	12:43 PM	2.200	0.6	0.300	0.6000	0.180	Standard Error > QC	
3	12:45 PM	2.600	0.6	0.600	0.6000	0.360	Standard Error > QC	
4	12:46 PM	3.000	0.6	0.650	0.6000	0.390	Standard Error > QC	
5	12:48 PM	3.400	0.6	0.650	0.6000	0.390	Standard Error > QC	
6	12:49 PM	3.800	0.6	0.650	0.6000	0.390	Standard Error > QC	
7	12:51 PM	4.200	0.6	0.750	0.6000	0.450	Standard Error > QC	
8	12:52 PM	4.600	0.6	0.800	0.6000	0.480	Standard Error > QC	
9	12:54 PM	5.000	0.6	0.750	0.6000	0.450	Standard Error > QC	
10	12:55 PM	5.400	0.6	0.800	0.6000	0.480	Standard Error > QC	
11	12:58 PM	5.800	0.6	0.700	0.6000	0.420	Standard Error > QC,High Stn % Discharge	
12	12:59 PM	6.200	0.6	0.700	0.6000	0.420	Standard Error > QC	
13	1:01 PM	6.600	0.6	0.700	0.6000	0.420	Standard Error > QC	
14	1:02 PM	7.000	0.6	0.650	0.6000	0.390	Standard Error > QC	
15	1:03 PM	7.400	0.6	0.550	0.6000	0.330	Standard Error > QC	
17	1:07 PM	8.200	0.6	0.450	0.6000	0.270	Standard Error > QC	
18	1:08 PM	9.400	None	0.000	0.0000	0.000	Stn Spacing > QC	

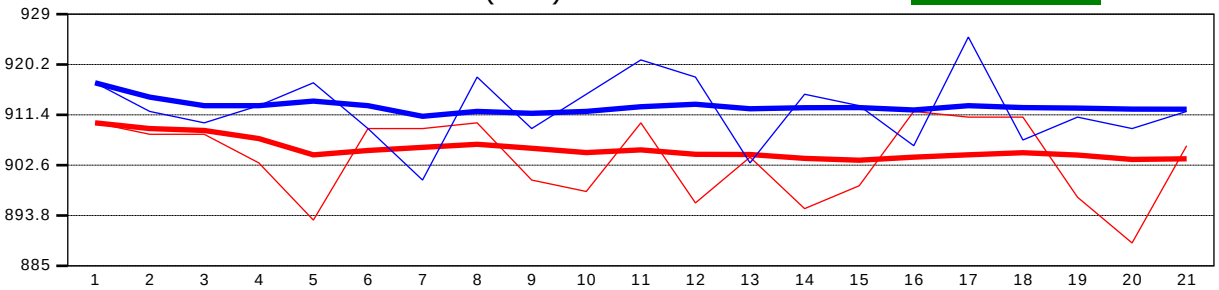
12/12/2019 6:41:10 AM

Automated beam check Start time 7/18/2019 12:40:42 PM

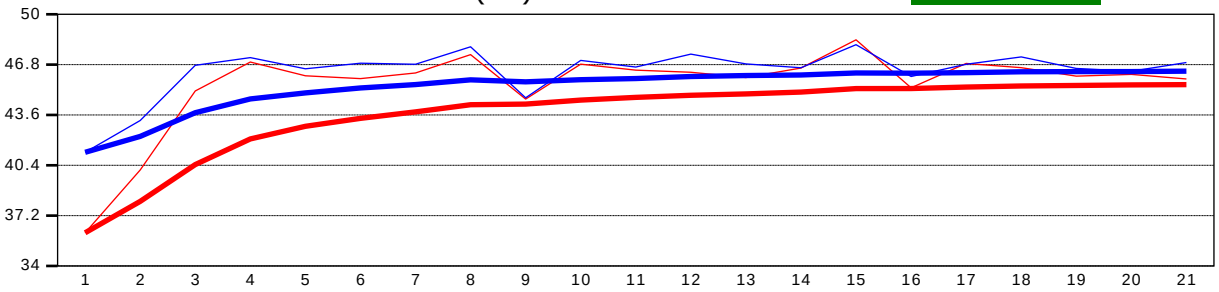
Automated beam check SNR(dB) PASS



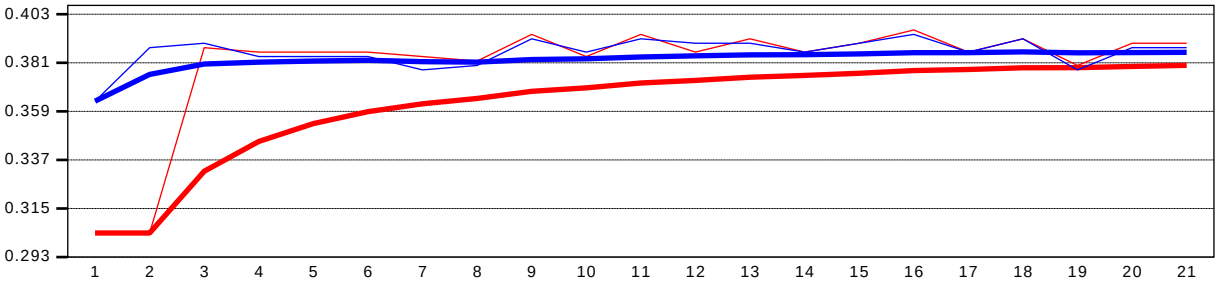
Automated beam check Noise level(cnts) PASS



Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings

Discharge Measurement Summary

File Information

File name	IOWAGLD2_20190813-135132.ft
Start date and time	8/13/2019 1:23 PM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	8/13/2019 1:24:21 PM	End time	8/13/2019 1:50:48 PM
# Stations	24	Avg interval	40
Mean depth	0.378 ft		
Mean velocity	1.8071 ft/s	Total width	7.400 ft
Mean SNR	40 dB	Total area	2.7975 ft²
Mean temp	44.057 °F	Total discharge	5.0554 ft³/s

System Information

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

Site Details

Site name	IOWAGLD2
Site number	002
Operator(s)	JEL
Comment	Temp gage

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.4%	5.9%
Velocity	0.8%	6.5%
Width	0.1%	0.1%
Method	2.1%	
# Stations	2.1%	
Overall	3.3%	8.8%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings

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

Summary overview

No changes were made to this file
Quality control warnings

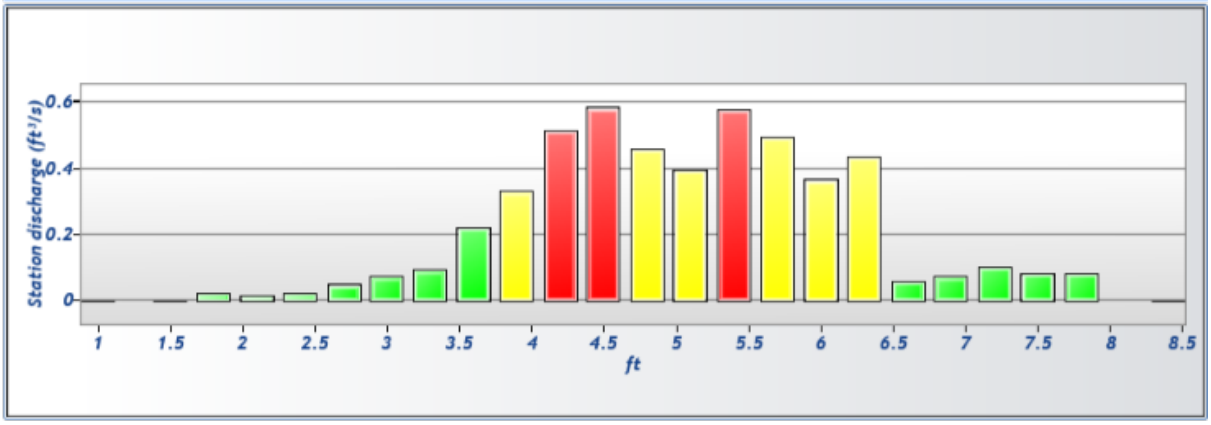
Data Collection Settings

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

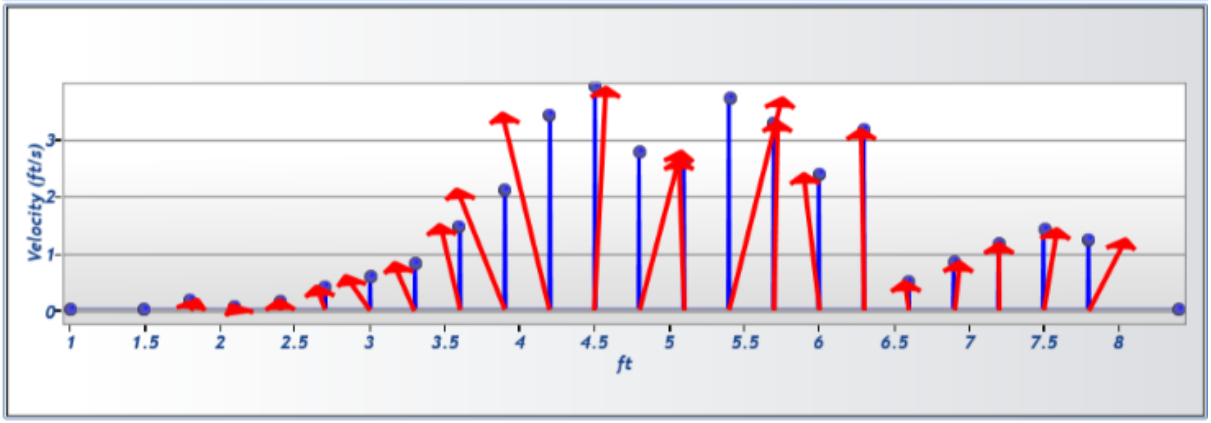
Quality Control Settings

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

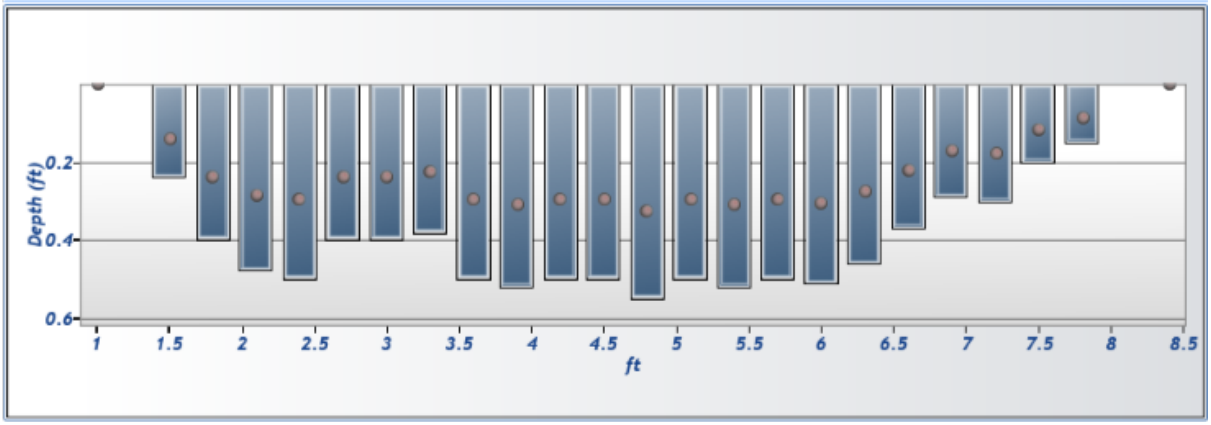
Discharge chart



Velocity chart



Depth chart



Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q		
0	1:24 PM	1.000	None	0.000	0.0000	0.000	0	0.0000	1.0000	-0.0007	0.0000	0.0000	0.00	✓	
1	1:25 PM	1.500	0.6	0.240	0.6000	0.144	80	-0.0007	1.0000	-0.0007	0.0960	-0.0001	0.00	✓	
2	1:26 PM	1.800	0.6	0.400	0.6000	0.240	80	0.1910	1.0000	0.1910	0.1200	0.0229	0.45	✓	
3	1:27 PM	2.100	0.6	0.480	0.6000	0.288	80	0.0843	1.0000	0.0843	0.1440	0.0121	0.24	✓	
4	1:28 PM	2.400	0.6	0.500	0.6000	0.300	80	0.1702	1.0000	0.1702	0.1500	0.0255	0.50	✓	
5	1:29 PM	2.700	0.6	0.400	0.6000	0.240	80	0.4053	1.0000	0.4053	0.1200	0.0486	0.96	✓	
6	1:30 PM	3.000	0.6	0.400	0.6000	0.240	80	0.5997	1.0000	0.5997	0.1200	0.0720	1.42	✓	
7	1:32 PM	3.300	0.6	0.380	0.6000	0.228	80	0.8225	1.0000	0.8225	0.1140	0.0938	1.85	✓	
8	1:33 PM	3.600	0.6	0.500	0.6000	0.300	80	1.4793	1.0000	1.4793	0.1500	0.2219	4.39	✓	
9	1:34 PM	3.900	0.6	0.520	0.6000	0.312	80	2.1089	1.0000	2.1089	0.1560	0.3290	6.51	✓	
10	1:35 PM	4.200	0.6	0.500	0.6000	0.300	80	3.4323	1.0000	3.4323	0.1500	0.5148	10.18	✓	
11	1:37 PM	4.500	0.6	0.500	0.6000	0.300	80	3.9034	1.0000	3.9034	0.1500	0.5855	11.58	✓	
12	1:38 PM	4.800	0.6	0.550	0.6000	0.330	80	2.7751	1.0000	2.7751	0.1650	0.4579	9.06	✓	
13	1:39 PM	5.100	0.6	0.500	0.6000	0.300	80	2.6274	1.0000	2.6274	0.1500	0.3941	7.80	✓	
14	1:40 PM	5.400	0.6	0.520	0.6000	0.312	80	3.7136	1.0000	3.7136	0.1560	0.5793	11.46	✓	
15	1:41 PM	5.700	0.6	0.500	0.6000	0.300	80	3.2875	1.0000	3.2875	0.1500	0.4931	9.75	✓	
16	1:42 PM	6.000	0.6	0.510	0.6000	0.306	80	2.3829	1.0000	2.3829	0.1530	0.3646	7.21	✓	
17	1:44 PM	6.300	0.6	0.460	0.6000	0.276	80	3.1641	1.0000	3.1641	0.1380	0.4366	8.64	✓	
18	1:45 PM	6.600	0.6	0.370	0.6000	0.222	80	0.5116	1.0000	0.5116	0.1110	0.0568	1.12	✓	
19	1:46 PM	6.900	0.6	0.290	0.6000	0.174	80	0.8381	1.0000	0.8381	0.0870	0.0729	1.44	✓	
20	1:47 PM	7.200	0.6	0.300	0.6000	0.180	80	1.1639	1.0000	1.1639	0.0900	0.1048	2.07	✓	
21	1:48 PM	7.500	0.6	0.200	0.6000	0.120	80	1.4181	1.0000	1.4181	0.0600	0.0851	1.68	✓	
22	1:49 PM	7.800	0.6	0.150	0.6000	0.090	80	1.2453	1.0000	1.2453	0.0675	0.0841	1.66	✓	
23	1:50 PM	8.400	None	0.000	0.0000	0.000	0	0.0000	1.0000	1.2453	0.0000	0.0000	0.00	✓	

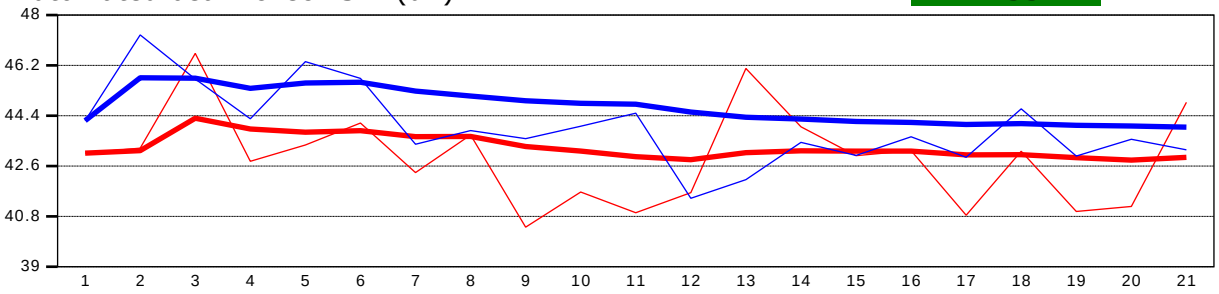
Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings	
1	1:25 PM	1.500	0.6	0.240	0.6000	0.144	Boundary Interference	
3	1:27 PM	2.100	0.6	0.480	0.6000	0.288	Velocity Angle > QC	
7	1:32 PM	3.300	0.6	0.380	0.6000	0.228	Standard Error > QC	
8	1:33 PM	3.600	0.6	0.500	0.6000	0.300	Standard Error > QC	
9	1:34 PM	3.900	0.6	0.520	0.6000	0.312	Standard Error > QC	
10	1:35 PM	4.200	0.6	0.500	0.6000	0.300	Standard Error > QC,High Stn % Discharge	
11	1:37 PM	4.500	0.6	0.500	0.6000	0.300	Standard Error > QC,High Stn % Discharge	
12	1:38 PM	4.800	0.6	0.550	0.6000	0.330	Standard Error > QC	
13	1:39 PM	5.100	0.6	0.500	0.6000	0.300	Standard Error > QC	
14	1:40 PM	5.400	0.6	0.520	0.6000	0.312	Standard Error > QC,High Stn % Discharge	
15	1:41 PM	5.700	0.6	0.500	0.6000	0.300	Standard Error > QC	
16	1:42 PM	6.000	0.6	0.510	0.6000	0.306	Standard Error > QC	
17	1:44 PM	6.300	0.6	0.460	0.6000	0.276	Standard Error > QC	
18	1:45 PM	6.600	0.6	0.370	0.6000	0.222	Boundary Interference,SNR Threshold Variation,Standard Error > QC	
19	1:46 PM	6.900	0.6	0.290	0.6000	0.174	Standard Error > QC	
21	1:48 PM	7.500	0.6	0.200	0.6000	0.120	Standard Error > QC	

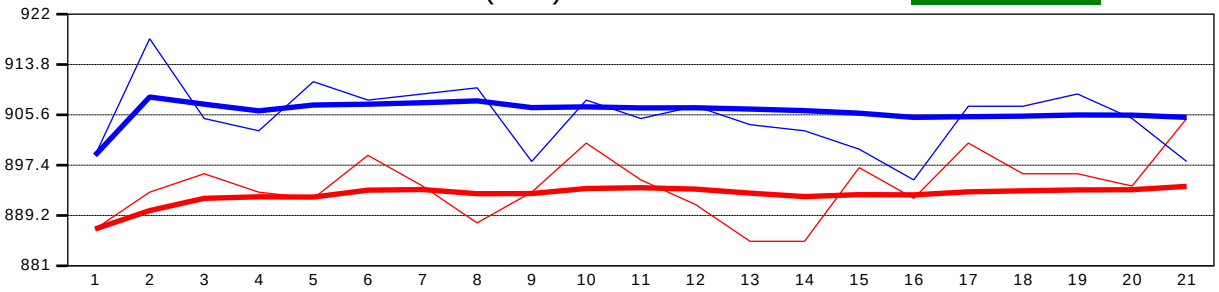
12/12/2019 6:43:21 AM

Automated beam check Start time 8/13/2019 1:23:55 PM

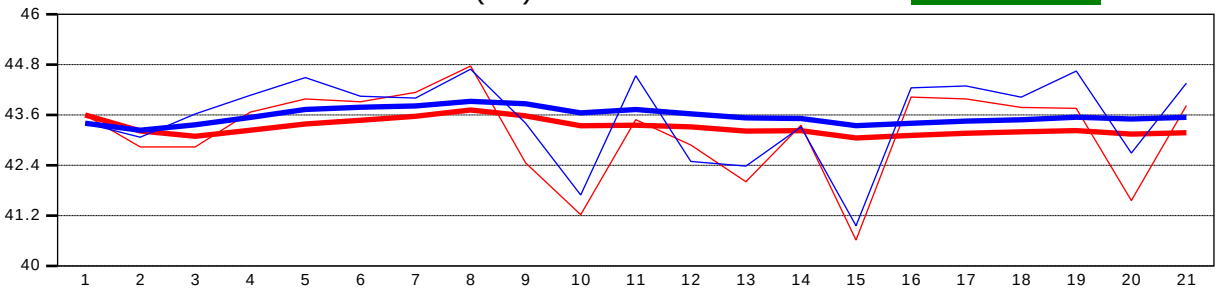
Automated beam check SNR(dB) PASS



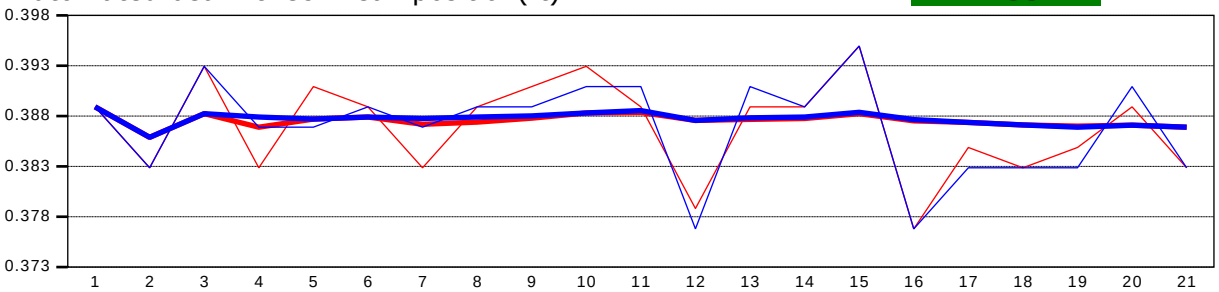
Automated beam check Noise level(cnts) PASS



Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings

Discharge Measurement Summary

File Information

File name	IOWAGLD2_20191009-110815.ft
Start date and time	10/9/2019 10:51 AM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	10/9/2019 10:52:21 AM	End time	10/9/2019 11:06:56 AM
# Stations	13	Avg interval	40
Mean depth	0.320 ft		
Mean velocity	0.6516 ft/s	Total width	3.800 ft
Mean SNR	41 dB	Total area	1.2170 ft²
Mean temp	40.335 °F	Total discharge	0.7930 ft³/s

System Information

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

Site Details

Site name	IOWAGLD2
Site number	003
Operator(s)	JEL
Comment	Temp gage

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.6%	10.3%
Velocity	1.3%	13.3%
Width	0.2%	0.2%
Method	2.8%	
# Stations	3.9%	
Overall	5.1%	16.8%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Rated

Station Warning Settings

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

Summary overview

No changes were made to this file
Quality control warnings

Data Collection Settings

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

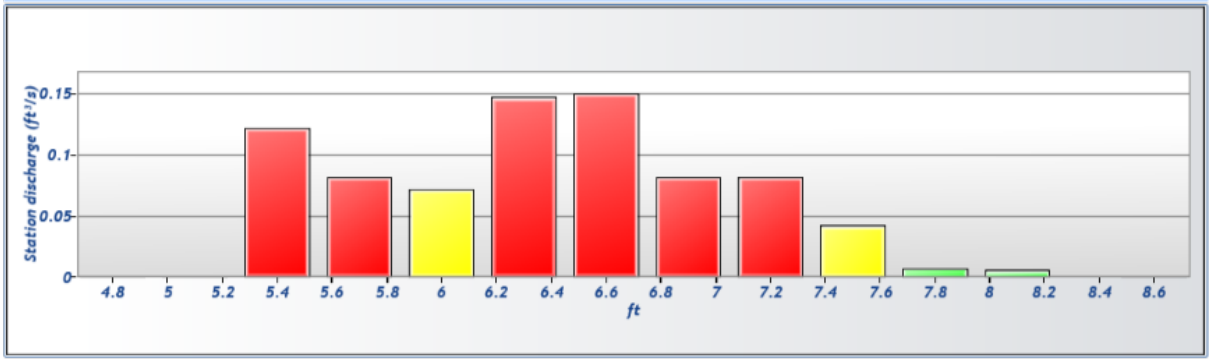
Quality Control Settings

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

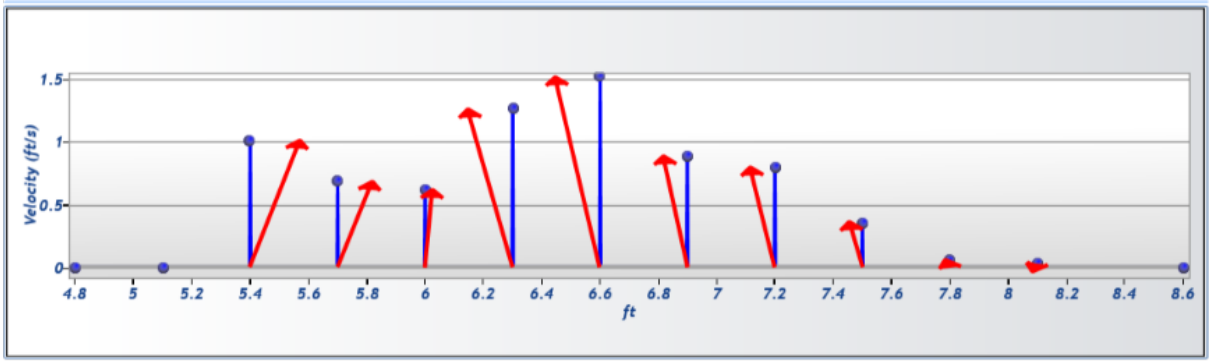
Supplemental data summary

Gauge height time	*Gauge height (ft)*	*Rated discharge (ft³/s)*	*Temperature (°F)*	*Salinity (PSS-78)*	*Gauge height comments*
10/9/2019 10:52:31 AM	0.310				

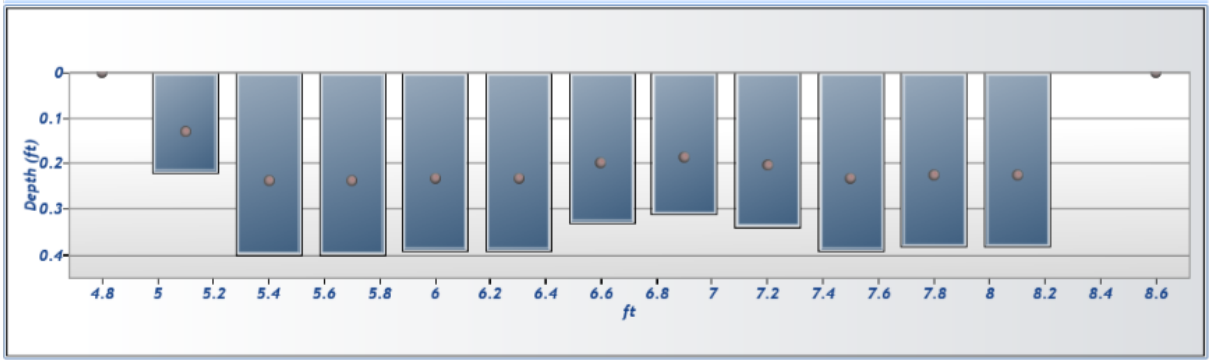
Discharge chart



Velocity chart



Depth chart



Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q	
0	10:52 AM	4.800	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.0008	0.0000	0.0000	0.00	✓
1	10:52 AM	5.100	0.6	0.220	0.6000	0.132	80	0.0008	1.0000	0.0008	0.0660	0.0001	0.01	✓
2	10:54 AM	5.400	0.6	0.400	0.6000	0.240	80	1.0156	1.0000	1.0156	0.1200	0.1219	15.37	✓
3	10:55 AM	5.700	0.6	0.400	0.6000	0.240	80	0.6842	1.0000	0.6842	0.1200	0.0821	10.35	✓
4	10:56 AM	6.000	0.6	0.390	0.6000	0.234	80	0.6174	1.0000	0.6174	0.1170	0.0722	9.11	✓
5	10:58 AM	6.300	0.6	0.390	0.6000	0.234	80	1.2625	1.0000	1.2625	0.1170	0.1477	18.63	✓
6	11:00 AM	6.600	0.6	0.330	0.6000	0.198	80	1.5204	1.0000	1.5204	0.0990	0.1505	18.98	✓
7	11:01 AM	6.900	0.6	0.310	0.6000	0.186	80	0.8892	1.0000	0.8892	0.0930	0.0827	10.43	✓
8	11:02 AM	7.200	0.6	0.340	0.6000	0.204	80	0.8017	1.0000	0.8017	0.1020	0.0818	10.31	✓
9	11:03 AM	7.500	0.6	0.390	0.6000	0.234	80	0.3580	1.0000	0.3580	0.1170	0.0419	5.28	✓
10	11:04 AM	7.800	0.6	0.380	0.6000	0.228	80	0.0572	1.0000	0.0572	0.1140	0.0065	0.82	✓
11	11:05 AM	8.100	0.6	0.380	0.6000	0.228	80	0.0372	1.0000	0.0372	0.1520	0.0057	0.71	✓
12	11:06 AM	8.600	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.0372	0.0000	0.0000	0.00	✓

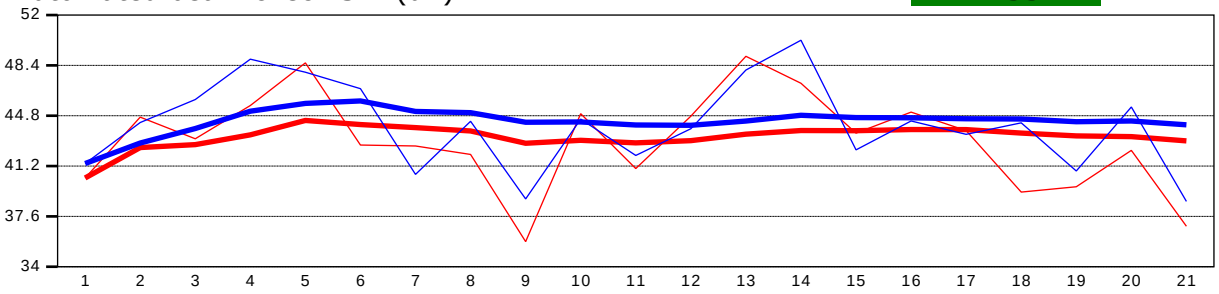
Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
1	10:52 AM	5.100	0.6	0.220	0.6000	0.132	Boundary Interference
2	10:54 AM	5.400	0.6	0.400	0.6000	0.240	High Stn % Discharge
3	10:55 AM	5.700	0.6	0.400	0.6000	0.240	High Stn % Discharge
4	10:56 AM	6.000	0.6	0.390	0.6000	0.234	Standard Error > QC
5	10:58 AM	6.300	0.6	0.390	0.6000	0.234	Standard Error > QC,High Stn % Discharge
6	11:00 AM	6.600	0.6	0.330	0.6000	0.198	High Stn % Discharge
7	11:01 AM	6.900	0.6	0.310	0.6000	0.186	Standard Error > QC,High Stn % Discharge
8	11:02 AM	7.200	0.6	0.340	0.6000	0.204	High Stn % Discharge
10	11:04 AM	7.800	0.6	0.380	0.6000	0.228	Large SNR Variation,SNR Threshold Variation
11	11:05 AM	8.100	0.6	0.380	0.6000	0.228	Large SNR Variation,SNR Threshold Variation

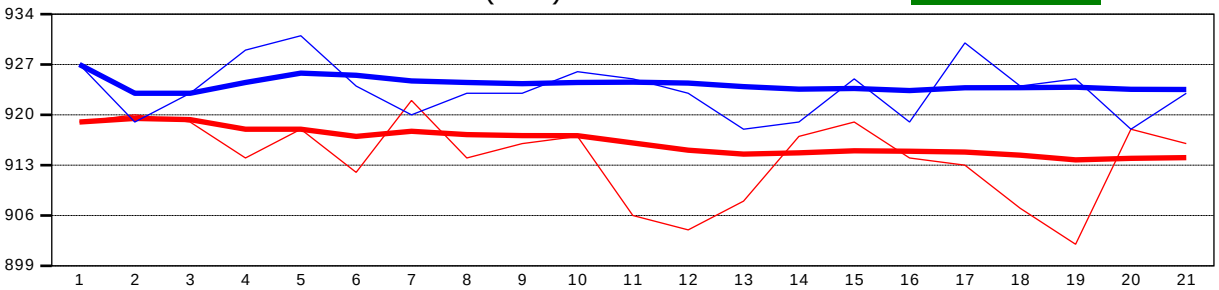
12/12/2019 6:43:49 AM

Automated beam check Start time 10/9/2019 10:51:58 AM

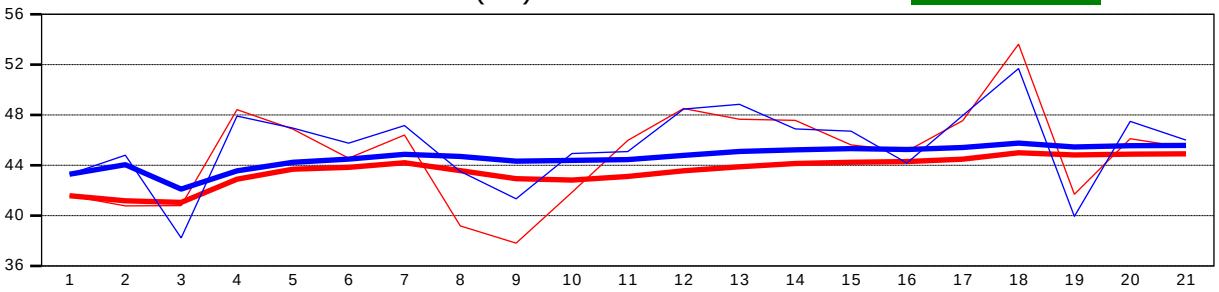
Automated beam check SNR(dB) PASS



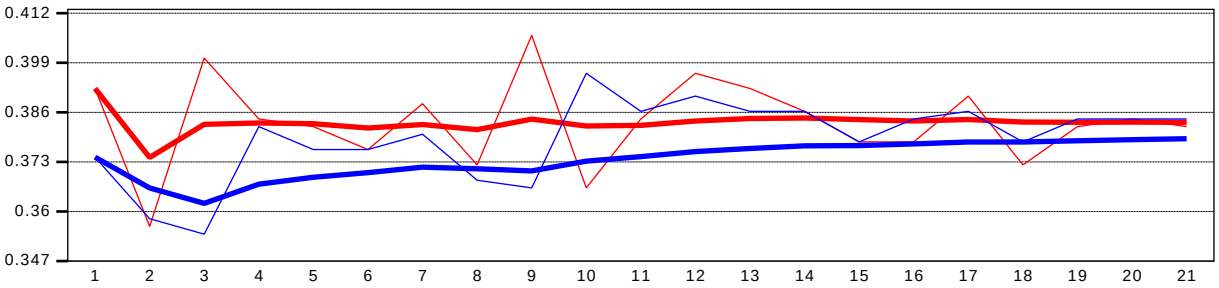
Automated beam check Noise level(cnts) PASS



Automated beam check Peak level(dB) PASS



Automated beam check Peak position(ft) PASS



Automated beam check Quality control warnings

No quality control warnings