DRAFT RECOMMENDATION – SUBJECT TO CHANGE

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 instream flow recommendation for Milk Creek, located in Water Division 6.

Location and Land Status. Milk Creek is tributary to the Yampa River approximately 12 miles southwest of Craig. This recommendation covers the stream reach beginning at the confluence with Wilson Creek and extends downstream to the confluence with the White River, a distance of 4.11 miles. Of this reach, BLM manages 2.49 miles, while 1.62 miles are in private ownership.

Biological Summary. This portion of Milk Creek is a low to moderate gradient stream in a canyon approximately 0.5 miles in width. In some locations, there is sufficient width in canyon bottom for the stream to meander over time. In other locations, stream movement is confined by bedrock. As such, the stream has a stable channel but has a highly variable substrate size, ranging from gravels to 2-foot diameter boulders. The stream has a good mix of riffle, run, and pool habitat to support native fish populations. Water quality, water temperatures, and food sources are also suitable for native species.

Fishery surveys indicate that the creek provides habitat for native species, including flannelmouth suckers, bluehead suckers, roundtail chub, and speckled dace. The creek provides important spawning habitat for native species that reside in the Yampa River. Recognizing the importance of the Milk Creek habitat, BLM and Colorado Parks and Wildlife (CPW) cooperatively stocked 2,800 bluehead sucker in the creek during summer 2015, and stocked another 2,500 bluehead suckers in summer 2016. The objective of the stocking effort is to replenish populations that have been reduced by predation by non-native fishes. BLM and CPW have also tagged the fish to enable monitoring of habitat usage by the fish population. Very few significant tributaries enter the Yampa River at the low elevations that are required for native fish spawning habitat, so Milk Creek provides important habitat for restoring sensitive fish populations. Non-native fish species that utilize Milk Creek include redside shiners, black bullhead, Johnny darter, plains killifish, bluegill sunfish.

The creek supports a riparian community comprised of willows, sedges, and rushes. The riparian community has been impacted by historic grazing practices but is now on an upward trend. Remnant cottonwood trees are present and substantial cottonwood regeneration has been observed. It appears that high flow events that routinely scour and erode the channel may be a limiting factor for riparian re-establishment.

R2Cross Analysis. BLM collected the following R2Cross data from Milk Creek. Note that the selection of critical riffles was designed to reflect the high variability in riffle width along this segment.

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)
8/17/2011 #1	8.30 cfs	47.57 feet	14.34 cfs	20.60 cfs
8/17/2011 #2	8.46 cfs	40.54 feet	6.57 cfs	20.86 cfs
6/28/2016 #1	12.72 cfs	37.50 feet	6.35 cfs	19.64 cfs
6/28/2016 #2	11.18 cfs	40.89 feet	10.75 cfs	15.91 cfs
		Averages:	**9.50 cfs**	**19.25 cfs**

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

> 19.25 cubic feet per second is recommended from April 1 to July 31. This period covers spawning activities by native fishes. In most of the cross sections collected, the recommended flow rates are driven by the average depth criteria. Protecting average depth for spawning habitat is important, because many portions of this reach that are suitable for spawning have a wide channel with large substrate. Without suitable depth, rough substrate would make much of the channel unusable for spawning. Some portions of this reach have high width-to-depth ratio, so it is also important to maintain sufficient depth for fish passage.
>
> 9.50 cubic feet per second is recommended from August 1 to March 31, the base flow period. This recommendation is driven by the average depth criteria. BLM believes that maintaining 9.25 cfs will prevent stress on the fish population during high temperature periods during late summer, and 9.25 cfs should keep pools sufficiently free of ice to allow overwintering of fish.

Water Availability. BLM is not aware of any decreed surface diversions within this reach. However, there are a high number of decreed diversions located upstream on Milk Creek and its tributaries. BLM recommends using USGS gage 09250000 (Milk Creek near Thornburgh, CO) as an indicator of water availability. Note that this gage is located substantially upstream of the recommended reach. As such, this gage measures of watershed of only 65 square miles. Incomparison, the watershed size for the recommended reach is approximately 223 square miles, so the gaged flows would have to be adjusted upward to account for the larger watershed size. In addition, BLM recommends using USGS gage 09249750 (Williams Fork at Mouth, near Hamilton, CO. This gage has s 16-year period of record, and the watershed has similar characteristics to Milk Creek. A basin apportionment process could be used with this gage data, in which the flows in the William Fork are multiplied by a factor of 0.536 to account for the

smaller watershed size of Milk Creek.

Relationship to Management Plans. The Little Snake Resource Management Plan identifies management of streams supporting sensitive fish species as a priority for BLM. The plan specifies that BLM will work to improve riparian and aquatic conditions in these streams, and will also work to prevent surface disturbances close to them. In addition, the plan specifies that BLM will work with the Colorado Water Conservation Board to appropriate instream flow water rights to protect these fisheries. The objective of this cooperation is to protect habitats for sensitive species, thereby avoiding the listing of the species under the Endangered Species Act.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2017. We thank both Colorado Parks and Wildlife and the CWCB for their cooperation in this effort.

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

Sincerely,

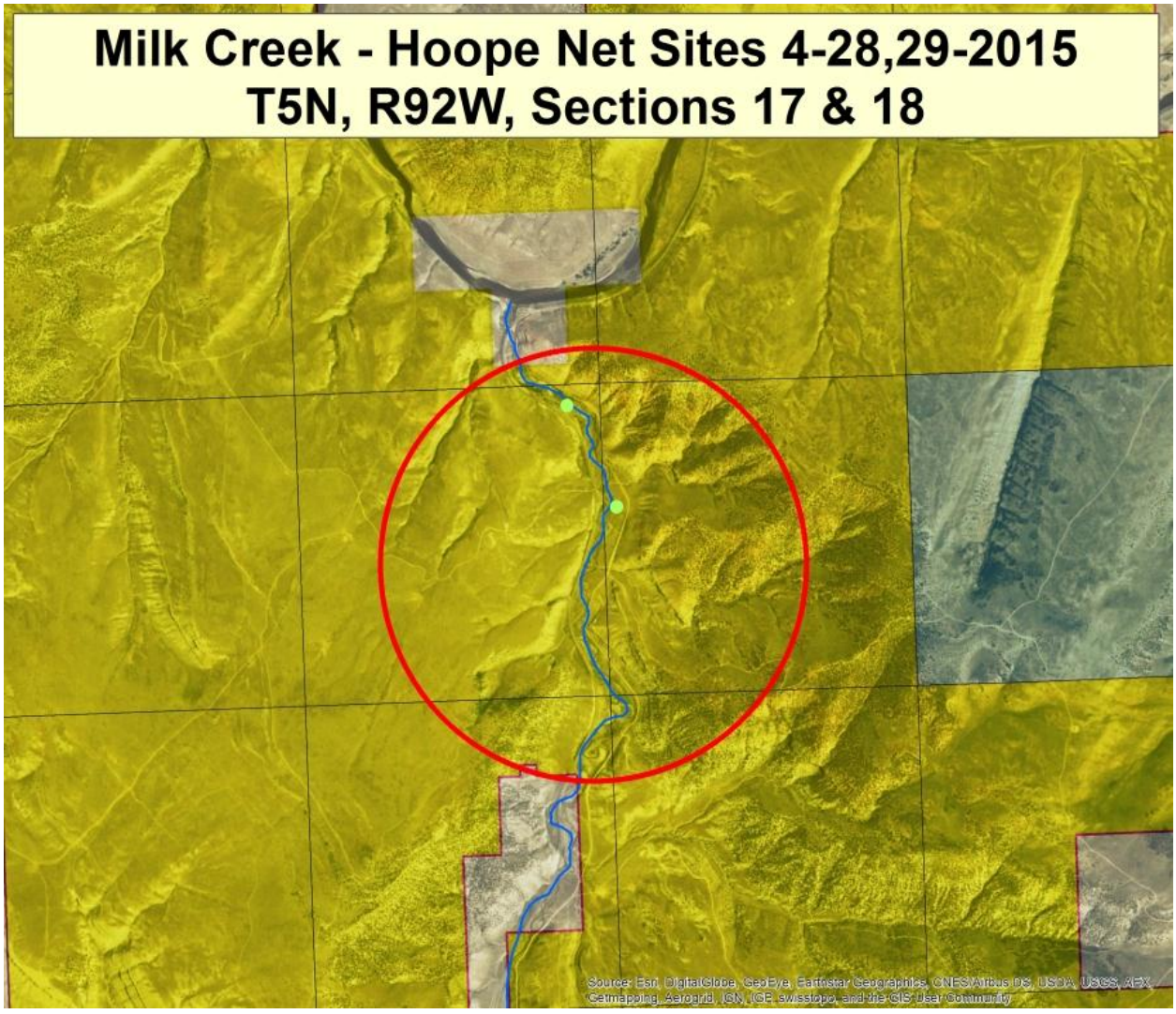
Brian St. George
Deputy State Director
Resources and Fire

cc: Bruce Sillitoe, White River Field Office
Eric Scherff, White River Field

Little Snake Field Office Stream Surveys
April - May 2015

Milk Creek - Water Code #24961

Introduction:
Milk Creek, located southwest of Craig, Colorado on BLM lands managed by the Little Snake Field Office, was sampled on April 28-29, and May 13-24, 2015. Milk Creek is tributary to the Yampa River. Hoop net sampling was conducted to further document spring use of the stream by adult native fishes (flannelmouth sucker, bluehead sucker, roundtail chub) moving out of the Yampa River to spawn. Personnel present were Tom Fresques, Kristen Doyle, and Jake Maas, BLM, and Jenn Logan and Crew, CPW.



Adult Bluehead Sucker

Adult Flannelmouth Sucker

Hoopnet Set – The successful net that collected both native fishes during April sets

Discussion:

Hoop nets resulted in the capture of one adult bluehead sucker, and one adult flannelmouth sucker both in the same hoop net during April's effort. In May, one additional flannelmouth sucker was collected as was a native speckled dace. Nonnative fishes collected in May included white sucker, creek chub, and fathead minnow. Flows were fairly high during sampling and net setting was difficult. The April fish were both in spawning condition as evidenced by turbiculation on the fins of the bluehead sucker (male), and the distended belly of the flannelmouth sucker (female). This data provides further documentation of adult use of the creek by target native species during the spring spawning period.

Recommendations:

- Consider additional sampling during the spring to better document the extent of spring use – timing of peak use is difficult but could be correlated with stream temperature data

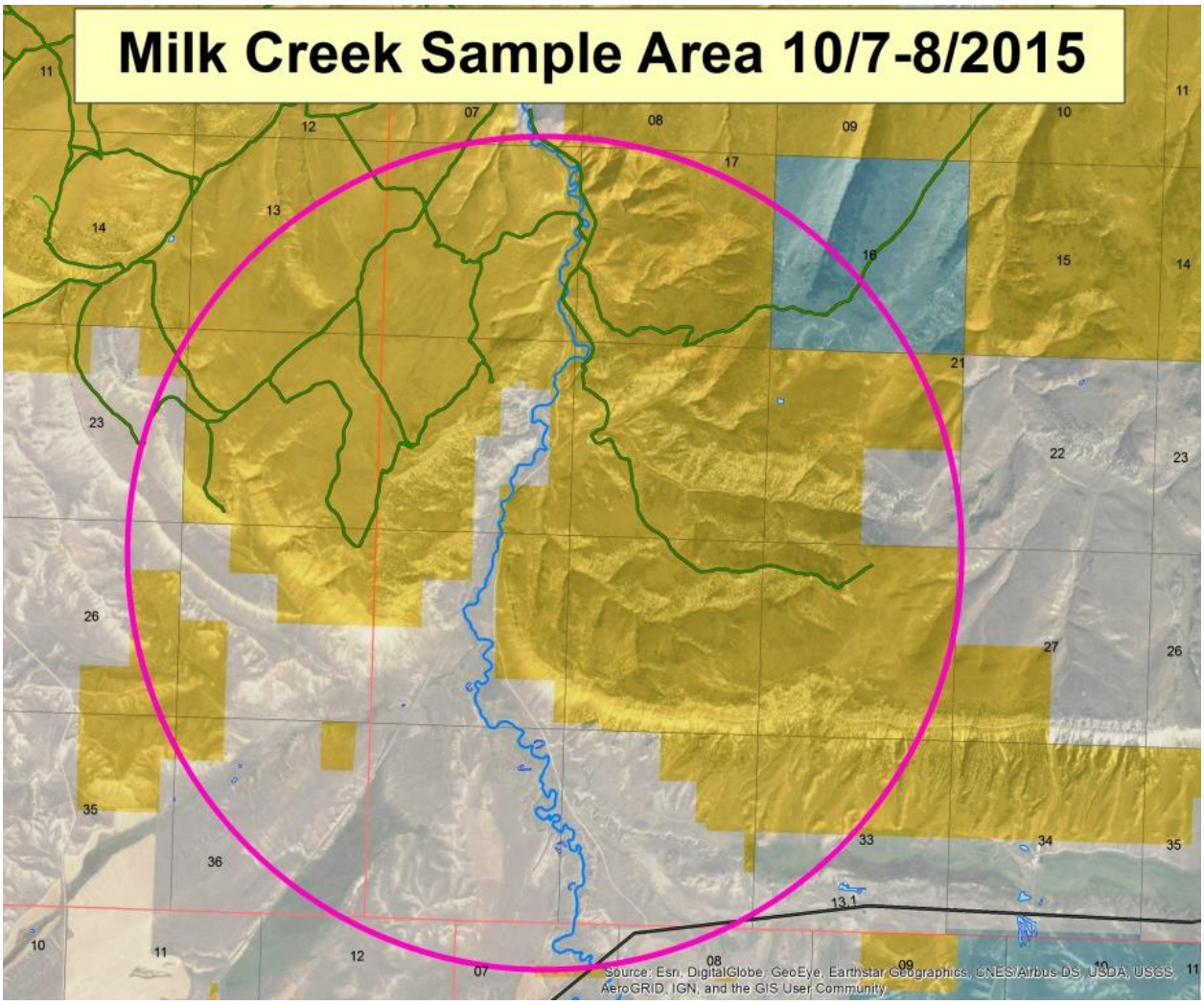
- Consider placement of a temperature probe in the stream to monitor seasonal stream temperatures

Little Snake Field Office

Stream Sampling October 2015

Milk Creek - Water Code #24961

Milk Creek, located southwest of Craig, Colorado on BLM lands managed by the Little Snake Field Office was sampled on October 7-8, 2015. Sampling was conducted to monitor stocked Bluehead Suckers, assess use by other native fishes, and to remove nonnative fishes. CPW and BLM split into four crews consisting of 3 persons each with two backpack electrofishers per crew and sampled over 4 miles of stream on ColoWyo and BLM lands. Species collected included native Bluehead Suckers, Flannelmouth Suckers, and Speckled Dace, and nonnatives including Creek Chubs, Sand Shiners, Red-Side Shiners, White Suckers, Fathead Minnows, Personnel present were Tom Fresques, BLM, and Jenn Logan and Crew, CPW.



Milk Creek – lower end on BLM above the confluence with the Yampa River

Milk Creek Bluehead Sucker

Milk Creek Flannelmouth Sucker

Discussion:

Milk Creek contains a diverse fishery comprised of both native and nonnative species. The stocking of passive integrative transponder (PIT) tagged Bluehead Suckers by CPW has been occurring for the past two years. This effort is aimed at bolstering populations in the Yampa River basin. Fish sampling was conducted to monitor these stocked fish and to remove nonnative/competitive species from the stream to give the stocked fish a better chance of survival with less competition. In addition to active fish sampling, CPW has deployed 3 portable PIT tag readers in the stream that passively monitor fish as they pass within the detection distance of the reader. The recorders pings and the unique tag number and time and date are recorded. CPW manages this data.

A large number of nonnative creek chubs were removed from the stream as well as lesser numbers of white suckers, sand shiners, red-side shiners, and fathead minnows among others. Stocking and monitoring is planned to continue in Milk Creek over the next 3 years with longer-term monitoring to continue after stocking is ceased. Bluehead Suckers stocked into Milk Creek in 2015 have already been captured in the Yampa River both up and downstream of the Milk Creek confluence by other researchers sampling the river. This is encouraging and shows that these fish are surviving in the short-term and are utilizing preferred habitats in both Milk Creek and the Yampa River.

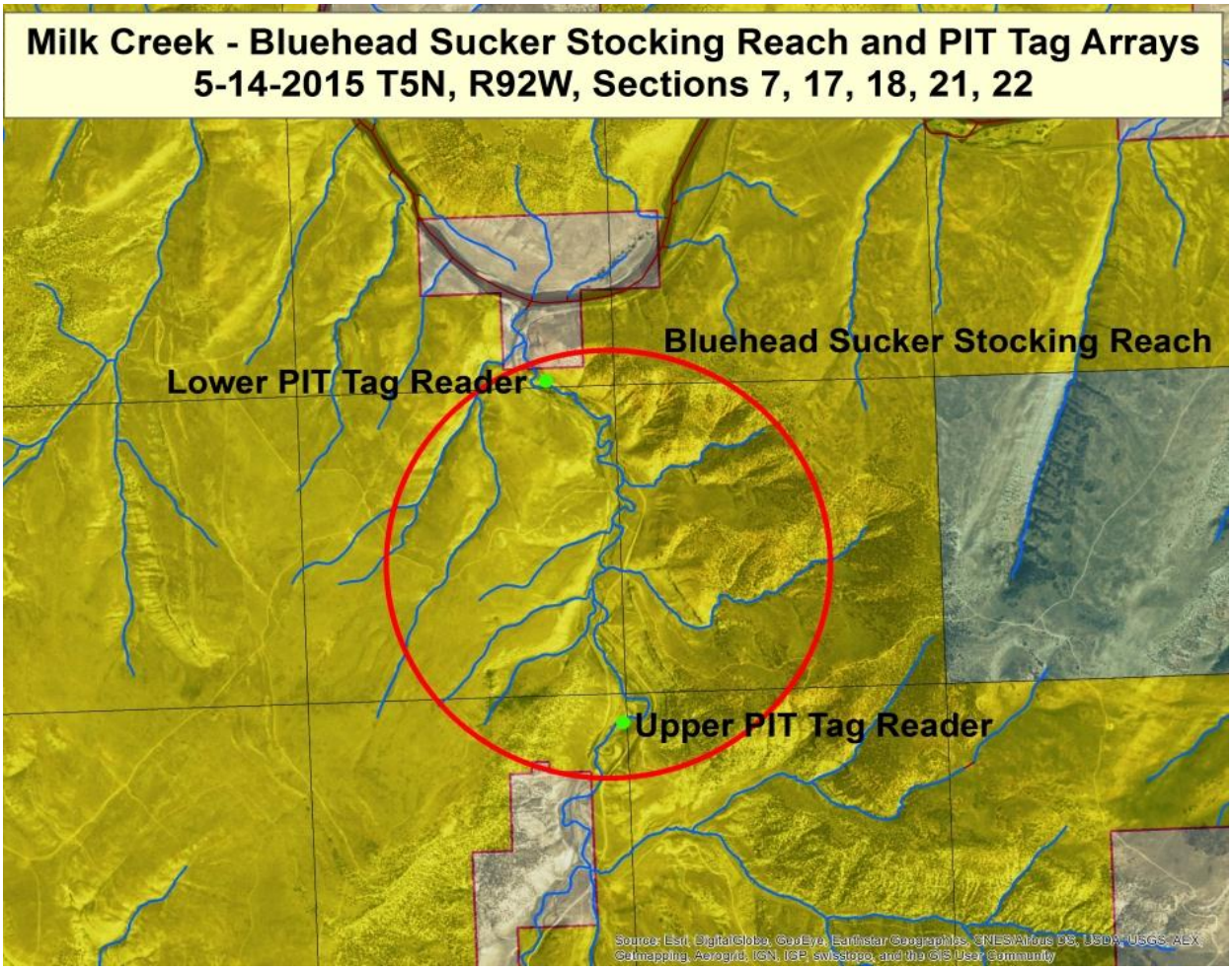
Recommendations:

- Continue to assist CPW with Bluehead Sucker stocking and monitoring efforts
- Consider some habitat improvement projects in the BLM stream reaches in addition to tamarisk removal that has already been conducted
    - Assess livestock use of the stream and consider changes to provide for increased rest and habitat improvement along the stream and riparian corridor
    - Look at road 1596D that parallels the stream and potential drainage improvements
    - Riparian planting
    - Other?

Little Snake Field Office Fisheries Work
May 2015

Milk Creek – Water Code # 24961

Introduction:
Milk Creek, located southwest of Craig, Colorado on BLM lands managed by the Little Snake Field Office, was visited on May 14, 2015. BLM personnel assisted Colorado Parks & Wildlife personnel with the stocking of 1,000 bluehead suckers (*Catostomus discobolus*) into BLM portions of the creek. Bluehead suckers are a BLM CO sensitive species and Milk Creek and the Yampa River both contain this species but due primarily to competition with and predation by nonnative fishes, bluehead suckers are now rare in these systems. Adult fish large enough to avoid smallmouth bass predation were stocked to bolster existing native populations. In addition, two portable tag readers were placed in the stream to monitor the stocked fish, all of which were inserted with tags prior to stocking. Personnel present included Jenn Logan and Crew, CPW, and Kristen Doyle, BLM.



Bluehead Suckers appeared to be in good condition after transport from the hatchery

CPW transfers Bluehead Suckers to be released into Milk Creek

Bluehead Suckers placed in buckets for hand transport into Milk Creek

Portable PIT Tag Array Reader in Milk Creek

Discussion:
Milk Creek was identified as a good stream in which to stock native bluehead suckers to help augment declining populations in the Yampa River and its tributaries. All stocked fish were implanted with Passive Integrated Transponder (PIT) tags at CPW's Native Aquatic Species Hatchery in Alamosa, Colorado prior to their arrival at Milk Creek. These fish can now be tracked by CPW as well as personnel from other state and federal agencies who are conducting fish sampling activities in the watershed.

To assist with monitoring efforts, CPW placed two small, portable PIT tag array readers in Milk Creek to help monitor these fish. These small, circular readers were placed on the bottom of the stream and as tagged fish move over or within reading distance, the tagged fish ping the unit which records the tag number and time/date. This passive sampling method limits handling of fish and provides good data on fish movement and use of the stream. Data is downloaded every 21 days and batteries are replaced. The units are removed during winter and will be placed and reactivated in March of 2016. Several stocked individuals have already been collected by partner agencies (USFWS, Colorado State University) conducting nonnative fish removal efforts in the Yampa River in 2015.

CPW plans to continue stocking and monitoring efforts for three - five years. In addition to passive monitoring via the portable PIT tag array readers, CPW and BLM will periodically sample portions of Milk Creek with backpack shockers to look for stocked fish and collect length and weight data. BLM will continue to assist with stocking and monitoring efforts.

Recommendations:

- Assist with CPW additional stocking and monitoring efforts
- Assist CPW with re-deployment of portable PIT Tag Array readers in March 2016 to monitor stocked bluehead suckers

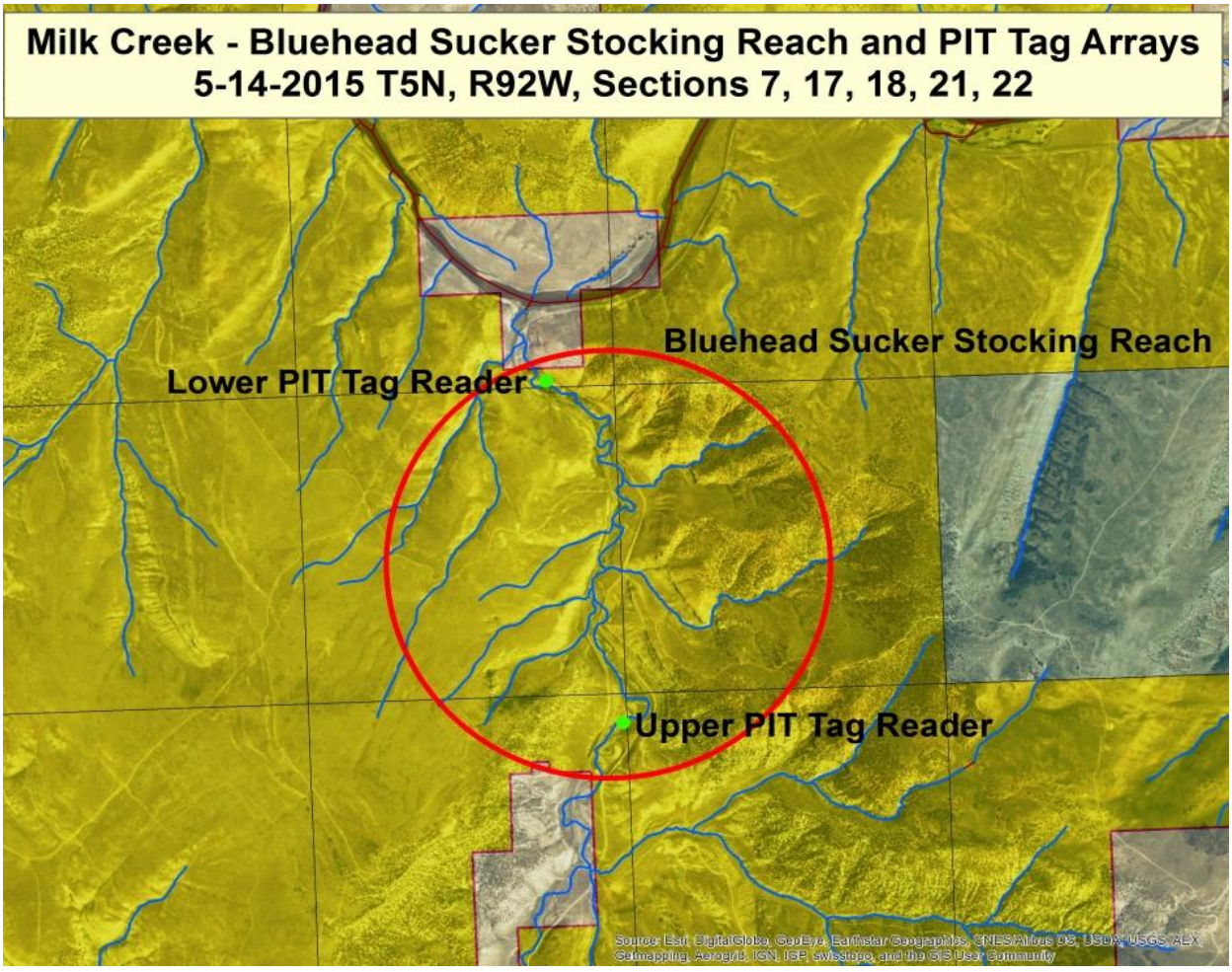
Little Snake Field Office

Fish Stocking September 2016

Milk Creek – Water Code # 24961

Introduction:

Milk Creek, located southwest of Craig, Colorado on BLM lands managed by the Little Snake Field Office, was visited on September 29, 2016. BLM personnel assisted Colorado Parks & Wildlife personnel with the stocking of approximately 2,800 Bluehead Suckers (*Catostomus discobolus*) into BLM portions of the creek. Bluehead Suckers are a BLM CO sensitive species and Milk Creek and the Yampa River both contain this species but due primarily to competition with and predation by nonnative fishes, this species is now rare in these systems. Adult fish large enough to avoid smallmouth bass predation were stocked to bolster existing native populations. In addition, two portable tag readers were placed in the stream to monitor the stocked fish, all of which were inserted with tags prior to stocking. Personnel present included Jenn Logan and Crew, CPW, and Kristen Doyle, BLM.



Bluehead Suckers appeared to be in good condition after transport from the hatchery

Bluehead Suckers placed in buckets for hand transport into Milk Creek

Portable PIT Tag Array Reader in Milk Creek

BLM Fisheries Technician Kristen Doyle releasing a bucket of Bluehead Suckers into Milk Creek

Discussion:
Milk Creek was identified as a good stream in which to stock native bluehead suckers to help augment declining populations in the Yampa River and its tributaries. All stocked fish were implanted with Passive Integrated Transponder (PIT) tags at CPW's Native Aquatic Species Hatchery in Alamosa, Colorado prior to their arrival at Milk Creek. These fish can now be tracked by CPW as well as personnel from other state and federal agencies who are conducting fish sampling activities in the watershed.

To assist with monitoring efforts, CPW placed small, portable PIT tag array readers in Milk Creek to help monitor these fish. These small, circular readers are placed on the bottom of the stream and as tagged fish move over or within detection range, the tagged fish ping the unit which records the tag number and time/date. This passive sampling method limits handling of fish and provides good data on fish movement and use of the stream. Data is downloaded every 21 days and batteries are replaced. The units are removed during winter and will be placed and reactivated each spring. Several stocked individuals have already been collected by partner agencies (USFWS, Colorado State University) conducting nonnative fish removal efforts in the Yampa River.

CPW plans to continue stocking efforts through 2019 and monitoring efforts for several years. In addition to passive monitoring, CPW and BLM will periodically sample portions of Milk Creek with backpack shockers to look for stocked fish and collect length and weight data. BLM will continue to assist with stocking and monitoring efforts.

Recommendations:

- Assist with CPW additional stocking and monitoring efforts

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

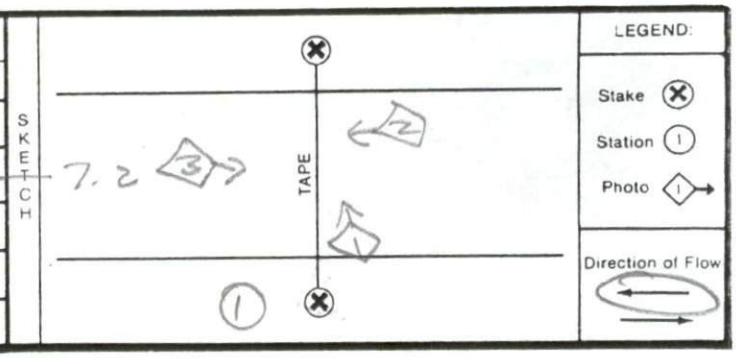
STREAM NAME: Milk Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 150 ft. upstream from 159b Road Crossing						
DATE: 8-17-11	OBSERVERS: R. Smith, E. Spencer					
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 17	TOWNSHIP: 5 N/S	RANGE: 92 E/W	PM: 6th	
COUNTY: Moffat	WATERSHED: Yampa	WATER DIVISION: 6	DOW WATER CODE: 24961			
MAP(S): USGS:			266334			
USFS:			4474162			

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4" cobbles to 2-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 39.2	6.25 / 6.20
② WS Upstream	66.4	5.66
③ WS Downstream	17.5	6.62
SLOPE	0.96 / 83.9 = .011	



AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly

COMMENTS

Ph = 8.47 Willow - Sedge - Rush riparian

Cond = 2054

Salinity = 1.1 ppt

Temp = 16°C

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Milk Creek	CROSS-SECTION NO.: 2	DATE: 8-17-11	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 11 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0	<2.7	3.00	<4.88							
G	3.4		5.10								
	5.5		5.75								
W	7.2		6.20								
	9		6.5		0.3				.03		
	10		6.6		0.4				1.58		
	11		6.7		0.5				2.36		
	12		6.7		0.5				2.80		
	13		6.5		0.3				2.69		
	14		6.65		0.45				2.09		
	15		6.5		0.3				1.19		
	16		6.65		0.45				1.46		
	17		6.5		0.3				0		
	18		6.3		0.1				0.68		
	19		6.4		0.2				0.81		
	20		6.4		0.2				0.87		
	22		6.3		0.1				0.28		
	24		6.5		0.3				1.25		
	26		6.45		0.2				0.37		
	28		6.35		0.1				0.32		
	30		6.35		0.1				0.06		
	32		6.45		0.2				Ø		
	34		6.45		0.2				0.25		
	36		6.45		0.2				0.23		
	38		6.65		0.4				1.19		
W	39.2		6.25								
G	44.0		5.12								
LS	59.2		4.79								
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: Milk Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: above 1596 Road Crossing						
DATE: 8-17-11	OBSERVERS: R. Smith, E. Spencer					
LEGAL DESCRIPTION	¼ SECTION: NW	SECTION: 17	TOWNSHIP: 5 (N/S)	RANGE: 92 (E/W)	PM: 6th	
COUNTY: Moffat	WATERSHED: Yampa	WATER DIVISION: 6	DOW WATER CODE: 24961			
MAP(S): USGS:	GPS Zone 13 266246					
USFS:	4474042					

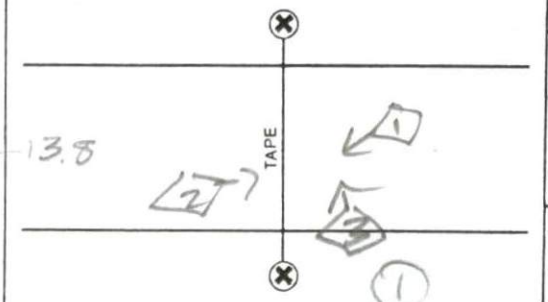
SUPPLEMENTAL DATA

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: 6" cobbles to 2-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 47.0	5.58 / 5.58
② WS Upstream	34.4	5.37
③ WS Downstream	66.9	6.16
SLOPE	0.79 / 101.3 = .008	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly

COMMENTS

pH = 8.47
Cond = 2054
Salinity = 1.1 ppt
Temp = 16°C

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Milk Creek	CROSS-SECTION NO.: 1	DATE: 8-17-11	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 10:15 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		2.32								
G	5.5		3.78								
	10.0		5.02								
W	13.8		5.6								
	16.0		5.6	Ø					Ø		
	18.0		5.85	.25					.09		
	20.0		5.75	.15					.10		
	22.0		5.85	.25					.11		
	23.5		5.6	Ø					Ø		
	24.0		5.9	0.3					.38		
	25.0		5.95	0.35					1.34		
	26.0		6.15	0.55					1.35		
	27.0		6.05	0.45					1.60		
	28.0		5.7	0.1					Ø		
	29.0		6.3	0.7					1.13		
	30.0		6.3	0.7					1.19		
	31.0		6.1	0.5					.98		
	32.0		6.3	0.7					1.38		
	33.0		6.3	0.7					.74		
	34.0		6.0	0.4					0.42		
	35.0		6.15	0.55					0.12		
	36.0		6.0	0.4					1.0		
	37.0		6.3	0.7					1.34		
	38.0		6.0	0.4					.40		
	39.0		5.6	Ø					Ø		
	40.0		6.1	0.5					Ø		
	41.0		6.2	0.6					0.16		
	42.0		5.9	0.3					Ø		
	43.0		5.95	0.35					0.97		
	44.0		5.95	0.35					0.57		
	45.0		5.9	0.3					0.66		
	46.0		5.8	0.2					Ø		
W	47.0		5.6	Ø					Ø		
	49.5		5.01								
	51.7		4.41								
LS+G	53.2		3.72								
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: Milk Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 2,000 ft. upstream from RR bridge.						
DATE: 6-28-16	OBSERVERS: R. Smith, E. Scherf					
LEGAL DESCRIPTION	¼ SECTION: NE NE	SECTION: 18	TOWNSHIP: 5 (N)/S	RANGE: 92 E/(W)	PM: 6th	
COUNTY: Moffat	WATERSHED: Yampa	WATER DIVISION: 6	DOW WATER CODE: 24961			
MAP(S): USGS:	Zone 13 266105					
USFS:	4474744					

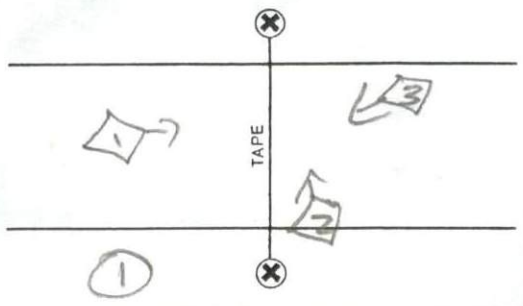
SUPPLEMENTAL DATA

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: gravels to 6"	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	7.60 / 7.80
(2) WS Upstream	19.5'	7.25
(3) WS Downstream	45.8'	8.35
SLOPE	1.10 / 65.3' = 0.017	

SKETCH



LEGEND:
- Stake (X)
- Station (1)
- Photo (1)
- Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Significant channel complexity.
Spotted dozens of fingerlings in side channels.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Milk Creek | CROSS-SECTION NO.: 2 | DATE: 6-28-16 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 10:20 am

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		5.05								
G	1.1		6.32								
W	1.5		7.60	Φ				Φ			
	3		8.28	0.5				0.8			
	4		8.28	0.7				0.35			
	5		7.70	0.1				Φ			
	6		8.00	0.4				1.43			
	7		8.15	0.6				0.06			
	8		8.17	0.45				0.99			
	9		8.14	0.35				3.04			
	10		8.05	0.35				0.49			
	11		8.12	0.30				2.95			
	12		8.06	0.30				3.40			
	13		8.24	0.60				1.55			
	14		8.25	0.50				1.34			
	15		8.16	0.55				1.29			
	16		8.00	0.35				2.46			
	17		7.93	0.35				0.54			
	18		7.92	0.25				0.15			
	19		7.99	0.15				1.43			
	20		7.90	0.20				1.00			
	21		7.86	0.20				1.32			
	22		7.98	0.10				0.56			
	23		7.72	0.20				Φ			
	24		8.14	0.40				Φ			
	25		8.02	0.20				0.97			
R	26		7.64	Φ				Φ			
	27		8.04	0.10				Φ			
	28		8.12	0.30				0.66			
	29		8.16	0.40				0.10			
	30		8.00	0.20				1.55			
	31		8.37	0.60				1.10			
	32		8.38	0.50				0.58			
	33		8.22	0.40				0.71			
	34		8.17	0.40				0.33			
W	35		7.80	Φ				Φ			
	36		7.31								
G	42		6.35								
RS	48		5.12								
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

LOCATION INFORMATION

STREAM NAME: Milk Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 1,000 fd. upstream from RR bridge						
DATE: 6-28-16	OBSERVERS: R. Smith, E. Scherff					
LEGAL DESCRIPTION	¼ SECTION: NE NE	SECTION: 18	TOWNSHIP: 5 (N)/S	RANGE: 92 E/(W)	PM: 6th	
COUNTY: Moffat	WATERSHED: Yampa	WATER DIVISION: 6	DOW WATER CODE: 24961			
MAP(S): USGS:			Zone 13 265948			
USFS:			4474852			

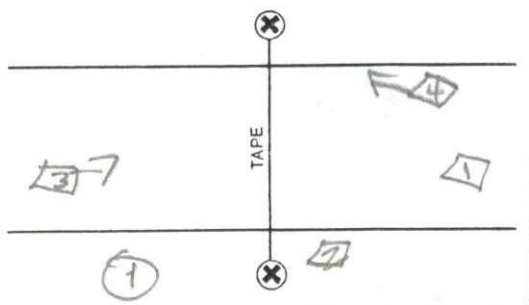
SUPPLEMENTAL DATA

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: gravels to 6" cobbles	PHOTOGRAPHS TAKEN (YES)/NO	NUMBER OF PHOTOGRAPHS: 4		

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	7.42 / 7.42
(2) WS Upstream	40.5'	7.36
(3) WS Downstream	27.2'	7.63
SLOPE	0.27/67.7 = 0.004	

SKETCH



LEGEND:
Stake (X)
Station (1)
Photo (1)
Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

Willow - narrowleaf cottonwood riparian. Substantial regeneration, sedges - rushes

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Milk Creek | CROSS-SECTION NO.: 1 | DATE: 6-28-16 | SHEET ___ OF ___

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

Features (Stake (S) Grassline (G) Waterline (W) Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		4.16								
	1.0		4.58								
G	1.4		5.80								
W	1.9		7.40								
	3		7.85	0.45				0.71			
	4		8.10	0.70				1.19			
	5		8.00	0.60				1.62			
	6		8.10	0.70				1.29			
	7		8.15	0.75				1.22			
	8		8.00	0.60				0.41			
	8.5		7.95	0.55				1.82			
	9		8.20	0.80				1.64			
	9.5		8.15	0.75				1.28			
	10		8.05	0.65				1.77			
	10.5		8.20	0.80				1.55			
	11.0		8.20	0.80				1.67			
	11.5		8.05	0.65				1.83			
	12.0		8.00	0.60				1.93			
	12.5		8.00	0.60				1.80			
	13.0		8.00	0.60				1.51			
	14		8.05	0.65				1.71			
	15		7.80	0.4				1.67			
	16		7.90	0.5				1.36			
	17		7.70	0.3				0.54			
	18		7.60	0.2				0.31			
W	19.0	7.40 →									
	32.1	6.14 →									
G	38.9	5.80 →									
RS	45.5	5.00 →									
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	Milk Creek
XS LOCATION:	150 ft upstream fr Road 1596 crossing
XS NUMBER:	Number 2
DATE:	8/17/2011
OBSERVERS:	R. Smith, E. Spencer
1/4 SEC:	NW
SECTION:	17
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.011 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 = 29					
	RS	0.00	3.00			0.00	0.00	0.00
		2.70	4.88			0.00	0.00	0.00
1	G	3.40	5.10			0.00	0.00	0.00
		5.50	5.75			0.00	0.00	0.00
	W	7.20	6.20	0.00	0.00	0.00	0.00	0.00
		9.00	6.50	0.30	0.03	0.42	0.01	6.20
		10.00	6.60	0.40	1.58	0.40	0.63	6.20
		11.00	6.70	0.50	2.36	0.50	1.18	6.20
		12.00	6.70	0.50	2.80	0.50	1.40	6.20
		13.00	6.50	0.30	2.69	0.30	0.81	6.20
		14.00	6.65	0.45	2.09	0.45	0.94	6.20
		15.00	6.50	0.30	1.19	0.30	0.36	6.20
		16.00	6.65	0.45	1.46	0.45	0.66	6.20
		17.00	6.50	0.30	0.00	0.30	0.00	6.20
		18.00	6.30	0.10	0.68	0.10	0.07	6.20
		19.00	6.40	0.20	0.81	0.20	0.16	6.20
		20.00	6.40	0.20	0.87	0.30	0.26	6.20
		22.00	6.30	0.10	0.28	0.20	0.06	6.20
		24.00	6.50	0.30	1.25	0.60	0.75	6.20
		26.00	6.45	0.20	0.37	0.40	0.15	6.25
		28.00	6.35	0.10	0.32	0.20	0.06	6.25
		30.00	6.35	0.10	0.06	0.20	0.01	6.25
		32.00	6.45	0.20	0.00	0.40	0.00	6.25
		34.00	6.45	0.20	0.25	0.40	0.10	6.25
		36.00	6.45	0.20	0.23	0.40	0.09	6.25
		38.00	6.65	0.40	1.19	0.64	0.76	6.25
	W	39.20	6.25	0.00	0.00	0.00	0.00	0.00
1	G	44.00	5.12			0.00	0.00	0.00
	LS	59.20	4.79			0.00	0.00	0.00
					Totals	7.66	8.46	

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

LOCATION INFORMATION

STREAM NAME:	Milk Creek
XS LOCATION:	150 ft upstream fr Road 1596 crossing
XS NUMBER:	Number 2
DATE:	17-Aug-11
OBSERVERS:	R. Smith, E. Spencer
1/4 SEC:	NW
SECTION:	17
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.011

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

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

STREAM NAME: Milk Creek
XS LOCATION: 150 ft upstream fr Road 1596 crossing
XS NUMBER: Number 2

DATA POINTS= 29

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	3.00			0.00		0.00	0.00	0.0%
		2.70	4.88			0.00		0.00	0.00	0.0%
1	G	3.40	5.10			0.00		0.00	0.00	0.0%
		5.50	5.75			0.00		0.00	0.00	0.0%
	W	7.20	6.20	0.00	0.00	0.00		0.00	0.00	0.0%
		9.00	6.50	0.30	0.03	1.82	0.30	0.42	0.01	0.1%
		10.00	6.60	0.40	1.58	1.00	0.40	0.40	0.63	7.5%
		11.00	6.70	0.50	2.36	1.00	0.50	0.50	1.18	13.9%
		12.00	6.70	0.50	2.80	1.00	0.50	0.50	1.40	16.5%
		13.00	6.50	0.30	2.69	1.02	0.30	0.30	0.81	9.5%
		14.00	6.65	0.45	2.09	1.01	0.45	0.45	0.94	11.1%
		15.00	6.50	0.30	1.19	1.01	0.30	0.30	0.36	4.2%
		16.00	6.65	0.45	1.46	1.01	0.45	0.45	0.66	7.8%
		17.00	6.50	0.30	0.00	1.01	0.30	0.30	0.00	0.0%
		18.00	6.30	0.10	0.68	1.02	0.10	0.10	0.07	0.8%
		19.00	6.40	0.20	0.81	1.00	0.20	0.20	0.16	1.9%
		20.00	6.40	0.20	0.87	1.00	0.20	0.30	0.26	3.1%
		22.00	6.30	0.10	0.28	2.00	0.10	0.20	0.06	0.7%
		24.00	6.50	0.30	1.25	2.01	0.30	0.60	0.75	8.9%
		26.00	6.45	0.20	0.37	2.00	0.20	0.40	0.15	1.7%
		28.00	6.35	0.10	0.32	2.00	0.10	0.20	0.06	0.8%
		30.00	6.35	0.10	0.06	2.00	0.10	0.20	0.01	0.1%
		32.00	6.45	0.20	0.00	2.00	0.20	0.40	0.00	0.0%
		34.00	6.45	0.20	0.25	2.00	0.20	0.40	0.10	1.2%
		36.00	6.45	0.20	0.23	2.00	0.20	0.40	0.09	1.1%
		38.00	6.65	0.40	1.19	2.01	0.40	0.64	0.76	9.0%
	W	39.20	6.25	0.00	0.00	1.26		0.00	0.00	0.0%
1	G	44.00	5.12			0.00		0.00	0.00	0.0%
	LS	59.20	4.79			0.00		0.00	0.00	0.0%
	TOTALS ----------					32.22	0.5 (Max.)	7.66	8.46	100.0%

Manning's n = 0.0542
Hydraulic Radius= 0.23776171

STREAM NAME: Milk Creek
XS LOCATION: 150 ft upstream fr Road 1596 crossing
XS NUMBER: Number 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	7.66	7.57	-1.1%
5.98	7.66	15.83	106.6%
6.00	7.66	15.15	97.8%
6.02	7.66	14.47	88.9%
6.04	7.66	13.80	80.2%
6.06	7.66	13.13	71.4%
6.08	7.66	12.46	62.7%
6.10	7.66	11.80	54.1%
6.12	7.66	11.14	45.5%
6.14	7.66	10.49	36.9%
6.16	7.66	9.83	28.4%
6.18	7.66	9.18	19.9%
6.19	7.66	8.86	15.7%
6.20	7.66	8.54	11.4%
6.21	7.66	8.21	7.2%
6.22	7.66	7.89	3.0%
6.23	7.66	7.57	-1.1%
6.24	7.66	7.25	-5.3%
6.25	7.66	6.94	-9.4%
6.26	7.66	6.62	-13.6%
6.27	7.66	6.30	-17.7%
6.28	7.66	5.99	-21.8%
6.30	7.66	5.36	-30.0%
6.32	7.66	4.74	-38.1%
6.34	7.66	4.14	-45.9%
6.36	7.66	3.58	-53.3%
6.38	7.66	3.07	-59.9%
6.40	7.66	2.61	-65.9%
6.42	7.66	2.19	-71.4%
6.44	7.66	1.81	-76.4%
6.46	7.66	1.47	-80.8%
6.48	7.66	1.22	-84.1%

WATERLINE AT ZERO
AREA ERROR = 6.222

STREAM NAME: Milk Creek
XS LOCATION: 150 ft upstream fr Road 1596 crossing
XS NUMBER: 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	5.12	40.54	1.18	1.58	47.74	41.04	100.0%	1.16	151.96	3.18
	5.22	39.77	1.10	1.48	43.63	40.25	98.1%	1.08	132.51	3.04
	5.27	39.40	1.06	1.43	41.65	39.86	97.1%	1.04	123.44	2.96
	5.32	39.02	1.02	1.38	39.69	39.47	96.2%	1.01	114.65	2.89
	5.37	38.65	0.98	1.33	37.75	39.08	95.2%	0.97	106.15	2.81
	5.42	38.27	0.94	1.28	35.82	38.70	94.3%	0.93	97.94	2.73
	5.47	37.90	0.89	1.23	33.92	38.31	93.4%	0.89	90.02	2.65
	5.52	37.53	0.85	1.18	32.03	37.92	92.4%	0.84	82.39	2.57
	5.57	37.15	0.81	1.13	30.17	37.53	91.5%	0.80	75.06	2.49
	5.62	36.78	0.77	1.08	28.32	37.15	90.5%	0.76	68.02	2.40
	5.67	36.40	0.73	1.03	26.49	36.76	89.6%	0.72	61.28	2.31
	5.72	36.03	0.68	0.98	24.68	36.37	88.6%	0.68	54.84	2.22
	5.77	35.64	0.64	0.93	22.89	35.97	87.7%	0.64	48.73	2.13
	5.82	35.24	0.60	0.88	21.11	35.56	86.7%	0.59	42.93	2.03
	5.87	34.84	0.56	0.83	19.36	35.15	85.6%	0.55	37.45	1.93
	5.92	34.44	0.51	0.78	17.63	34.73	84.6%	0.51	32.29	1.83
	5.97	34.04	0.47	0.73	15.92	34.32	83.6%	0.46	27.45	1.72
	6.02	33.64	0.42	0.68	14.23	33.91	82.6%	0.42	22.95	1.61
	6.07	33.24	0.38	0.63	12.55	33.49	81.6%	0.37	18.78	1.50
	6.12	32.84	0.33	0.58	10.90	33.08	80.6%	0.33	14.97	1.37
	6.17	32.43	0.29	0.53	9.27	32.66	79.6%	0.28	11.52	1.24
WL	6.22	31.98	0.24	0.48	7.66	32.20	78.5%	0.24	8.46	1.10
	6.27	31.50	0.19	0.43	6.07	31.71	77.3%	0.19	5.81	0.96
	6.32	30.05	0.15	0.38	4.52	30.24	73.7%	0.15	3.66	0.81
	6.37	24.46	0.13	0.33	3.14	24.62	60.0%	0.13	2.29	0.73
	6.42	19.42	0.11	0.28	2.05	19.57	47.7%	0.10	1.31	0.64
	6.47	12.00	0.10	0.23	1.25	12.12	29.5%	0.10	0.79	0.63
	6.52	8.73	0.08	0.18	0.74	8.82	21.5%	0.08	0.41	0.55
	6.57	6.00	0.06	0.13	0.37	6.06	14.8%	0.06	0.16	0.45
	6.62	3.26	0.04	0.08	0.14	3.29	8.0%	0.04	0.05	0.35
	6.67	1.42	0.02	0.03	0.03	1.42	3.5%	0.02	0.01	0.24

STREAM NAME: Milk Creek
XS LOCATION: 150 ft upstream fr Road 1596 crossing
XS NUMBER: Number 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	8.46	cfs
CALCULATED FLOW (Qc)=	8.46	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	6.23	ft
CALCULATED WATERLINE (WLc)=	6.22	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.48	ft
(Dm-Dc)/Dm * 100	4.5	%
MEAN VELOCITY=	1.10	ft/sec
MANNING'S N=	0.054	
SLOPE=	0.011	ft/ft
.4 * Qm =	3.4	cfs
2.5 * Qm=	21.2	cfs

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

FLOW (CFS)	PERIOD

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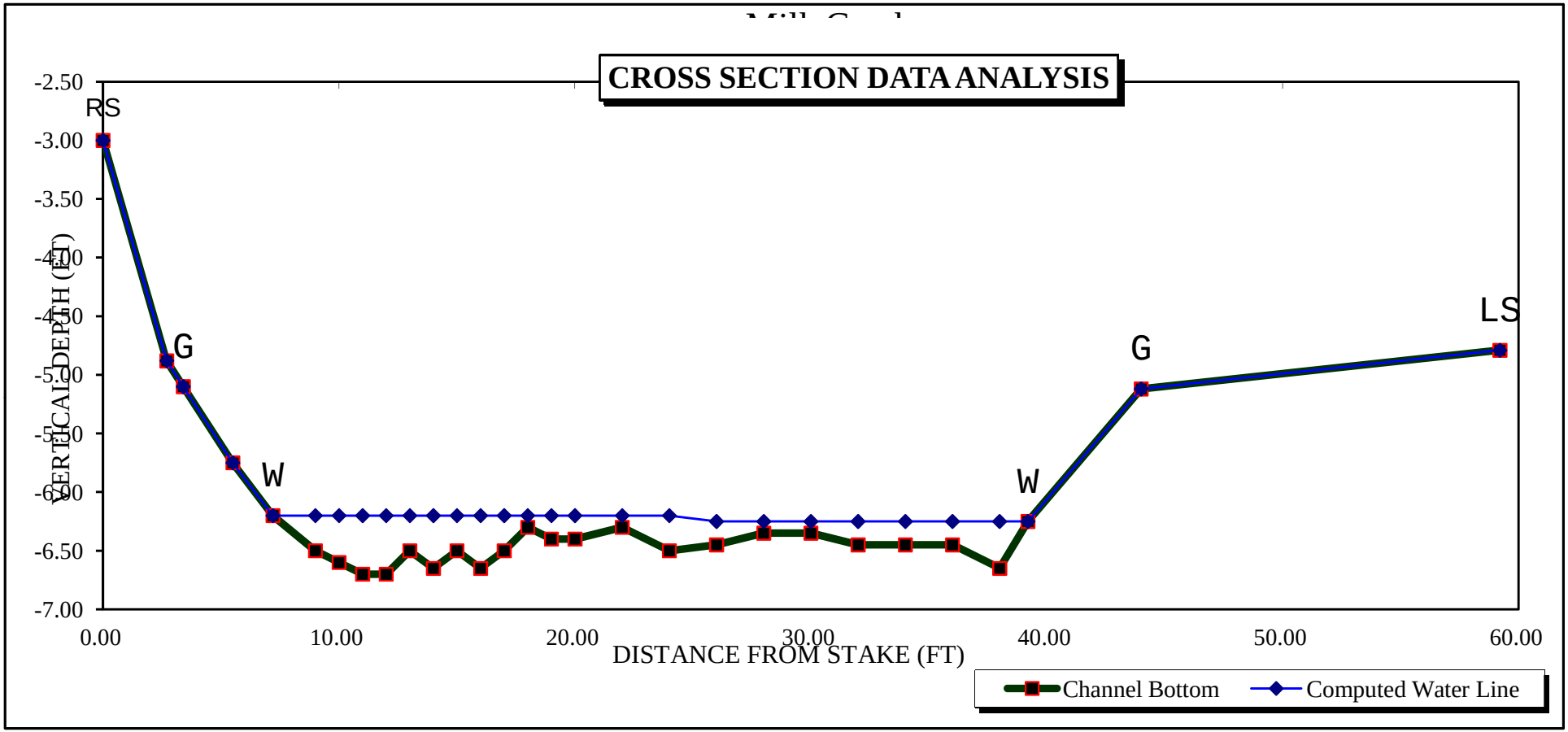
RECOMMENDATION BY: ………………...………..…….............................. AGENCY..……………………......……...…...…….…...... DATE:.......…...…......……………

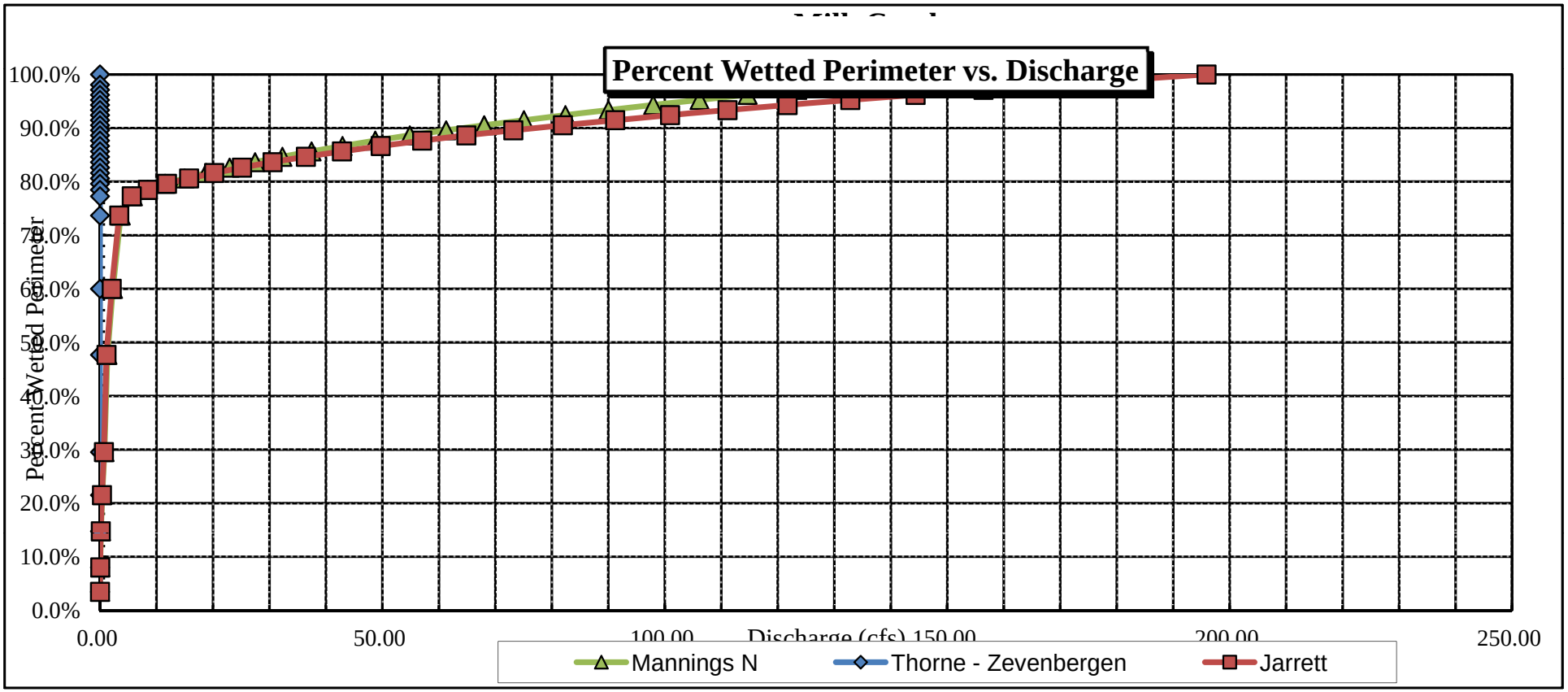
CWCB REVIEW BY: ..……………………….....…………………………………………………...................................…............. DATE:.................…………….…

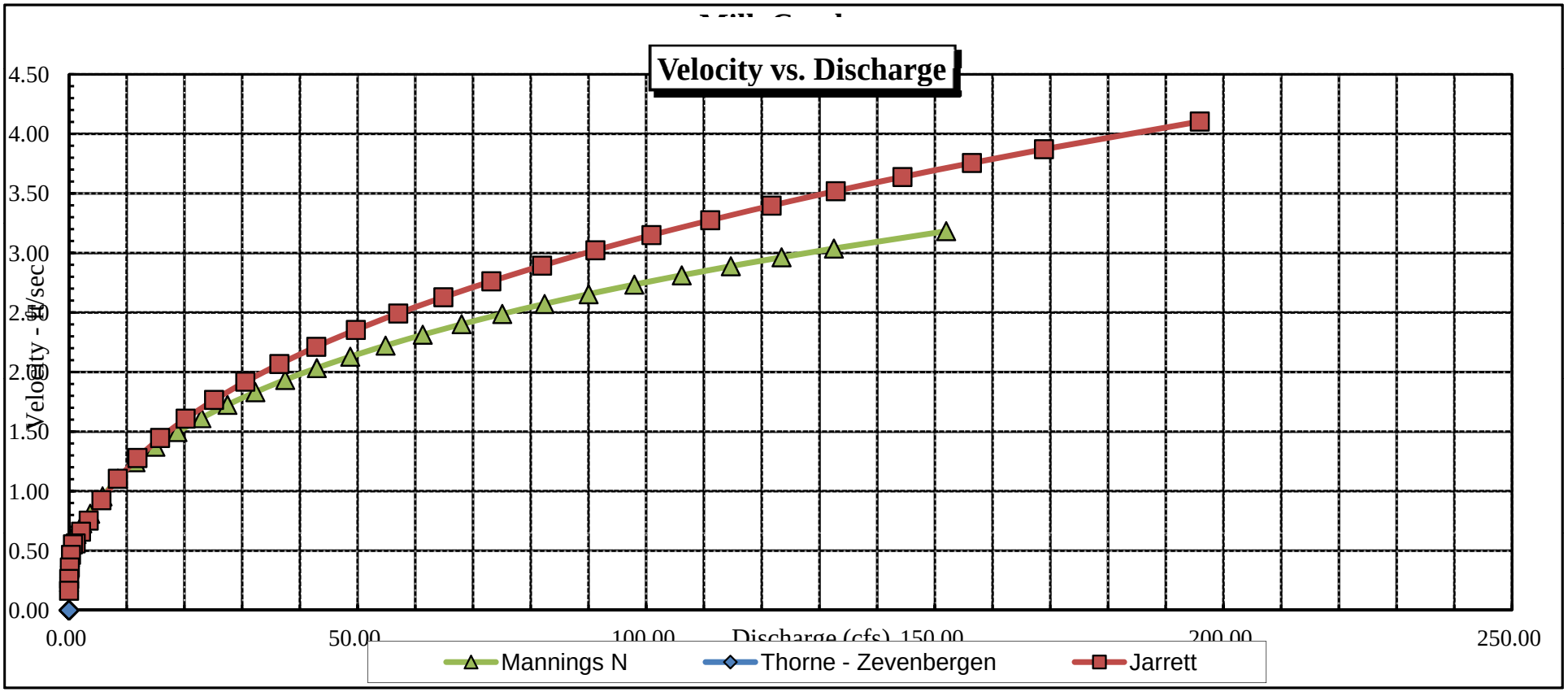
STREAM NAME: Milk Creek
XS LOCATION: 150 ft upstream fr Road 1596 crossing
XS NUMBER: Number 2 Jarrett Variable Manning's n Correction Applied

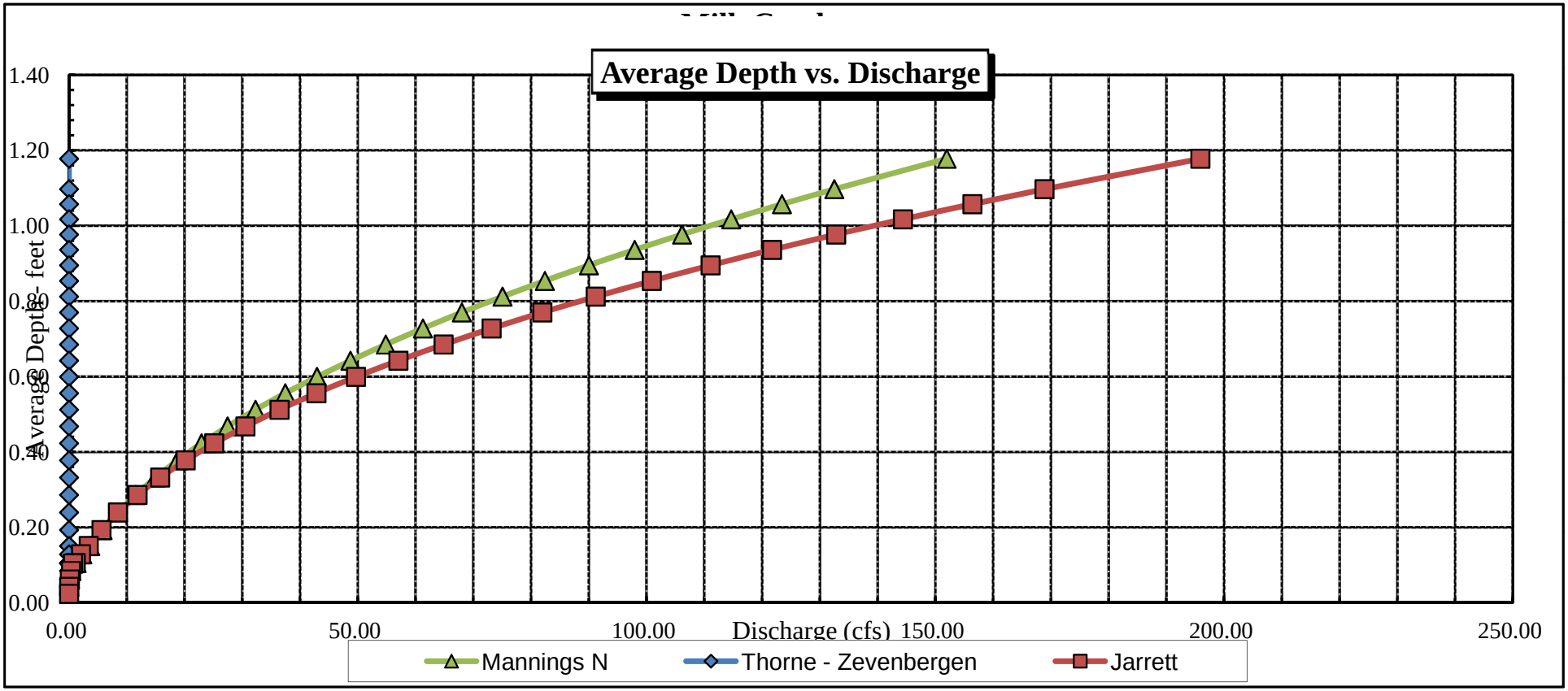
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

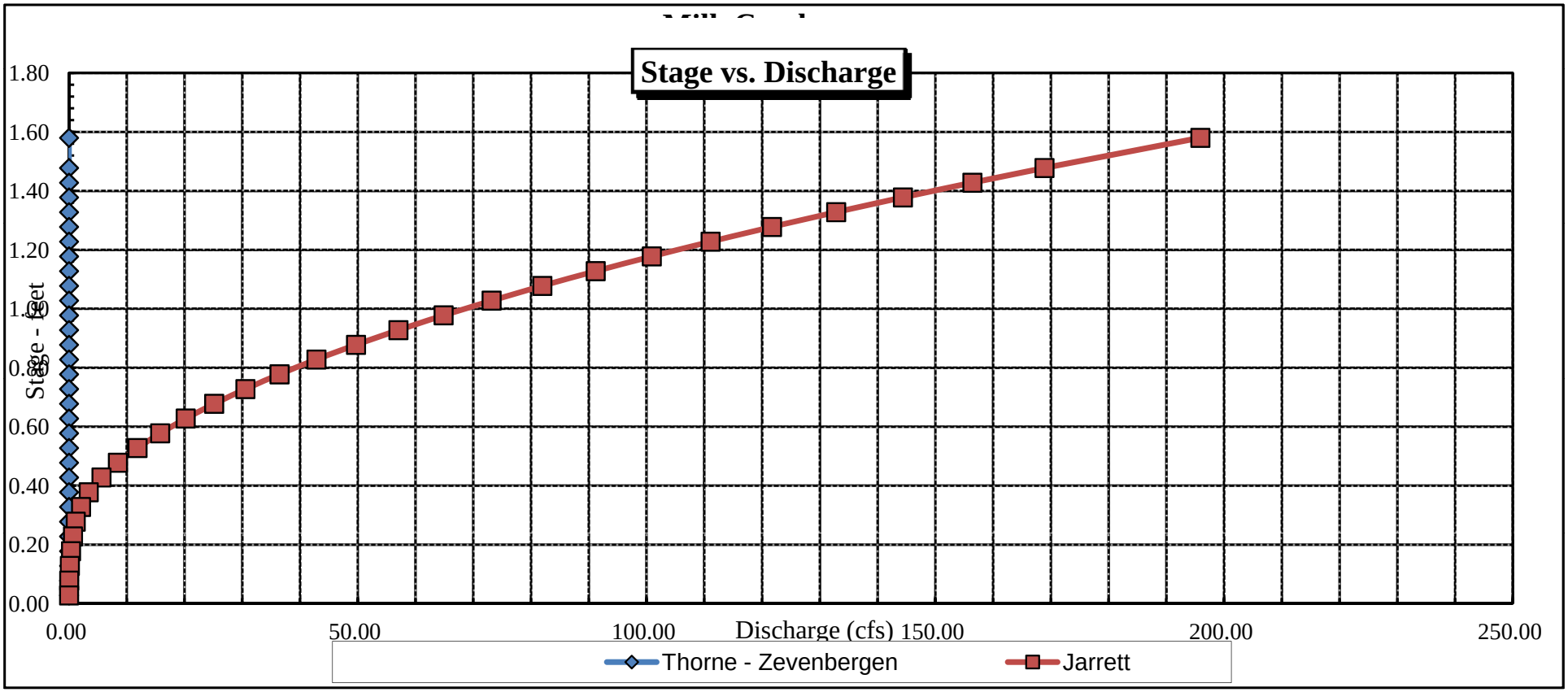
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.12	40.54	1.18	1.58	47.74	41.04	100.0%	1.16	195.90	4.10
	5.22	39.77	1.10	1.48	43.63	40.25	98.1%	1.08	168.91	3.87
	5.27	39.40	1.06	1.43	41.65	39.86	97.1%	1.04	156.42	3.76
	5.32	39.02	1.02	1.38	39.69	39.47	96.2%	1.01	144.40	3.64
	5.37	38.65	0.98	1.33	37.75	39.08	95.2%	0.97	132.83	3.52
	5.42	38.27	0.94	1.28	35.82	38.70	94.3%	0.93	121.73	3.40
	5.47	37.90	0.89	1.23	33.92	38.31	93.4%	0.89	111.09	3.28
	5.52	37.53	0.85	1.18	32.03	37.92	92.4%	0.84	100.91	3.15
	5.57	37.15	0.81	1.13	30.17	37.53	91.5%	0.80	91.20	3.02
	5.62	36.78	0.77	1.08	28.32	37.15	90.5%	0.76	81.95	2.89
	5.67	36.40	0.73	1.03	26.49	36.76	89.6%	0.72	73.17	2.76
	5.72	36.03	0.68	0.98	24.68	36.37	88.6%	0.68	64.86	2.63
	5.77	35.64	0.64	0.93	22.89	35.97	87.7%	0.64	57.03	2.49
	5.82	35.24	0.60	0.88	21.11	35.56	86.7%	0.59	49.70	2.35
	5.87	34.84	0.56	0.83	19.36	35.15	85.6%	0.55	42.84	2.21
	5.92	34.44	0.51	0.78	17.63	34.73	84.6%	0.51	36.45	2.07
	5.97	34.04	0.47	0.73	15.92	34.32	83.6%	0.46	30.55	1.92
	6.02	33.64	0.42	0.68	14.23	33.91	82.6%	0.42	25.13	1.77
	6.07	33.24	0.38	0.63	12.55	33.49	81.6%	0.37	20.20	1.61
	6.12	32.84	0.33	0.58	10.90	33.08	80.6%	0.33	15.77	1.45
	6.17	32.43	0.29	0.53	9.27	32.66	79.6%	0.28	11.85	1.28
WL	6.22	31.98	0.24	0.48	7.66	32.20	78.5%	0.24	8.46	1.10
	6.27	31.50	0.19	0.43	6.07	31.71	77.3%	0.19	5.61	0.92
	6.32	30.05	0.15	0.38	4.52	30.24	73.7%	0.15	3.40	0.75
	6.37	24.46	0.13	0.33	3.14	24.62	60.0%	0.13	2.07	0.66
	6.42	19.42	0.11	0.28	2.05	19.57	47.7%	0.10	1.15	0.56
	6.47	12.00	0.10	0.23	1.25	12.12	29.5%	0.10	0.69	0.55
	6.52	8.73	0.08	0.18	0.74	8.82	21.5%	0.08	0.34	0.47
	6.57	6.00	0.06	0.13	0.37	6.06	14.8%	0.06	0.13	0.36
	6.62	3.26	0.04	0.08	0.14	3.29	8.0%	0.04	0.04	0.26
	6.67	1.42	0.02	0.03	0.03	1.42	3.5%	0.02	0.01	0.16


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
1.80
1.60
1.40
1.20
0.60
0.40
0.20
0.00
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Milk Creek
XS LOCATION:	700 ft upstream fr 1596 Road crossing
XS NUMBER:	Number 1
DATE:	8/17/2011
OBSERVERS:	R. Smith, E. Spencer
1/4 SEC:	NW
SECTION:	17
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.008 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 = 36					
	RS	0.00	2.32			0.00	0.00	0.00
1	G	5.50	3.78			0.00	0.00	0.00
		10.00	5.02			0.00	0.00	0.00
	W	13.80	5.60	0.00	0.00	0.00	0.00	0.00
		16.00	5.60	0.00	0.00	0.00	0.00	0.00
		18.00	5.85	0.25	0.09	0.50	0.05	5.60
		20.00	5.75	0.15	0.10	0.30	0.03	5.60
		22.00	5.85	0.25	0.11	0.44	0.05	5.60
		23.50	5.60	0.00	0.00	0.00	0.00	0.00
		24.00	5.90	0.30	0.38	0.23	0.09	5.60
		25.00	5.95	0.35	1.34	0.35	0.47	5.60
		26.00	6.15	0.55	1.35	0.55	0.74	5.60
		27.00	6.05	0.45	1.60	0.45	0.72	5.60
		28.00	5.70	0.10	0.00	0.10	0.00	5.60
		29.00	6.30	0.70	1.13	0.70	0.79	5.60
		30.00	6.30	0.70	1.19	0.70	0.83	5.60
		31.00	6.10	0.50	0.98	0.50	0.49	5.60
		32.00	6.30	0.70	1.38	0.70	0.97	5.60
		33.00	6.30	0.70	0.74	0.70	0.52	5.60
		34.00	6.00	0.40	0.42	0.40	0.17	5.60
		35.00	6.15	0.55	0.12	0.55	0.07	5.60
		36.00	6.00	0.40	1.00	0.40	0.40	5.60
		37.00	6.30	0.70	1.34	0.70	0.94	5.60
		38.00	6.00	0.40	0.40	0.40	0.16	5.60
		39.00	5.60	0.00	0.00	0.00	0.00	0.00
		40.00	6.10	0.50	0.00	0.50	0.00	5.60
		41.00	6.20	0.60	0.16	0.60	0.10	5.60
		42.00	5.90	0.30	0.00	0.30	0.00	5.60
		43.00	5.95	0.35	0.97	0.35	0.34	5.60
		44.00	5.95	0.35	0.57	0.35	0.20	5.60
		45.00	5.90	0.30	0.66	0.30	0.20	5.60
		46.00	5.80	0.20	0.00	0.20	0.00	5.60
	W	47.00	5.60	0.00	0.00	0.00	0.00	0.00
		49.50	5.01			0.00	0.00	0.00
		51.70	4.41			0.00	0.00	0.00
1	LS & G	53.20	3.72			0.00	0.00	0.00
					Totals	11.26	8.30	

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

LOCATION INFORMATION

STREAM NAME:	Milk Creek
XS LOCATION:	700 ft upstream fr 1596 Road crossing
XS NUMBER:	Number 1
DATE:	17-Aug-11
OBSERVERS:	R. Smith, E. Spencer
1/4 SEC:	NW
SECTION:	17
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.008

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

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

STREAM NAME: Milk Creek
XS LOCATION: 700 ft upstream fr 1596 Road crossing
XS NUMBER: Number 1

DATA POINTS= 36

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
RS	0.00	2.32			0.00		0.00	0.00	0.0%
1 G	5.50	3.78			0.00		0.00	0.00	0.0%
	10.00	5.02			0.00		0.00	0.00	0.0%
W	13.80	5.60	0.00	0.00	0.00		0.00	0.00	0.0%
	16.00	5.60	0.00	0.00	0.00		0.00	0.00	0.0%
	18.00	5.85	0.25	0.09	2.02	0.25	0.50	0.05	0.5%
	20.00	5.75	0.15	0.10	2.00	0.15	0.30	0.03	0.4%
	22.00	5.85	0.25	0.11	2.00	0.25	0.44	0.05	0.6%
	23.50	5.60	0.00	0.00	1.52		0.00	0.00	0.0%
	24.00	5.90	0.30	0.38	0.58	0.30	0.23	0.09	1.0%
	25.00	5.95	0.35	1.34	1.00	0.35	0.35	0.47	5.6%
	26.00	6.15	0.55	1.35	1.02	0.55	0.55	0.74	8.9%
	27.00	6.05	0.45	1.60	1.00	0.45	0.45	0.72	8.7%
	28.00	5.70	0.10	0.00	1.06	0.10	0.10	0.00	0.0%
	29.00	6.30	0.70	1.13	1.17	0.70	0.70	0.79	9.5%
	30.00	6.30	0.70	1.19	1.00	0.70	0.70	0.83	10.0%
	31.00	6.10	0.50	0.98	1.02	0.50	0.50	0.49	5.9%
	32.00	6.30	0.70	1.38	1.02	0.70	0.70	0.97	11.6%
	33.00	6.30	0.70	0.74	1.00	0.70	0.70	0.52	6.2%
	34.00	6.00	0.40	0.42	1.04	0.40	0.40	0.17	2.0%
	35.00	6.15	0.55	0.12	1.01	0.55	0.55	0.07	0.8%
	36.00	6.00	0.40	1.00	1.01	0.40	0.40	0.40	4.8%
	37.00	6.30	0.70	1.34	1.04	0.70	0.70	0.94	11.3%
	38.00	6.00	0.40	0.40	1.04	0.40	0.40	0.16	1.9%
	39.00	5.60	0.00	0.00	1.08		0.00	0.00	0.0%
	40.00	6.10	0.50	0.00	1.12	0.50	0.50	0.00	0.0%
	41.00	6.20	0.60	0.16	1.00	0.60	0.60	0.10	1.2%
	42.00	5.90	0.30	0.00	1.04	0.30	0.30	0.00	0.0%
	43.00	5.95	0.35	0.97	1.00	0.35	0.35	0.34	4.1%
	44.00	5.95	0.35	0.57	1.00	0.35	0.35	0.20	2.4%
	45.00	5.90	0.30	0.66	1.00	0.30	0.30	0.20	2.4%
	46.00	5.80	0.20	0.00	1.00	0.20	0.20	0.00	0.0%
W	47.00	5.60	0.00	0.00	1.02		0.00	0.00	0.0%
	49.50	5.01			0.00		0.00	0.00	0.0%
	51.70	4.41			0.00		0.00	0.00	0.0%
1 LS & G	53.20	3.72			0.00		0.00	0.00	0.0%
TOTALS ----------					31.84	0.7 (Max.)	11.26	8.30	100.0%

Manning's n = 0.0902
Hydraulic Radius= 0.35370497

STREAM NAME: Milk Creek
XS LOCATION: 700 ft upstream fr 1596 Road crossing
XS NUMBER: Number 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	11.26	11.26	0.0%
5.35	11.26	19.90	76.7%
5.37	11.26	19.18	70.3%
5.39	11.26	18.47	64.0%
5.41	11.26	17.77	57.7%
5.43	11.26	17.06	51.5%
5.45	11.26	16.36	45.3%
5.47	11.26	15.67	39.1%
5.49	11.26	14.98	33.0%
5.51	11.26	14.29	26.9%
5.53	11.26	13.61	20.9%
5.55	11.26	12.94	14.9%
5.56	11.26	12.60	11.9%
5.57	11.26	12.26	8.9%
5.58	11.26	11.93	5.9%
5.59	11.26	11.59	3.0%
5.60	11.26	11.26	0.0%
5.61	11.26	10.95	-2.7%
5.62	11.26	10.65	-5.5%
5.63	11.26	10.34	-8.2%
5.64	11.26	10.04	-10.8%
5.65	11.26	9.74	-13.5%
5.67	11.26	9.15	-18.7%
5.69	11.26	8.57	-23.9%
5.71	11.26	8.00	-28.9%
5.73	11.26	7.45	-33.9%
5.75	11.26	6.90	-38.7%
5.77	11.26	6.38	-43.4%
5.79	11.26	5.88	-47.8%
5.81	11.26	5.41	-52.0%
5.83	11.26	4.97	-55.9%
5.85	11.26	4.56	-59.5%

WATERLINE AT ZERO
AREA ERROR = 5.600

STREAM NAME: Milk Creek
XS LOCATION: 700 ft upstream fr 1596 Road crossing
XS NUMBER: Number 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.78	47.57	1.82	2.52	86.58	48.91	100.0%	1.77	186.77	2.16
	4.60	42.53	1.17	1.70	49.55	43.59	89.1%	1.14	79.56	1.61
	4.65	42.16	1.13	1.65	47.43	43.22	88.4%	1.10	74.40	1.57
	4.70	41.80	1.08	1.60	45.33	42.84	87.6%	1.06	69.40	1.53
	4.75	41.43	1.04	1.55	43.25	42.46	86.8%	1.02	64.55	1.49
	4.80	41.07	1.00	1.50	41.19	42.08	86.0%	0.98	59.86	1.45
	4.85	40.70	0.96	1.45	39.15	41.70	85.3%	0.94	55.33	1.41
	4.90	40.34	0.92	1.40	37.12	41.32	84.5%	0.90	50.94	1.37
	4.95	39.97	0.88	1.35	35.11	40.95	83.7%	0.86	46.72	1.33
	5.00	39.61	0.84	1.30	33.12	40.57	82.9%	0.82	42.66	1.29
	5.05	39.13	0.80	1.25	31.15	40.08	81.9%	0.78	38.82	1.25
	5.10	38.59	0.76	1.20	29.21	39.53	80.8%	0.74	35.19	1.20
	5.15	38.05	0.72	1.15	27.29	38.98	79.7%	0.70	31.73	1.16
	5.20	37.52	0.68	1.10	25.41	38.43	78.6%	0.66	28.42	1.12
	5.25	36.98	0.64	1.05	23.54	37.88	77.5%	0.62	25.27	1.07
	5.30	36.44	0.60	1.00	21.71	37.34	76.3%	0.58	22.29	1.03
	5.35	35.90	0.55	0.95	19.90	36.79	75.2%	0.54	19.47	0.98
	5.40	35.36	0.51	0.90	18.12	36.24	74.1%	0.50	16.82	0.93
	5.45	34.82	0.47	0.85	16.36	35.69	73.0%	0.46	14.34	0.88
	5.50	34.28	0.43	0.80	14.64	35.14	71.8%	0.42	12.03	0.82
	5.55	33.74	0.38	0.75	12.94	34.59	70.7%	0.37	9.90	0.77
WL	5.60	31.00	0.36	0.70	11.26	31.84	65.1%	0.35	8.30	0.74
	5.65	29.74	0.33	0.65	9.74	30.54	62.4%	0.32	6.71	0.69
	5.70	28.48	0.29	0.60	8.29	29.23	59.8%	0.28	5.27	0.64
	5.75	27.00	0.26	0.55	6.90	27.68	56.6%	0.25	4.03	0.58
	5.80	23.51	0.24	0.50	5.64	24.12	49.3%	0.23	3.15	0.56
	5.85	19.78	0.23	0.45	4.56	20.31	41.5%	0.22	2.48	0.54
	5.90	18.74	0.19	0.40	3.59	19.22	39.3%	0.19	1.73	0.48
	5.95	14.13	0.19	0.35	2.75	14.55	29.7%	0.19	1.33	0.49
	6.00	13.26	0.16	0.30	2.06	13.62	27.9%	0.15	0.86	0.42
	6.05	11.35	0.13	0.25	1.45	11.64	23.8%	0.12	0.53	0.37
	6.10	9.08	0.10	0.20	0.94	9.30	19.0%	0.10	0.30	0.32
	6.15	5.92	0.09	0.15	0.56	6.06	12.4%	0.09	0.17	0.30
	6.20	4.17	0.07	0.10	0.31	4.26	8.7%	0.07	0.08	0.26
	6.25	3.08	0.04	0.05	0.13	3.13	6.4%	0.04	0.02	0.17
	6.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Milk Creek
XS LOCATION: 700 ft upstream fr 1596 Road crossing
XS NUMBER: Number 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	8.30	cfs
CALCULATED FLOW (Qc)=	8.30	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.60	ft
CALCULATED WATERLINE (WLc)=	5.60	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.70	ft
MAX CALCULATED DEPTH (Dc)=	0.70	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.74	ft/sec
MANNING'S N=	0.090	
SLOPE=	0.008	ft/ft
.4 * Qm =	3.3	cfs
2.5 * Qm=	20.8	cfs

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

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

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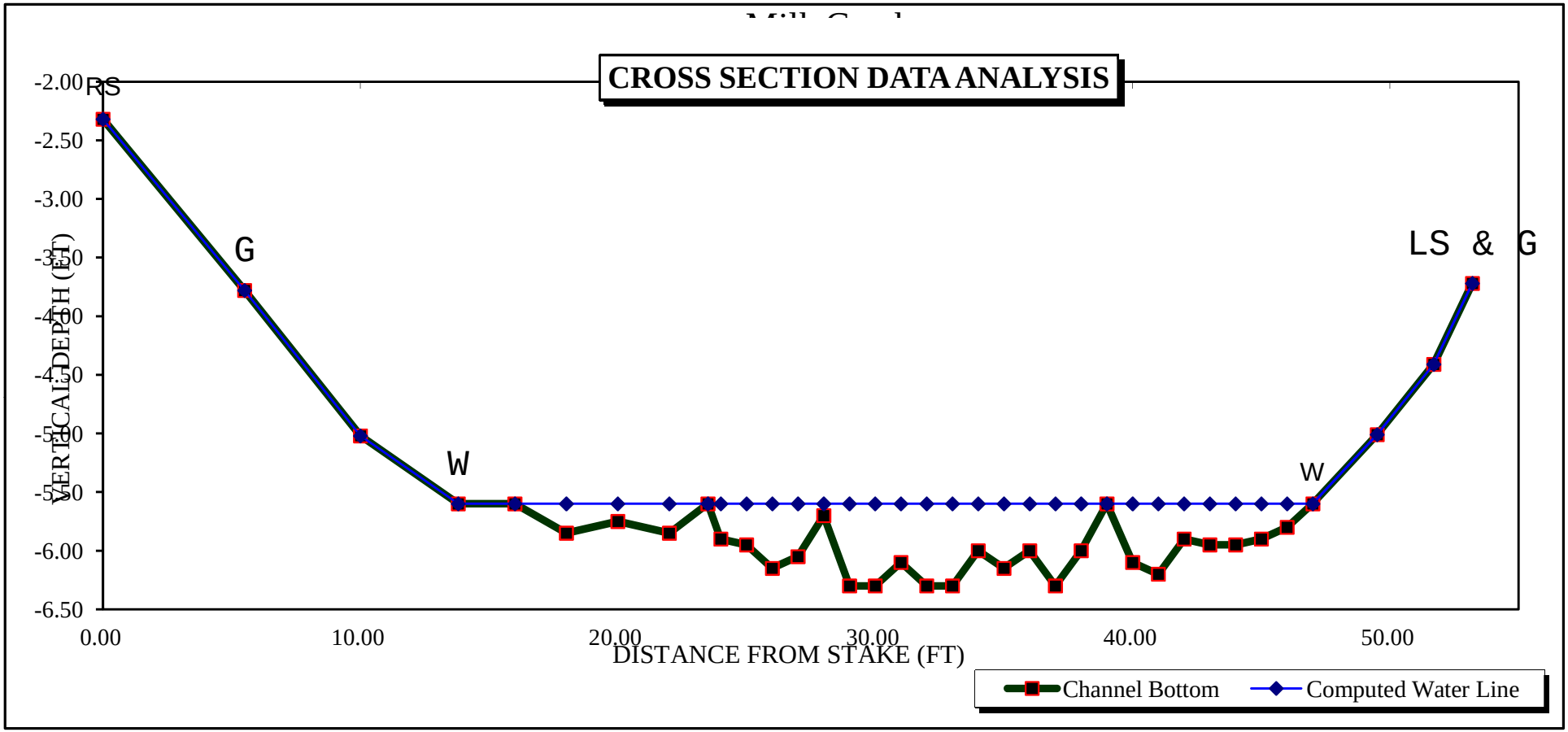
RECOMMENDATION BY: ………………...………..……............................... AGENCY...……………………......……...…...……....... DATE:......…...…......……………

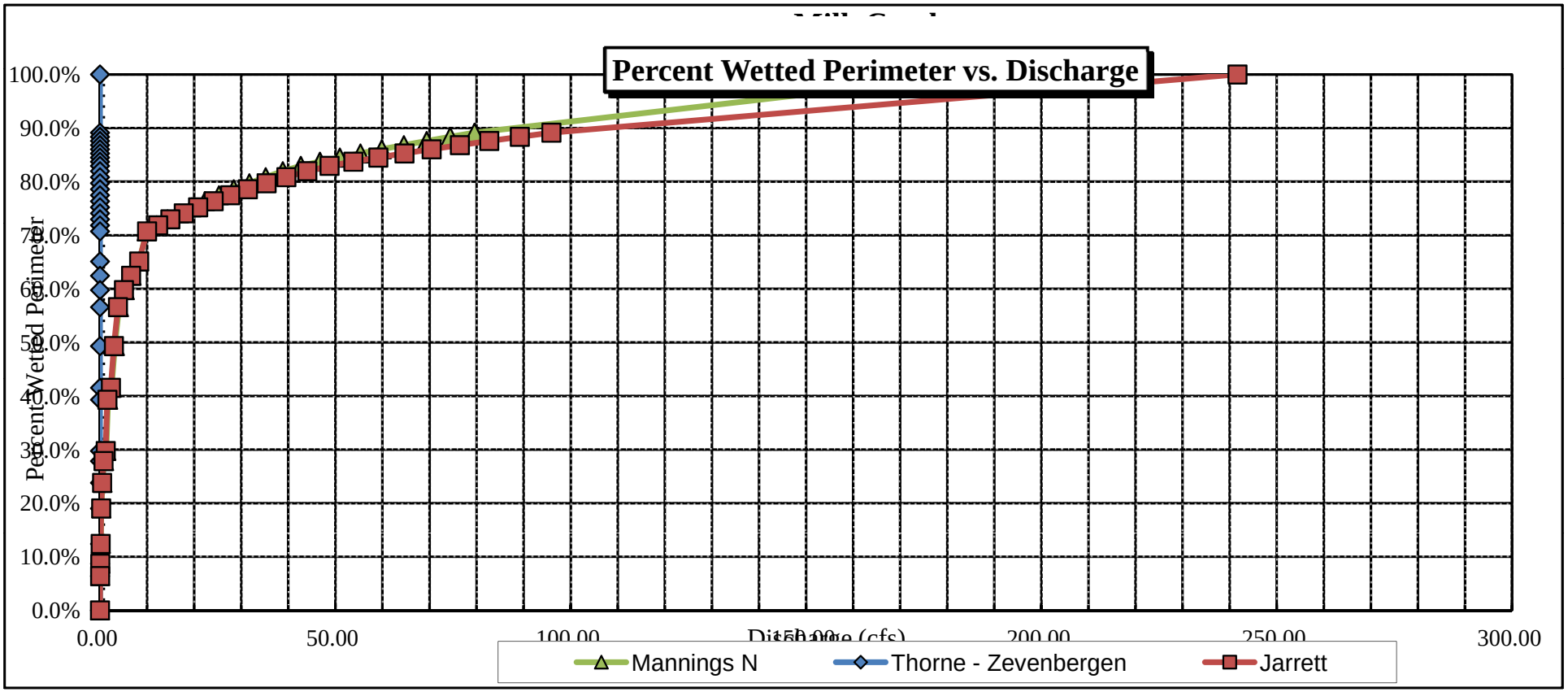
CWCB REVIEW BY: ..……………………………....…………………………………………………...…............. DATE:.................…………….....

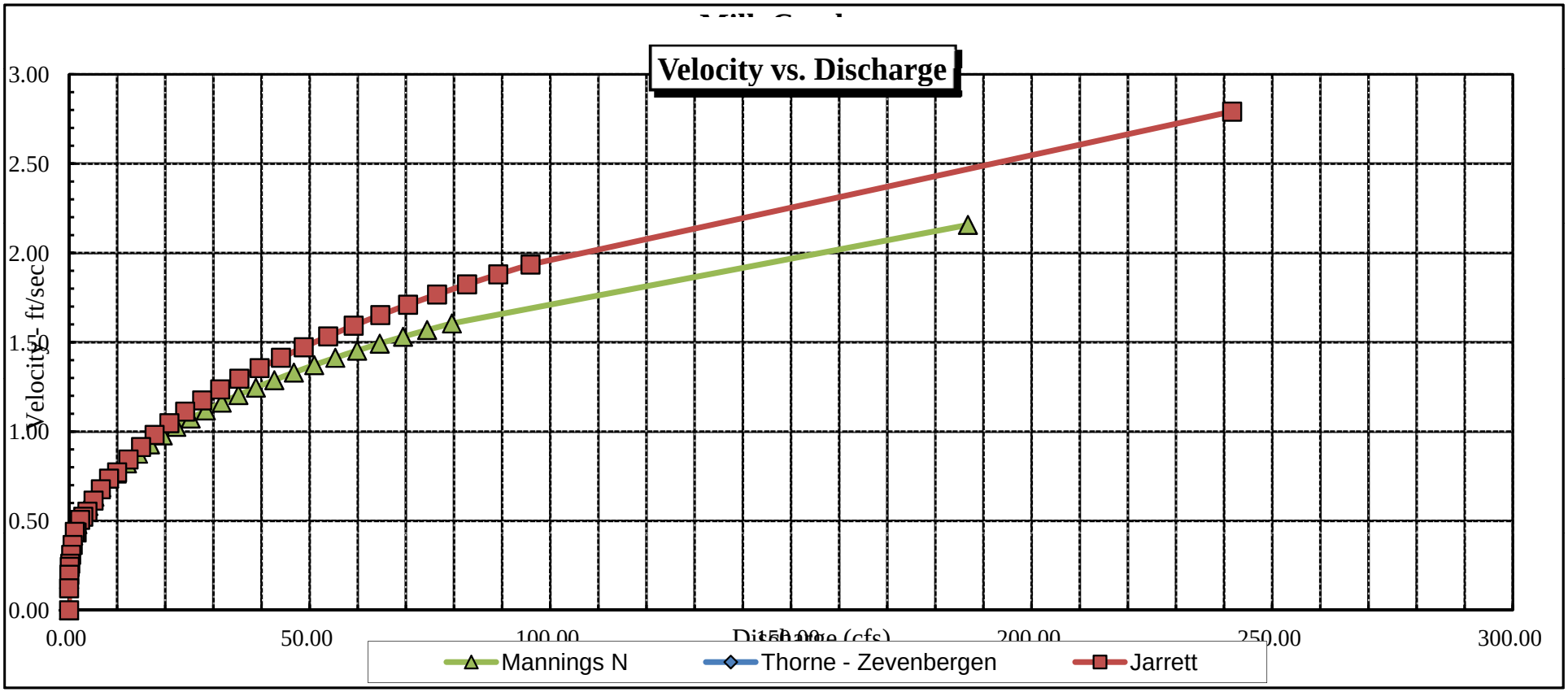
STREAM NAME: Milk Creek
XS LOCATION: 700 ft upstream fr 1596 Road crossing
XS NUMBER: Number 1 Jarrett Variable Manning's n Correction Applied

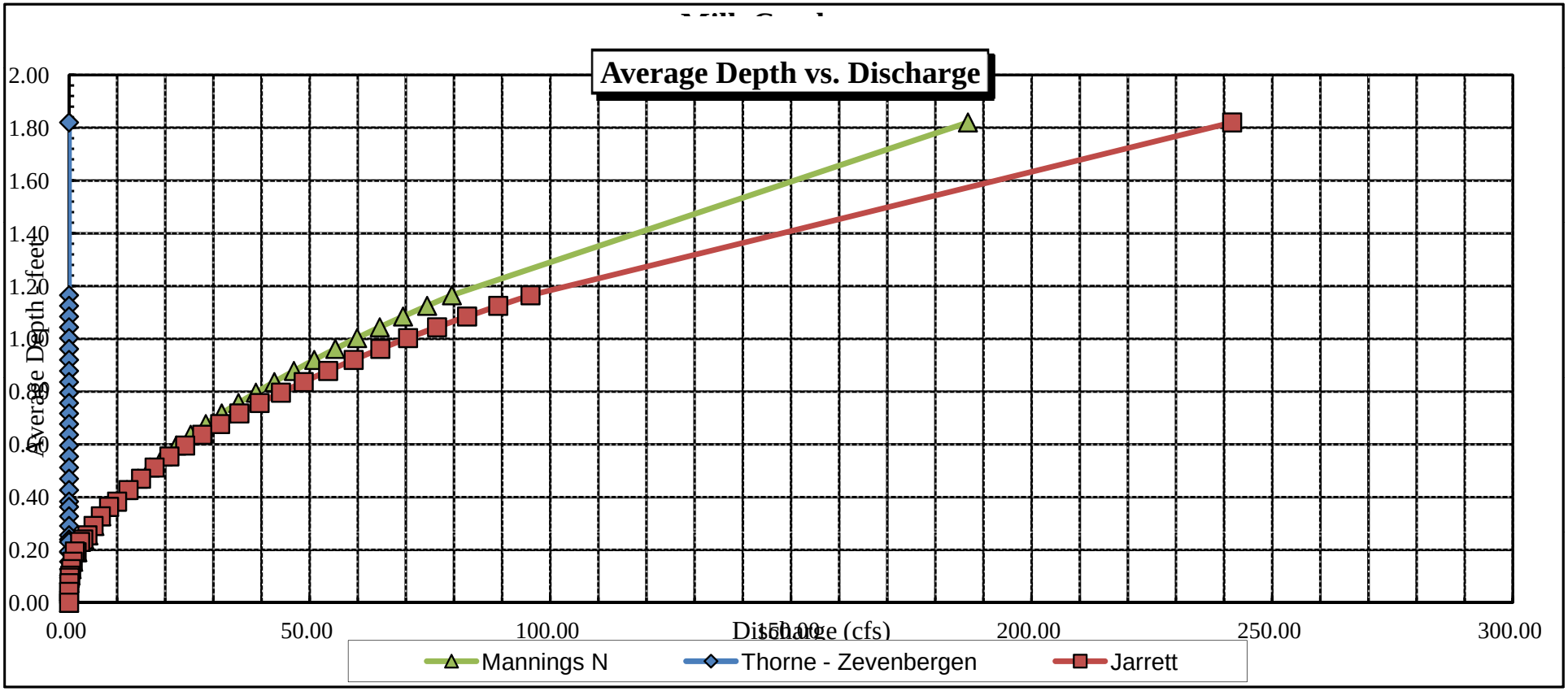
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

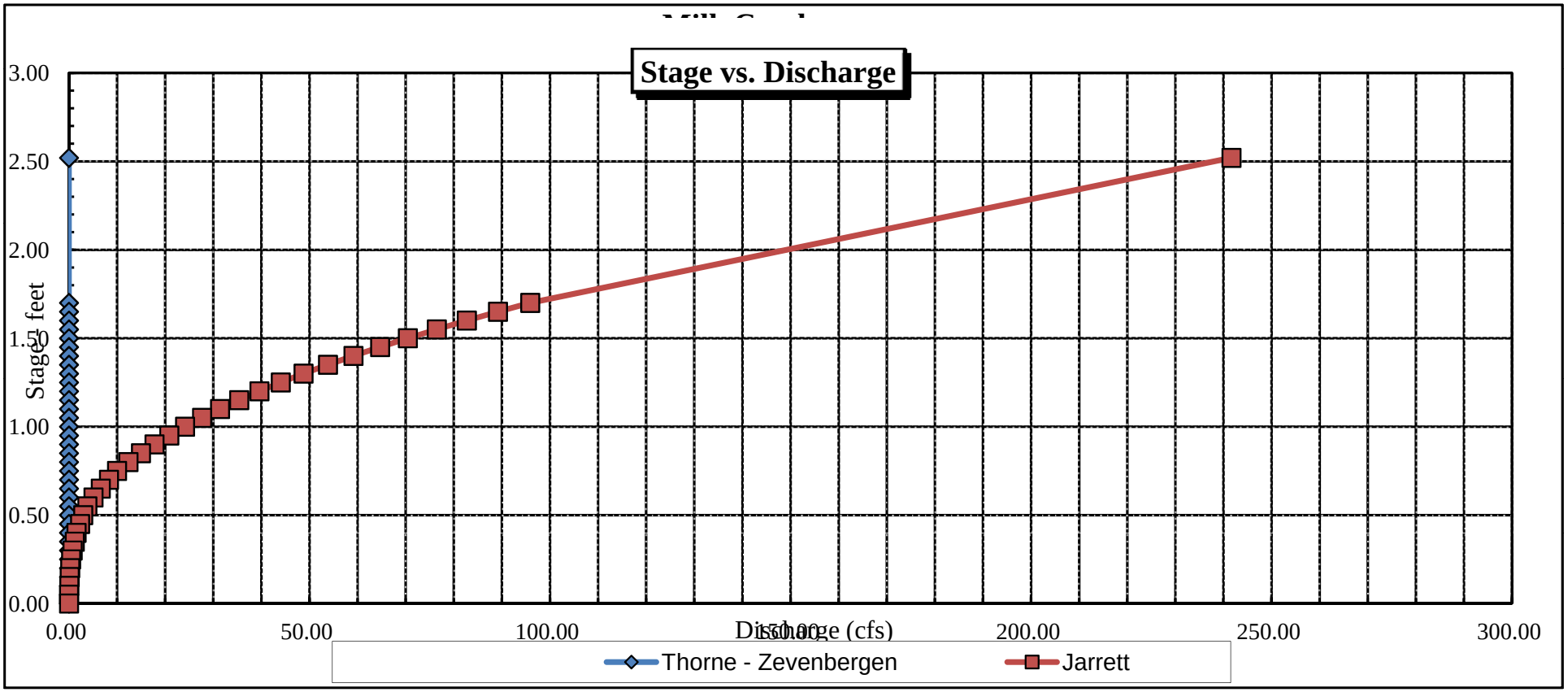
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.78	47.57	1.82	2.52	86.58	48.91	100.0%	1.77	241.66	2.79
	4.60	42.53	1.17	1.70	49.55	43.59	89.1%	1.14	95.89	1.94
	4.65	42.16	1.13	1.65	47.43	43.22	88.4%	1.10	89.18	1.88
	4.70	41.80	1.08	1.60	45.33	42.84	87.6%	1.06	82.70	1.82
	4.75	41.43	1.04	1.55	43.25	42.46	86.8%	1.02	76.46	1.77
	4.80	41.07	1.00	1.50	41.19	42.08	86.0%	0.98	70.45	1.71
	4.85	40.70	0.96	1.45	39.15	41.70	85.3%	0.94	64.68	1.65
	4.90	40.34	0.92	1.40	37.12	41.32	84.5%	0.90	59.14	1.59
	4.95	39.97	0.88	1.35	35.11	40.95	83.7%	0.86	53.83	1.53
	5.00	39.61	0.84	1.30	33.12	40.57	82.9%	0.82	48.76	1.47
	5.05	39.13	0.80	1.25	31.15	40.08	81.9%	0.78	44.04	1.41
	5.10	38.59	0.76	1.20	29.21	39.53	80.8%	0.74	39.60	1.36
	5.15	38.05	0.72	1.15	27.29	38.98	79.7%	0.70	35.39	1.30
	5.20	37.52	0.68	1.10	25.41	38.43	78.6%	0.66	31.41	1.24
	5.25	36.98	0.64	1.05	23.54	37.88	77.5%	0.62	27.66	1.17
	5.30	36.44	0.60	1.00	21.71	37.34	76.3%	0.58	24.14	1.11
	5.35	35.90	0.55	0.95	19.90	36.79	75.2%	0.54	20.84	1.05
	5.40	35.36	0.51	0.90	18.12	36.24	74.1%	0.50	17.78	0.98
	5.45	34.82	0.47	0.85	16.36	35.69	73.0%	0.46	14.95	0.91
	5.50	34.28	0.43	0.80	14.64	35.14	71.8%	0.42	12.35	0.84
	5.55	33.74	0.38	0.75	12.94	34.59	70.7%	0.37	9.99	0.77
WL	5.60	31.00	0.36	0.70	11.26	31.84	65.1%	0.35	8.30	0.74
	5.65	29.74	0.33	0.65	9.74	30.54	62.4%	0.32	6.60	0.68
	5.70	28.48	0.29	0.60	8.29	29.23	59.8%	0.28	5.09	0.61
	5.75	27.00	0.26	0.55	6.90	27.68	56.6%	0.25	3.81	0.55
	5.80	23.51	0.24	0.50	5.64	24.12	49.3%	0.23	2.95	0.52
	5.85	19.78	0.23	0.45	4.56	20.31	41.5%	0.22	2.30	0.51
	5.90	18.74	0.19	0.40	3.59	19.22	39.3%	0.19	1.56	0.44
	5.95	14.13	0.19	0.35	2.75	14.55	29.7%	0.19	1.20	0.44
	6.00	13.26	0.16	0.30	2.06	13.62	27.9%	0.15	0.75	0.37
	6.05	11.35	0.13	0.25	1.45	11.64	23.8%	0.12	0.45	0.31
	6.10	9.08	0.10	0.20	0.94	9.30	19.0%	0.10	0.24	0.26
	6.15	5.92	0.09	0.15	0.56	6.06	12.4%	0.09	0.14	0.24
	6.20	4.17	0.07	0.10	0.31	4.26	8.7%	0.07	0.06	0.20
	6.25	3.08	0.04	0.05	0.13	3.13	6.4%	0.04	0.02	0.12
	6.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
RS
G
W
W
LS & G
-2.00
-2.50
-3.00
-6.00
-6.50
0.00
10.00
20.00
30.00
40.00
50.00
VERTICAL DEPTH (FT)
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth (feet)
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage, feet
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Milk Creek
XS LOCATION:	2000 ft upstr from RR bridge
XS NUMBER:	2
DATE:	6/28/2016
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	NE NE
SECTION:	18
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.017 ft / ft

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

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

Total Data Points = 38

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	LS	0.00	5.05			0.00	0.00	0.00
1	G	1.10	6.32			0.00	0.00	0.00
	W	1.50	7.60	0.00	0.00	0.00	0.00	0.00
		3.00	8.28	0.50	0.80	0.63	0.50	7.78
		4.00	8.28	0.70	0.35	0.70	0.25	7.58
		5.00	7.70	0.10	0.00	0.10	0.00	7.60
		6.00	8.00	0.40	1.43	0.40	0.57	7.60
		7.00	8.15	0.60	0.06	0.60	0.04	7.55
		8.00	8.17	0.45	0.99	0.45	0.45	7.72
		9.00	8.14	0.35	3.04	0.35	1.06	7.79
		10.00	8.05	0.35	0.49	0.35	0.17	7.70
		11.00	8.12	0.30	2.95	0.30	0.89	7.82
		12.00	8.06	0.30	3.40	0.30	1.02	7.76
		13.00	8.24	0.60	1.55	0.60	0.93	7.64
		14.00	8.25	0.50	1.34	0.50	0.67	7.75
		15.00	8.16	0.55	1.29	0.55	0.71	7.61
		16.00	8.00	0.35	2.46	0.35	0.86	7.65
		17.00	7.93	0.35	0.54	0.35	0.19	7.58
		18.00	7.92	0.25	0.15	0.25	0.04	7.67
		19.00	7.99	0.15	1.43	0.15	0.21	7.84
		20.00	7.90	0.20	1.00	0.20	0.20	7.70
		21.00	7.86	0.20	1.32	0.20	0.26	7.66
		22.00	7.98	0.10	0.56	0.10	0.06	7.88
		23.00	7.72	0.20	0.00	0.20	0.00	7.52
		24.00	8.14	0.40	0.00	0.40	0.00	7.74
		25.00	8.02	0.20	0.97	0.20	0.19	7.82
	R	26.00	7.64	0.00	0.00	0.00	0.00	0.00
		27.00	8.04	0.10	0.00	0.10	0.00	7.94
		28.00	8.12	0.30	0.68	0.30	0.20	7.82
		29.00	8.16	0.40	0.10	0.40	0.04	7.76
		30.00	8.00	0.20	1.55	0.20	0.31	7.80
		31.00	8.37	0.60	1.10	0.60	0.66	7.77
		32.00	8.38	0.50	0.58	0.50	0.29	7.88
		33.00	8.22	0.40	0.71	0.40	0.28	7.82
		34.00	8.17	0.40	0.33	0.40	0.13	7.77
	W	35.00	7.80	0.00	0.00	0.00	0.00	0.00
		36.00	7.31			0.00	0.00	0.00
1	G	42.00	6.35			0.00	0.00	0.00
					Totals	11.13	11.18	

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

LOCATION INFORMATION

STREAM NAME:	Milk Creek
XS LOCATION:	2000 ft upstr from RR bridge
XS NUMBER:	2
DATE:	28-Jun-16
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	NE NE
SECTION:	18
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
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:	0.017

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

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

STREAM NAME: Milk Creek
XS LOCATION: 2000 ft upstr from RR bridge
XS NUMBER: 2

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
LS	0.00	5.05			0.00		0.00	0.00	0.0%
1 G	1.10	6.32			0.00		0.00	0.00	0.0%
W	1.50	7.60	0.00	0.00	0.00		0.00	0.00	0.0%
	3.00	8.28	0.50	0.80	1.65	0.50	0.63	0.50	4.5%
	4.00	8.28	0.70	0.35	1.00	0.70	0.70	0.25	2.2%
	5.00	7.70	0.10	0.00	1.16	0.10	0.10	0.00	0.0%
	6.00	8.00	0.40	1.43	1.04	0.40	0.40	0.57	5.1%
	7.00	8.15	0.60	0.06	1.01	0.60	0.60	0.04	0.3%
	8.00	8.17	0.45	0.99	1.00	0.45	0.45	0.45	4.0%
	9.00	8.14	0.35	3.04	1.00	0.35	0.35	1.06	9.5%
	10.00	8.05	0.35	0.49	1.00	0.35	0.35	0.17	1.5%
	11.00	8.12	0.30	2.95	1.00	0.30	0.30	0.89	7.9%
	12.00	8.06	0.30	3.40	1.00	0.30	0.30	1.02	9.1%
	13.00	8.24	0.60	1.55	1.02	0.60	0.60	0.93	8.3%
	14.00	8.25	0.50	1.34	1.00	0.50	0.50	0.67	6.0%
	15.00	8.16	0.55	1.29	1.00	0.55	0.55	0.71	6.3%
	16.00	8.00	0.35	2.46	1.01	0.35	0.35	0.86	7.7%
	17.00	7.93	0.35	0.54	1.00	0.35	0.35	0.19	1.7%
	18.00	7.92	0.25	0.15	1.00	0.25	0.25	0.04	0.3%
	19.00	7.99	0.15	1.43	1.00	0.15	0.15	0.21	1.9%
	20.00	7.90	0.20	1.00	1.00	0.20	0.20	0.20	1.8%
	21.00	7.86	0.20	1.32	1.00	0.20	0.20	0.26	2.4%
	22.00	7.98	0.10	0.56	1.01	0.10	0.10	0.06	0.5%
	23.00	7.72	0.20	0.00	1.03	0.20	0.20	0.00	0.0%
	24.00	8.14	0.40	0.00	1.08	0.40	0.40	0.00	0.0%
	25.00	8.02	0.20	0.97	1.01	0.20	0.20	0.19	1.7%
R	26.00	7.64	0.00	0.00	1.07		0.00	0.00	0.0%
	27.00	8.04	0.10	0.00	1.08	0.10	0.10	0.00	0.0%
	28.00	8.12	0.30	0.68	1.00	0.30	0.30	0.20	1.8%
	29.00	8.16	0.40	0.10	1.00	0.40	0.40	0.04	0.4%
	30.00	8.00	0.20	1.55	1.01	0.20	0.20	0.31	2.8%
	31.00	8.37	0.60	1.10	1.07	0.60	0.60	0.66	5.9%
	32.00	8.38	0.50	0.58	1.00	0.50	0.50	0.29	2.6%
	33.00	8.22	0.40	0.71	1.01	0.40	0.40	0.28	2.5%
	34.00	8.17	0.40	0.33	1.00	0.40	0.40	0.13	1.2%
W	35.00	7.80	0.00	0.00	1.07		0.00	0.00	0.0%
	36.00	7.31			0.00		0.00	0.00	0.0%
1 G	42.00	6.35			0.00		0.00	0.00	0.0%
TOTALS ----------					34.35	0.7 (Max.)	11.13	11.18	100.0%

Manning's n = 0.0909
Hydraulic Radius= 0.32385264

STREAM NAME: Milk Creek
XS LOCATION: 2000 ft upstr from RR bridge
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	11.13	11.25	1.1%
7.47	11.13	19.70	77.1%
7.49	11.13	19.01	70.9%
7.51	11.13	18.33	64.8%
7.53	11.13	17.65	58.7%
7.55	11.13	16.97	52.5%
7.57	11.13	16.29	46.4%
7.59	11.13	15.61	40.3%
7.61	11.13	14.93	34.2%
7.63	11.13	14.26	28.1%
7.65	11.13	13.58	22.1%
7.67	11.13	12.91	16.0%
7.68	11.13	12.58	13.0%
7.69	11.13	12.24	10.0%
7.70	11.13	11.91	7.1%
7.71	11.13	11.58	4.1%
7.72	11.13	11.25	1.1%
7.73	11.13	10.92	-1.8%
7.74	11.13	10.60	-4.8%
7.75	11.13	10.27	-7.7%
7.76	11.13	9.95	-10.6%
7.77	11.13	9.63	-13.4%
7.79	11.13	9.00	-19.1%
7.81	11.13	8.37	-24.7%
7.83	11.13	7.76	-30.3%
7.85	11.13	7.15	-35.7%
7.87	11.13	6.55	-41.1%
7.89	11.13	5.98	-46.3%
7.91	11.13	5.42	-51.3%
7.93	11.13	4.89	-56.1%
7.95	11.13	4.39	-60.5%
7.97	11.13	3.93	-64.7%

WATERLINE AT ZERO
AREA ERROR = 7.724

STREAM NAME: Milk Creek
XS LOCATION: 2000 ft upstr from RR bridge
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	6.35	40.89	1.50	2.03	61.43	42.85	100.0%	1.43	166.53	2.71
	6.72	38.44	1.21	1.66	46.61	40.09	93.6%	1.16	109.85	2.36
	6.77	38.11	1.17	1.61	44.69	39.72	92.7%	1.13	103.07	2.31
	6.82	37.78	1.13	1.56	42.80	39.36	91.8%	1.09	96.48	2.25
	6.87	37.45	1.09	1.51	40.92	38.99	91.0%	1.05	90.08	2.20
	6.92	37.12	1.05	1.46	39.05	38.62	90.1%	1.01	83.87	2.15
	6.97	36.80	1.01	1.41	37.20	38.25	89.3%	0.97	77.86	2.09
	7.02	36.47	0.97	1.36	35.37	37.88	88.4%	0.93	72.04	2.04
	7.07	36.14	0.93	1.31	33.56	37.51	87.5%	0.89	66.42	1.98
	7.12	35.81	0.89	1.26	31.76	37.14	86.7%	0.86	60.99	1.92
	7.17	35.48	0.84	1.21	29.97	36.77	85.8%	0.82	55.76	1.86
	7.22	35.16	0.80	1.16	28.21	36.41	85.0%	0.77	50.73	1.80
	7.27	34.83	0.76	1.11	26.46	36.04	84.1%	0.73	45.91	1.74
	7.32	34.56	0.72	1.06	24.73	35.72	83.4%	0.69	41.25	1.67
	7.37	34.44	0.67	1.01	23.00	35.56	83.0%	0.65	36.68	1.59
	7.42	34.32	0.62	0.96	21.28	35.39	82.6%	0.60	32.32	1.52
	7.47	34.21	0.57	0.91	19.57	35.23	82.2%	0.56	28.19	1.44
	7.52	34.09	0.52	0.86	17.86	35.06	81.8%	0.51	24.29	1.36
	7.57	33.97	0.48	0.81	16.16	34.89	81.4%	0.46	20.62	1.28
	7.62	33.81	0.43	0.76	14.46	34.69	81.0%	0.42	17.21	1.19
	7.67	33.42	0.38	0.71	12.78	34.27	80.0%	0.37	14.12	1.10
WL	7.72	32.81	0.34	0.66	11.12	33.61	78.4%	0.33	11.35	1.02
	7.77	31.78	0.30	0.61	9.51	32.50	75.8%	0.29	8.94	0.94
	7.82	30.73	0.26	0.56	7.95	31.37	73.2%	0.25	6.78	0.85
	7.87	29.20	0.22	0.51	6.44	29.77	69.5%	0.22	4.95	0.77
	7.92	26.36	0.19	0.46	5.05	26.85	62.7%	0.19	3.53	0.70
	7.97	22.36	0.17	0.41	3.84	22.77	53.1%	0.17	2.50	0.65
	8.02	20.17	0.14	0.36	2.78	20.49	47.8%	0.14	1.57	0.56
	8.07	16.83	0.11	0.31	1.84	17.08	39.9%	0.11	0.89	0.48
	8.12	11.93	0.09	0.26	1.12	12.11	28.2%	0.09	0.49	0.44
	8.17	7.09	0.09	0.21	0.64	7.20	16.8%	0.09	0.28	0.43
	8.22	4.97	0.07	0.16	0.34	5.04	11.8%	0.07	0.12	0.36
	8.27	2.95	0.05	0.11	0.16	2.98	6.9%	0.05	0.05	0.30
	8.32	1.48	0.04	0.06	0.06	1.49	3.5%	0.04	0.02	0.26
	8.37	0.66	0.00	0.01	0.00	0.66	1.5%	0.00	0.00	0.05

STREAM NAME: Milk Creek
XS LOCATION: 2000 ft upstr from RR bridge
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	11.18	cfs
CALCULATED FLOW (Qc)=	11.35	cfs
(Qm-Qc)/Qm * 100 =	-1.5	%
MEASURED WATERLINE (WLm)=	7.72	ft
CALCULATED WATERLINE (WLc)=	7.72	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.70	ft
MAX CALCULATED DEPTH (Dc)=	0.66	ft
(Dm-Dc)/Dm * 100	6.3	%
MEAN VELOCITY=	1.02	ft/sec
MANNING'S N=	0.091	
SLOPE=	0.017	ft/ft
.4 * Qm =	4.5	cfs
2.5 * Qm=	28.0	cfs

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

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

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

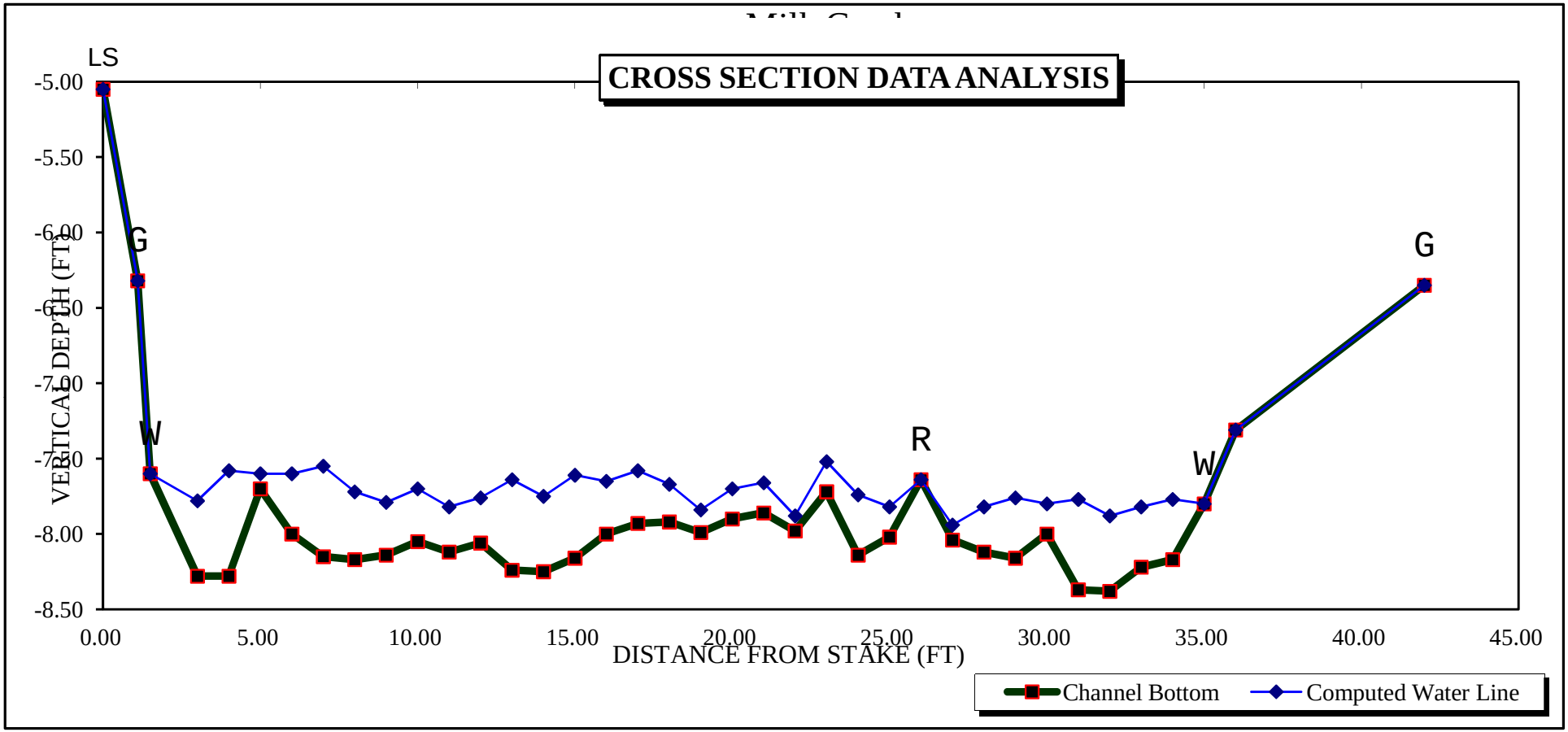
RECOMMENDATION BY: ……………………...………..……................................ AGENCY..………………………......……...…...……...... DATE:.......…...….......……………

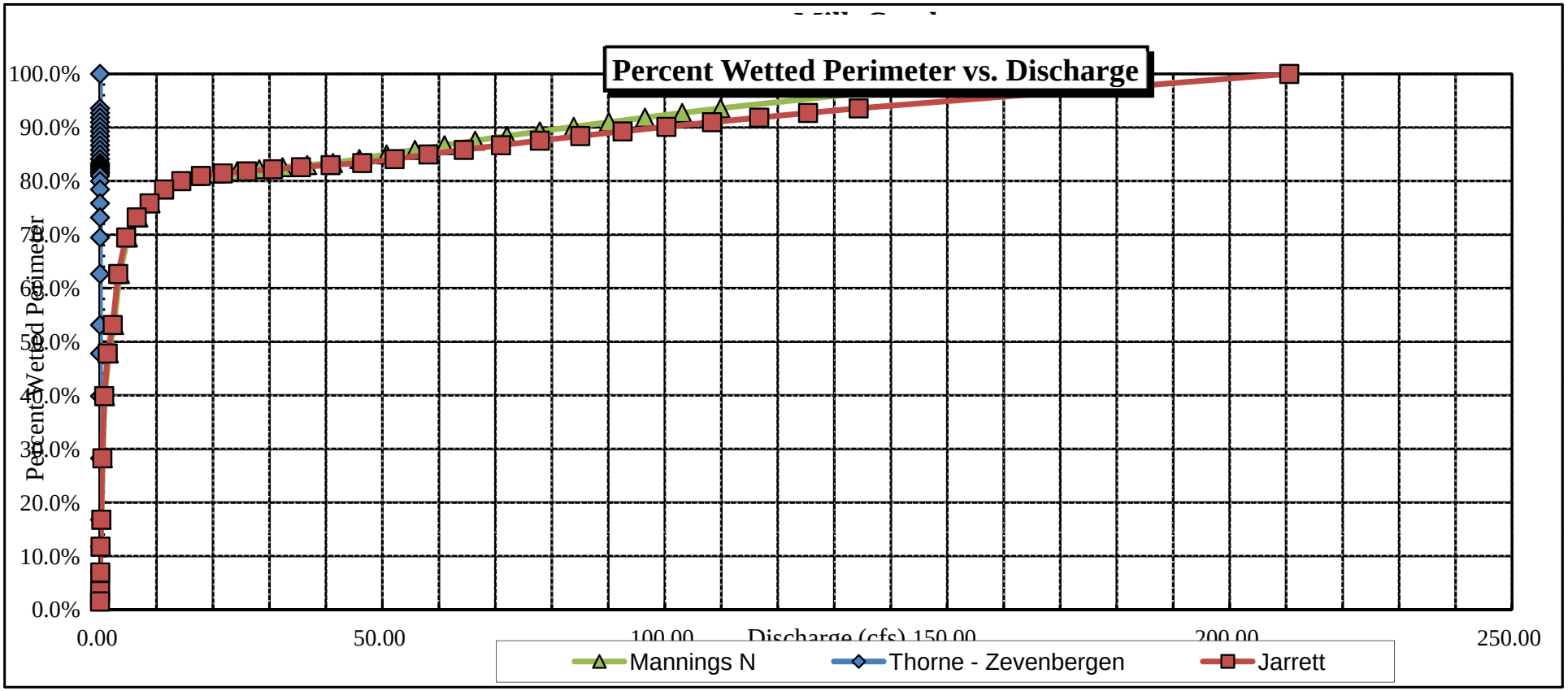
CWCB REVIEW BY: ..……………………………....………………………………………………………..…............. DATE:.................…………….....…

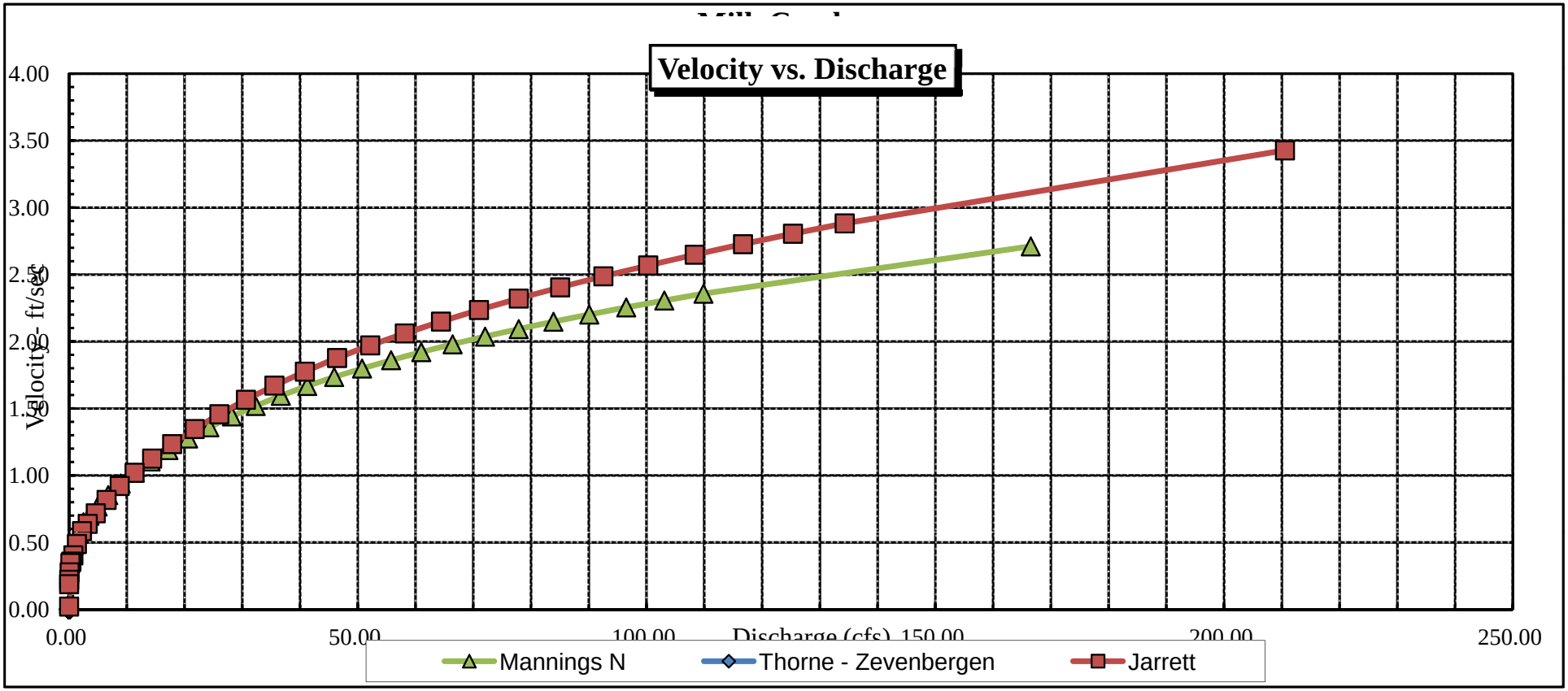
STREAM NAME: Milk Creek
XS LOCATION: 2000 ft upstr from RR bridge
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

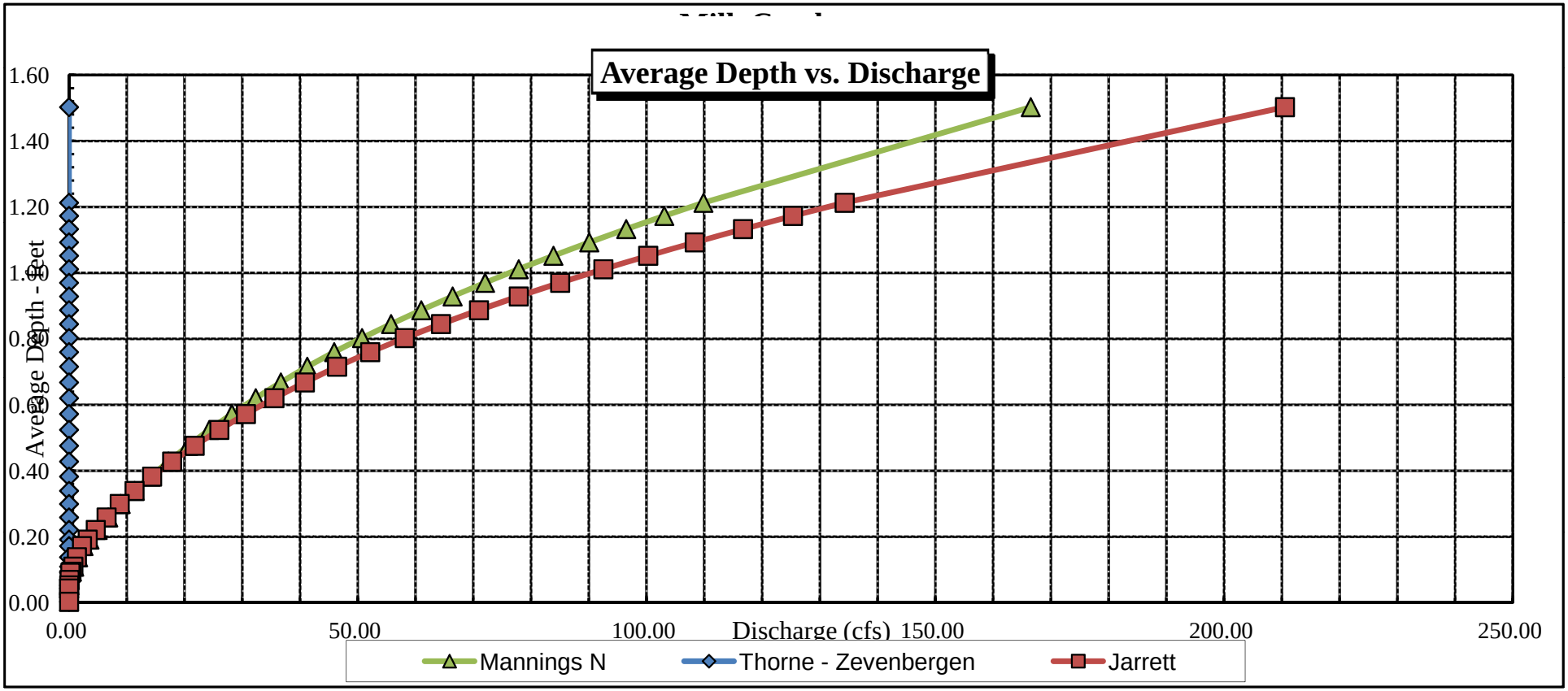
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

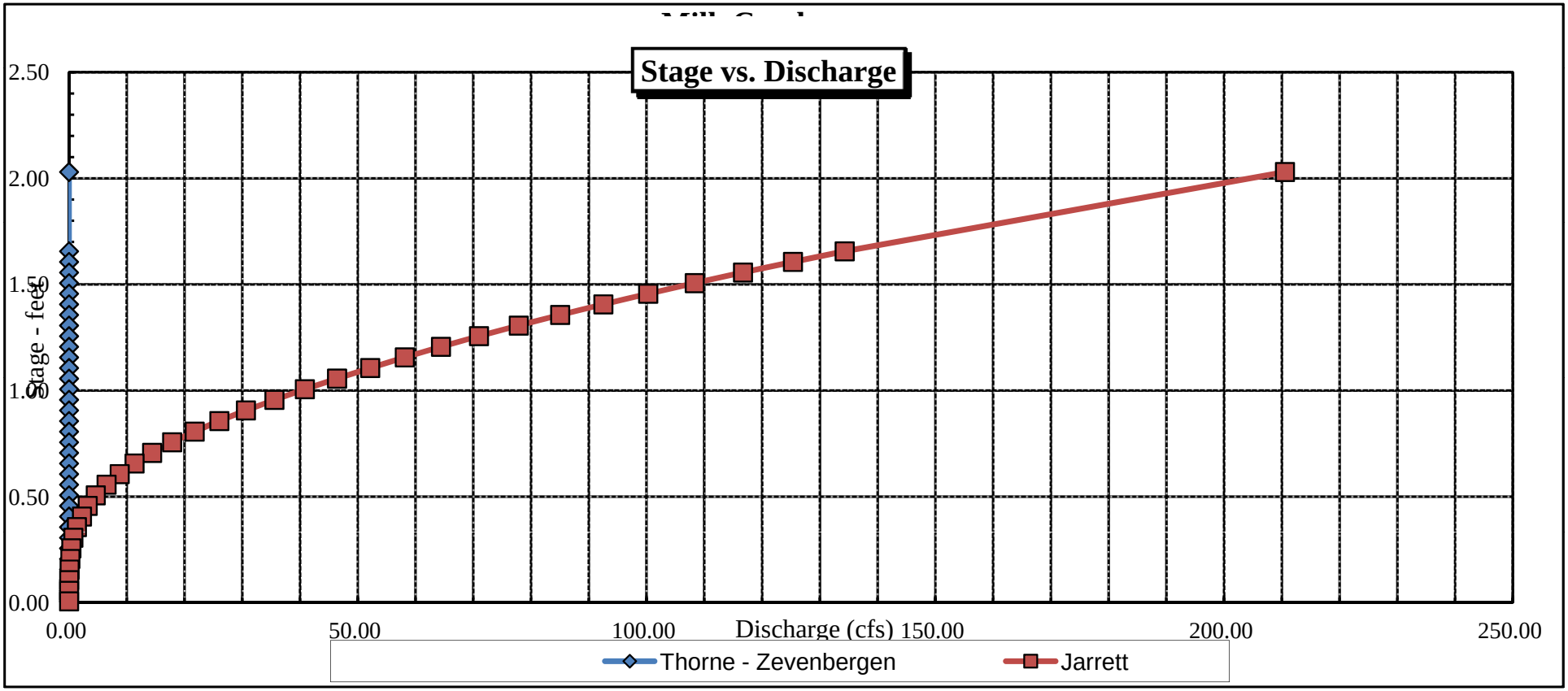
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.35	40.89	1.50	2.03	61.43	42.85	100.0%	1.43	210.54	3.43
	6.72	38.44	1.21	1.66	46.61	40.09	93.6%	1.16	134.31	2.88
	6.77	38.11	1.17	1.61	44.69	39.72	92.7%	1.13	125.36	2.80
	6.82	37.78	1.13	1.56	42.80	39.36	91.8%	1.09	116.70	2.73
	6.87	37.45	1.09	1.51	40.92	38.99	91.0%	1.05	108.35	2.65
	6.92	37.12	1.05	1.46	39.05	38.62	90.1%	1.01	100.28	2.57
	6.97	36.80	1.01	1.41	37.20	38.25	89.3%	0.97	92.51	2.49
	7.02	36.47	0.97	1.36	35.37	37.88	88.4%	0.93	85.04	2.40
	7.07	36.14	0.93	1.31	33.56	37.51	87.5%	0.89	77.87	2.32
	7.12	35.81	0.89	1.26	31.76	37.14	86.7%	0.86	70.99	2.24
	7.17	35.48	0.84	1.21	29.97	36.77	85.8%	0.82	64.41	2.15
	7.22	35.16	0.80	1.16	28.21	36.41	85.0%	0.77	58.13	2.06
	7.27	34.83	0.76	1.11	26.46	36.04	84.1%	0.73	52.15	1.97
	7.32	34.56	0.72	1.06	24.73	35.72	83.4%	0.69	46.41	1.88
	7.37	34.44	0.67	1.01	23.00	35.56	83.0%	0.65	40.83	1.77
	7.42	34.32	0.62	0.96	21.28	35.39	82.6%	0.60	35.56	1.67
	7.47	34.21	0.57	0.91	19.57	35.23	82.2%	0.56	30.63	1.57
	7.52	34.09	0.52	0.86	17.86	35.06	81.8%	0.51	26.02	1.46
	7.57	33.97	0.48	0.81	16.16	34.89	81.4%	0.46	21.76	1.35
	7.62	33.81	0.43	0.76	14.46	34.69	81.0%	0.42	17.86	1.23
	7.67	33.42	0.38	0.71	12.78	34.27	80.0%	0.37	14.39	1.13
WL	7.72	32.81	0.34	0.66	11.12	33.61	78.4%	0.33	11.35	1.02
	7.77	31.78	0.30	0.61	9.51	32.50	75.8%	0.29	8.76	0.92
	7.82	30.73	0.26	0.56	7.95	31.37	73.2%	0.25	6.50	0.82
	7.87	29.20	0.22	0.51	6.44	29.77	69.5%	0.22	4.62	0.72
	7.92	26.36	0.19	0.46	5.05	26.85	62.7%	0.19	3.22	0.64
	7.97	22.36	0.17	0.41	3.84	22.77	53.1%	0.17	2.24	0.58
	8.02	20.17	0.14	0.36	2.78	20.49	47.8%	0.14	1.36	0.49
	8.07	16.83	0.11	0.31	1.84	17.08	39.9%	0.11	0.74	0.40
	8.12	11.93	0.09	0.26	1.12	12.11	28.2%	0.09	0.40	0.36
	8.17	7.09	0.09	0.21	0.64	7.20	16.8%	0.09	0.22	0.35
	8.22	4.97	0.07	0.16	0.34	5.04	11.8%	0.07	0.10	0.28
	8.27	2.95	0.05	0.11	0.16	2.98	6.9%	0.05	0.03	0.22
	8.32	1.48	0.04	0.06	0.06	1.49	3.5%	0.04	0.01	0.19
	8.37	0.66	0.00	0.01	0.00	0.66	1.5%	0.00	0.00	0.02


CROSS SECTION DATA ANALYSIS
LS
G
W
R
W
G
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - Feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Thorne - Zevenbergen
Jarrett

Data Input & Proofing

STREAM NAME:	Milk Creek
XS LOCATION:	1000 ft upstr from RR Bridge
XS NUMBER:	1
DATE:	6/28/2016
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	0.7
SECTION:	18
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.004 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 = 28						
	LS	0.00	4.16			0.00	0.00	0.00
		1.00	4.58			0.00	0.00	0.00
1	G	1.40	5.80			0.00	0.00	0.00
	W	1.90	7.40	0.00	0.00	0.00	0.00	0.00
		3.00	7.85	0.45	0.71	0.47	0.34	7.40
		4.00	8.10	0.70	1.19	0.70	0.83	7.40
		5.00	8.00	0.60	1.62	0.60	0.97	7.40
		6.00	8.10	0.70	1.29	0.70	0.90	7.40
		7.00	8.15	0.75	1.22	0.75	0.92	7.40
		8.00	8.00	0.60	0.41	0.45	0.18	7.40
		8.50	7.95	0.55	1.82	0.28	0.50	7.40
		9.00	8.20	0.80	1.64	0.40	0.66	7.40
		9.50	8.15	0.75	1.28	0.38	0.48	7.40
		10.00	8.05	0.65	1.77	0.33	0.58	7.40
		10.50	8.20	0.80	1.55	0.40	0.62	7.40
		11.00	8.20	0.80	1.67	0.40	0.67	7.40
		11.50	8.05	0.65	1.83	0.33	0.59	7.40
		12.00	8.00	0.60	1.93	0.30	0.58	7.40
		12.50	8.00	0.60	1.80	0.30	0.54	7.40
		13.00	8.00	0.60	1.51	0.45	0.68	7.40
		14.00	8.05	0.65	1.71	0.65	1.11	7.40
		15.00	7.80	0.40	1.67	0.40	0.67	7.40
		16.00	7.90	0.50	1.36	0.50	0.68	7.40
		17.00	7.70	0.30	0.54	0.30	0.16	7.40
		18.00	7.60	0.20	0.31	0.20	0.06	7.40
	W	19.00	7.40	0.00	0.00	0.00	0.00	0.00
		32.10	6.14			0.00	0.00	0.00
1	G	38.90	5.80			0.00	0.00	0.00
	RS	45.50	5.00					
					Totals	9.27	12.72	

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

LOCATION INFORMATION

STREAM NAME:	Milk Creek
XS LOCATION:	1000 ft upstr from RR Bridge
XS NUMBER:	1
DATE:	28-Jun-16
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	0.7
SECTION:	18
TWP:	5N
RANGE:	92W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Yampa River
DIVISION:	6
DOW CODE:	24961
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:	0.004

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

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

STREAM NAME: Milk Creek
XS LOCATION: 1000 ft upstr from RR Bridge
XS NUMBER: 1

DATA POINTS= 28

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	4.16			0.00		0.00	0.00	0.0%
	1.00	4.58			0.00		0.00	0.00	0.0%
1 G	1.40	5.80			0.00		0.00	0.00	0.0%
W	1.90	7.40	0.00	0.00	0.00		0.00	0.00	0.0%
	3.00	7.85	0.45	0.71	1.19	0.45	0.47	0.34	2.6%
	4.00	8.10	0.70	1.19	1.03	0.70	0.70	0.83	6.5%
	5.00	8.00	0.60	1.62	1.00	0.60	0.60	0.97	7.6%
	6.00	8.10	0.70	1.29	1.00	0.70	0.70	0.90	7.1%
	7.00	8.15	0.75	1.22	1.00	0.75	0.75	0.92	7.2%
	8.00	8.00	0.60	0.41	1.01	0.60	0.45	0.18	1.5%
	8.50	7.95	0.55	1.82	0.50	0.55	0.28	0.50	3.9%
	9.00	8.20	0.80	1.64	0.56	0.80	0.40	0.66	5.2%
	9.50	8.15	0.75	1.28	0.50	0.75	0.38	0.48	3.8%
	10.00	8.05	0.65	1.77	0.51	0.65	0.33	0.58	4.5%
	10.50	8.20	0.80	1.55	0.52	0.80	0.40	0.62	4.9%
	11.00	8.20	0.80	1.67	0.50	0.80	0.40	0.67	5.3%
	11.50	8.05	0.65	1.83	0.52	0.65	0.33	0.59	4.7%
	12.00	8.00	0.60	1.93	0.50	0.60	0.30	0.58	4.6%
	12.50	8.00	0.60	1.80	0.50	0.60	0.30	0.54	4.2%
	13.00	8.00	0.60	1.51	0.50	0.60	0.45	0.68	5.3%
	14.00	8.05	0.65	1.71	1.00	0.65	0.65	1.11	8.7%
	15.00	7.80	0.40	1.67	1.03	0.40	0.40	0.67	5.3%
	16.00	7.90	0.50	1.36	1.00	0.50	0.50	0.68	5.3%
	17.00	7.70	0.30	0.54	1.02	0.30	0.30	0.16	1.3%
	18.00	7.60	0.20	0.31	1.00	0.20	0.20	0.06	0.5%
W	19.00	7.40	0.00	0.00	1.02		0.00	0.00	0.0%
	32.10	6.14			0.00		0.00	0.00	0.0%
1 G	38.90	5.80			0.00		0.00	0.00	0.0%
TOTALS ----------					17.44	0.8 (Max.)	9.27	12.72	100.0%

Manning's n = 0.0450
Hydraulic Radius= 0.53156684

STREAM NAME: Milk Creek
XS LOCATION: 1000 ft upstr from RR Bridge
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	9.27	9.27	0.0%
7.15	9.27	13.88	49.7%
7.17	9.27	13.49	45.5%
7.19	9.27	13.10	41.3%
7.21	9.27	12.71	37.1%
7.23	9.27	12.33	33.0%
7.25	9.27	11.96	29.0%
7.27	9.27	11.59	25.0%
7.29	9.27	11.22	21.0%
7.31	9.27	10.85	17.1%
7.33	9.27	10.50	13.2%
7.35	9.27	10.14	9.4%
7.36	9.27	9.97	7.5%
7.37	9.27	9.79	5.6%
7.38	9.27	9.62	3.7%
7.39	9.27	9.44	1.9%
7.40	9.27	9.27	0.0%
7.41	9.27	9.10	-1.8%
7.42	9.27	8.93	-3.7%
7.43	9.27	8.76	-5.5%
7.44	9.27	8.59	-7.3%
7.45	9.27	8.43	-9.1%
7.47	9.27	8.09	-12.7%
7.49	9.27	7.76	-16.3%
7.51	9.27	7.44	-19.8%
7.53	9.27	7.11	-23.3%
7.55	9.27	6.79	-26.8%
7.57	9.27	6.47	-30.2%
7.59	9.27	6.16	-33.6%
7.61	9.27	5.85	-37.0%
7.63	9.27	5.54	-40.3%
7.65	9.27	5.24	-43.5%

WATERLINE AT ZERO
AREA ERROR = 7.400

STREAM NAME: Milk Creek
XS LOCATION: 1000 ft upstr from RR Bridge
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.80	37.50	1.36	2.40	50.90	39.09	100.0%	1.30	126.87	2.49
	6.40	27.81	1.14	1.80	31.73	28.94	74.0%	1.10	70.52	2.22
	6.45	27.27	1.11	1.75	30.35	28.36	72.6%	1.07	66.38	2.19
	6.50	26.74	1.08	1.70	29.00	27.79	71.1%	1.04	62.37	2.15
	6.55	26.20	1.06	1.65	27.68	27.21	69.6%	1.02	58.51	2.11
	6.60	25.67	1.03	1.60	26.38	26.64	68.1%	0.99	54.79	2.08
	6.65	25.13	1.00	1.55	25.11	26.06	66.7%	0.96	51.20	2.04
	6.70	24.60	0.97	1.50	23.87	25.49	65.2%	0.94	47.75	2.00
	6.75	24.06	0.94	1.45	22.65	24.91	63.7%	0.91	44.43	1.96
	6.80	23.53	0.91	1.40	21.46	24.34	62.3%	0.88	41.25	1.92
	6.85	22.99	0.88	1.35	20.30	23.76	60.8%	0.85	38.20	1.88
	6.90	22.45	0.85	1.30	19.16	23.19	59.3%	0.83	35.27	1.84
	6.95	21.92	0.82	1.25	18.05	22.62	57.9%	0.80	32.47	1.80
	7.00	21.38	0.79	1.20	16.97	22.04	56.4%	0.77	29.80	1.76
	7.05	20.85	0.76	1.15	15.91	21.47	54.9%	0.74	27.25	1.71
	7.10	20.31	0.73	1.10	14.88	20.89	53.4%	0.71	24.82	1.67
	7.15	19.78	0.70	1.05	13.88	20.32	52.0%	0.68	22.51	1.62
	7.20	19.24	0.67	1.00	12.91	19.74	50.5%	0.65	20.32	1.57
	7.25	18.71	0.64	0.95	11.96	19.17	49.0%	0.62	18.25	1.53
	7.30	18.17	0.61	0.90	11.04	18.59	47.6%	0.59	16.29	1.48
	7.35	17.64	0.58	0.85	10.14	18.02	46.1%	0.56	14.45	1.42
WL	7.40	17.10	0.54	0.80	9.27	17.44	44.6%	0.53	12.72	1.37
	7.45	16.73	0.50	0.75	8.43	17.06	43.6%	0.49	11.01	1.31
	7.50	16.36	0.46	0.70	7.60	16.67	42.6%	0.46	9.41	1.24
	7.55	15.98	0.42	0.65	6.79	16.28	41.7%	0.42	7.92	1.17
	7.60	15.61	0.38	0.60	6.00	15.90	40.7%	0.38	6.55	1.09
	7.65	14.99	0.35	0.55	5.24	15.26	39.0%	0.34	5.36	1.02
	7.70	14.37	0.31	0.50	4.50	14.63	37.4%	0.31	4.29	0.95
	7.75	13.99	0.27	0.45	3.79	14.24	36.4%	0.27	3.28	0.87
	7.80	13.62	0.23	0.40	3.10	13.85	35.4%	0.22	2.39	0.77
	7.85	12.55	0.20	0.35	2.45	12.76	32.6%	0.19	1.70	0.70
	7.90	11.40	0.16	0.30	1.85	11.59	29.6%	0.16	1.14	0.62
	7.95	11.00	0.12	0.25	1.29	11.17	28.6%	0.12	0.64	0.50
	8.00	9.00	0.08	0.20	0.76	9.15	23.4%	0.08	0.31	0.40
	8.05	5.67	0.07	0.15	0.40	5.78	14.8%	0.07	0.14	0.35
	8.10	3.45	0.05	0.10	0.17	3.52	9.0%	0.05	0.05	0.28
	8.15	1.43	0.03	0.05	0.05	1.46	3.7%	0.03	0.01	0.22
	8.20	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Milk Creek
XS LOCATION: 1000 ft upstr from RR Bridge
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	12.72	cfs
CALCULATED FLOW (Qc)=	12.72	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.40	ft
CALCULATED WATERLINE (WLc)=	7.40	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.80	ft
MAX CALCULATED DEPTH (Dc)=	0.80	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.37	ft/sec
MANNING'S N=	0.045	
SLOPE=	0.004	ft/ft
.4 * Qm =	5.1	cfs
2.5 * Qm=	31.8	cfs

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

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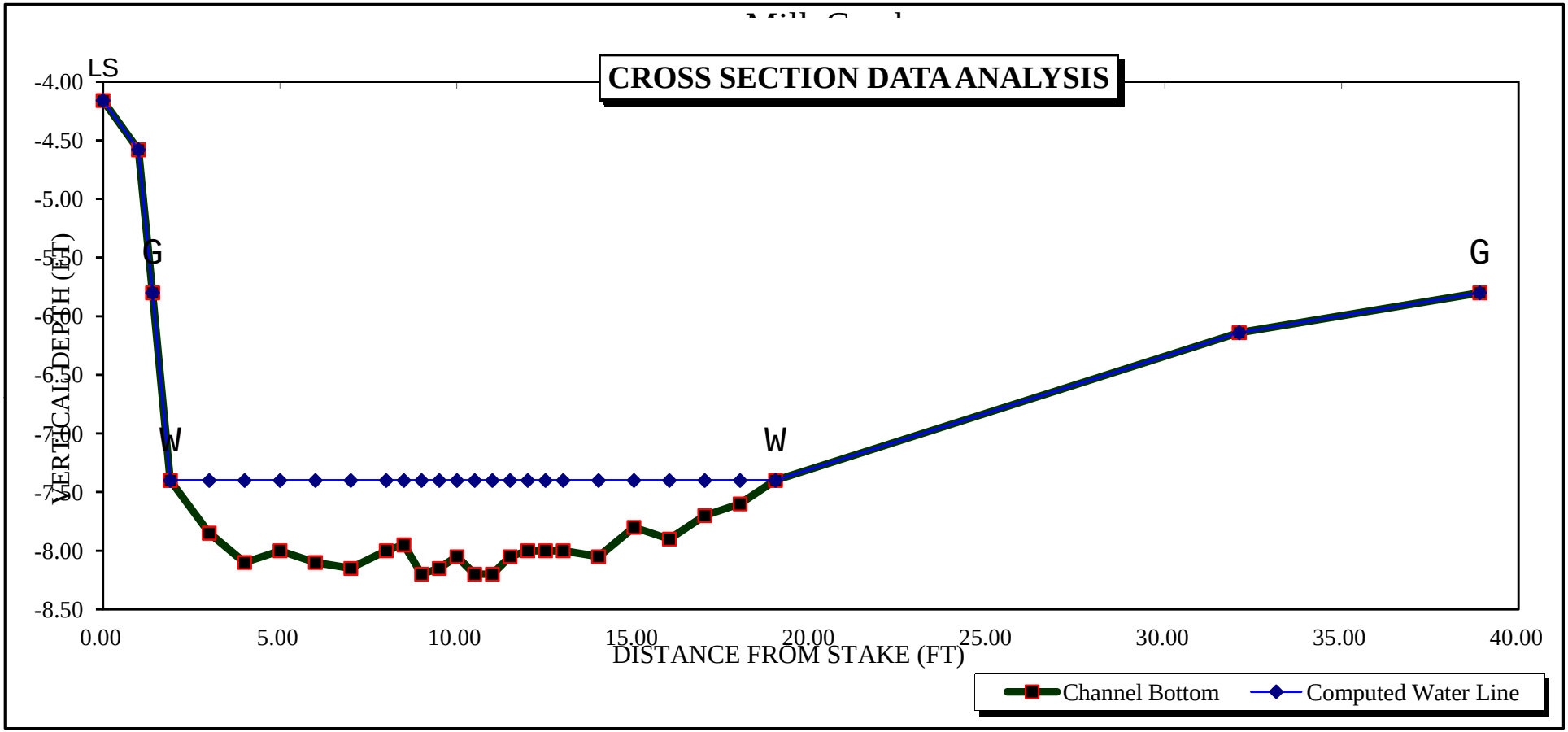
RECOMMENDATION BY: ……………………………………………………… AGENCY……………………………………………… DATE:……………………………

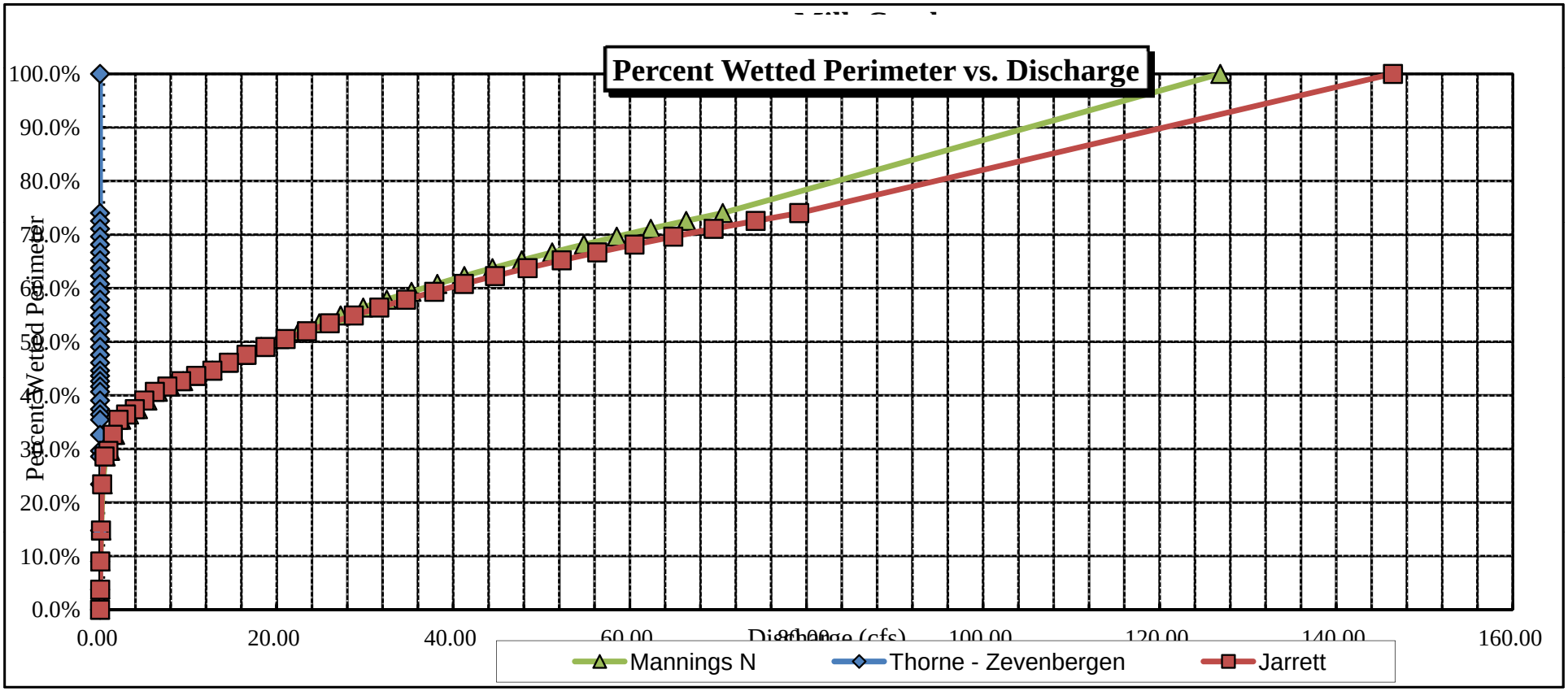
CWCB REVIEW BY: …… DATE:……………………………

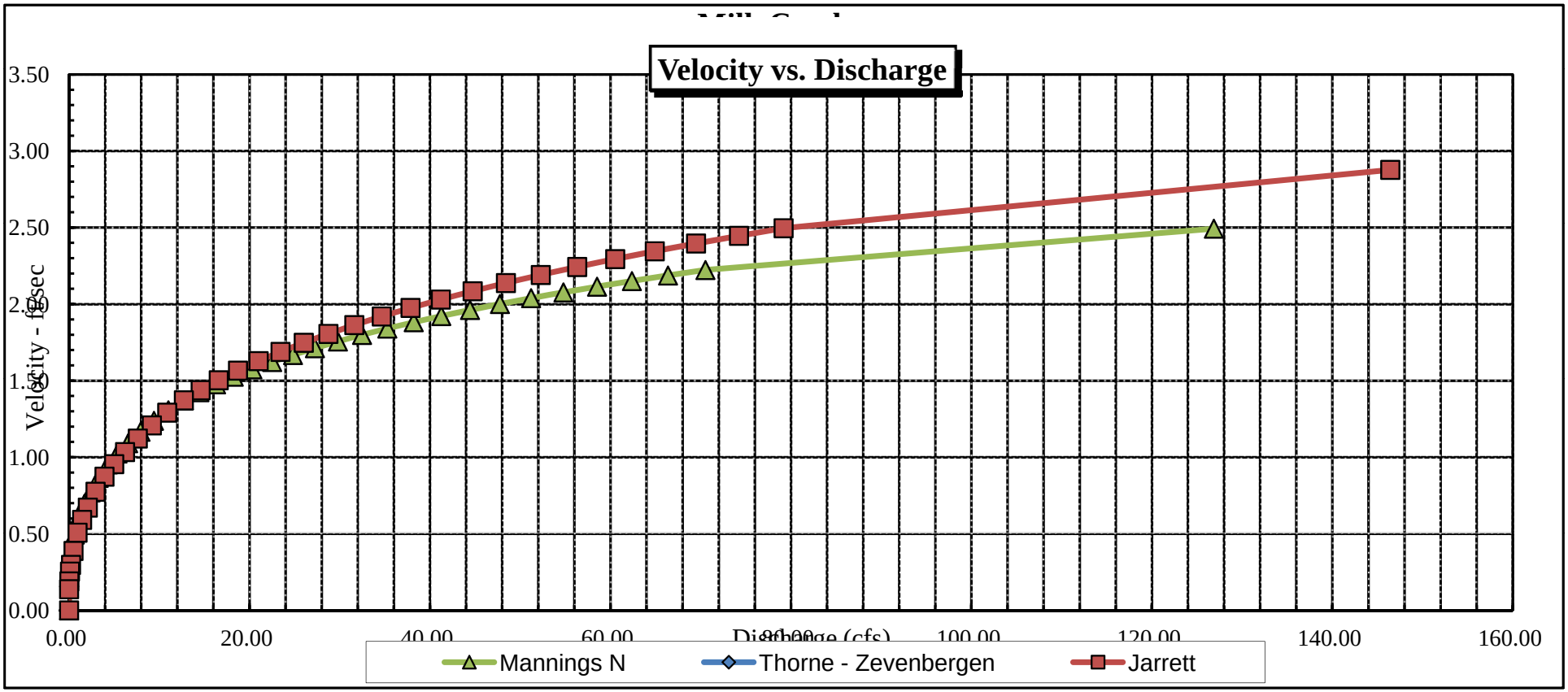
STREAM NAME: Milk Creek
XS LOCATION: 1000 ft upstr from RR Bridge
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

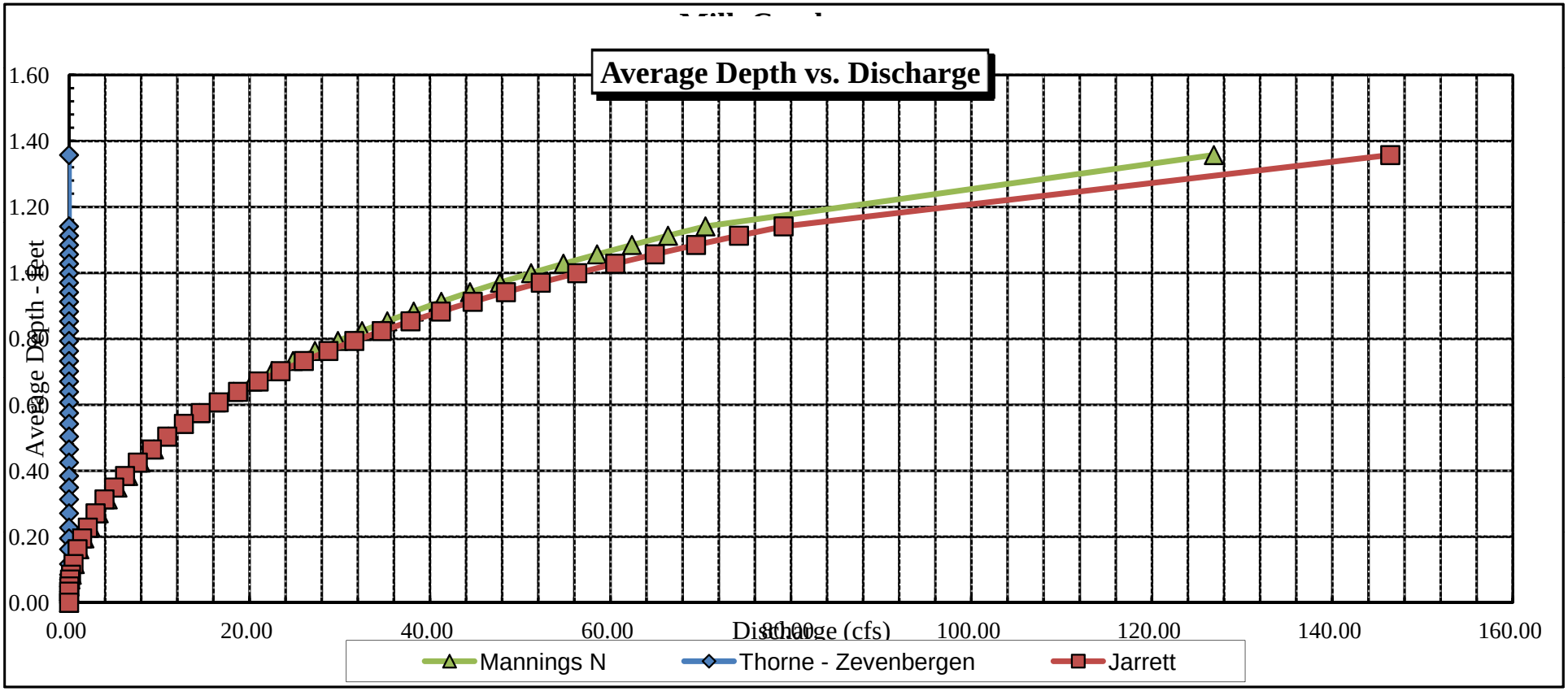
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

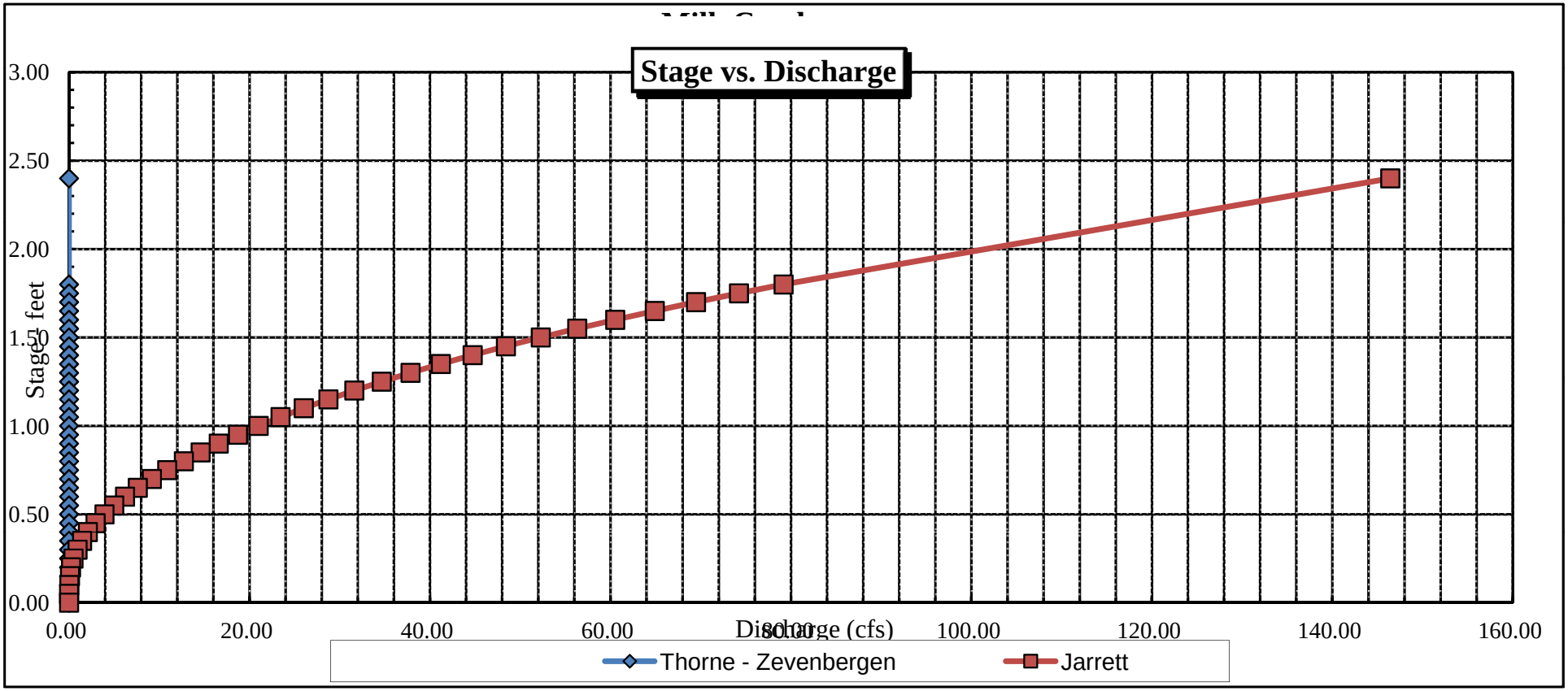
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.80	37.50	1.36	2.40	50.90	39.09	100.0%	1.30	146.42	2.88
	6.40	27.81	1.14	1.80	31.73	28.94	74.0%	1.10	79.19	2.50
	6.45	27.27	1.11	1.75	30.35	28.36	72.6%	1.07	74.24	2.45
	6.50	26.74	1.08	1.70	29.00	27.79	71.1%	1.04	69.48	2.40
	6.55	26.20	1.06	1.65	27.68	27.21	69.6%	1.02	64.91	2.35
	6.60	25.67	1.03	1.60	26.38	26.64	68.1%	0.99	60.52	2.29
	6.65	25.13	1.00	1.55	25.11	26.06	66.7%	0.96	56.31	2.24
	6.70	24.60	0.97	1.50	23.87	25.49	65.2%	0.94	52.28	2.19
	6.75	24.06	0.94	1.45	22.65	24.91	63.7%	0.91	48.42	2.14
	6.80	23.53	0.91	1.40	21.46	24.34	62.3%	0.88	44.73	2.08
	6.85	22.99	0.88	1.35	20.30	23.76	60.8%	0.85	41.21	2.03
	6.90	22.45	0.85	1.30	19.16	23.19	59.3%	0.83	37.85	1.98
	6.95	21.92	0.82	1.25	18.05	22.62	57.9%	0.80	34.65	1.92
	7.00	21.38	0.79	1.20	16.97	22.04	56.4%	0.77	31.62	1.86
	7.05	20.85	0.76	1.15	15.91	21.47	54.9%	0.74	28.74	1.81
	7.10	20.31	0.73	1.10	14.88	20.89	53.4%	0.71	26.01	1.75
	7.15	19.78	0.70	1.05	13.88	20.32	52.0%	0.68	23.44	1.69
	7.20	19.24	0.67	1.00	12.91	19.74	50.5%	0.65	21.01	1.63
	7.25	18.71	0.64	0.95	11.96	19.17	49.0%	0.62	18.72	1.57
	7.30	18.17	0.61	0.90	11.04	18.59	47.6%	0.59	16.58	1.50
	7.35	17.64	0.58	0.85	10.14	18.02	46.1%	0.56	14.58	1.44
WL	7.40	17.10	0.54	0.80	9.27	17.44	44.6%	0.53	12.72	1.37
	7.45	16.73	0.50	0.75	8.43	17.06	43.6%	0.49	10.88	1.29
	7.50	16.36	0.46	0.70	7.60	16.67	42.6%	0.46	9.18	1.21
	7.55	15.98	0.42	0.65	6.79	16.28	41.7%	0.42	7.62	1.12
	7.60	15.61	0.38	0.60	6.00	15.90	40.7%	0.38	6.20	1.03
	7.65	14.99	0.35	0.55	5.24	15.26	39.0%	0.34	5.00	0.96
	7.70	14.37	0.31	0.50	4.50	14.63	37.4%	0.31	3.93	0.87
	7.75	13.99	0.27	0.45	3.79	14.24	36.4%	0.27	2.94	0.77
	7.80	13.62	0.23	0.40	3.10	13.85	35.4%	0.22	2.08	0.67
	7.85	12.55	0.20	0.35	2.45	12.76	32.6%	0.19	1.45	0.59
	7.90	11.40	0.16	0.30	1.85	11.59	29.6%	0.16	0.94	0.51
	7.95	11.00	0.12	0.25	1.29	11.17	28.6%	0.12	0.50	0.39
	8.00	9.00	0.08	0.20	0.76	9.15	23.4%	0.08	0.23	0.30
	8.05	5.67	0.07	0.15	0.40	5.78	14.8%	0.07	0.10	0.25
	8.10	3.45	0.05	0.10	0.17	3.52	9.0%	0.05	0.03	0.19
	8.15	1.43	0.03	0.05	0.05	1.46	3.7%	0.03	0.01	0.14
	8.20	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
20.00
40.00
60.00
Discharge (cfs)
100.00
120.00
140.00
160.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Average Depth - Feet
0.00
20.00
40.00
60.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett