United States Department of the Interior

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

In Reply Refer To:
7250 (CO-930)

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 increase to the existing instream flow water rights on a portion of Oh Be Joyful Creek, located in Water Division 4. This is an atypical instream flow recommendation from the BLM, because the BLM owns and manages only a very small portion of the creek. The BLM's rationale for the instream flow recommendation is explained below.

One of the missions assigned to the BLM by the U.S. Congress is to manage public lands in historical mining districts, and to facilitate community-based efforts to remediate water quality impacts from historic mining activities. Pursuant to this mission, the BLM and multiple other partners have worked to address acid mine drainage impacts associated with the historic mining district in the upper Slate River watershed. These partners include other federal and state agencies, nonprofit groups, private companies, and private landowners.

Within the Oh-Be-Joyful Creek watershed, a sub-watershed of the upper Slate River, metamorphic formations have been historically mined for silver, zinc, lead, copper and gold ores. Most of the mining has occurred on privately-held patents. Historic mining was concentrated in Redwell Basin, a large tributary to the creek. The most conspicuous features of this historic mining are large waste rock piles and open adits with acid discharge as low as 2.3 pH. As a result of these discharges, the Colorado Department of Public Health and Environment has placed Oh Be Joyful Creek on the 303(d) list for excessive concentrations of cadmium, zinc, copper and lead.

Projects implemented by the partnership within the Oh Be Joyful Creek watershed have included characterization of the watershed to identify the location, magnitude, and severity of acid mine discharge, studies on the impact of acid mine discharge on aquatic life in the creek, and plugging abandoned well bores that discharge low pH water. The Upper Slate River Committee of the Coal Creek Watershed Coalition is developing a watershed management plan for the area in coordination with BLM and other agencies. The plan will be completed during 2013. The

Gunsight Pass historic mining site on BLM lands has been characterized. A process is underway to select a remediation approach and secure funding for the remediation project. Once the water quality of impaired streams is sufficiently improved to remove serious limitations on the abundance and diversity of aquatic life, that achievement can be comprised by new diversions that divert clean water necessary for dilution of heavy metals and maintenance of pH levels. The BLM has worked with partners and private landowners in the Oh Be Joyful Creek watershed to obtain support for instream flow water rights that will help ensure the flows necessary to maintain the improving natural environment in Oh Be Joyful Creek. These partners have asked the BLM to take the lead in making an instream flow recommendation for the creek to the Colorado Water Conservation Board (CWCB).

The details of the BLM's instream flow recommendation are outlined in the enclosure to this letter.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross sections were included with the BLM's draft recommendation in February 2013. If you have any questions regarding our instream flow recommendation, please contact Roy Smith, Water Rights Specialist, at (303) 239-3940. We thank both the Division of Parks and Wildlife and the CWCB for their cooperation in this effort.

Sincerely,

Leigh D. Espy
Deputy State Director, Resources and Fire

Enclosure

cc: Brian St. George, Gunnison Field Office
Andrew Breibart, Gunnison Field Office
Valori Armstrong, Southwest District

ENCLOSURE - INSTREAM FLOW RECOMMENDATION FOR OH BE JOYFUL CREEK

Location and Land Status. Oh Be Joyful Creek originates near Hancock Peak, approximately eight miles northwest of Crested Butte, and flows into the Slate River approximately four miles north of Crested Butte. This recommendation covers the stream reach beginning at the confluence with the unnamed tributary that drains Peeler Basin and terminates at the confluence with the Slate River.

This stream reach covers a distance of approximately 1.8 miles. Within this reach, 0.8 miles are managed by the Bureau of Land Management (BLM), 0.7 miles are managed by the U.S. Forest Service, and 0.3 miles are in private ownership.

Existing Instream Flow Water Rights. The Colorado Water Conservation Board (CWCB) currently holds the following water right on Oh Be Joyful Creek:

- Unnamed tributary to confluence with Slate River – 3.0 cfs, January 1 to December 31

Biological Summary. Oh Be Joyful Creek is a moderate gradient stream flowing through a canyon where bedrock restricts movement of the channel. The creek carries a heavy load of large diameter sediments, due to natural erosional processes that occur in this type of metamorphic geology. The substrate is generally moderate in size, ranging from gravels up to cobbles eight inches in diameter.

Fishery surveys have revealed self-sustaining populations of brook trout, with individuals up to nine inches in length. Although fish distribution data is lacking before the 1980s, wild trout have been documented since that time. Colorado Parks and Wildlife stocked the creek with 1 to 3-inch cutthroat trout during the 1970s. The recommended insteam flow reaches have fish numbers and biomass that are above average when compared to other streams in this area. However, other portions of the recommended segment have reduced habitat available and fish numbers because of the high bed load transport in this watershed, which results in poor pool development.

Comprehensive macroinvertebrate surveys have been performed on this creek. Compared to other streams in the Southern Rocky Mountains ecoregion, the surveys revealed an above average abundance of macroinvertebrates, but below average diversity. This is to be expected in a stream system that is affected by excessive heavy metal concentrations. The surveys also revealed that the creek is populated exclusively by taxa that are intolerant of other forms of water pollution, such as sediments and organic pollution. This indicates that the watershed is in good condition except for contributions of heavy metals by historic mining activities.

The riparian community consists of a blue spruce and willow community. The community is robust, provides good shading for the creek, and doesn't show signs of significant impairment from heavy metals. The nonconsumptive water needs assessment performed by the Basin Roundtable identified this stream segment as having significant riparian communities worthy of protection.

R2Cross Analysis. The BLM collected the following R2Cross data from Oh Be Joyful Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/29/2011 #1	3.25 cfs	38.2 feet	4.62 cfs	Out of range
09/29/2011 #2	2.94 cfs	34.2 feet	6.28 cfs	Out of range
06/07/2012 #1	49.0 cfs	42.7 feet	Out of range	20.83 cfs
07/17/2013 #1	9.07 cfs	43.1 feet	7.25 cfs	13.39 cfs
		Averages:	6.05 cfs	17.10 cfs

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

6 cubic feet per second is recommended during the period from April 1 to April 30. Protecting this flow rate would require an increase of 3 cfs between April 1 and April 30. This recommendation is driven by water availability, and reflects the period when snowmelt is beginning. Given that very limited physical habitat is available during most of the year on this creek, any flows that provide expanded physical habitat should be protected.

17 cubic feet per second is recommended during the snowmelt runoff period between May 1 and July 15. Protecting this flow rate would require an increase of 14 cfs between May 1 and July 15. This recommendation is driven by the wetted perimeter criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff flows are available. In addition, protection of a higher flow rate will help scour fine sediments from important spawning areas.

6 cubic feet per second is recommended for the mid-summer period, from July 16 to August 15. Protecting this flow rate would require an increase of 3 cfs between July 16 and August 15. This recommendation is driven by the wetted perimeter criteria and by water availability. The increased flow rate should help prevent excessively high temperatures and help ensure that sufficient physical habitat is available during the highest feeding and growth period of the year.

The BLM recommends that the current instream flow water right of 3 cfs for the period between August 16 and March 31 remain unchanged. The current instream flow water right appears to reflect the limited water availability during the fall and winter months.

Water Availability. Although there is no gage data available for this creek, U.S. Geological

Survey (USGS) gage 09111500 (Slate River near Crested Butte, CO) is located a few miles downstream. This stream gage incorporates inflow from Coal Creek and Washington Gulch. The BLM recommends that a gage apportionment analysis be performed. It is important to note that Coal Creek and Washington Gulch drain watersheds that are lower in overall elevation than the Oh-Be-Joyful Creek watershed. Accordingly, a strict basin apportionment will be likely to slightly underestimate flows in Oh Be Joyful Creek. Given this limitation, the BLM recommends also consulting the StreamStats package developed jointly between the USGS and the CWCB.

The BLM is not aware of any decreed water rights within or above the reach proposed for an increase.

Rationale For Enlargement of Instream Flow Water Right. The BLM does not consider the current instream flow water right to be fully protective of the natural environment in Oh Be Joyful Creek, pursuant to modern analytical procedures used by the CWCB. The current instream flow water right does not meet all three instream flow criteria during the spring and summer, which is a critical growth and spawning period for the fish population. This period is especially critical for maintaining the fish population, because the fish population already experiences other stresses and biological limitations associated with the heavy metal pollutants described previously.

DRAFT INSTREAM FLOW RECOMMENDATION

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 increase to the existing instream flow water rights on a portion of Oh Be Joyful Creek, located in Water Division 4. This is an atypical instream flow recommendation from BLM, because BLM owns and manages only a very small portion of the creek. BLM's rationale for the instream flow recommendation is explained below.

One of the missions assigned to BLM by the U.S. Congress is to manage public lands in historical mining districts, and to facilitate community-based efforts to remediate water quality impacts from historic mining activities. Pursuant to this mission, BLM and multiple other partners have worked to address acid mine drainage impacts associated with the historic mining district in the upper Slate River watershed. These partners include other federal and state agencies, nonprofit groups, private companies, and private landowners.

Within the Oh-Be-Joyful Creek watershed, a sub-watershed of the upper Slate River, metamorphic formations have been historically mined for silver, zinc, lead, copper, and gold ores. Most of the mining has occurred on privately-held patents. Historic mining was concentrated in Redwell Basin, a large tributary to the creek. The most conspicuous features of this historic mining are large waste rock piles and open adits with acid discharge as low as 2.3 pH. As a result of these discharges, the Colorado Department of Public Health and Environment has placed Oh Be Joyful Creek on the 303(d) list for excessive concentrations of cadmium, zinc, copper and lead.

Projects implemented by the partnership within the Oh Be Joyful Creek watershed have included characterization of the watershed to identify the location, magnitude, and severity of acid mine discharge, studies on the impact of acid mine discharge on aquatic life in the creek, and plugging abandoned well bores that discharge low pH water. The Upper Slate River Committee of the Coal Creek Watershed Coalition is developing a watershed management plan for the area in coordination with BLM and other agencies. The plan will be completd during 2013. The Gunsight Pass historic mining location on BLM lands has been characterized and a process is underway to select a remediation approach and secure funding for the remediation project.

Once the water quality of impaired streams is sufficiently improved to be able to remove serious limitations on the abundance and diversity of aquatic life, that achievement can be comprised by new diversions that divert clean water necessary for dilution of heavy metals and maintenance of pH levels. BLM has worked with partners and private landowners in the Oh Be Joyful Creek watershed to obtain support for instream flow water rights that will help ensure the flows

necessary to maintain the improving natural environment in Oh Be Joyful Creek. These partners have asked BLM to take the lead in making an instream flow recommendation for the creek to the Colorado Water Conservation Board.

The details of BLM's instream flow recommendation are outlined in the attachment to this letter. Data sheets, R2Cross output, fishery survey information, and photographs of the cross sections were included with BLM's draft recommendation in February 2013. If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940. We thank both the Division of Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

Sincerely,

Leigh Espy
Deputy State Director
Resources and Fire

Cc: Brian St. George, Gunnison Field Office
Andrew Breibart, Gunnison Field Office
Valori Armstrong, Southwest District

Enclosure

ENCLOSURE - DRAFT INSTREAM FLOW RECOMMENDATION FOR OH BE JOYFUL CREEK

Location and Land Status. On Be Joyful Creek originates near Hancock Peak, approximately eight miles northwest of Crested Butte, and flows into the Slate River approximately four miles north of Crested Butte. This recommendation covers the stream reach beginning at the confluence with the unnamed tributary that drains Peeler Basin and terminates at the confluence with the Slate River.

This stream reach covers a distance of approximately 1.8 miles. Within this reach, 0.8 miles are managed by the BLM, 0.7 miles are managed by the U.S. Forest Service, and 0.3 miles are in private ownership

Existing Instream Flow Water Rights. The CWCB currently holds the following water right on Oh Be Joyful Creek:

- Unnamed tributary to confluence with Slate River – 3.0 cfs, January 1 to December 31

Biological Summary. Oh Be Joyful Creek is a moderate gradient stream flowing through a canyon where bedrock restricts movement of the channel. The creek carries a heavy load of large diameter sediments, due to natural erosional processes that occur in this type of metamorphic geology. The substrate is generally moderate in size, ranging from gravels up to cobbles eight inches in diameter.

Fishery surveys have revealed self-sustaining populations of brook trout, with individuals up to nine inches in length. Although fish distribution data is lacking before the 1980s, wild trout have been document since that time. Colorado Parks and Wildlife have stocked the creek with 1 to 3-inch cutthroat trout during the 1970s. The recommended insteam flow reaches have numbers and biomass that are above average when compared to other streams in this area. However, other portions of the recommended segments have reduced habitat available and fish numbers because of the high bed load transport in this watershed, which results in poor pool development.

Comprehensive macroinvertebrate surveys have been performed on this creek. Compared to other streams in the Southern Rocky Mountains ecoregion, the surveys revealed an above average abundance of macroinvertebrates, but below average diversity. This is to be expected in a stream system that is affected by excessive heavy metal concentrations. The surveys also revealed that the creek is populated exclusively by taxa that are intolerant of other forms of water pollution, such as sediments and organic pollution. This indicates that the watershed is in good condition except for contributions of heavy metals by historic mining activities.

The riparian community consists of a blue spruce and willow community. The community is robust, provides good shading for the creek, and doesn't show signs of significant impairment from heavy metals. The nonconsumptive water needs assessment performed by the Basin Roundtable identified this stream segment as having significant riparian communities worthy of

protection.

R2Cross Analysis. BLM collected the following R2Cross data from Oh Be Joyful Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/29/2011 #1	3.25 cfs	38.2 feet	4.62 cfs	Out of range
09/29/2011 #2	2.94 cfs	34.2 feet	6.28 cfs	Out of range
06/07/2012 #1	49.0 cfs	42.7 feet	Out of range	20.83 cfs
07/17/2013 #1	9.07 cfs	43.1 feet	7.25 cfs	13.39 cfs
		Averages:	6.05 cfs	17.10 cfs

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

6.05 cubic feet per second is recommended during the period from April 1 to April 30. Protecting this flow rate would require an increase of 3.05 cfs between April 1 and April 30. This recommendation is driven by water availability, and reflects the period when snowmelt is beginning. Given that very limited physical habitat is available during most of the year on this creek, any flows that provide expanded physical habitat should be protected.

17.1 cubic feet per second is recommended during the snowmelt runoff period between May 1 and July 15. Protecting this flow rate would require an increase of 14.1 cfs between May 1 and July 15. This recommendation is driven by the wetted perimeter criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff flows are available. In addition, protection of a higher flow rate will help scour fine sediments from important spawning areas.

6.05 cubic feet per second is recommended for the mid-summer period, from July 16 to August 15. Protecting this flow rate would require an increase of 2.45 cfs between July 16 and August 15. This recommendation is driven by the wetted perimeter criteria and by water availability. The increased flow rate should help prevent excessively high temperatures and help ensure that sufficient physical habitat is available during the highest feeding and growth period of the year.

BLM recommends that the current instream flow water right of 3.0 cfs for the period between August 16 and March 31 remain unchanged. The current instream flow water right appears to reflect the limited water availability during the fall and winter months.

Water Availability. Although there is no gage data available for this creek, USGS gage 09111500 (Slate River near Crested Butte, CO) is located a few miles downstream. This stream gage incorporates inflow from Coal Creek and Washington Gulch. BLM recommends that a gage apportionment analysis be performed. It is important to note that Coal Creek and Washington Gulch drain watersheds that are lower in overall elevation than the Oh-Be-Joyful Creek watershed. Accordingly, a strict basin apportionment will be likely to slightly underestimate flows in Oh Be Joyful Creek. Given this limitation, BLM recommends also consulting the StreamStats package developed jointly between the U.S. Geological Survey and the CWCB.

BLM is not aware of any decreed water rights within or above the reach proposed for an increase.

DRAFT INSTREAM FLOW RECOMMENDATION

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 increase to the existing instream flow water rights on a portion of Oh Be Joyful Creek, located in Water Division 4. This is an atypical instream flow recommendation from BLM, because BLM owns and manages only a very small portion of the creek. BLM's rationale for the instream flow recommendation is explained below.

One of the missions assigned to BLM by the U.S. Congress is to manage public lands in historical mining districts, and to facilitate community-based efforts to remediate water quality impacts from historic mining activities. Pursuant to this mission, BLM and multiple other partners have worked to address acid mine drainage impacts associated with the historic mining district in the upper Slate River watershed. These partners include other federal and state agencies, nonprofit groups, private companies, and private landowners.

Within the Oh-Be-Joyful Creek watershed, a sub-watershed of the upper Slate River, metamorphic formations have been historically mined for silver, zinc, lead, copper, and gold ores. Most of the mining has occurred on privately-held patents. Historic mining was concentrated in Redwell Basin, a large tributary to the creek. The most conspicuous features of this historic mining are large waste rock piles and open adits with acid discharge as low as 2.3 pH. As a result of these discharges, the Colorado Department of Public Health and Environment has placed Oh Be Joyful Creek on the 303(d) list for excessive concentrations of cadmium, zinc, copper and lead.

Projects implemented by the partnership within the Oh Be Joyful Creek watershed have included characterization of the watershed to identify the location, magnitude, and severity of acid mine discharge, studies on the impact of acid mine discharge on aquatic life in the creek, and plugging abandoned well bores that discharge low pH water. The Upper Slate River Committee of the Coal Creek Watershed Coalition is developing a watershed management plan for the area in coordination with BLM and other agencies. The plan will be completd during 2013. The Gunsight Pass historic mining location on BLM lands has been characterized and a process is underway to select a remediation approach and secure funding for the remediation project.

Once the water quality of impaired streams is sufficiently improved to be able to remove serious limitations on the abundance and diversity of aquatic life, that achievement can be comprised by new diversions that divert clean water necessary for dilution of heavy metals and maintenance of pH levels. BLM has worked with partners and private landowners in the Oh Be Joyful Creek watershed to obtain support for instream flow water rights that will help ensure the flows

necessary to maintain the improving natural environment in Oh Be Joyful Creek. These partners have asked BLM to take the lead in making an instream flow recommendation for the creek to the Colorado Water Conservation Board.

The details of BLM's instream flow recommendation are outlined in the attachment to this letter. Data sheets, R2Cross output, fishery survey information, and photographs of the cross sections were included with BLM's draft recommendation in February 2013. If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940. We thank both the Division of Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

Sincerely,

Leigh Espy
Deputy State Director
Resources and Fire

Cc: Brian St. George, Gunnison Field Office
Andrew Breibart, Gunnison Field Office
Valori Armstrong, Southwest District

Enclosure

ENCLOSURE - DRAFT INSTREAM FLOW RECOMMENDATION FOR OH BE JOYFUL CREEK

Location and Land Status. On Be Joyful Creek originates near Hancock Peak, approximately eight miles northwest of Crested Butte, and flows into the Slate River approximately four miles north of Crested Butte. This recommendation covers the stream reach beginning at the confluence with the unnamed tributary that drains Peeler Basin and terminates at the confluence with the Slate River.

This stream reach covers a distance of approximately 1.8 miles. Within this reach, 0.8 miles are managed by the BLM, 0.7 miles are managed by the U.S. Forest Service, and 0.3 miles are in private ownership

Existing Instream Flow Water Rights. The CWCB currently holds the following water right on Oh Be Joyful Creek:

- Unnamed tributary to confluence with Slate River – 3.0 cfs, January 1 to December 31

Biological Summary. Oh Be Joyful Creek is a moderate gradient stream flowing through a canyon where bedrock restricts movement of the channel. The creek carries a heavy load of large diameter sediments, due to natural erosional processes that occur in this type of metamorphic geology. The substrate is generally moderate in size, ranging from gravels up to cobbles eight inches in diameter.

Fishery surveys have revealed self-sustaining populations of brook trout, with individuals up to nine inches in length. Although fish distribution data is lacking before the 1980s, wild trout have been document since that time. Colorado Parks and Wildlife have stocked the creek with 1 to 3-inch cutthroat trout during the 1970s. The recommended insteam flow reaches have numbers and biomass that are above average when compared to other streams in this area. However, other portions of the recommended segments have reduced habitat available and fish numbers because of the high bed load transport in this watershed, which results in poor pool development.

Comprehensive macroinvertebrate surveys have been performed on this creek. Compared to other streams in the Southern Rocky Mountains ecoregion, the surveys revealed an above average abundance of macroinvertebrates, but below average diversity. This is to be expected in a stream system that is affected by excessive heavy metal concentrations. The surveys also revealed that the creek is populated exclusively by taxa that are intolerant of other forms of water pollution, such as sediments and organic pollution. This indicates that the watershed is in good condition except for contributions of heavy metals by historic mining activities.

The riparian community consists of a blue spruce and willow community. The community is robust, provides good shading for the creek, and doesn't show signs of significant impairment from heavy metals. The nonconsumptive water needs assessment performed by the Basin Roundtable identified this stream segment as having significant riparian communities worthy of

protection.

R2Cross Analysis. BLM collected the following R2Cross data from Oh Be Joyful Creek:

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
09/29/2011 #1	3.25 cfs	38.2 feet	4.62 cfs	Out of range
09/29/2011 #2	2.94 cfs	34.2 feet	6.28 cfs	Out of range
06/07/2012 #1	49.0 cfs	42.7 feet	Out of range	20.83 cfs
		Averages:	5.45 cfs	20.83 cfs

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

> 5.45 cubic feet per second is recommended during the period from April 1 to April 30. Protecting this flow rate would require an increase of 2.45 cfs between April 1 and April 30. This recommendation is driven by water availability, and reflects the period when snowmelt is beginning. Given that very limited physical habitat is available during most of the year on this creek, any flows that provide expanded physical habitat should be protected.
>
> 20.8 cubic feet per second is recommended during the snowmelt runoff period between May 1 and July 15. Protecting this flow rate would require an increase of 17.8 cfs between May 1 and July 15. This recommendation is driven by the wetted perimeter criteria. This creek experiences consistently low flows during late summer and fall, so it is important to protect as much physical habitat as possible during the limited time when snowmelt runoff flows are available. In addition, protection of a higher flow rate will help scour fine sediments from important spawning areas.
>
> 5.45 cubic feet per second is recommended for the late summer period and fall, from July 16 to October 31. Protecting this flow rate would require an increase of 2.45 cfs between July 16 and October 31. This recommendation is driven by the wetted perimeter criteria and by water availability. The increased flow rate should help prevent excessively high temperatures and help ensure that sufficient physical habitat is available during the highest feeding and growth period of the year.
>
> BLM recommends that the current instream flow water right of 3.0 cfs for the period between November 1 and March 31 remain unchanged. The current instream flow water right appears to reflect the limited water availability during the winter months.

Water Availability. Although there is no gage data available for this creek, USGS gage 09111500 (Slate River near Crested Butte, CO) is located a few miles downstream. This stream gage incorporates inflow from Coal Creek and Washington Gulch. BLM recommends that a gage apportionment analysis be performed. It is important to note that Coal Creek and Washington Gulch drain watersheds that are lower in overall elevation than the Oh-Be-Joyful Creek watershed. Accordingly, a strict basin apportionment will be likely to slightly underestimate flows in Oh Be Joyful Creek. Given this limitation, BLM recommends also consulting the StreamStats package developed jointly between the U.S. Geological Survey and the CWCB.

BLM is not aware of any decreed water rights within or above the reach proposed for an increase.

LEVEL 2 - STREAM SURVEY (2 PASS REMOVAL)

SAVE | PRINT | PRINT | DONE

Water: **Oh Be Joyful Creek**
Location: East of Peeler Peak
Drainage: Slate River
Crew: Brauch, Golder
Notes:

Date: 9/18/2008
Water Code: 41929
UTM Zone: 13T
UTM X: 320652
UTM Y: 4309342
Station Length (ft): 246
Station Width (ft): 13.6

SUMMARY INFORMATION

Species	# Caught	% Catch	Min Size	Capture P	#/Mile	95% CI	#/Acre	95% CI	Lbs/Acre	95% CI
BRK	112	100	85	0.76	2550	191	1547	116	112	8

LENGTH FREQUENCY RECORD (cm)

Species	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	42-44	44-46	46-48	48-50	50-52	52-54	54-56	56-58	58-60	>60
BRK		1	29	4	11	26	17	25	17	13	3	1																			

BROOK TROUT

DONE

Water: Oh Be Joyful Creek
Location: East of Peeler Peak
Drainage: Slate River
Crew: Brauch, Golder
Notes:

Date: 9/18/2008
Water Code: 41929
UTM Zone: 13T
UTM X: 320652
UTM Y: 4309342
Station Length (ft): 246
Station Width (ft): 13.6

Metric

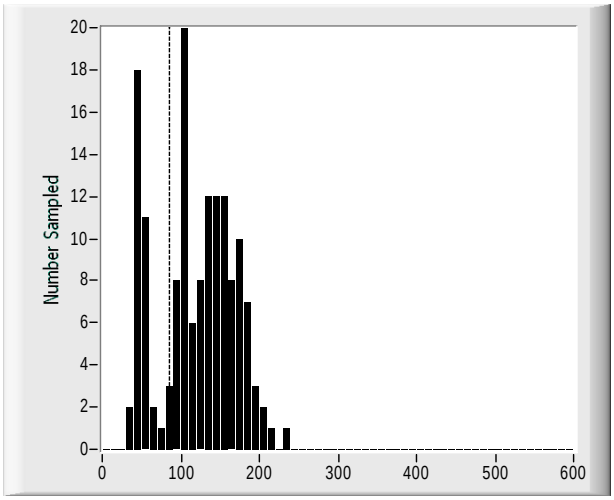
	Estimate	95% CI (+/-)
NUMBER/HA	3822	286
kg/HA	126	9
NUMBER/km	1584	118
kg/km	52	4

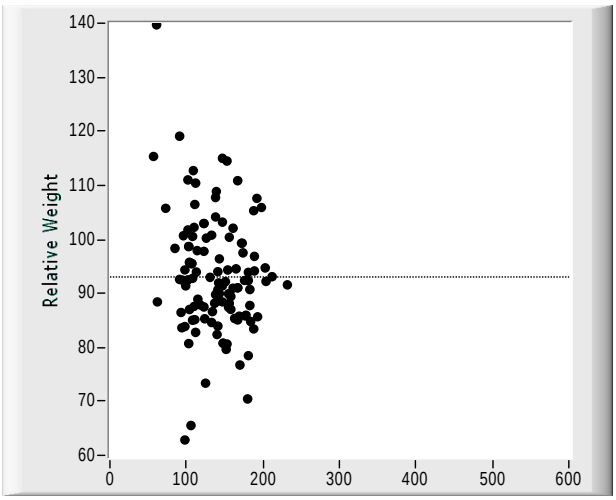
1st PASS	90
2nd PASS	22
Capture P	0.76
Pop Estimate	118.79
95% CI (+/-)	8.88

English

	Estimate	95% CI (+/-)
NUMBER/Acre	1547	116
Lbs/Acre	112	8
NUMBER/Mile	2550	191
Lbs/Mile	185	14

1st PASS	90
2nd PASS	22
Capture P	0.76
Pop Estimate	118.79
95% CI (+/-)	8.88

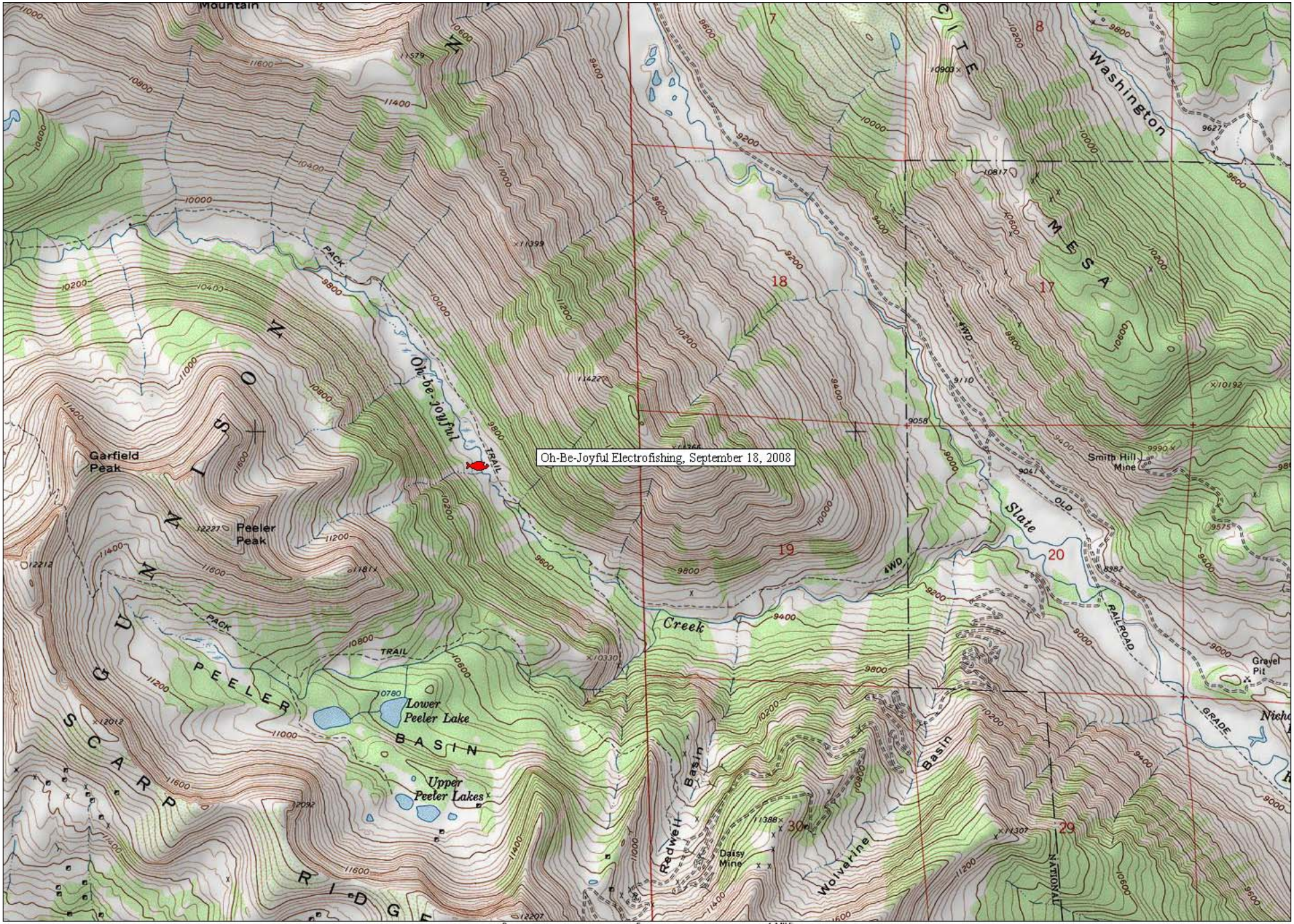




MIN CUT: 85
MAX CUT: -1

After

Length (mm)



TN 10½° MN

0 .5 1 MILE

0 1000 FEET 0 500 1000 METERS

Stream 2 Pass Electrofishing Survey Data

Team Name Ch-Be-Joyful Ck. Personnel CC, KK, JH, DB Date 18 Sept 08

Survey site _____ Station Length 75 M

	SPECIES	Total LENGTH	WEIGHT	SAMPLE NUMBER? fork length	PASS
1	BRK	142	28	135	1
2	BRK	146	35	142	1
3	BRK	176	52	171	1
4	BRK	187	61	180	1
5	BRK	139	24	132	1
6	BRK	64	-	61	1
7	BRK	122	17	118	1
8	BRK	166	46	159	1
9	BRK	187	77	180	1
10	BRK	182	61	177	1
11	BRK	231	129	222	1
12	BRK	191	84	184	1
13	BRK	183	58	178	1
14	BRK	197	91	189	1
15	BRK	141	27	134	1
16	BRK	160	51	172	1
17	BRK	188	72	183	1
18	BRK	168	45	161	1
19	BRK	153	37	148	1
20	BRK	203	87	197	1
21	BRK	155	36	149	1
22	BRK	133	22	127	1
23	BRK	202	88	192	1
24	BRK	197	68	184	1
25	BRK	173	56	167	1
26	BRK	160	41	154	1
27	BRK	164	46	158	1
28	BRK	138	31	132	1
29	BRK	171	55	162	1
30	BRK	160	61	172	1

Widths
3.2 m
4.1 m 31
4.0 M 32
5.8 M
3.6 M 33
4.14 34 avg

	SPECIES	Total LENGTH	WEIGHT	SAMPLE fork NUMBER? Length	PASS
35	BRK	179	45	173	1
36	BRK	188	70	179	1
37	BRK	169	41	164	1
38	BRK	177	53	169	1
39	BRK	180	60	174	1
40	BRK	182	59	176	1
41	BRK	122	19	116	1
42	BRK	101	11	95	1
43	BRK	97	8	92	1
44	BRK	166	46	158	1
45	BRK	152	31	146	1
46	BRK	150	34	142	1
47	BRK	52	-	50	1
48	BRK	109	12	103	1
49	BRK	141	28	134	1
50	BRK	146	30	139	1
51	BRK	155	41	150	1
52	BRK	147	28	140	1
53	BRK	123	17	119	1
54	BRK	125	21	121	1
55	BRK	140	27	133	1
56	BRK	137	29	134	1
57	BRK	124	15	119	1
58	BRK	132	25	126	1
59	BRK	166	43	162	1
60	BRK	140	28	135	1
61	BRK	152	44	147	1
62	BRK	97	6	93	1
63	BRK	147	36	138	1
64	BRK	157	38	152	

Stream 2 Pass Electrofishing Survey Data

Stream Name Oh-Be-Joyful Personnel _____ Date 18 Sept 08

Survey _____ Station Length _____

	SPECIES	Total LENGTH	WEIGHT	SAMPLE NUMBER? Fork Length	PASS
1	BRK	142	30	136	1
2	BRK	110	12	106	1
3	BRK	157	37	152	1
4	BRK	175	55	168	1
5	BRK	114	14	109	1
6	BRK	101	10	97	1
7	BRK	106	12	102	1
8	BRK	154	35	147	1
9	BRK	137	30	130	1
10	BRK	162	40	154	1
11	BRK	101	12	96	1
12	BRK	141	27	136	1
13	BRK	97	9	93	1
14	BRK	140	25	133	1
15	BRK	111	12	105	1
16	BRK	103	11	98	1
17	BRK	112	14	107	1
18	BRK	72	4	69	1
19	BRK	132	21	126	1
20	BRK	137	25	131	1
21	BRK	96	9	94	1
22	BRK	102	11	97	1
23	BRK	56	—	54	1
24	BRK	107	12	103	1
25	BRK	102	9	97	1
26	BRK	105	8	100	1
27	BRK	90	9	86	1
28	BRK	113	15	108	1
29	BRK	117	15	111	1
30	BRK	106	12	101	1

	SPECIES	Total LENGTH	WEIGHT	SAMPLE NUMBER? Fork Length	PASS
31	BRK	92	7	88	1
32	BRK	93	7	89	1
33	BRK	94	8	89	1
34	BRK	90	7	86	1
35	BRK	84	6	81	1
36	BRK	58	1	56	1
37	BRK	42	—	41	1
38	BRK	47	—	45	1
39	BRK	45	—	43	1
40	BRK	57	—	55	1
41	BRK	50	—	48	1
42	BRK	53	—	52	1
43	BRK	56	—	54	1
44	BRK	48	—	47	1
45	BRK	44	—	42	1
46	BRK	48	—	47	1
47	BRK	42	—	41	1
48	BRK	42	—	41	1
49	BRK	40	—	39	1
50	BRK	43	—	42	1
51	BRK	51	—	49	1
52	BRK	211	99	202	2
53	BRK	172	56	168	2
54	BRK	160	46	154	2
55	BRK	166	56	160	2
56	BRK	146	39	142	2
57	BRK	154	36	148	2
58	BRK	151	30	145	2
59	BRK	136	24	132	2
60	BRK	114	16	104	2

1 SOT:

Stream 2 Pass Electrofishing Survey Data

Stream Name Oh-Be-Joyful Ck Personnel _____ Date 18 Sep 08

Survey site _____ Station Length _____

	SPECIES	LENGTH	WEIGHT	SAMPLE NUMBER?	PASS
1	BRK	122	20	117	2
2	BRK	109	14	105	2
3	BRK	108	15	104	2
4	BRK	103	11	99	2
5	BRK	130	22	125	2
6	BRK	146	31	141	2
7	BRK	122	20	117	2
8	BRK	110	15	105	2
9	BRK	107	11	102	2
10	BRK	103	10	98	2
11	BRK	107	13	101	2
12	BRK	102	11	98	2
13	BRK	95	9	90	2
14	BRK	50	—	49	2
15	BRK	51	—	50	2
16	BRK	44	—	43	2
17	BRK	50	—	49	2
18	BRK	57	—	55	2
19	BRK	61	2	59	2
20	BRK	60	3	58	2
21	BRK	56	2	55	2
22	BRK	45	—	44	2
23	BRK	47	—	46	2
24	BRK	45	—	44	2
25	BRK	44	—	43	2
26	BRK	39	—	38	2
27	BRK	50	—	49	2
28					
29					
30					

	SPECIES	LENGTH	WEIGHT	SAMPLE NUMBER?	PASS
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Oh Be Joyful Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 400' upstream from conf. w/ Slade River						
DATE: 7-17-13	OBSERVERS: R. Smith, A. Breibart					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 20	TOWNSHIP: 13 N/S	RANGE: 86E/W	PM: 6th	
COUNTY: Gunnison	WATERSHED: East River	WATER DIVISION: 4	DOW WATER CODE: 41929			
MAP(S): USGS:	GPS Zone 13S 383911					
USFS:	4308775					

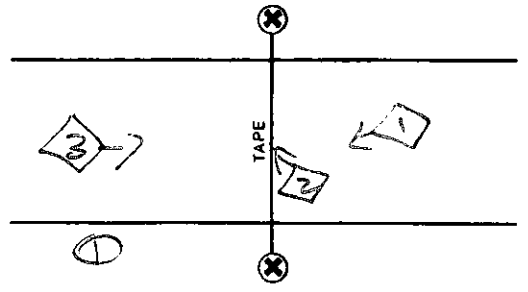
SUPPLEMENTAL DATA

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 8" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape @ Stake LB	0.0	surveyed
Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	4.70 / 4.70
② WS Upstream	12.3	4.66
③ WS Downstream	65.0	5.36
SLOPE	0.70 / 77.3 = 0.10	

SKETCH



LEGEND: Stake ⊗ Station ① Photo ◇ Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

pH = 8.04 Air Temp: 23° C
Temp = 16.1° C
DO = 6.08 85.1
Cond = 64.8

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Oh Be Joyful Creek	CROSS-SECTION NO: 1	DATE 7-17-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME 2:25 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS+G	0.8		2.35								
	3.0		3.15								
	7.0		3.94								
W	7.6		4.70								
	8.0		5.35	0.65				0.96			
	8.5		5.45	0.75				1.00			
	9.0		5.40	0.70				1.09			
	9.5		5.40	0.70				1.14			
	10.0		5.40	0.70				1.62			
	10.5		5.40	0.70				1.51			
	11.0		5.40	0.70				1.40			
	11.5		5.40	0.70				1.44			
	12.0		5.30	0.60				1.55			
	12.5		5.80	0.60				1.62			
	13.0		5.30	0.60				1.46			
	13.5		5.40	0.70				1.27			
	14.0		5.30	0.60				1.78			
	14.5		5.20	0.50				1.62			
	15.0		5.20	0.50				1.62			
	15.5		5.20	0.50				1.56			
	16.5		5.20	0.50				1.28			
	17.5		5.10	0.40				1.05			
	18.5		4.80	0.10				0.68			
	19.5		4.80	0.10				0			
	21.0		4.90	0.2				0.34			
	22.0		5.0	0.3				0.52			
	23.0		5.0	0.3				0.37			
	24.0		5.0	0.3				0.50			
	25.0		4.9	0.2				0.40			
	26.0		4.9	0.2				0.36			
	27.0		4.8	0.1				0.02			
	29.0		4.8	0.1				0			
W	30.9		4.70								
	34.0		4.45								
	43.4		3.86								
G	44.0		2.30								
LS	46.6		2.05								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Oh Be Joyful Creek
XS LOCATION:	400' upstream fr. conf. with Slate River
XS NUMBER:	1
DATE:	17-Jul-13
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SE NW
SECTION:	20
TWP:	13S
RANGE:	86W
PM:	Sixth
COUNTY:	Gunnison
WATERSHED:	East River
DIVISION:	4
DOW CODE:	41929
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:	0.1

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

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

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
XS NUMBER: 1

DATA POINTS= 37

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	RS & G	0.80	2.35			0.00		0.00	0.00	0.0%
		3.00	3.15			0.00		0.00	0.00	0.0%
		7.00	3.94			0.00		0.00	0.00	0.0%
	W	7.60	4.70	0.00	0.00	0.00		0.00	0.00	0.0%
		8.00	5.35	0.65	0.96	0.76	0.65	0.29	0.28	3.1%
		8.50	5.45	0.75	1.00	0.51	0.75	0.38	0.38	4.1%
		9.00	5.40	0.70	1.09	0.50	0.70	0.35	0.38	4.2%
		9.50	5.40	0.70	1.14	0.50	0.70	0.35	0.40	4.4%
		10.00	5.40	0.70	1.62	0.50	0.70	0.35	0.57	6.2%
		10.50	5.40	0.70	1.51	0.50	0.70	0.35	0.53	5.8%
		11.00	5.40	0.70	1.40	0.50	0.70	0.35	0.49	5.4%
		11.50	5.40	0.70	1.44	0.50	0.70	0.35	0.50	5.6%
		12.00	5.30	0.60	1.55	0.51	0.60	0.30	0.47	5.1%
		12.50	5.30	0.60	1.62	0.50	0.60	0.30	0.49	5.4%
		13.00	5.30	0.60	1.46	0.50	0.60	0.30	0.44	4.8%
		13.50	5.40	0.70	1.27	0.51	0.70	0.35	0.44	4.9%
		14.00	5.30	0.60	1.78	0.51	0.60	0.30	0.53	5.9%
		14.50	5.20	0.50	1.62	0.51	0.50	0.25	0.41	4.5%
		15.00	5.20	0.50	1.62	0.50	0.50	0.25	0.41	4.5%
		15.50	5.20	0.50	1.56	0.50	0.50	0.38	0.59	6.4%
		16.50	5.20	0.50	1.28	1.00	0.50	0.50	0.64	7.1%
		17.50	5.10	0.40	1.05	1.00	0.40	0.40	0.42	4.6%
		18.50	4.80	0.10	0.68	1.04	0.10	0.10	0.07	0.7%
		19.50	4.80	0.10	0.00	1.00	0.10	0.13	0.00	0.0%
		21.00	4.90	0.20	0.34	1.50	0.20	0.25	0.09	0.9%
		22.00	5.00	0.30	0.52	1.00	0.30	0.30	0.16	1.7%
		23.00	5.00	0.30	0.37	1.00	0.30	0.30	0.11	1.2%
		24.00	5.00	0.30	0.50	1.00	0.30	0.30	0.15	1.7%
		25.00	4.90	0.20	0.40	1.00	0.20	0.20	0.08	0.9%
		26.00	4.90	0.20	0.36	1.00	0.20	0.20	0.07	0.8%
		27.00	4.80	0.10	0.02	1.00	0.10	0.15	0.00	0.0%
		29.00	4.80	0.10	0.00	2.00	0.10	0.20	0.00	0.0%
	W	30.90	4.70	0.00	0.00	1.90		0.00	0.00	0.0%
		34.00	4.45			0.00		0.00	0.00	0.0%
		43.40	3.86			0.00		0.00	0.00	0.0%
1	G	44.00	2.30			0.00		0.00	0.00	0.0%
	LS	48.60	2.05			0.00		0.00	0.00	0.0%
	TOTALS ----------					23.79	0.75 (Max.)	8.21	9.07	100.0%

Manning's n = 0.2093
Hydraulic Radius= 0.34527831

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	8.21	8.21	0.0%
4.45	8.21	14.45	75.9%
4.47	8.21	13.92	69.5%
4.49	8.21	13.40	63.1%
4.51	8.21	12.88	56.8%
4.53	8.21	12.36	50.6%
4.55	8.21	11.86	44.4%
4.57	8.21	11.35	38.2%
4.59	8.21	10.86	32.2%
4.61	8.21	10.36	26.2%
4.63	8.21	9.88	20.3%
4.65	8.21	9.39	14.4%
4.66	8.21	9.16	11.5%
4.67	8.21	8.92	8.6%
4.68	8.21	8.68	5.7%
4.69	8.21	8.45	2.8%
4.70	8.21	8.21	0.0%
4.71	8.21	7.98	-2.8%
4.72	8.21	7.75	-5.6%
4.73	8.21	7.52	-8.4%
4.74	8.21	7.30	-11.2%
4.75	8.21	7.07	-13.9%
4.77	8.21	6.63	-19.3%
4.79	8.21	6.20	-24.6%
4.81	8.21	5.80	-29.4%
4.83	8.21	5.44	-33.7%
4.85	8.21	5.10	-37.9%
4.87	8.21	4.77	-41.9%
4.89	8.21	4.45	-45.8%
4.91	8.21	4.15	-49.5%
4.93	8.21	3.87	-52.9%
4.95	8.21	3.60	-56.2%

WATERLINE AT ZERO
AREA ERROR = 4.700

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
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	2.35	43.18	2.18	3.10	94.11	45.32	100.0%	2.08	343.91	3.65
	3.70	37.68	1.04	1.75	39.02	38.69	85.4%	1.01	88.11	2.26
	3.75	37.40	0.99	1.70	37.15	38.38	84.7%	0.97	81.60	2.20
	3.80	37.13	0.95	1.65	35.28	38.07	84.0%	0.93	75.30	2.13
	3.85	36.86	0.91	1.60	33.43	37.76	83.3%	0.89	69.21	2.07
	3.90	35.96	0.88	1.55	31.61	36.85	81.3%	0.86	64.07	2.03
	3.95	34.96	0.85	1.50	29.84	35.83	79.1%	0.83	59.29	1.99
	4.00	34.12	0.82	1.45	28.11	34.97	77.2%	0.80	54.56	1.94
	4.05	33.29	0.79	1.40	26.43	34.11	75.3%	0.77	50.04	1.89
	4.10	32.45	0.76	1.35	24.78	33.25	73.4%	0.75	45.74	1.85
	4.15	31.61	0.73	1.30	23.18	32.38	71.5%	0.72	41.64	1.80
	4.20	30.78	0.70	1.25	21.62	31.52	69.6%	0.69	37.75	1.75
	4.25	29.94	0.67	1.20	20.10	30.66	67.7%	0.66	34.06	1.69
	4.30	29.11	0.64	1.15	18.63	29.80	65.8%	0.63	30.57	1.64
	4.35	28.27	0.61	1.10	17.19	28.94	63.9%	0.59	27.28	1.59
	4.40	27.43	0.58	1.05	15.80	28.08	62.0%	0.56	24.18	1.53
	4.45	26.60	0.54	1.00	14.45	27.21	60.1%	0.53	21.27	1.47
	4.50	25.94	0.51	0.95	13.14	26.53	58.5%	0.50	18.46	1.41
	4.55	25.28	0.47	0.90	11.86	25.84	57.0%	0.46	15.83	1.34
	4.60	24.62	0.43	0.85	10.61	25.16	55.5%	0.42	13.39	1.26
	4.65	23.96	0.39	0.80	9.39	24.47	54.0%	0.38	11.14	1.19
WL	4.70	23.30	0.35	0.75	8.21	23.79	52.5%	0.35	9.07	1.10
	4.75	22.32	0.32	0.70	7.07	22.78	50.3%	0.31	7.28	1.03
	4.80	18.34	0.33	0.65	5.98	18.77	41.4%	0.32	6.26	1.05
	4.85	16.89	0.30	0.60	5.10	17.28	38.1%	0.30	5.07	1.00
	4.90	14.44	0.30	0.55	4.29	14.79	32.6%	0.29	4.22	0.98
	4.95	13.25	0.27	0.50	3.60	13.55	29.9%	0.27	3.34	0.93
	5.00	10.05	0.30	0.45	2.97	10.32	22.8%	0.29	2.90	0.98
	5.05	9.85	0.25	0.40	2.47	10.08	22.2%	0.24	2.17	0.88
	5.10	9.65	0.21	0.35	1.98	9.85	21.7%	0.20	1.53	0.77
	5.15	9.12	0.17	0.30	1.51	9.29	20.5%	0.16	1.01	0.67
	5.20	6.59	0.16	0.25	1.07	6.73	14.8%	0.16	0.70	0.66
	5.25	6.31	0.12	0.20	0.75	6.41	14.2%	0.12	0.40	0.54
	5.30	5.03	0.09	0.15	0.44	5.10	11.3%	0.09	0.19	0.44
	5.35	4.25	0.05	0.10	0.21	4.28	9.4%	0.05	0.06	0.30
	5.40	0.75	0.02	0.05	0.02	0.76	1.7%	0.02	0.00	0.19

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	9.07	cfs
CALCULATED FLOW (Qc)=	9.07	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.70	ft
CALCULATED WATERLINE (WLc)=	4.70	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.75	ft
MAX CALCULATED DEPTH (Dc)=	0.75	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.10	ft/sec
MANNING'S N=	0.209	
SLOPE=	0.1	ft/ft
.4 * Qm =	3.6	cfs
2.5 * Qm=	22.7	cfs

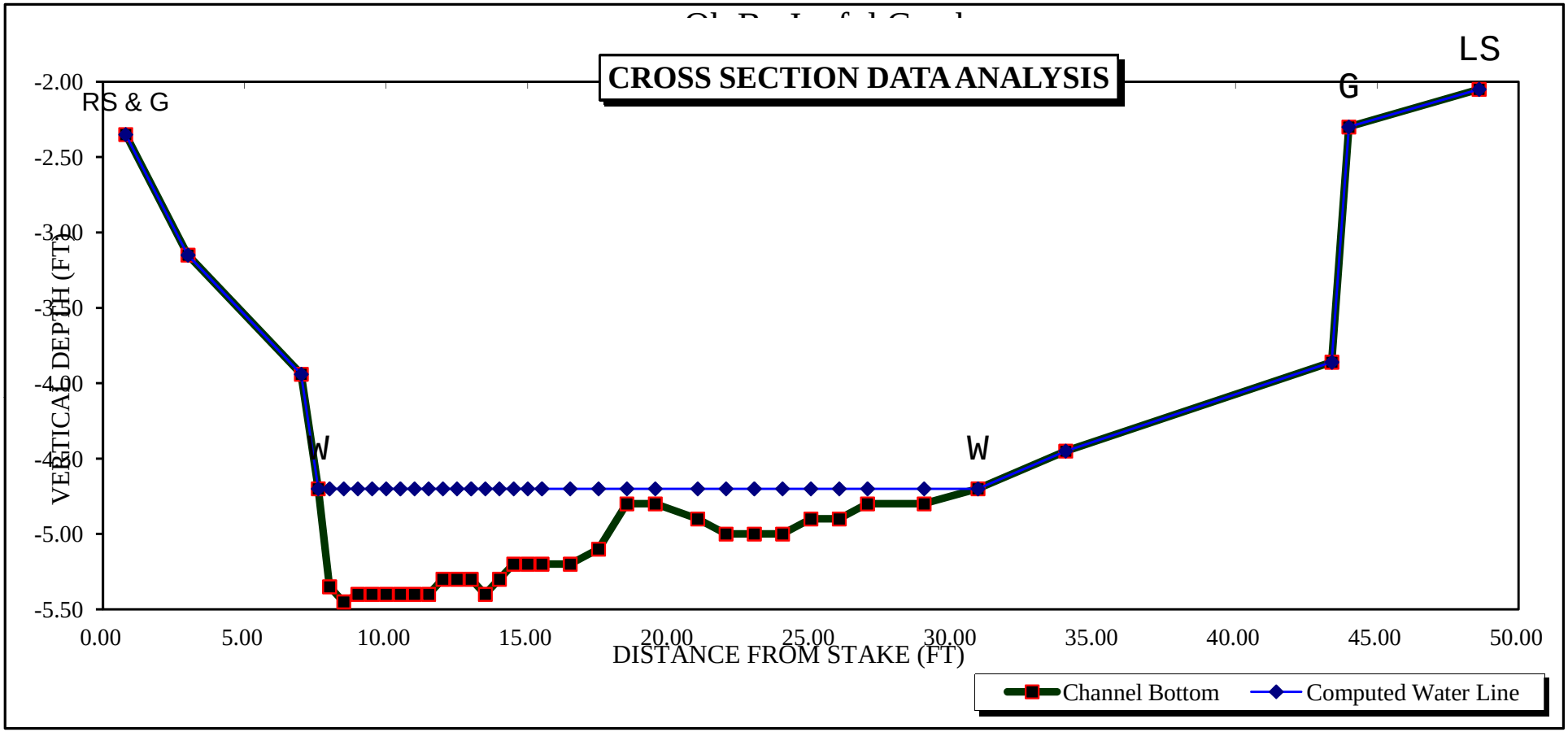
RECOMMENDED INSTREAM FLOW:
============================

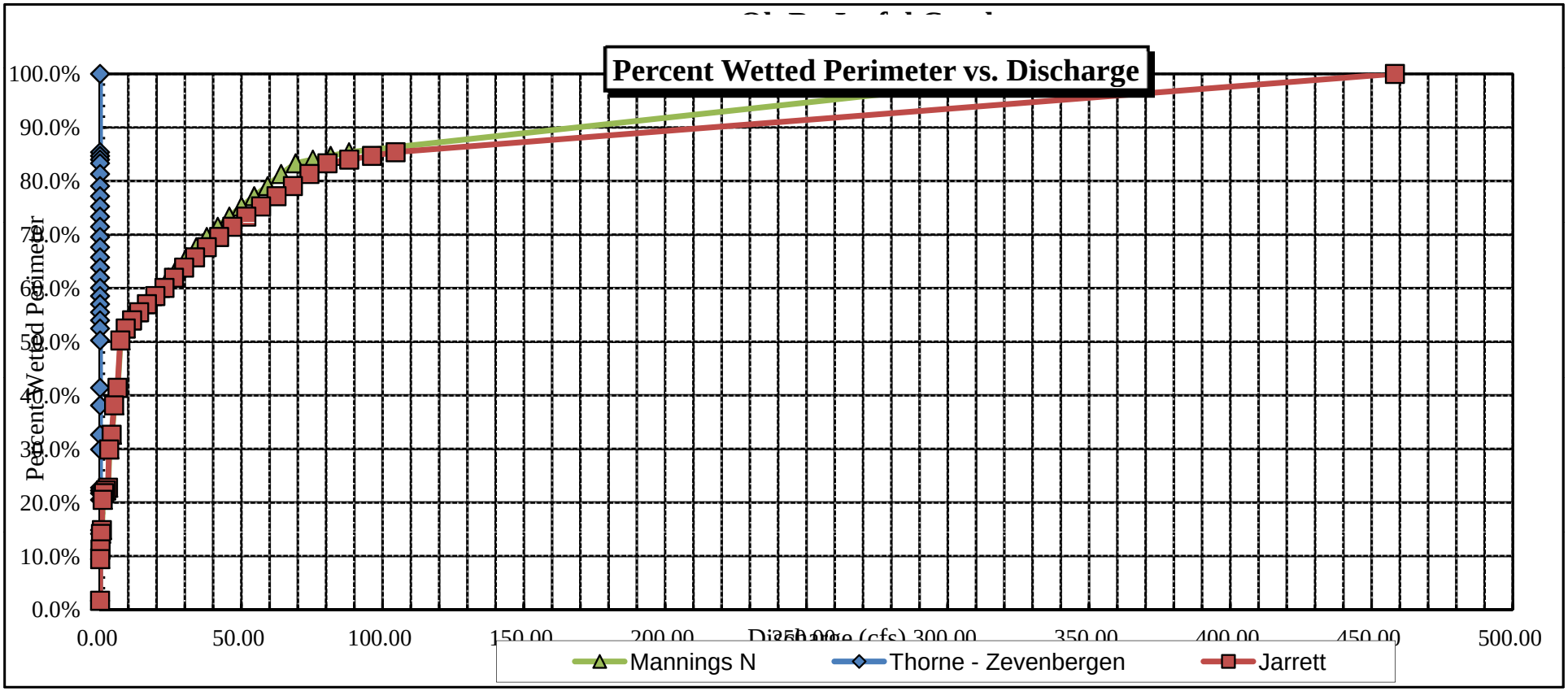
FLOW (CFS)	PERIOD
___________________	__________________
___________________	__________________
___________________	__________________
___________________	__________________

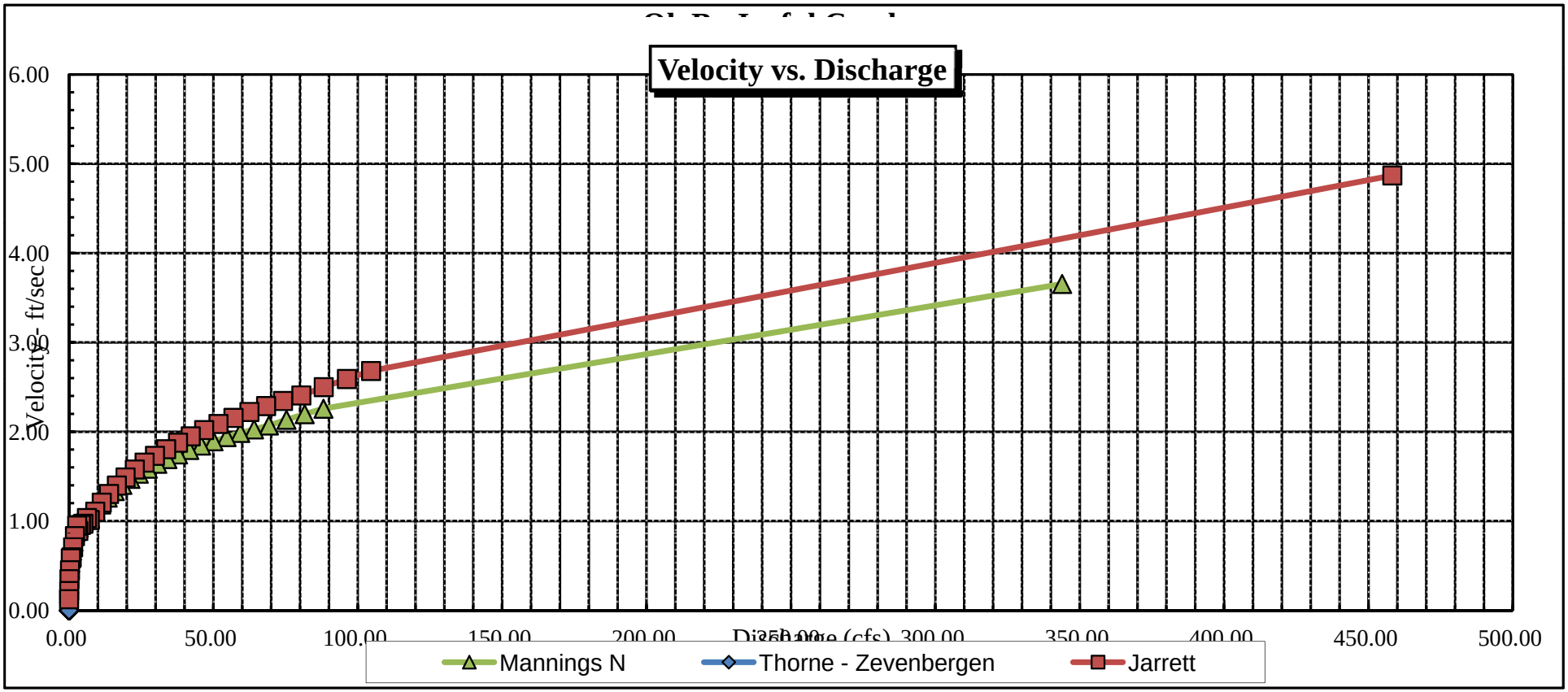
RATIONALE FOR RECOMMENDATION:
============================

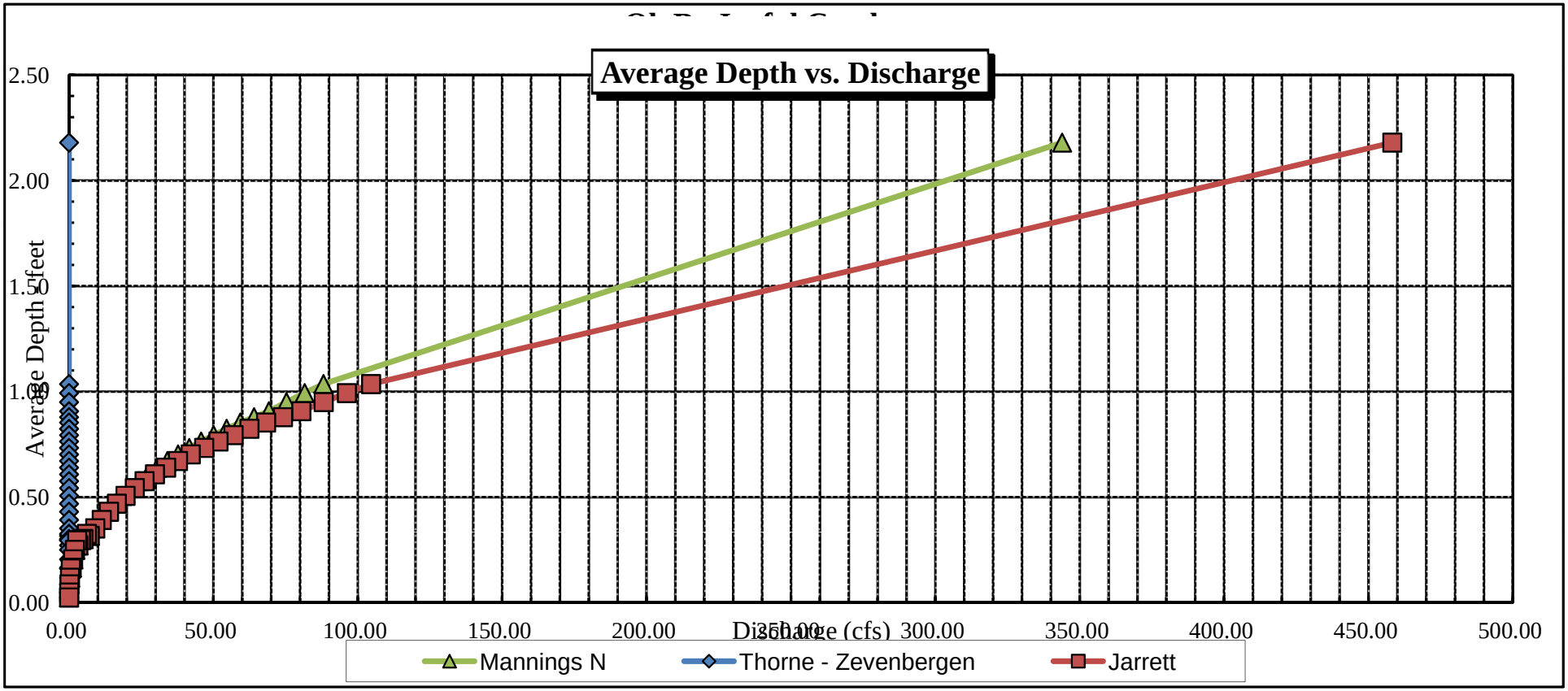
RECOMMENDATION BY: ……………………...………..……............................... AGENCY...………………………......……...…...……....... DATE:......…...…......……………

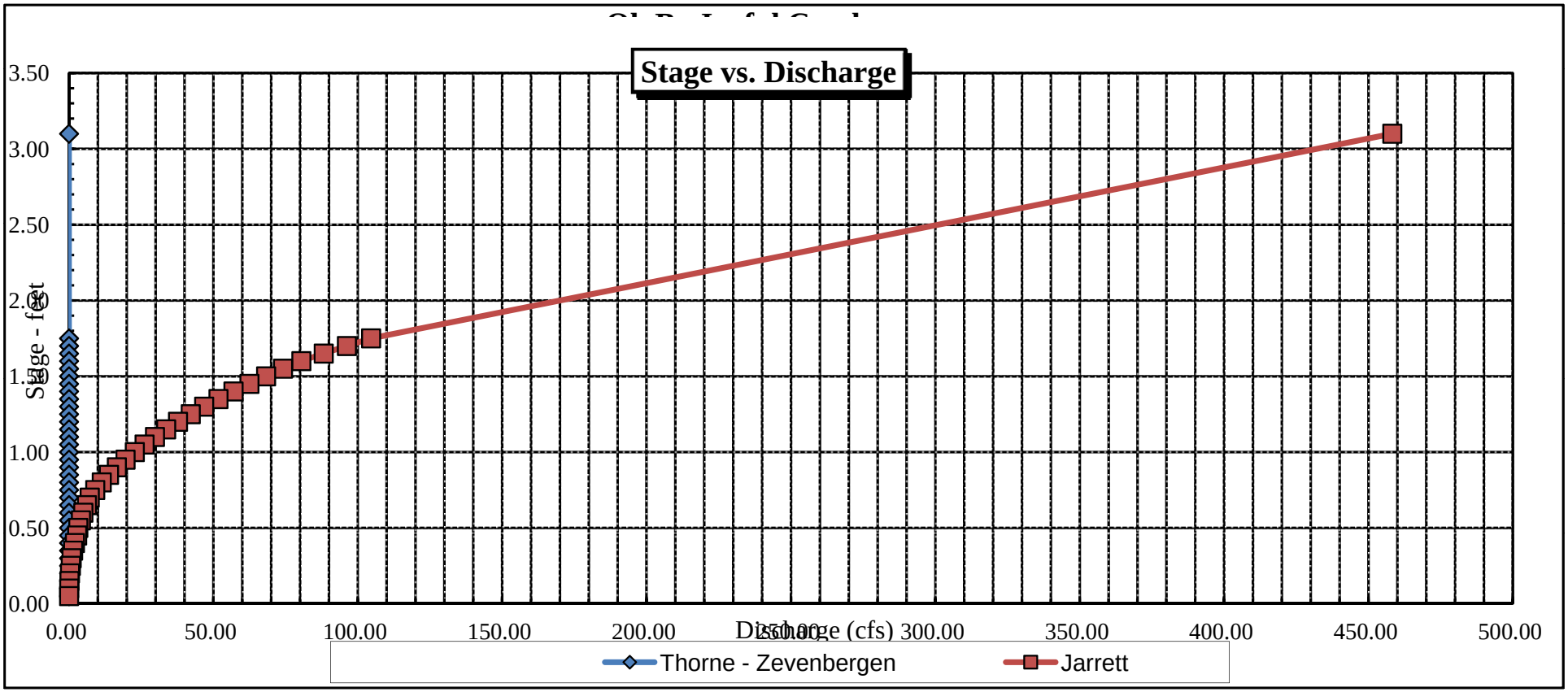
CWCB REVIEW BY: ..……………………………....………………………………………………………...…............. DATE:.................…………….....


CROSS SECTION DATA ANALYSIS
RS & G
W
W
G
LS
-2.00
-2.50
-3.00
-4.00
-5.00
-5.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
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
150.00
200.00
Discharge (cfs)
300.00
350.00
400.00
450.00
500.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
50.00
100.00
150.00
200.00
300.00
350.00
400.00
450.00
500.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
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
350.00
400.00
450.00
500.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
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
300.00
350.00
400.00
450.00
500.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Oh-Be-Joyful Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 400 ft. upstream from confluence with Slate River						
DATE: 9-29-11	OBSERVERS: R. Smith, A. Breidenthal					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 20	TOWNSHIP: 13 N(S)	RANGE: 86 E(W)	PM: Sixth	
COUNTY: Gunnison	WATERSHED: East River	WATER DIVISION: 4	DOW WATER CODE: 41929			
MAP(S): USGS:						
USFS:						

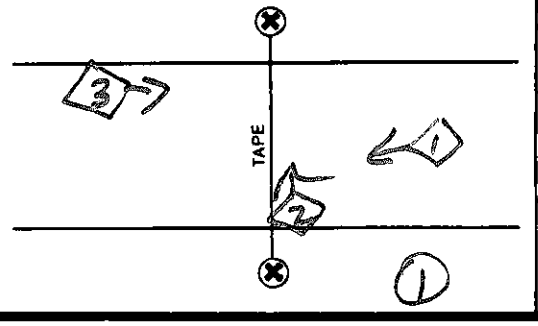
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: Marsh McBirney			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 2 to 8" cobbles	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	3.78 / 3.46
② WS Upstream	8.0	3.88
③ WS Downstream	47.0	4.52
SLOPE	0.64/55.0 = .012	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

Ph = 7.3
Temp: 20°C
Cond = 75
Salinity = 0

Ø = Zero
7 = Seven

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Oh Be Joyful Creek	CROSS-SECTION NO:	DATE: 9/29/11	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 0930

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		1.42								
G	5.0		2.62								
	7.0		2.89								
W	7.2		3.96								
	7.5		4.1	0.15					Ø		
	8.0		4.2	0.25					Ø		
	8.5		4.3	0.35					0.03		
	9.0		4.3	0.35					1.39		
	9.5		4.25	0.30					1.86		
	10.0		4.2	0.25					1.80		
	10.5		4.2	0.25					1.70		
	11.0		4.25	0.30					1.59		
	11.5		4.20	0.25					1.66		
	12.0		4.2	0.25					1.51		
	12.5		4.2	0.25					1.50		
	13.0		4.1	0.15					1.25		
	13.5		4.25	0.30					1.47		
	14.0		4.2	0.25					1.37		
	14.5		4.35	0.40					1.63		
	15.0		4.3	0.30					1.65		
	15.5		4.2	0.25					1.61		
	16.0		4.2	0.20					0.72		
	16.5		4.2	0.20					0.54		
	17.0		4.2	0.20					0.34		
	17.5		4.1	0.10					0.57		
	18.0		4.1	0.10					0.24		
	18.5		4.05	0.05					0.0		
W	19.2		3.98								
	23.2		3.92								
	28.0		3.80								
	36		3.46								
	112		2.72								
G	43.1		2.78								
TOTALS	43.4										

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

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

LOCATION INFORMATION

STREAM NAME:	Oh-Be-Joyful Creek
XS LOCATION:	400 ft upst fr confluence w/ Slate R.
XS NUMBER:	1
DATE:	29-Sep-11
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SE NW
SECTION:	20
TWP:	13S
RANGE:	86W
PM:	Sixth
COUNTY:	Gunnison
WATERSHED:	East River
DIVISION:	4
DOW CODE:	41929
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:	0.012

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

ASSIGNED TO: ….....…….....DATE.....

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 400 ft upst fr confluence w/ Slate R.
XS NUMBER: 1

DATA POINTS= 34

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	1.42			0.00		0.00	0.00	0.0%
1 G	5.00	2.62			0.00		0.00	0.00	0.0%
	7.00	2.89			0.00		0.00	0.00	0.0%
W	7.20	3.96	0.00	0.00	0.00		0.00	0.00	0.0%
	7.50	4.10	0.15	0.00	0.33	0.15	0.06	0.00	0.0%
	8.00	4.20	0.25	0.00	0.51	0.25	0.13	0.00	0.0%
	8.50	4.30	0.35	0.03	0.51	0.35	0.18	0.01	0.2%
	9.00	4.30	0.35	1.39	0.50	0.35	0.18	0.24	7.5%
	9.50	4.25	0.30	1.86	0.50	0.30	0.15	0.28	8.6%
	10.00	4.20	0.25	1.80	0.50	0.25	0.13	0.23	6.9%
	10.50	4.20	0.25	1.70	0.50	0.25	0.13	0.21	6.5%
	11.00	4.25	0.30	1.59	0.50	0.30	0.15	0.24	7.3%
	11.50	4.20	0.25	1.66	0.50	0.25	0.13	0.21	6.4%
	12.00	4.20	0.25	1.51	0.50	0.25	0.13	0.19	5.8%
	12.50	4.20	0.25	1.50	0.50	0.25	0.13	0.19	5.8%
	13.00	4.10	0.15	1.25	0.51	0.15	0.08	0.09	2.9%
	13.50	4.25	0.30	1.47	0.52	0.30	0.15	0.22	6.8%
	14.00	4.20	0.25	1.37	0.50	0.25	0.13	0.17	5.3%
	14.50	4.35	0.40	1.63	0.52	0.40	0.20	0.33	10.0%
	15.00	4.30	0.30	1.65	0.50	0.30	0.15	0.25	7.6%
	15.50	4.20	0.25	1.61	0.51	0.25	0.13	0.20	6.2%
	16.00	4.20	0.20	0.72	0.50	0.20	0.10	0.07	2.2%
	16.50	4.20	0.20	0.54	0.50	0.20	0.10	0.05	1.7%
	17.00	4.20	0.20	0.34	0.50	0.20	0.10	0.03	1.0%
	17.50	4.10	0.10	0.57	0.51	0.10	0.05	0.03	0.9%
	18.00	4.10	0.10	0.24	0.50	0.10	0.05	0.01	0.4%
	18.50	4.05	0.05	0.00	0.50	0.05	0.03	0.00	0.0%
W	19.20	3.98	0.00	0.00	0.70		0.00	0.00	0.0%
	23.50	3.92			0.00		0.00	0.00	0.0%
	28.00	3.88			0.00		0.00	0.00	0.0%
	36.00	3.46			0.00		0.00	0.00	0.0%
	42.00	3.22			0.00		0.00	0.00	0.0%
G	43.10	2.78			0.00		0.00	0.00	0.0%
1 LS	43.40	1.72			0.00		0.00	0.00	0.0%
TOTALS ----------					12.15	0.4 (Max.)	2.72	3.25	100.0%

Manning's n = 0.0501
Hydraulic Radius= 0.22353872

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 400 ft upst fr confluence w/ Slate R.
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.72	2.67	-1.6%
3.72	2.72	7.72	184.2%
3.74	2.72	7.24	166.7%
3.76	2.72	6.77	149.5%
3.78	2.72	6.32	132.6%
3.80	2.72	5.87	116.0%
3.82	2.72	5.42	99.7%
3.84	2.72	4.99	83.7%
3.86	2.72	4.56	67.9%
3.88	2.72	4.14	52.4%
3.90	2.72	3.74	37.9%
3.92	2.72	3.40	25.1%
3.93	2.72	3.24	19.2%
3.94	2.72	3.08	13.6%
3.95	2.72	2.94	8.3%
3.96	2.72	2.80	3.2%
3.97	2.72	2.67	-1.6%
3.98	2.72	2.55	-6.2%
3.99	2.72	2.43	-10.6%
4.00	2.72	2.31	-14.9%
4.01	2.72	2.19	-19.2%
4.02	2.72	2.08	-23.4%
4.04	2.72	1.85	-31.8%
4.06	2.72	1.63	-40.0%
4.08	2.72	1.41	-48.0%
4.10	2.72	1.20	-55.8%
4.12	2.72	1.00	-63.0%
4.14	2.72	0.81	-70.0%
4.16	2.72	0.63	-76.7%
4.18	2.72	0.46	-83.1%
4.20	2.72	0.29	-89.3%
4.22	2.72	0.20	-92.6%

WATERLINE AT ZERO
AREA ERROR = 3.967

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 400 ft upst fr confluence w/ Slate R.
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	2.62	38.15	1.15	1.73	43.92	39.42	100.0%	1.11	153.31	3.49
	2.97	35.62	0.88	1.38	31.18	36.65	93.0%	0.85	90.90	2.92
	3.02	35.48	0.83	1.33	29.40	36.47	92.5%	0.81	82.71	2.81
	3.07	35.35	0.78	1.28	27.63	36.28	92.0%	0.76	74.83	2.71
	3.12	35.22	0.73	1.23	25.86	36.10	91.6%	0.72	67.27	2.60
	3.17	35.08	0.69	1.18	24.11	35.91	91.1%	0.67	60.03	2.49
	3.22	34.95	0.64	1.13	22.36	35.73	90.6%	0.63	53.12	2.38
	3.27	33.76	0.61	1.08	20.64	34.50	87.5%	0.60	47.58	2.31
	3.32	32.50	0.58	1.03	18.98	33.20	84.2%	0.57	42.46	2.24
	3.37	31.25	0.56	0.98	17.39	31.90	80.9%	0.55	37.68	2.17
	3.42	29.99	0.53	0.93	15.85	30.60	77.6%	0.52	33.22	2.10
	3.47	28.77	0.50	0.88	14.39	29.33	74.4%	0.49	29.06	2.02
	3.52	27.80	0.47	0.83	12.97	28.33	71.9%	0.46	25.03	1.93
	3.57	26.84	0.43	0.78	11.61	27.32	69.3%	0.42	21.30	1.84
	3.62	25.88	0.40	0.73	10.29	26.32	66.8%	0.39	17.87	1.74
	3.67	24.92	0.36	0.68	9.02	25.31	64.2%	0.36	14.72	1.63
	3.72	23.96	0.33	0.63	7.80	24.31	61.7%	0.32	11.86	1.52
	3.77	23.00	0.29	0.58	6.62	23.31	59.1%	0.28	9.30	1.40
	3.82	22.03	0.25	0.53	5.50	22.30	56.6%	0.25	7.02	1.28
	3.87	21.07	0.21	0.48	4.42	21.30	54.0%	0.21	5.03	1.14
	3.92	16.69	0.21	0.43	3.45	16.87	42.8%	0.20	3.89	1.13
WL	3.97	12.95	0.21	0.38	2.71	13.09	33.2%	0.21	3.09	1.14
	4.02	11.51	0.18	0.33	2.12	11.64	29.5%	0.18	2.21	1.04
	4.07	10.91	0.14	0.28	1.56	11.02	28.0%	0.14	1.37	0.88
	4.12	9.70	0.11	0.23	1.04	9.80	24.9%	0.11	0.75	0.73
	4.17	8.78	0.07	0.18	0.57	8.86	22.5%	0.06	0.30	0.52
	4.22	4.23	0.05	0.13	0.21	4.28	10.9%	0.05	0.09	0.44
	4.27	1.95	0.04	0.08	0.07	1.97	5.0%	0.03	0.02	0.35
	4.32	0.45	0.02	0.03	0.01	0.45	1.1%	0.02	0.00	0.21

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 400 ft upst fr confluence w/ Slate R.
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	3.25	cfs
CALCULATED FLOW (Qc)=	3.09	cfs
(Qm-Qc)/Qm * 100 =	4.9	%
MEASURED WATERLINE (WLm)=	3.97	ft
CALCULATED WATERLINE (WLc)=	3.97	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.38	ft
(Dm-Dc)/Dm * 100	4.2	%
MEAN VELOCITY=	1.14	ft/sec
MANNING'S N=	0.050	
SLOPE=	0.012	ft/ft
.4 * Qm =	1.3	cfs
2.5 * Qm=	8.1	cfs

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

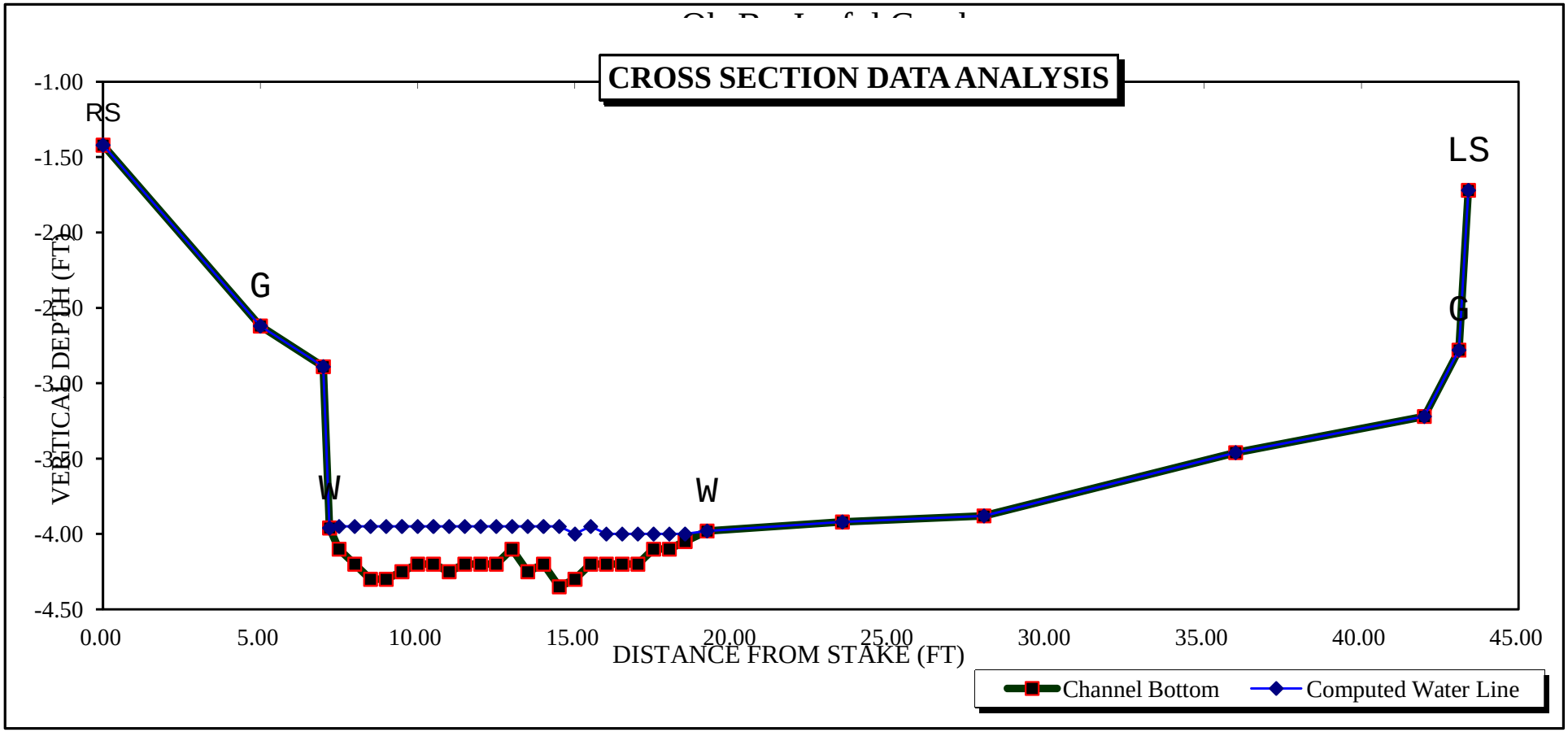
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

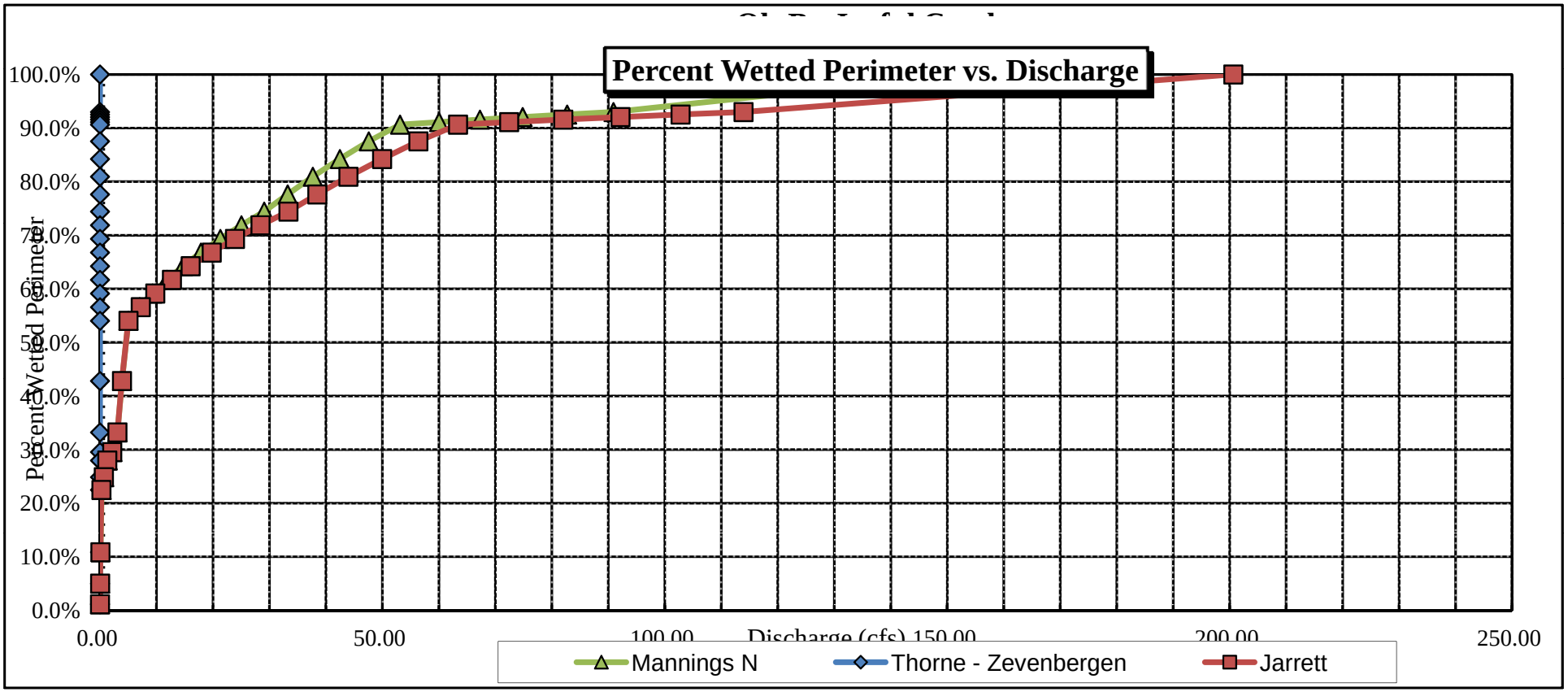
RATIONALE FOR RECOMMENDATION:
==========

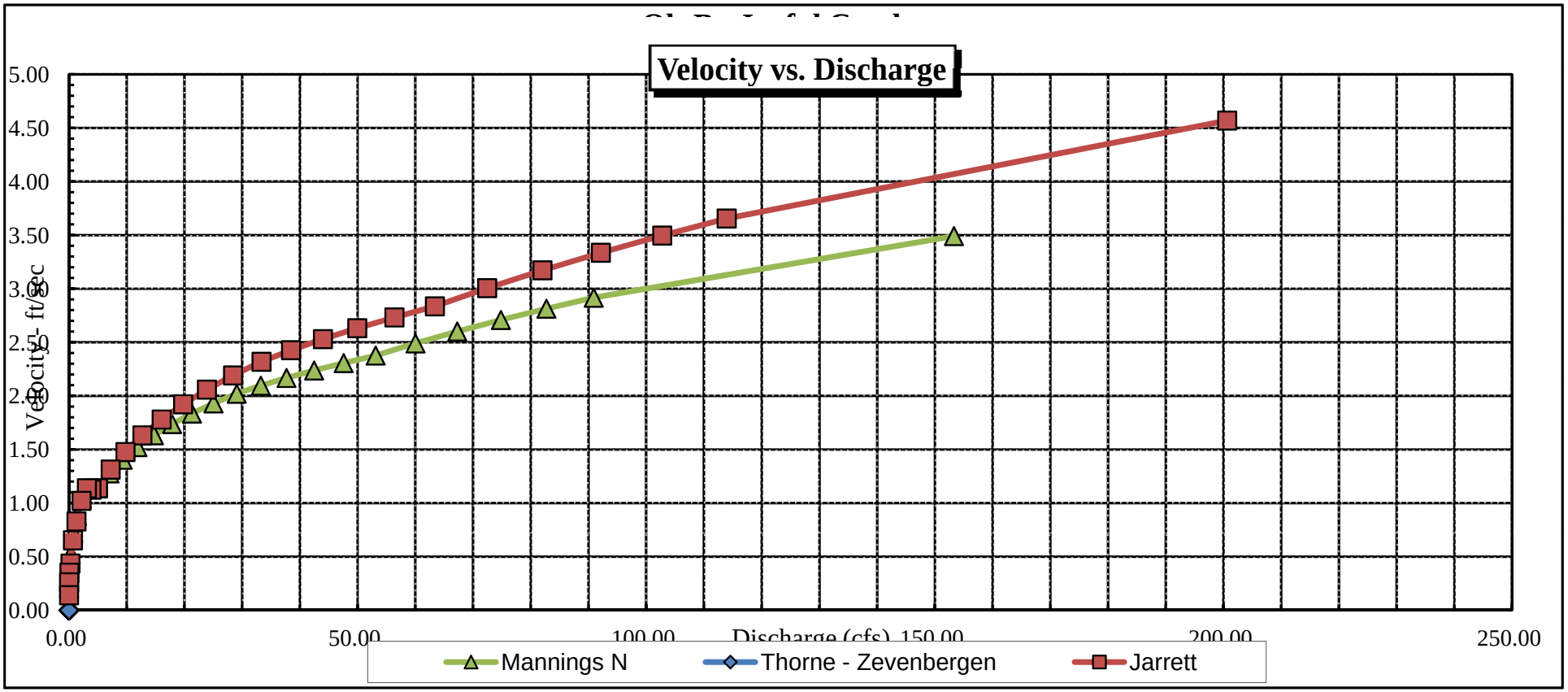
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

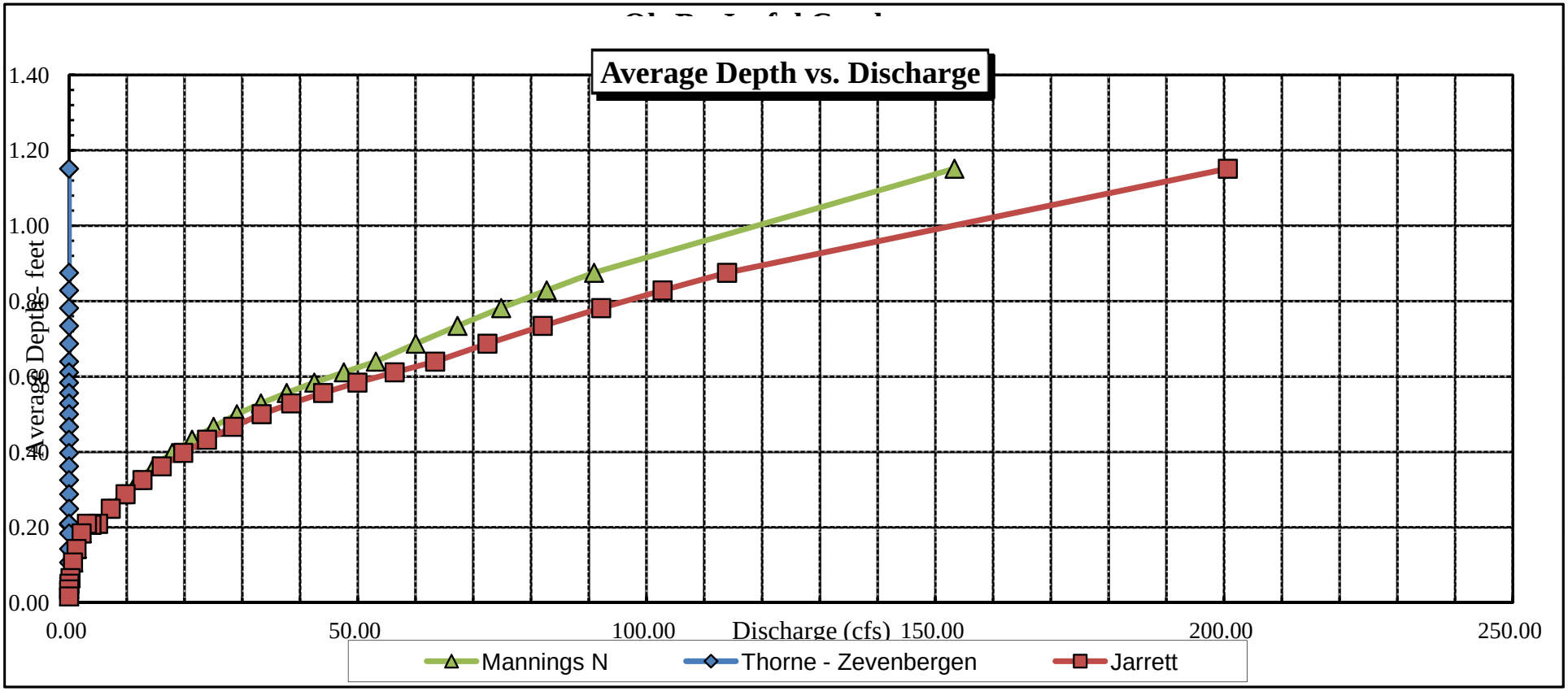
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

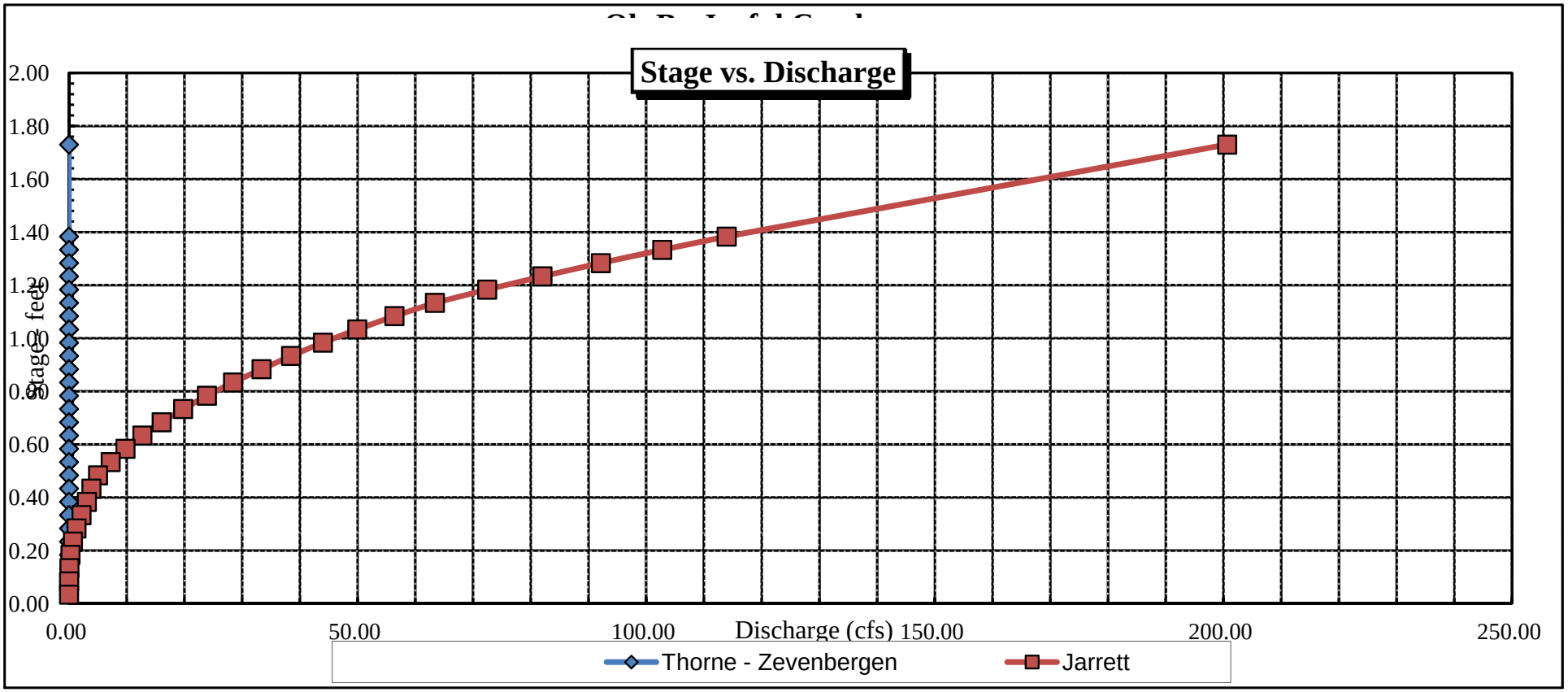
CWCB REVIEW BY: ..... DATE:.....


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
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
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Velocity - ft/sec
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


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


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
50.00
100.00
Discharge (cfs) 150.00
200.00
250.00
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Oh-Be-Joyful Creek						CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 200' upstream from conf. w/ Slate River							
DATE: 6-7-12	OBSERVERS: R. Smith, A. Breidart						
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 20	TOWNSHIP: 13 N/S	RANGE: 86 E/W	PM: 6th		
COUNTY: Gunnison	WATERSHED: East River	WATER DIVISION: 4	DOW WATER CODE: 41928				
MAP(S):	USGS:						
	USFS:						

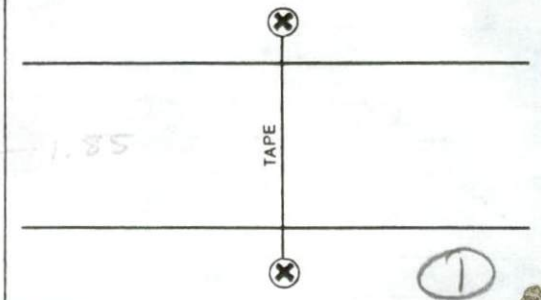
SUPPLEMENTAL DATA

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 6" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.10 / 5.08
② WS Upstream	27.0	5.20
③ WS Downstream	29.0	4.92
SLOPE	0.28 / 56.0 =	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

PH = 5.91
Cond = 37
Temp = 13.7°C
Salinity = 0

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Oh-Be-Joyful Creek	CROSS-SECTION NO.:	DATE: 6-7-12	SHEET ___ OF ___

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 4:35 p.m.

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		2.82								
G	1.6		3.55								
G	1.65		4.22								
W	1.7		5.08								
	2		5.9	0.8				1.37			
	3.5		5.95	0.85				1.13			
	5		6.10	1.0				1.66			
	6.5		6.20	1.1				1.13			
	8		6.35	1.25				1.75			
	9.5		6.35	1.25				1.71			
	11		6.20	1.10				2.84			
	12.5		6.15	1.05				2.85			
	14		6.05	0.95				2.75			
	15.5		5.95	0.85				2.54			
	17		5.75	0.65				2.84			
	18.5		5.7	0.60				2.35			
	20		5.7	0.60				2.61			
	21.5		5.7	0.60				2.63			
	23		6.0	0.90				2.60			
	24.5		6.0	0.90				2.95			
	26		5.85	0.75				1.38			
	27.5		5.7	0.60				1.80			
	29		5.45	0.35				1.43			
	30.3										
W	30.4		5.10								
	31.0		4.68								
LS & G	45.0		3.48								
	45.5		3.66								
TOTALS											

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

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

LOCATION INFORMATION

STREAM NAME:	Oh Be Joyful Creek
XS LOCATION:	300' upstream fr conf. w/ Slate river
XS NUMBER:	1
DATE:	7-Jun-12
OBSERVERS:	R. Smith, A Breibart
1/4 SEC:	SE NW
SECTION:	20
TWP:	13S
RANGE:	86W
PM:	Sixth
COUNTY:	Gunnison
WATERSHED:	East River
DIVISION:	4
DOW CODE:	41929
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:	0.0076

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

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

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 300' upstream fr conf. w/ Slate river
XS NUMBER: 1

DATA POINTS= 32

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	2.45			0.00		0.00	0.00	0.0%
1	G	1.80	3.05			0.00		0.00	0.00	0.0%
		1.90	4.23			0.00		0.00	0.00	0.0%
		5.60	4.00			0.00		0.00	0.00	0.0%
		8.20	4.21			0.00		0.00	0.00	0.0%
	W	9.50	4.65	0.00	0.00	0.00		0.00	0.00	0.0%
		10.00	6.35	1.65	2.55	1.77	1.65	1.65	4.21	8.6%
		11.50	6.00	1.30	3.03	1.54	1.30	1.95	5.91	12.1%
		13.00	5.95	1.25	3.20	1.50	1.25	1.88	6.00	12.2%
		14.50	5.70	1.00	2.98	1.52	1.00	1.50	4.47	9.1%
		16.00	5.60	0.90	2.88	1.50	0.90	1.35	3.89	7.9%
		17.50	5.60	0.90	2.42	1.50	0.90	1.35	3.27	6.7%
		19.00	5.40	0.70	2.27	1.51	0.70	1.05	2.38	4.9%
		20.50	5.30	0.60	2.00	1.50	0.60	0.90	1.80	3.7%
		22.00	5.30	0.60	2.47	1.50	0.60	0.90	2.22	4.5%
		23.50	5.30	0.60	2.17	1.50	0.60	0.90	1.95	4.0%
		25.00	5.30	0.60	2.15	1.50	0.60	0.90	1.94	3.9%
		26.50	5.30	0.60	2.53	1.50	0.60	0.90	2.28	4.6%
		28.00	5.40	0.70	2.17	1.50	0.70	1.05	2.28	4.7%
		29.50	5.35	0.65	1.76	1.50	0.65	0.98	1.72	3.5%
		31.00	5.20	0.50	2.06	1.51	0.50	0.75	1.55	3.2%
		32.50	5.10	0.40	1.57	1.50	0.40	0.60	0.94	1.9%
		34.00	5.05	0.35	1.56	1.50	0.35	0.53	0.82	1.7%
		35.50	5.05	0.35	0.74	1.50	0.35	0.53	0.39	0.8%
		37.00	5.00	0.30	1.05	1.50	0.30	0.45	0.47	1.0%
		38.50	4.90	0.20	1.14	1.50	0.20	0.30	0.34	0.7%
		40.00	4.85	0.15	0.80	1.50	0.15	0.23	0.18	0.4%
		41.50	4.80	0.10	0.00	1.50	0.10	0.15	0.00	0.0%
	W	43.00	4.70	0.00	0.00	1.50		0.00	0.00	0.0%
		44.40	4.36			0.00		0.00	0.00	0.0%
1	G	44.50	2.95			0.00		0.00	0.00	0.0%
	LS	48.80	2.05			0.00		0.00	0.00	0.0%
	TOTALS ----------					34.88	1.65 (Max.)	20.78	49.00	100.0%

Manning's n = 0.0389
Hydraulic Radius= 0.5956354

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 300' upstream fr conf. w/ Slate river
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	20.78	21.60	4.0%
4.43	20.78	30.21	45.4%
4.45	20.78	29.50	42.0%
4.47	20.78	28.80	38.6%
4.49	20.78	28.10	35.3%
4.51	20.78	27.40	31.9%
4.53	20.78	26.71	28.6%
4.55	20.78	26.02	25.3%
4.57	20.78	25.33	21.9%
4.59	20.78	24.65	18.6%
4.61	20.78	23.97	15.4%
4.63	20.78	23.29	12.1%
4.64	20.78	22.95	10.5%
4.65	20.78	22.61	8.8%
4.66	20.78	22.27	7.2%
4.67	20.78	21.94	5.6%
4.68	20.78	21.60	4.0%
4.69	20.78	21.27	2.4%
4.70	20.78	20.93	0.7%
4.71	20.78	20.60	-0.9%
4.72	20.78	20.26	-2.5%
4.73	20.78	19.93	-4.1%
4.75	20.78	19.27	-7.2%
4.77	20.78	18.62	-10.4%
4.79	20.78	17.97	-13.5%
4.81	20.78	17.33	-16.6%
4.83	20.78	16.70	-19.6%
4.85	20.78	16.08	-22.6%
4.87	20.78	15.48	-25.5%
4.89	20.78	14.88	-28.4%
4.91	20.78	14.30	-31.2%
4.93	20.78	13.73	-33.9%

WATERLINE AT ZERO
AREA ERROR = 4.700

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 300' upstream fr conf. w/ Slate river
XS NUMBER: 1

Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.05	42.69	2.03	3.30	86.71	46.50	100.0%	1.86	437.60	5.05
	3.70	42.59	1.39	2.65	59.00	45.20	97.2%	1.31	234.79	3.98
	3.75	42.58	1.34	2.60	56.88	45.10	97.0%	1.26	221.17	3.89
	3.80	42.58	1.29	2.55	54.75	45.00	96.8%	1.22	207.85	3.80
	3.85	42.57	1.24	2.50	52.62	44.90	96.6%	1.17	194.85	3.70
	3.90	42.56	1.19	2.45	50.49	44.80	96.3%	1.13	182.16	3.61
	3.95	42.55	1.14	2.40	48.36	44.70	96.1%	1.08	169.80	3.51
	4.00	42.55	1.09	2.35	46.23	44.61	95.9%	1.04	157.75	3.41
	4.05	41.12	1.07	2.30	44.14	43.08	92.6%	1.02	149.46	3.39
	4.10	39.69	1.06	2.25	42.12	41.56	89.4%	1.01	141.60	3.36
	4.15	38.26	1.05	2.20	40.17	40.03	86.1%	1.00	134.16	3.34
	4.20	36.83	1.04	2.15	38.30	38.50	82.8%	0.99	127.13	3.32
	4.25	36.09	1.01	2.10	36.48	37.68	81.0%	0.97	118.94	3.26
	4.30	35.94	0.96	2.05	34.68	37.47	80.6%	0.93	109.71	3.16
	4.35	35.79	0.92	2.00	32.89	37.27	80.1%	0.88	100.79	3.06
	4.40	35.48	0.88	1.95	31.10	36.93	79.4%	0.84	92.41	2.97
	4.45	35.12	0.84	1.90	29.34	36.56	78.6%	0.80	84.39	2.88
	4.50	34.77	0.79	1.85	27.59	36.20	77.8%	0.76	76.70	2.78
	4.55	34.42	0.75	1.80	25.86	35.83	77.0%	0.72	69.32	2.68
	4.60	34.06	0.71	1.75	24.15	35.46	76.3%	0.68	62.27	2.58
	4.65	33.71	0.67	1.70	22.45	35.09	75.5%	0.64	55.55	2.47
WL	4.70	33.49	0.62	1.65	20.77	34.83	74.9%	0.60	49.04	2.36
	4.75	32.73	0.58	1.60	19.12	34.03	73.2%	0.56	43.37	2.27
	4.80	31.97	0.55	1.55	17.50	33.23	71.5%	0.53	38.03	2.17
	4.85	30.45	0.52	1.50	15.94	31.68	68.1%	0.50	33.60	2.11
	4.90	28.93	0.50	1.45	14.46	30.12	64.8%	0.48	29.53	2.04
	4.95	28.17	0.46	1.40	13.03	29.32	63.0%	0.44	25.28	1.94
	5.00	27.41	0.42	1.35	11.64	28.52	61.3%	0.41	21.34	1.83
	5.05	24.39	0.42	1.30	10.31	25.46	54.8%	0.40	18.79	1.82
	5.10	22.87	0.40	1.25	9.13	23.91	51.4%	0.38	16.00	1.75
	5.15	22.11	0.36	1.20	8.00	23.10	49.7%	0.35	13.15	1.64
	5.20	21.34	0.32	1.15	6.91	22.30	47.9%	0.31	10.55	1.53
	5.25	20.83	0.28	1.10	5.86	21.74	46.8%	0.27	8.15	1.39
	5.30	14.32	0.34	1.05	4.83	15.20	32.7%	0.32	7.50	1.55
	5.35	12.32	0.34	1.00	4.16	13.15	28.3%	0.32	6.45	1.55
	5.40	9.28	0.39	0.95	3.62	10.07	21.7%	0.36	6.11	1.69
	5.45	8.89	0.36	0.90	3.17	9.64	20.7%	0.33	5.03	1.59
	5.50	8.50	0.32	0.85	2.73	9.21	19.8%	0.30	4.05	1.48
	5.55	8.11	0.29	0.80	2.32	8.78	18.9%	0.26	3.18	1.37
	5.60	6.23	0.31	0.75	1.92	6.85	14.7%	0.28	2.75	1.43
	5.65	5.46	0.30	0.70	1.63	6.05	13.0%	0.27	2.27	1.39
	5.70	4.69	0.29	0.65	1.38	5.24	11.3%	0.26	1.88	1.37
	5.75	4.38	0.26	0.60	1.15	4.89	10.5%	0.24	1.46	1.27
	5.80	4.06	0.23	0.55	0.94	4.53	9.7%	0.21	1.09	1.17
	5.85	3.75	0.20	0.50	0.74	4.17	9.0%	0.18	0.78	1.05
	5.90	3.43	0.16	0.45	0.56	3.82	8.2%	0.15	0.52	0.93
	5.95	3.13	0.13	0.40	0.40	3.47	7.5%	0.12	0.32	0.79
	6.00	1.60	0.18	0.35	0.28	1.91	4.1%	0.15	0.26	0.93
	6.05	1.38	0.15	0.30	0.21	1.63	3.5%	0.13	0.17	0.84
	6.10	1.15	0.13	0.25	0.14	1.36	2.9%	0.11	0.11	0.74
	6.15	0.92	0.10	0.20	0.09	1.09	2.3%	0.08	0.06	0.64
	6.20	0.69	0.08	0.15	0.05	0.82	1.8%	0.06	0.03	0.53
	6.25	0.46	0.05	0.10	0.02	0.55	1.2%	0.04	0.01	0.40
	6.30	0.23	0.03	0.05	0.01	0.27	0.6%	0.02	0.00	0.26
	6.35	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 300' upstream fr conf. w/ Slate river
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	49.00	cfs
CALCULATED FLOW (Qc)=	49.04	cfs
(Qm-Qc)/Qm * 100 =	-0.1	%
MEASURED WATERLINE (WLm)=	4.68	ft
CALCULATED WATERLINE (WLc)=	4.70	ft
(WLm-WLc)/WLm * 100 =	-0.5	%
MAX MEASURED DEPTH (Dm)=	1.65	ft
MAX CALCULATED DEPTH (Dc)=	1.65	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	2.36	ft/sec
MANNING'S N=	0.039	
SLOPE=	0.0076	ft/ft
.4 * Qm =	19.6	cfs
2.5 * Qm=	122.5	cfs

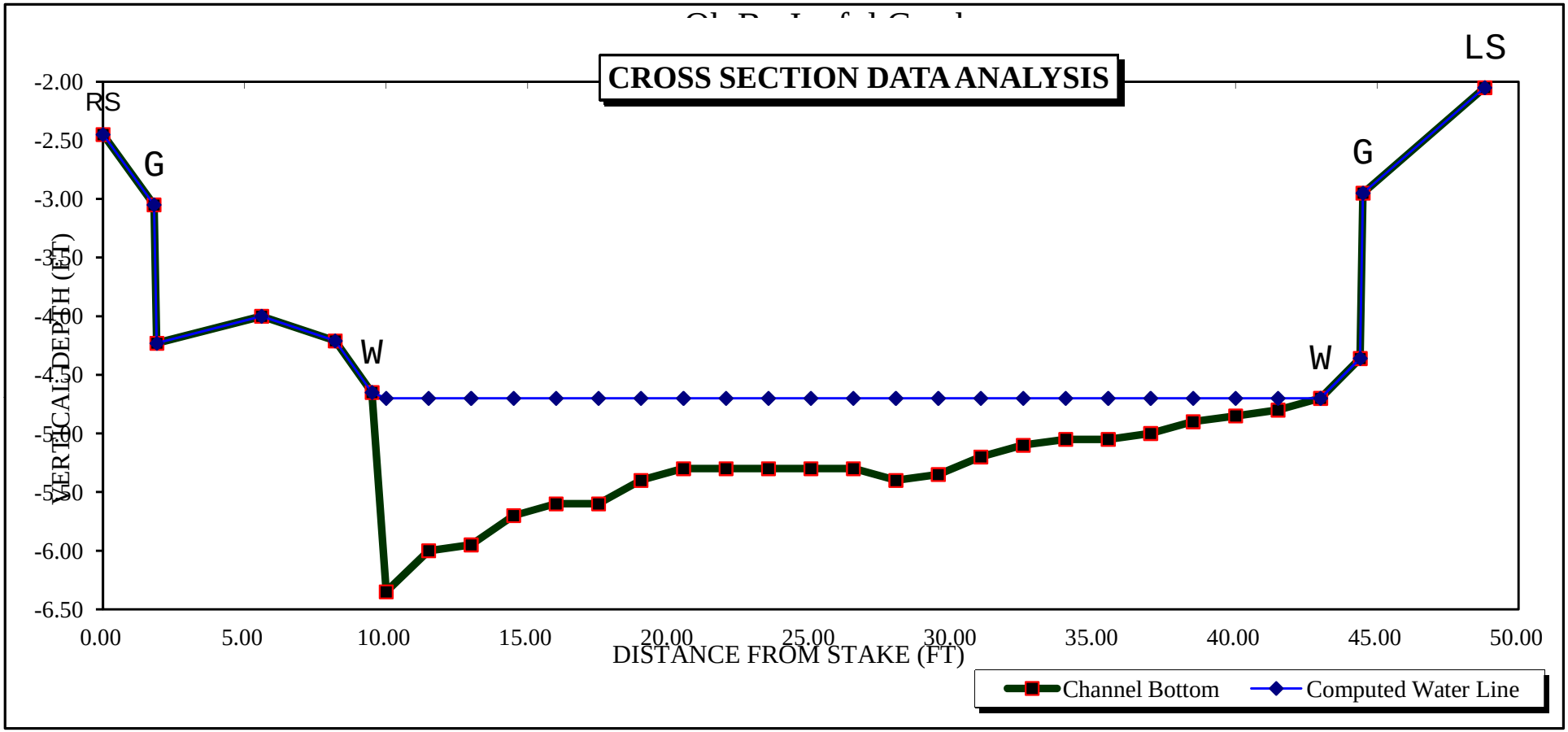
RECOMMENDED INSTREAM FLOW:
============================

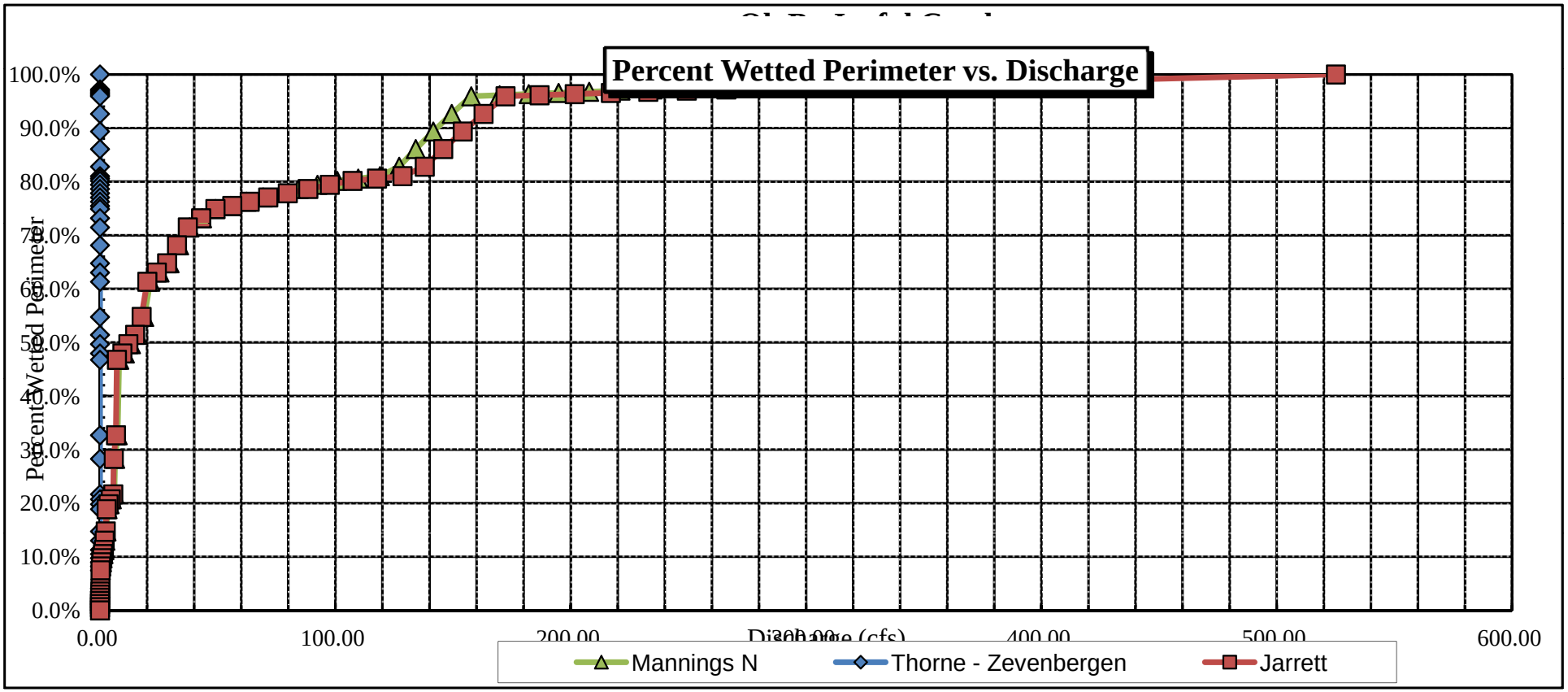
FLOW (CFS)	PERIOD
___________________	___________________
___________________	___________________
___________________	___________________
___________________	___________________

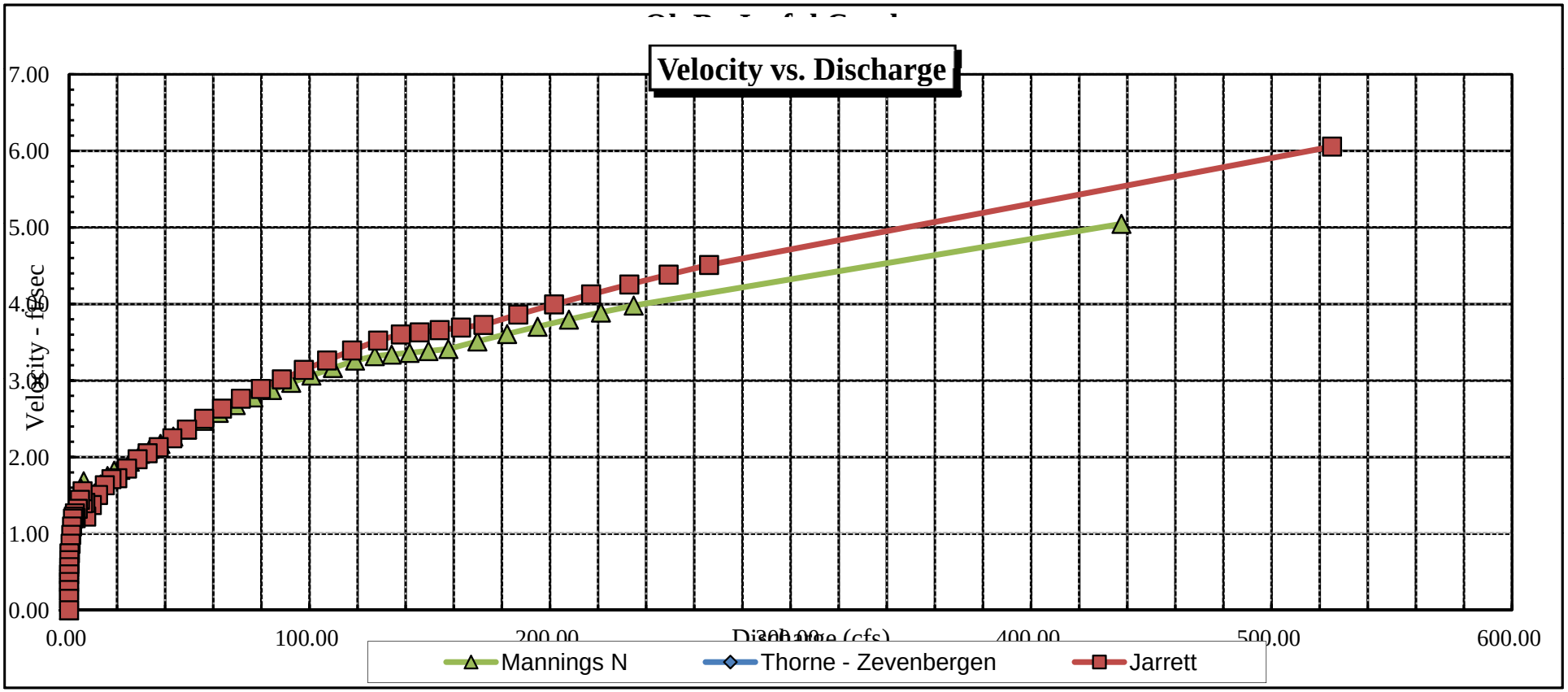
RATIONALE FOR RECOMMENDATION:
============================

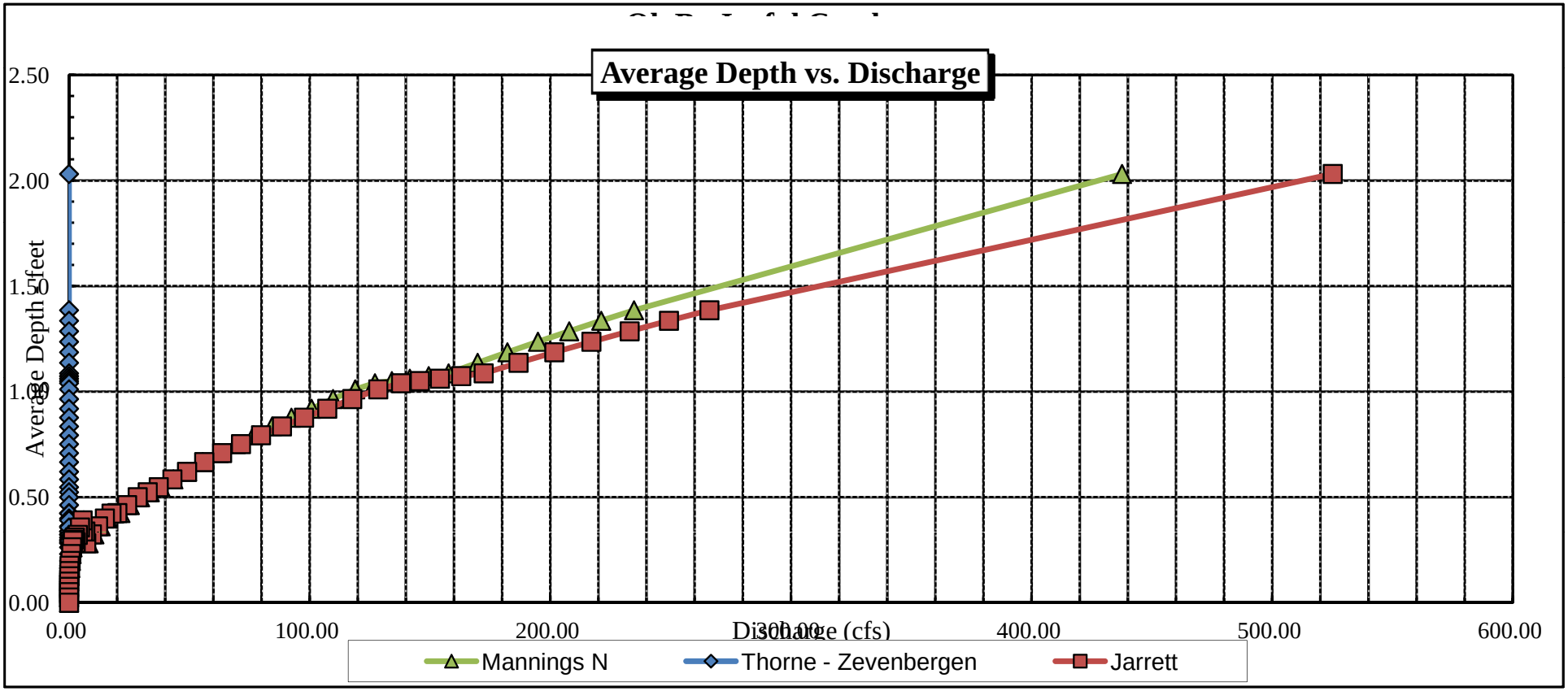
RECOMMENDATION BY: ……………………...………..……................................ AGENCY..………………………......……...……...……....... DATE:......…...…......……………

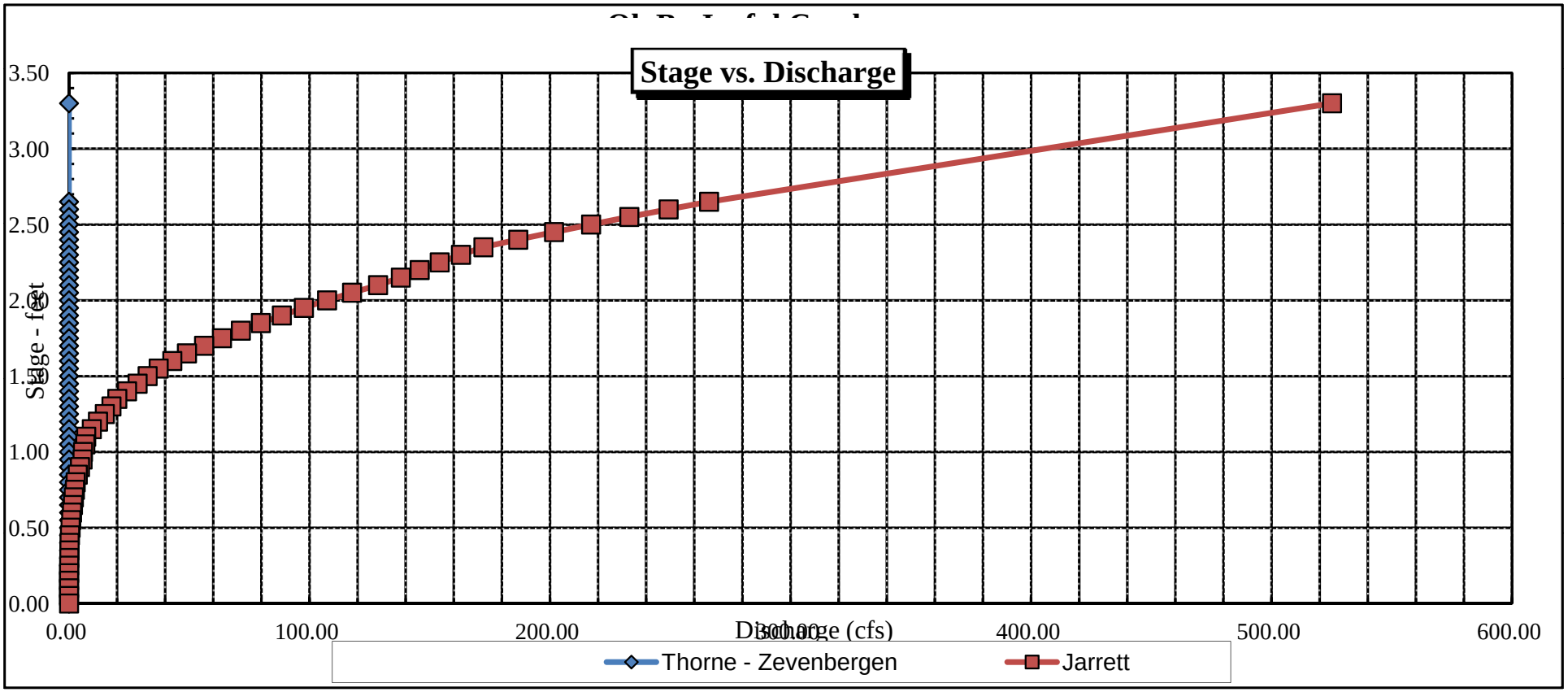
CWCB REVIEW BY: ..…………………………....……………………………………………………...…............. DATE:.................…………….....


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-2.00
-2.50
-3.00
-6.00
-6.50
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
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
100.00
200.00
400.00
500.00
600.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
100.00
200.00
400.00
500.00
600.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Oh-Be-Joyful Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: 300' upstream from confluence w/ Slate River						
DATE: 6-7-12	OBSERVERS: R. Smith, A. Breibart					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 20	TOWNSHIP: 13 N/S	RANGE: 86 E/W	PM: 6th	
COUNTY: Gunnison	WATERSHED: East River	WATER DIVISION: 4	DOW WATER CODE: 41929			
MAP(S): USGS:	GPS Zone 13 323911					
USFS:	4308765					

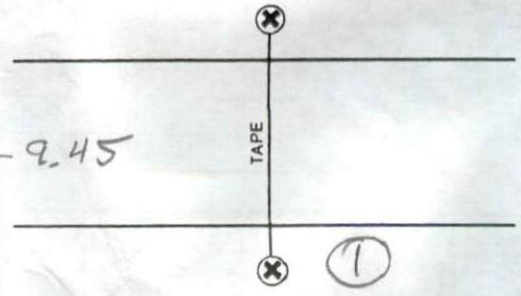
SUPPLEMENTAL DATA

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 6" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 4		

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 43.0	4.70 / 4.65
② WS Upstream	25.0	4.55
③ WS Downstream	34.2	5.00
SLOPE	0.45/59.2 = .0076	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:
mayfly, caddisfly, stonefly

COMMENTS

Ph = 5.91
Cond = 37
Temp = 13.7°C
Salinity = 0.0 ppt

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Oh-Be-Joyful Creek | CROSS-SECTION NO.: 1 | DATE: 6-7-12 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 3:45

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		2.45								
G	1.8		3.05								
	1.9		4.23								
	5.6		4.00								
	8.2		4.21								
W	9.5		4.65	ϕ					ϕ		
	10		6.35	1.65					2.55		
	11.5		6.00	1.30					3.03		
	13		5.95	1.25					3.20		
	14.5		5.7	1.00					2.98		
	16		5.6	0.90					2.88		
	17.5		5.6	0.90					2.42		
	19		5.4	0.70					2.27		
	20.5		5.3	0.60					2.00		
	22		5.3	0.60					2.47		
	23.5		5.3	0.60					2.17		
	25		5.3	0.60					2.15		
	26.5		5.30	0.60					2.53		
	28		5.40	0.70					2.17		
	29.5		5.35	0.65					1.70		
	31		5.20	0.50					2.06		
	32.5		5.10	0.40					1.57		
	34		5.05	0.35					1.56		
	35.5		5.05	0.35					0.74		
	37		5.00	0.30					1.05		
	38.5		4.90	0.20					1.14		
	40		4.85	0.15					0.80		
	41.5		4.80	0.10					ϕ		
W	43.0		4.70	ϕ					ϕ		
	44.4		4.36								
G	44.5		2.95								
LS	48.8		2.05								
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: Oh Be Joyful Creek					CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: 300 ft. upstream from confluence w/ Slate River					
DATE: 9/20/[illegible]	OBSERVERS: Brown, A, R. Smith				
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 20	TOWNSHIP: 13 N/(S)	RANGE: 86 E/(W)	PM: Sixth
COUNTY: Gunnison	WATERSHED: [illegible]	WATER DIVISION: 4		DOW WATER CODE: 41929	
MAP(S):	USGS:	GPS Zone 13 323928			
	USFS:	4308769			

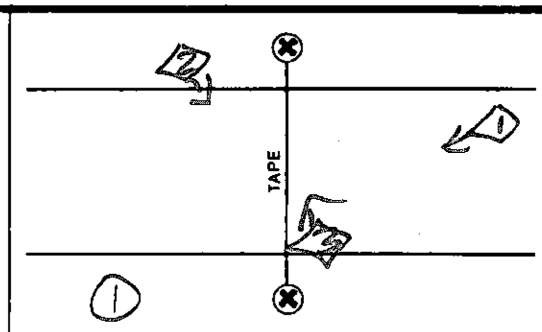
SUPPLEMENTAL DATA

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: 2 to 8" cobbles		PHOTOGRAPHS TAKEN (YES)/NO	NUMBER OF PHOTOGRAPHS: 3	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0	4.74 / 4.74
(2) WS Upstream	23.0	4.46
(3) WS Downstream	17.1	4.68
SLOPE	0.22/40.1 = .005	

SKETCH



LEGEND: Stake ⊗ Station (1) Photo ◇→ Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

mayfly, caddisfly, stonefly

COMMENTS

Salinity = 0.0 ppt   Spruce-Willow Riparian
Temp = 7.0°C
Cond = 75
Ph = 7.30

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
Unnamed Creek	2	9-29-11	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 10:10 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		1.32								
G	5.5		3.18								
	6.2		3.50								
	6.8		4.28								
W	7.0		4.74								
	7.5		4.8	.05				0			
	8.0		4.85	.10				0.50			
	8.5		4.85	.10				0.63			
	9.0		4.90	.15				1.03			
	9.5		5.0	.25				0.74			
	10.0		5.1	.35				1.72			
	10.5		5.15	.40				1.68			
	11.0		5.05	.30				2.07			
	11.5		5.1	.35				1.93			
	12.0		5.15	.40				2.10			
	12.5		5.15	.40				2.34			
	13.0		5.20	.45				1.53			
	13.5		5.10	.35				0.70			
	14.0		4.95	.20				0.44			
	14.5		4.85	.10				0.51			
	15.0		4.85	.10				0			
	15.5		4.80	.05				0			
	16.0		4.80	.05				0			
W	16.2		4.74								
	21.0		3.94								
	25.0		3.78								
	33.0		4.12								
	38.0		4.52								
G	39.8		3.12								
LS	41.3		1.98								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Oh-Be-Joyful Creek
XS LOCATION:	300 ft upst fr conf w/ Slate R.
XS NUMBER:	2
DATE:	29-Sep-11
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SE NW
SECTION:	20
TWP:	13S
RANGE:	86W
PM:	Sixth
COUNTY:	Gunnison
WATERSHED:	East River
DIVISION:	4
DOW CODE:	41929
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:	0.005

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

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

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 300 ft upst fr conf w/ Slate R.
XS NUMBER: 2

DATA POINTS= 30

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	1.32			0.00		0.00	0.00	0.0%
1	G	5.50	3.18			0.00		0.00	0.00	0.0%
		6.20	3.50			0.00		0.00	0.00	0.0%
		6.80	4.28			0.00		0.00	0.00	0.0%
	W	7.00	4.74	0.00	0.00	0.00		0.00	0.00	0.0%
		7.50	4.80	0.05	0.00	0.50	0.05	0.03	0.00	0.0%
		8.00	4.85	0.10	0.50	0.50	0.10	0.05	0.03	0.9%
		8.50	4.85	0.10	0.63	0.50	0.10	0.05	0.03	1.1%
		9.00	4.90	0.15	1.03	0.50	0.15	0.08	0.08	2.6%
		9.50	5.00	0.25	0.74	0.51	0.25	0.13	0.09	3.2%
		10.00	5.10	0.35	1.72	0.51	0.35	0.18	0.30	10.3%
		10.50	5.15	0.40	1.68	0.50	0.40	0.20	0.34	11.4%
		11.00	5.05	0.30	2.07	0.51	0.30	0.15	0.31	10.6%
		11.50	5.10	0.35	1.93	0.50	0.35	0.18	0.34	11.5%
		12.00	5.15	0.40	2.10	0.50	0.40	0.20	0.42	14.3%
		12.50	5.15	0.40	2.34	0.50	0.40	0.20	0.47	15.9%
		13.00	5.20	0.45	1.53	0.50	0.45	0.23	0.34	11.7%
		13.50	5.10	0.35	0.70	0.51	0.35	0.18	0.12	4.2%
		14.00	4.95	0.20	0.44	0.52	0.20	0.10	0.04	1.5%
		14.50	4.85	0.10	0.51	0.51	0.10	0.05	0.03	0.9%
		15.00	4.85	0.10	0.00	0.50	0.10	0.05	0.00	0.0%
		15.50	4.80	0.05	0.00	0.50	0.05	0.03	0.00	0.0%
		16.00	4.80	0.05	0.00	0.50	0.05	0.02	0.00	0.0%
	W	16.20	4.74	0.00	0.00	0.21		0.00	0.00	0.0%
		21.00	3.94			0.00		0.00	0.00	0.0%
		25.00	3.78			0.00		0.00	0.00	0.0%
		32.00	4.12			0.00		0.00	0.00	0.0%
		38.00	4.52			0.00		0.00	0.00	0.0%
1	G	39.80	3.12			0.00		0.00	0.00	0.0%
	LS	41.30	1.98			0.00		0.00	0.00	0.0%
	TOTALS ----------					9.30	0.45 (Max.)	2.07	2.94	100.0%

Manning's n = 0.0272
Hydraulic Radius= 0.22227897

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 300 ft upst fr conf w/ Slate R.
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.07	2.16	4.3%
4.49	2.07	4.66	125.6%
4.51	2.07	4.44	114.9%
4.53	2.07	4.23	104.6%
4.55	2.07	4.02	94.4%
4.57	2.07	3.81	84.4%
4.59	2.07	3.61	74.5%
4.61	2.07	3.41	64.8%
4.63	2.07	3.21	55.1%
4.65	2.07	3.01	45.6%
4.67	2.07	2.82	36.2%
4.69	2.07	2.62	26.9%
4.70	2.07	2.53	22.3%
4.71	2.07	2.43	17.8%
4.72	2.07	2.34	13.2%
4.73	2.07	2.25	8.7%
4.74	2.07	2.16	4.3%
4.75	2.07	2.06	-0.1%
4.76	2.07	1.97	-4.5%
4.77	2.07	1.89	-8.8%
4.78	2.07	1.80	-13.1%
4.79	2.07	1.71	-17.3%
4.81	2.07	1.55	-25.2%
4.83	2.07	1.39	-32.6%
4.85	2.07	1.25	-39.5%
4.87	2.07	1.13	-45.2%
4.89	2.07	1.02	-50.6%
4.91	2.07	0.92	-55.7%
4.93	2.07	0.82	-60.5%
4.95	2.07	0.72	-65.2%
4.97	2.07	0.63	-69.7%
4.99	2.07	0.54	-74.1%

WATERLINE AT ZERO
AREA ERROR = 4.750

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 300 ft upst fr conf w/ Slate R.
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	3.18	34.22	1.14	2.02	38.98	35.63	100.0%	1.09	160.19	4.11
	3.75	32.60	0.61	1.45	20.01	33.62	94.4%	0.60	54.78	2.74
	3.80	31.60	0.58	1.40	18.39	32.58	91.4%	0.56	48.61	2.64
	3.85	29.22	0.58	1.35	16.87	30.15	84.6%	0.56	44.32	2.63
	3.90	26.83	0.58	1.30	15.47	27.72	77.8%	0.56	40.57	2.62
	3.95	24.64	0.58	1.25	14.18	25.48	71.5%	0.56	37.15	2.62
	4.00	23.20	0.56	1.20	12.99	24.00	67.4%	0.54	33.38	2.57
	4.05	21.77	0.54	1.15	11.86	22.52	63.2%	0.53	29.95	2.52
	4.10	20.34	0.53	1.10	10.81	21.04	59.1%	0.51	26.84	2.48
	4.15	19.07	0.52	1.05	9.83	19.73	55.4%	0.50	23.90	2.43
	4.20	17.92	0.50	1.00	8.90	18.53	52.0%	0.48	21.14	2.37
	4.25	16.77	0.48	0.95	8.04	17.33	48.6%	0.46	18.63	2.32
	4.30	15.62	0.46	0.90	7.23	16.13	45.3%	0.45	16.37	2.27
	4.35	14.49	0.45	0.85	6.47	14.94	41.9%	0.43	14.34	2.22
	4.40	13.35	0.43	0.80	5.78	13.75	38.6%	0.42	12.54	2.17
	4.45	12.21	0.42	0.75	5.14	12.56	35.2%	0.41	10.96	2.13
	4.50	11.08	0.41	0.70	4.56	11.36	31.9%	0.40	9.59	2.10
	4.55	10.42	0.39	0.65	4.02	10.67	29.9%	0.38	8.13	2.02
	4.60	10.10	0.35	0.60	3.51	10.31	28.9%	0.34	6.62	1.89
	4.65	9.78	0.31	0.55	3.01	9.95	27.9%	0.30	5.26	1.75
	4.70	9.46	0.27	0.50	2.53	9.59	26.9%	0.26	4.03	1.59
WL	4.75	9.09	0.23	0.45	2.07	9.19	25.8%	0.23	2.96	1.43
	4.80	8.01	0.20	0.40	1.63	8.10	22.7%	0.20	2.16	1.33
	4.85	6.00	0.21	0.35	1.25	6.09	17.1%	0.21	1.69	1.35
	4.90	5.25	0.18	0.30	0.97	5.33	15.0%	0.18	1.21	1.24
	4.95	4.75	0.15	0.25	0.72	4.82	13.5%	0.15	0.78	1.09
	5.00	4.34	0.11	0.20	0.49	4.39	12.3%	0.11	0.44	0.90
	5.05	3.92	0.07	0.15	0.29	3.97	11.1%	0.07	0.19	0.67
	5.10	2.76	0.04	0.10	0.12	2.78	7.8%	0.04	0.06	0.47
	5.15	0.75	0.03	0.05	0.02	0.76	2.1%	0.03	0.01	0.33
	5.20	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Oh-Be-Joyful Creek
XS LOCATION: 300 ft upst fr conf w/ Slate R.
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.94	cfs
CALCULATED FLOW (Qc)=	2.96	cfs
(Qm-Qc)/Qm * 100 =	-0.8	%
MEASURED WATERLINE (WLm)=	4.74	ft
CALCULATED WATERLINE (WLc)=	4.75	ft
(WLm-WLc)/WLm * 100 =	-0.2	%
MAX MEASURED DEPTH (Dm)=	0.45	ft
MAX CALCULATED DEPTH (Dc)=	0.45	ft
(Dm-Dc)/Dm * 100	-0.1	%
MEAN VELOCITY=	1.43	ft/sec
MANNING'S N=	0.027	
SLOPE=	0.005	ft/ft
.4 * Qm =	1.2	cfs
2.5 * Qm=	7.3	cfs

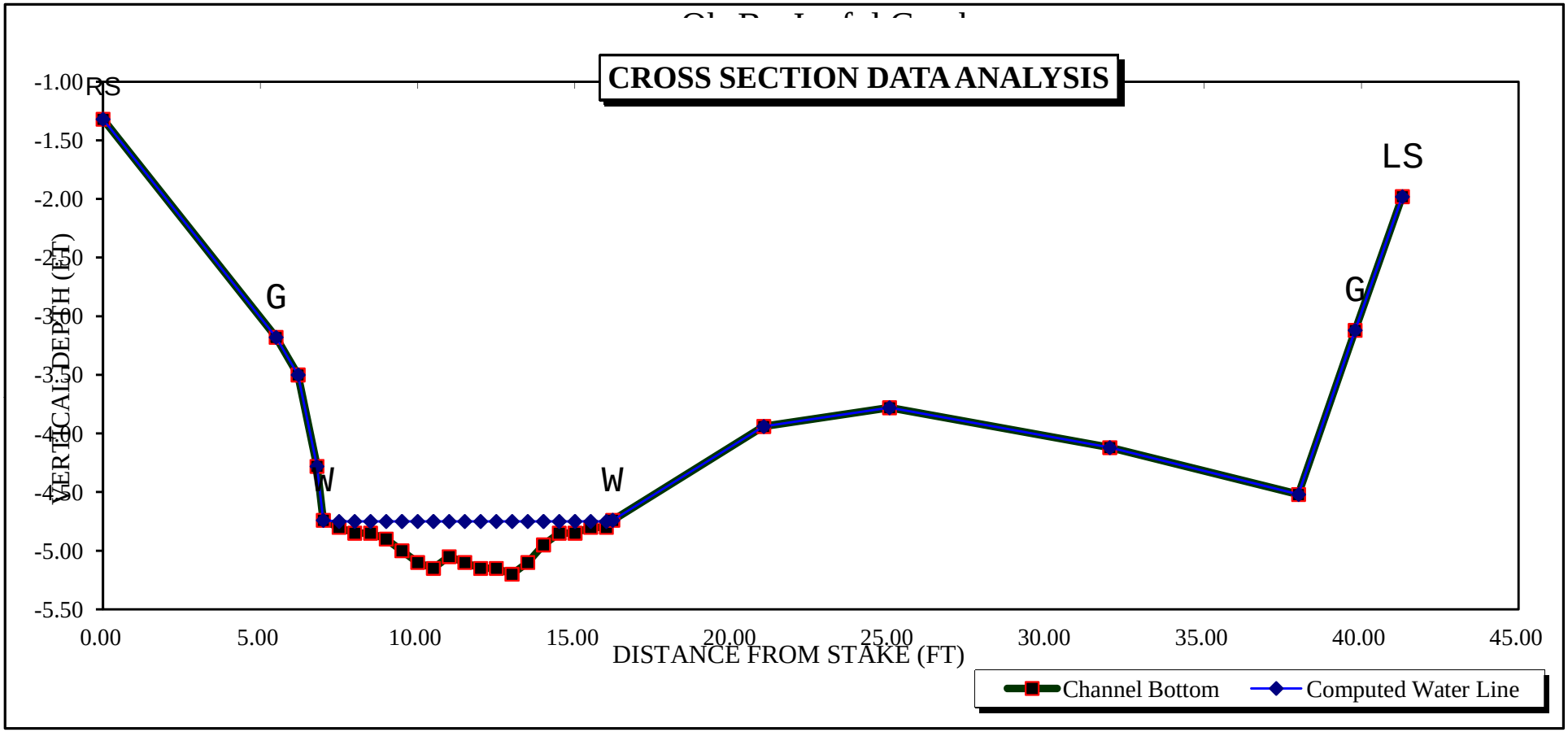
RECOMMENDED INSTREAM FLOW:
=============================

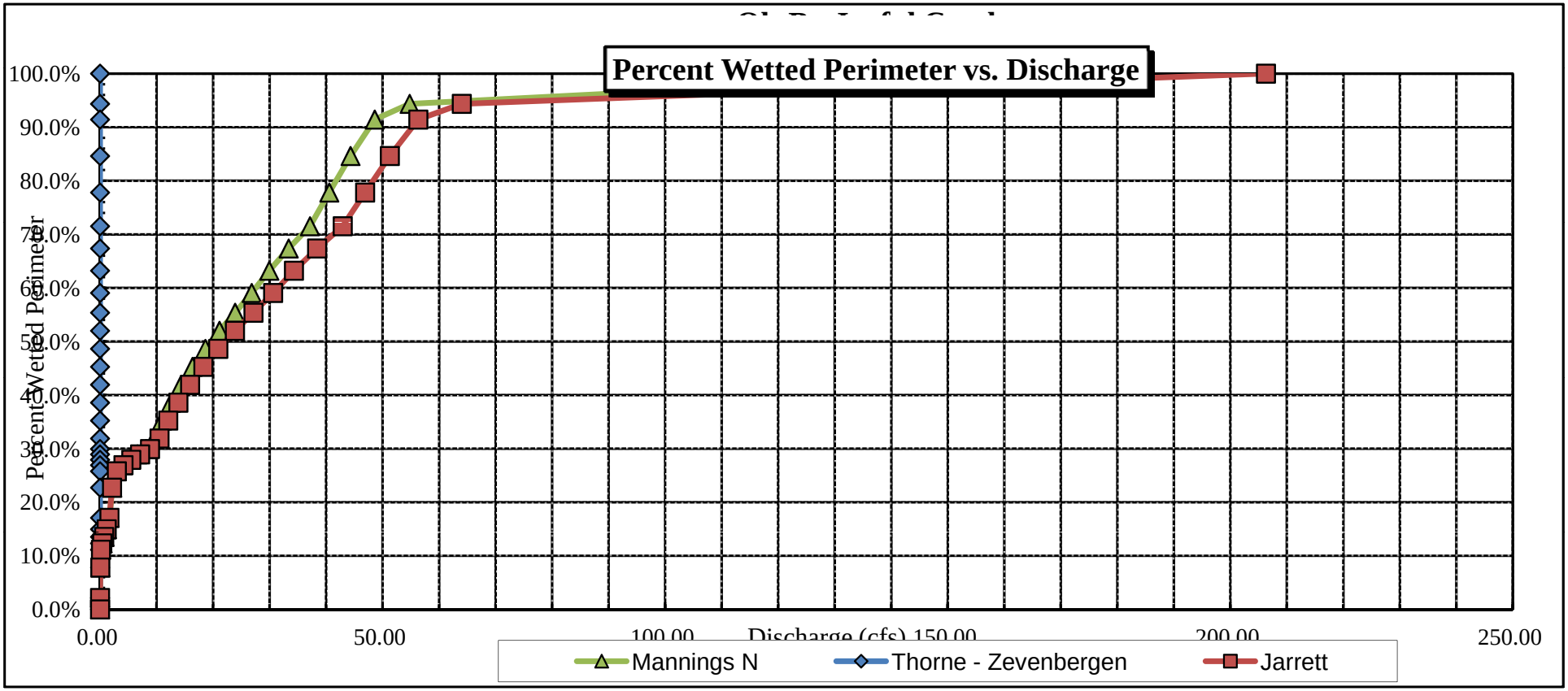
FLOW (CFS)	PERIOD
===========	========
____________________	___________________
____________________	___________________
____________________	___________________
____________________	___________________

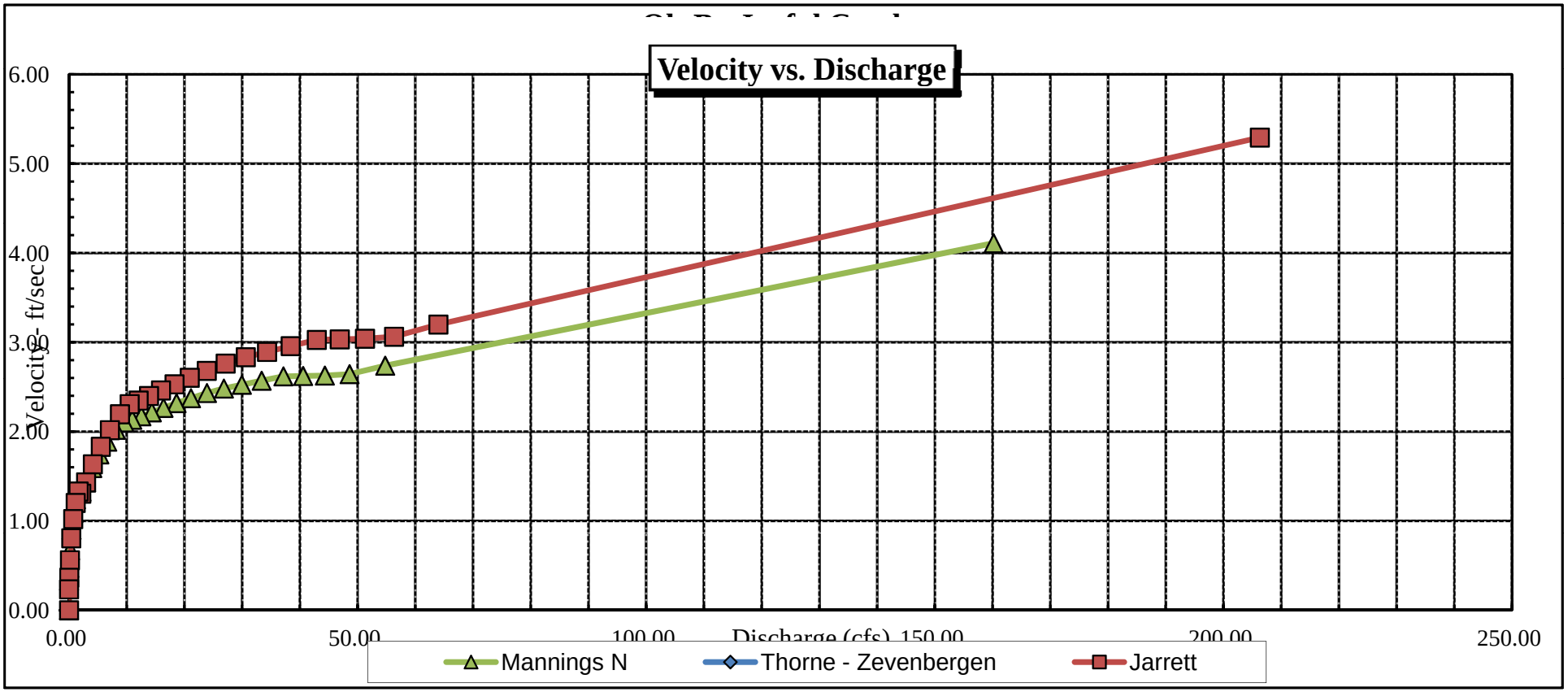
RATIONALE FOR RECOMMENDATION:
=============================

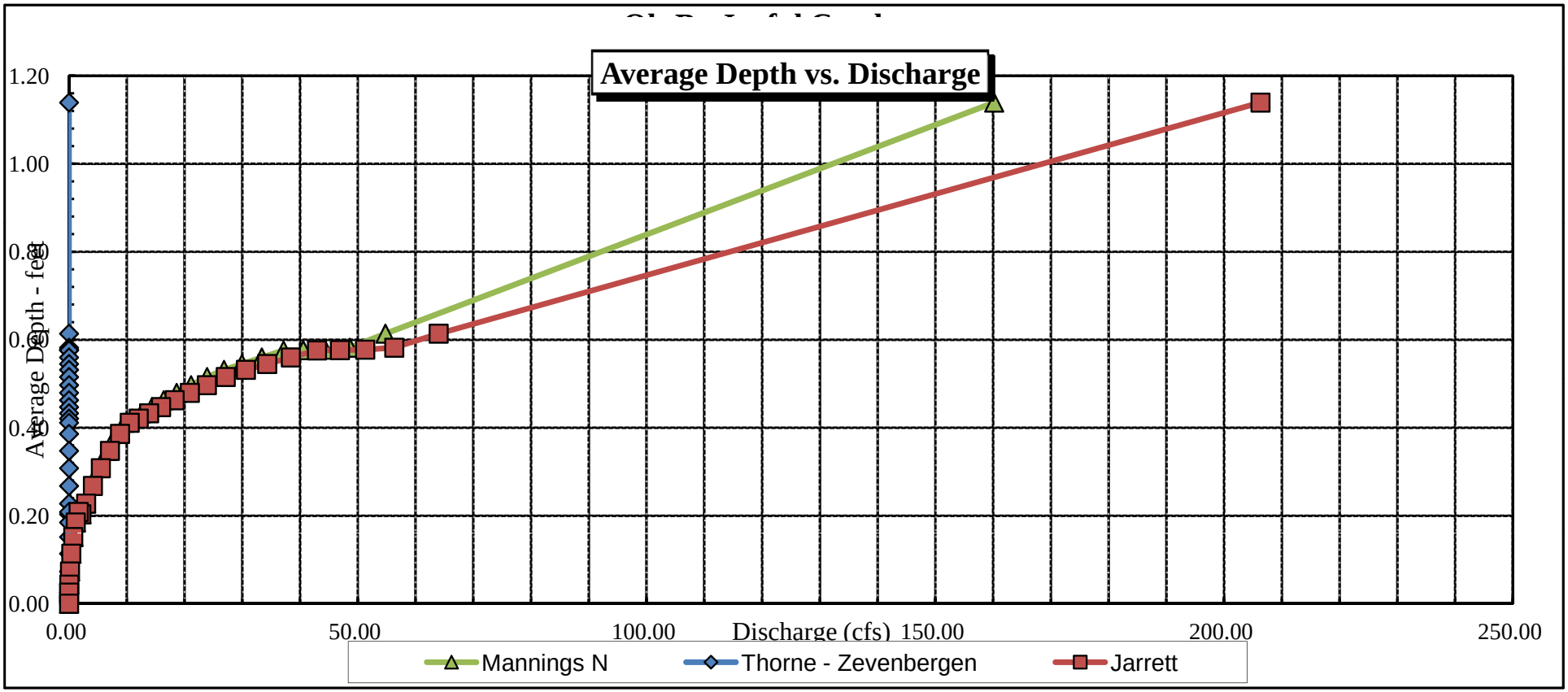
RECOMMENDATION BY: ………………...………..……............................. AGENCY...……………………......…….....…...……...... DATE:......…...…......……………

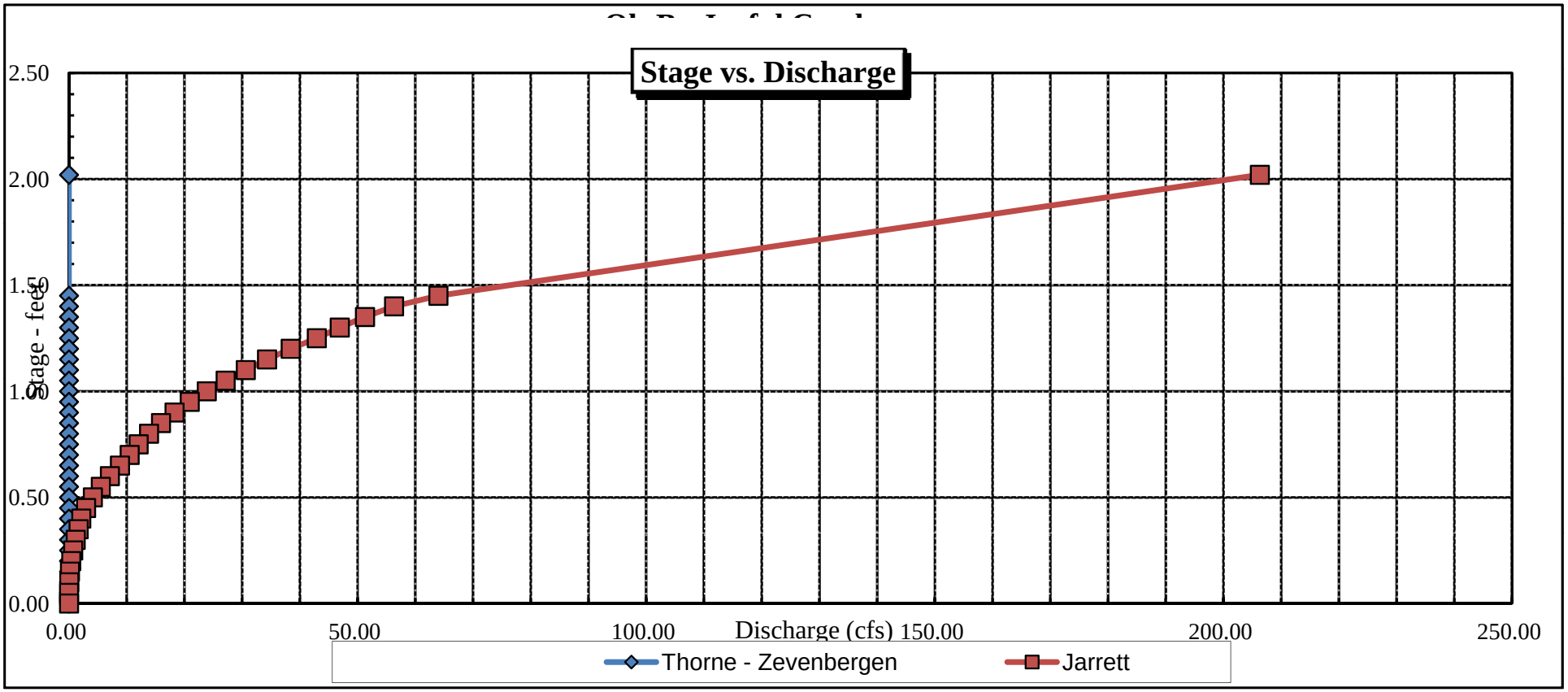
CWCB REVIEW BY: ..……………………………....………………………………………………...…............. DATE:.................…………….....


CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-1.00
-1.50
-2.00
-5.00
-5.50
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
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
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
50.00
100.00
Discharge (cfs)
150.00
200.00
250.00
Mannings N
Thorne - Zevenbergen
Jarrett


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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Oh Be Joyful Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 400' upstream from conf. w/ Slade River						
DATE: 7-17-13	OBSERVERS: R. Smith, A. Breibart					
LEGAL DESCRIPTION	¼ SECTION: SE NW	SECTION: 20	TOWNSHIP: 13 N/S	RANGE: 86E/W	PM: 6th	
COUNTY: Gunnison	WATERSHED: East River	WATER DIVISION: 4	DOW WATER CODE: 41929			
MAP(S): USGS:	GPS Zone 13S 383911					
USFS:	4308775					

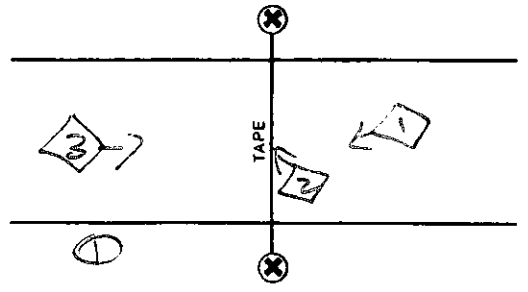
SUPPLEMENTAL DATA

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 8" cobbles	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape @ Stake LB	0.0	surveyed
Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	4.70 / 4.70
② WS Upstream	12.3	4.66
③ WS Downstream	65.0	5.36
SLOPE	0.70 / 77.3 = 0.10	

SKETCH



LEGEND: Stake ⊗ Station ① Photo ◇ Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

pH = 8.04 Air Temp: 23° C
Temp = 16.1° C
DO = 6.08 85.1
Cond = 64.8

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Oh Be Joyful Creek	CROSS-SECTION NO: 1	DATE 7-17-13	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME 2:25 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS+G	0.8		2.35								
	3.0		3.15								
	7.0		3.94								
W	7.6		4.70								
	8.0		5.35	0.65				0.96			
	8.5		5.45	0.75				1.00			
	9.0		5.40	0.70				1.09			
	9.5		5.40	0.70				1.14			
	10.0		5.40	0.70				1.62			
	10.5		5.40	0.70				1.51			
	11.0		5.40	0.70				1.40			
	11.5		5.40	0.70				1.44			
	12.0		5.30	0.60				1.55			
	12.5		5.80	0.60				1.62			
	13.0		5.30	0.60				1.46			
	13.5		5.40	0.70				1.27			
	14.0		5.30	0.60				1.78			
	14.5		5.20	0.50				1.62			
	15.0		5.20	0.50				1.62			
	15.5		5.20	0.50				1.56			
	16.5		5.20	0.50				1.28			
	17.5		5.10	0.40				1.05			
	18.5		4.80	0.10				0.68			
	19.5		4.80	0.10				0			
	21.0		4.90	0.2				0.34			
	22.0		5.0	0.3				0.52			
	23.0		5.0	0.3				0.37			
	24.0		5.0	0.3				0.50			
	25.0		4.9	0.2				0.40			
	26.0		4.9	0.2				0.36			
	27.0		4.8	0.1				0.02			
	29.0		4.8	0.1				0			
W	30.9		4.70								
	34.0		4.45								
	43.4		3.86								
G	44.0		2.30								
LS	46.6		2.05								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Oh Be Joyful Creek
XS LOCATION:	400' upstream fr. conf. with Slate River
XS NUMBER:	1
DATE:	17-Jul-13
OBSERVERS:	R. Smith, A. Breibart
1/4 SEC:	SE NW
SECTION:	20
TWP:	13S
RANGE:	86W
PM:	Sixth
COUNTY:	Gunnison
WATERSHED:	East River
DIVISION:	4
DOW CODE:	41929
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:	0.1

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

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

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
XS NUMBER: 1

DATA POINTS= 37

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	RS & G	0.80	2.35			0.00		0.00	0.00	0.0%
		3.00	3.15			0.00		0.00	0.00	0.0%
		7.00	3.94			0.00		0.00	0.00	0.0%
	W	7.60	4.70	0.00	0.00	0.00		0.00	0.00	0.0%
		8.00	5.35	0.65	0.96	0.76	0.65	0.29	0.28	3.1%
		8.50	5.45	0.75	1.00	0.51	0.75	0.38	0.38	4.1%
		9.00	5.40	0.70	1.09	0.50	0.70	0.35	0.38	4.2%
		9.50	5.40	0.70	1.14	0.50	0.70	0.35	0.40	4.4%
		10.00	5.40	0.70	1.62	0.50	0.70	0.35	0.57	6.2%
		10.50	5.40	0.70	1.51	0.50	0.70	0.35	0.53	5.8%
		11.00	5.40	0.70	1.40	0.50	0.70	0.35	0.49	5.4%
		11.50	5.40	0.70	1.44	0.50	0.70	0.35	0.50	5.6%
		12.00	5.30	0.60	1.55	0.51	0.60	0.30	0.47	5.1%
		12.50	5.30	0.60	1.62	0.50	0.60	0.30	0.49	5.4%
		13.00	5.30	0.60	1.46	0.50	0.60	0.30	0.44	4.8%
		13.50	5.40	0.70	1.27	0.51	0.70	0.35	0.44	4.9%
		14.00	5.30	0.60	1.78	0.51	0.60	0.30	0.53	5.9%
		14.50	5.20	0.50	1.62	0.51	0.50	0.25	0.41	4.5%
		15.00	5.20	0.50	1.62	0.50	0.50	0.25	0.41	4.5%
		15.50	5.20	0.50	1.56	0.50	0.50	0.38	0.59	6.4%
		16.50	5.20	0.50	1.28	1.00	0.50	0.50	0.64	7.1%
		17.50	5.10	0.40	1.05	1.00	0.40	0.40	0.42	4.6%
		18.50	4.80	0.10	0.68	1.04	0.10	0.10	0.07	0.7%
		19.50	4.80	0.10	0.00	1.00	0.10	0.13	0.00	0.0%
		21.00	4.90	0.20	0.34	1.50	0.20	0.25	0.09	0.9%
		22.00	5.00	0.30	0.52	1.00	0.30	0.30	0.16	1.7%
		23.00	5.00	0.30	0.37	1.00	0.30	0.30	0.11	1.2%
		24.00	5.00	0.30	0.50	1.00	0.30	0.30	0.15	1.7%
		25.00	4.90	0.20	0.40	1.00	0.20	0.20	0.08	0.9%
		26.00	4.90	0.20	0.36	1.00	0.20	0.20	0.07	0.8%
		27.00	4.80	0.10	0.02	1.00	0.10	0.15	0.00	0.0%
		29.00	4.80	0.10	0.00	2.00	0.10	0.20	0.00	0.0%
	W	30.90	4.70	0.00	0.00	1.90		0.00	0.00	0.0%
		34.00	4.45			0.00		0.00	0.00	0.0%
		43.40	3.86			0.00		0.00	0.00	0.0%
1	G	44.00	2.30			0.00		0.00	0.00	0.0%
	LS	48.60	2.05			0.00		0.00	0.00	0.0%
	TOTALS ----------					23.79	0.75 (Max.)	8.21	9.07	100.0%

Manning's n = 0.2093
Hydraulic Radius= 0.34527831

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	8.21	8.21	0.0%
4.45	8.21	14.45	75.9%
4.47	8.21	13.92	69.5%
4.49	8.21	13.40	63.1%
4.51	8.21	12.88	56.8%
4.53	8.21	12.36	50.6%
4.55	8.21	11.86	44.4%
4.57	8.21	11.35	38.2%
4.59	8.21	10.86	32.2%
4.61	8.21	10.36	26.2%
4.63	8.21	9.88	20.3%
4.65	8.21	9.39	14.4%
4.66	8.21	9.16	11.5%
4.67	8.21	8.92	8.6%
4.68	8.21	8.68	5.7%
4.69	8.21	8.45	2.8%
4.70	8.21	8.21	0.0%
4.71	8.21	7.98	-2.8%
4.72	8.21	7.75	-5.6%
4.73	8.21	7.52	-8.4%
4.74	8.21	7.30	-11.2%
4.75	8.21	7.07	-13.9%
4.77	8.21	6.63	-19.3%
4.79	8.21	6.20	-24.6%
4.81	8.21	5.80	-29.4%
4.83	8.21	5.44	-33.7%
4.85	8.21	5.10	-37.9%
4.87	8.21	4.77	-41.9%
4.89	8.21	4.45	-45.8%
4.91	8.21	4.15	-49.5%
4.93	8.21	3.87	-52.9%
4.95	8.21	3.60	-56.2%

WATERLINE AT ZERO
AREA ERROR = 4.700

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
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	2.35	43.18	2.18	3.10	94.11	45.32	100.0%	2.08	343.91	3.65
	3.70	37.68	1.04	1.75	39.02	38.69	85.4%	1.01	88.11	2.26
	3.75	37.40	0.99	1.70	37.15	38.38	84.7%	0.97	81.60	2.20
	3.80	37.13	0.95	1.65	35.28	38.07	84.0%	0.93	75.30	2.13
	3.85	36.86	0.91	1.60	33.43	37.76	83.3%	0.89	69.21	2.07
	3.90	35.96	0.88	1.55	31.61	36.85	81.3%	0.86	64.07	2.03
	3.95	34.96	0.85	1.50	29.84	35.83	79.1%	0.83	59.29	1.99
	4.00	34.12	0.82	1.45	28.11	34.97	77.2%	0.80	54.56	1.94
	4.05	33.29	0.79	1.40	26.43	34.11	75.3%	0.77	50.04	1.89
	4.10	32.45	0.76	1.35	24.78	33.25	73.4%	0.75	45.74	1.85
	4.15	31.61	0.73	1.30	23.18	32.38	71.5%	0.72	41.64	1.80
	4.20	30.78	0.70	1.25	21.62	31.52	69.6%	0.69	37.75	1.75
	4.25	29.94	0.67	1.20	20.10	30.66	67.7%	0.66	34.06	1.69
	4.30	29.11	0.64	1.15	18.63	29.80	65.8%	0.63	30.57	1.64
	4.35	28.27	0.61	1.10	17.19	28.94	63.9%	0.59	27.28	1.59
	4.40	27.43	0.58	1.05	15.80	28.08	62.0%	0.56	24.18	1.53
	4.45	26.60	0.54	1.00	14.45	27.21	60.1%	0.53	21.27	1.47
	4.50	25.94	0.51	0.95	13.14	26.53	58.5%	0.50	18.46	1.41
	4.55	25.28	0.47	0.90	11.86	25.84	57.0%	0.46	15.83	1.34
	4.60	24.62	0.43	0.85	10.61	25.16	55.5%	0.42	13.39	1.26
	4.65	23.96	0.39	0.80	9.39	24.47	54.0%	0.38	11.14	1.19
WL	4.70	23.30	0.35	0.75	8.21	23.79	52.5%	0.35	9.07	1.10
	4.75	22.32	0.32	0.70	7.07	22.78	50.3%	0.31	7.28	1.03
	4.80	18.34	0.33	0.65	5.98	18.77	41.4%	0.32	6.26	1.05
	4.85	16.89	0.30	0.60	5.10	17.28	38.1%	0.30	5.07	1.00
	4.90	14.44	0.30	0.55	4.29	14.79	32.6%	0.29	4.22	0.98
	4.95	13.25	0.27	0.50	3.60	13.55	29.9%	0.27	3.34	0.93
	5.00	10.05	0.30	0.45	2.97	10.32	22.8%	0.29	2.90	0.98
	5.05	9.85	0.25	0.40	2.47	10.08	22.2%	0.24	2.17	0.88
	5.10	9.65	0.21	0.35	1.98	9.85	21.7%	0.20	1.53	0.77
	5.15	9.12	0.17	0.30	1.51	9.29	20.5%	0.16	1.01	0.67
	5.20	6.59	0.16	0.25	1.07	6.73	14.8%	0.16	0.70	0.66
	5.25	6.31	0.12	0.20	0.75	6.41	14.2%	0.12	0.40	0.54
	5.30	5.03	0.09	0.15	0.44	5.10	11.3%	0.09	0.19	0.44
	5.35	4.25	0.05	0.10	0.21	4.28	9.4%	0.05	0.06	0.30
	5.40	0.75	0.02	0.05	0.02	0.76	1.7%	0.02	0.00	0.19

STREAM NAME: Oh Be Joyful Creek
XS LOCATION: 400' upstream fr. conf. with Slate River
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	9.07	cfs
CALCULATED FLOW (Qc)=	9.07	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	4.70	ft
CALCULATED WATERLINE (WLc)=	4.70	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.75	ft
MAX CALCULATED DEPTH (Dc)=	0.75	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.10	ft/sec
MANNING'S N=	0.209	
SLOPE=	0.1	ft/ft
.4 * Qm =	3.6	cfs
2.5 * Qm=	22.7	cfs

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

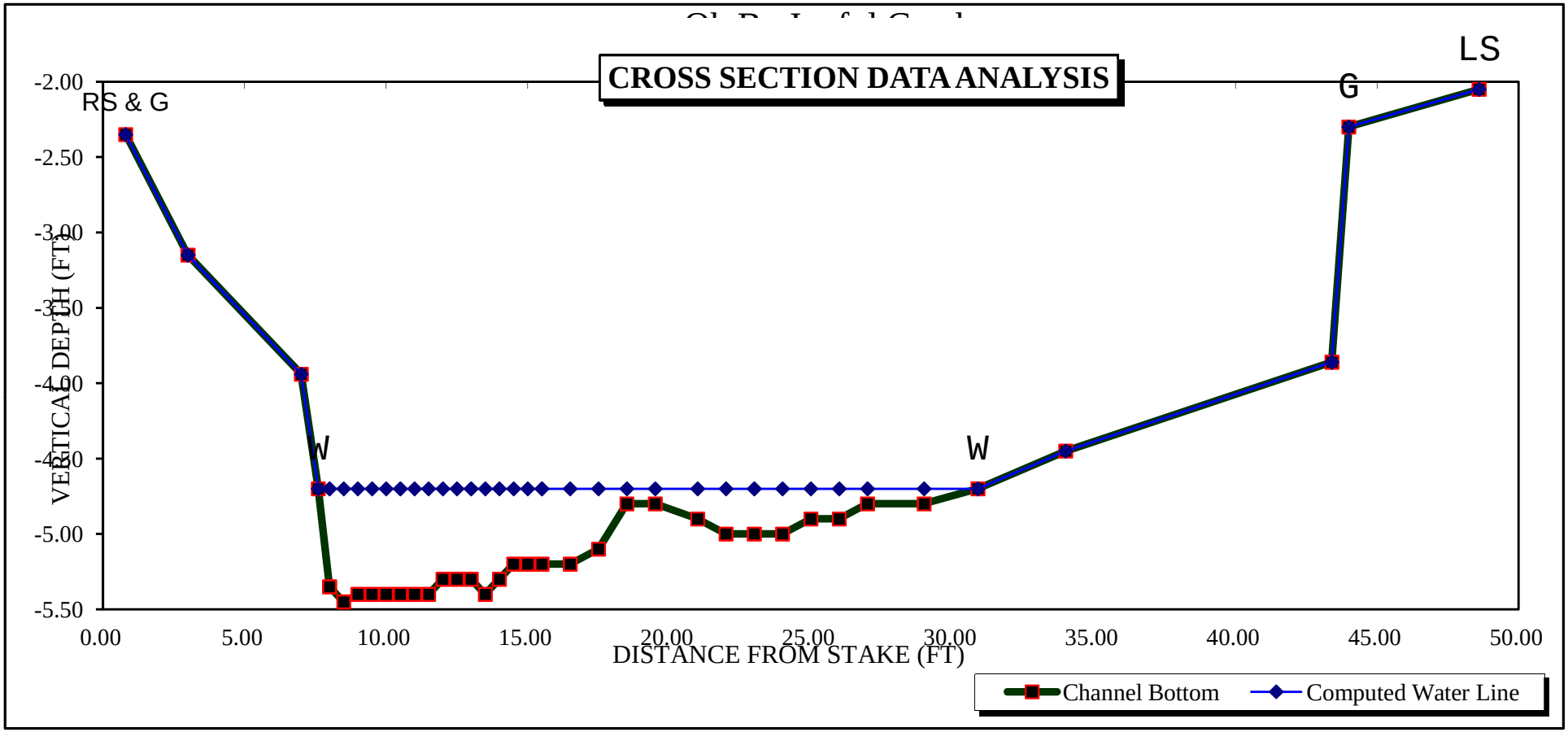
FLOW (CFS)	PERIOD
___________	________

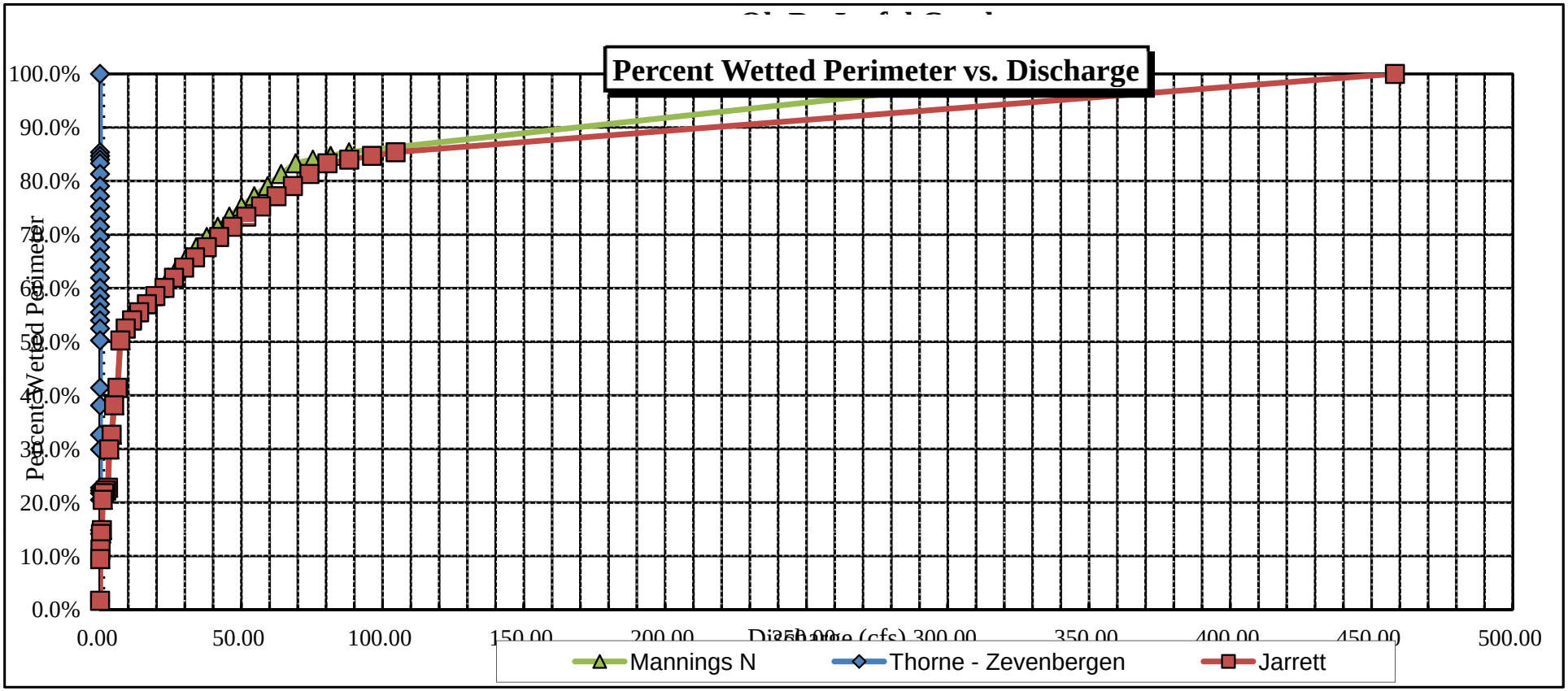
RATIONALE FOR RECOMMENDATION:
============================

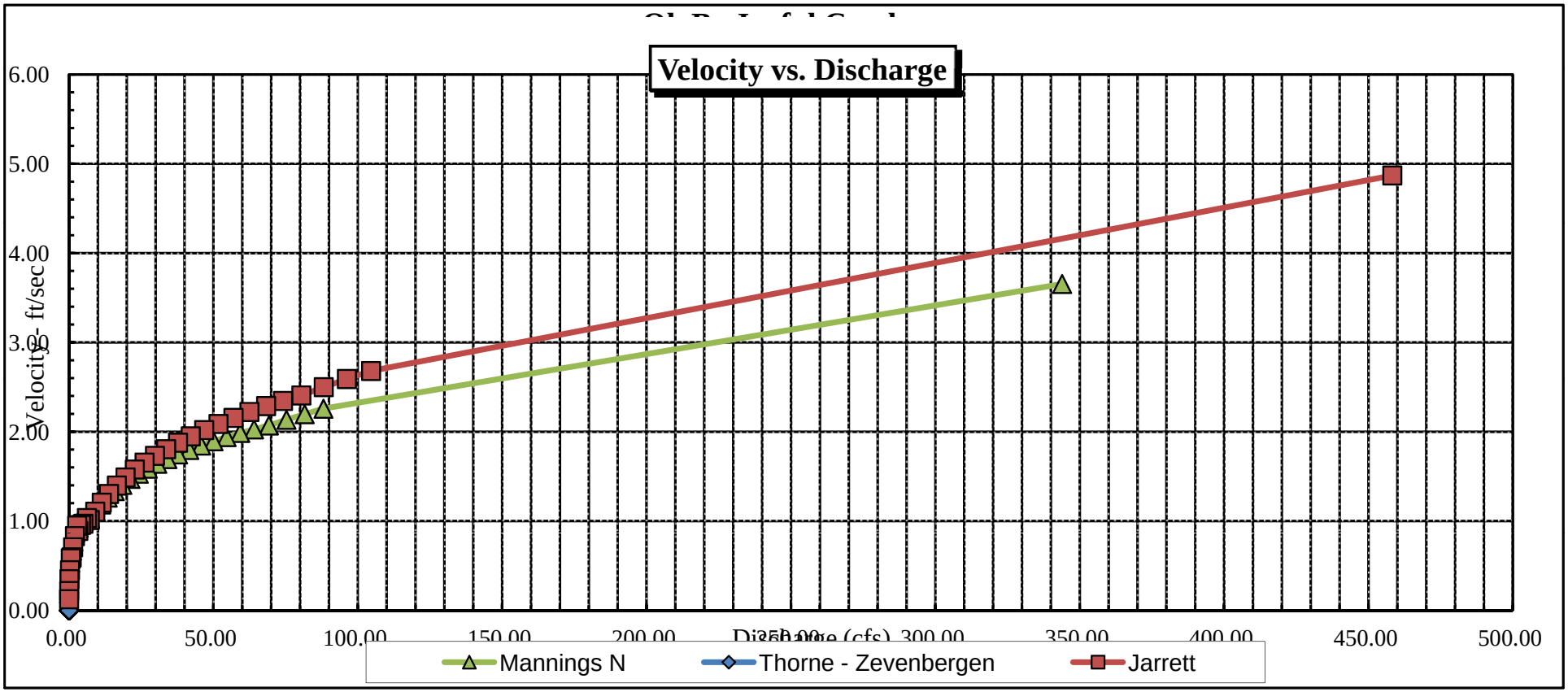
____
____
____
____
____
____
____
____
____
____
____
____
____
____
____

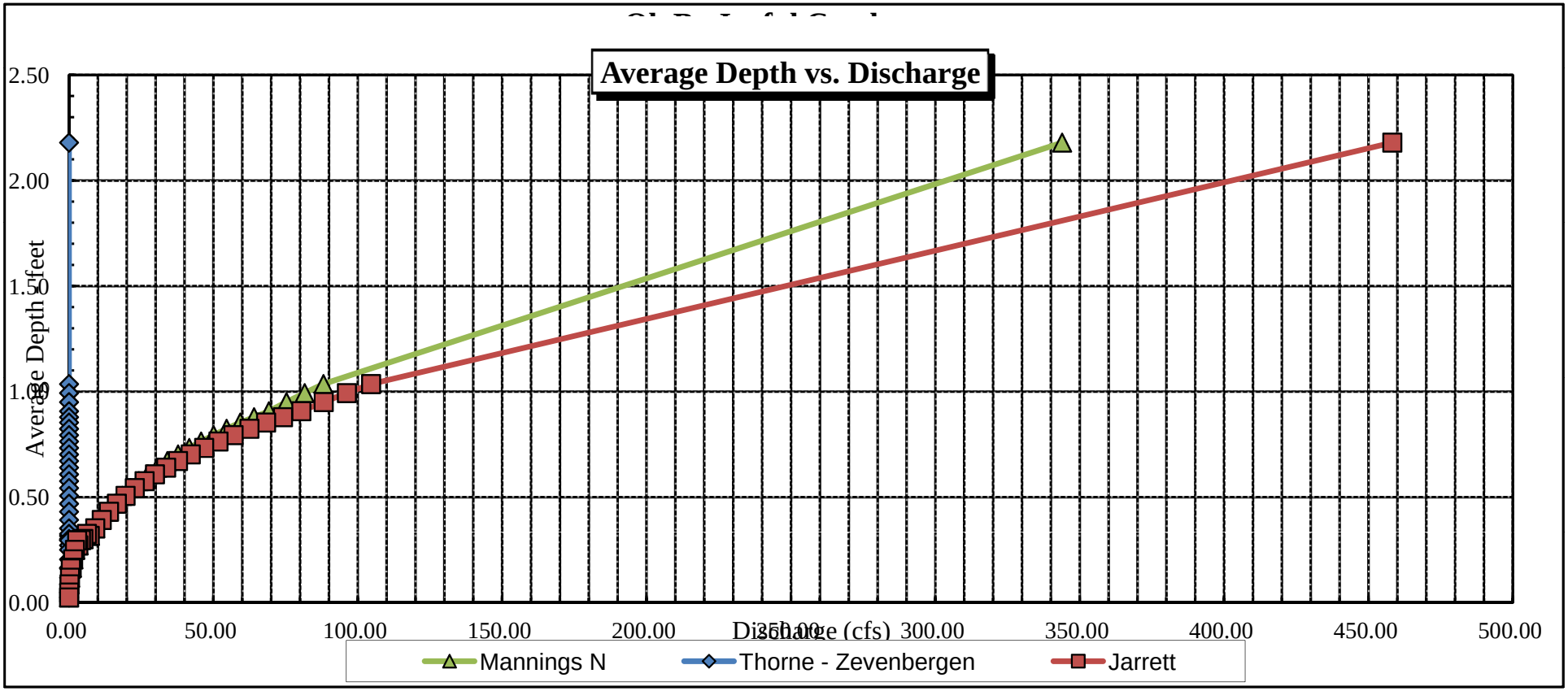
RECOMMENDATION BY: ……………………...………..……............................... AGENCY...……………………….....……....…...……....... DATE:......…...…......……………

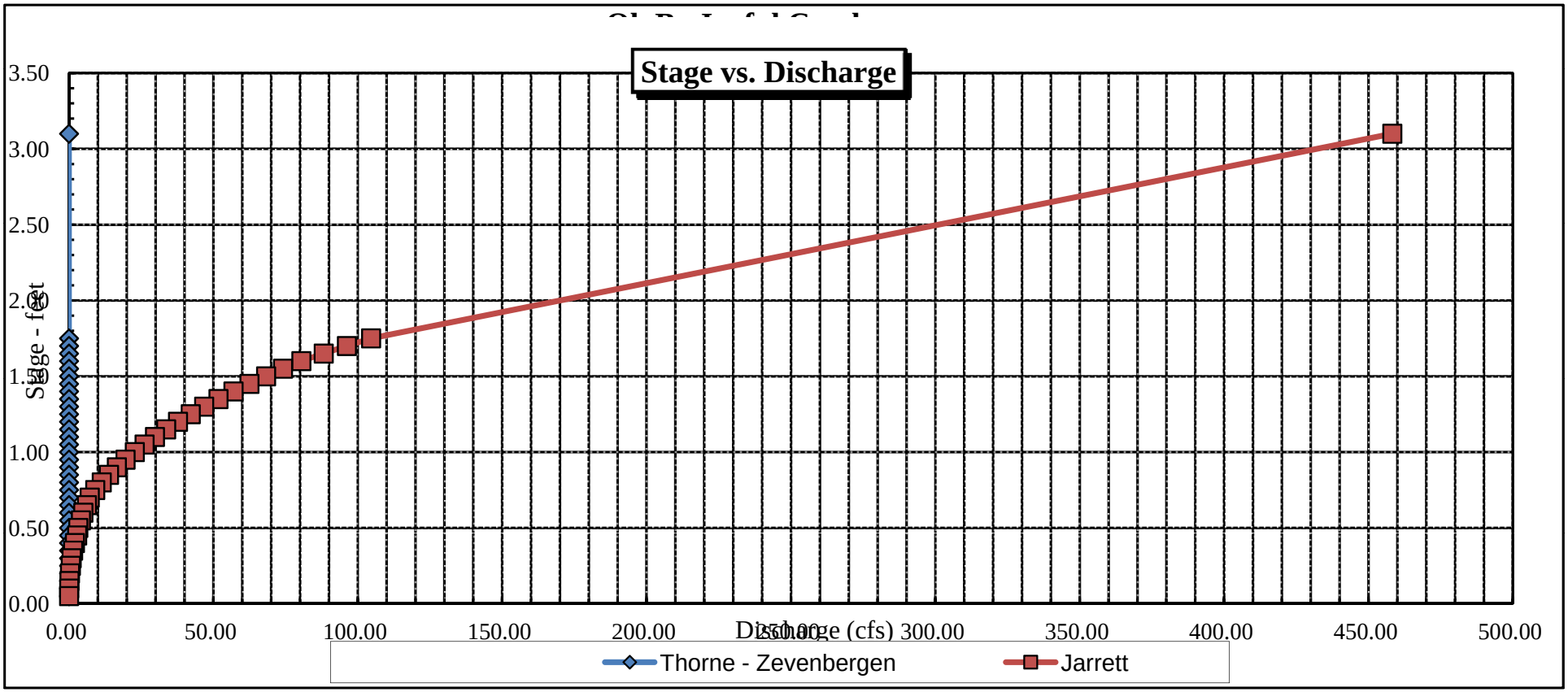
CWCB REVIEW BY: ..……………………………...……………………………………………………...…............. DATE:..................…………….....


CROSS SECTION DATA ANALYSIS
RS & G
W
W
G
LS
-2.00
-2.50
-3.00
-4.00
-5.00
-5.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
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
150.00
200.00
Discharge (cfs)
300.00
350.00
400.00
450.00
500.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Velocity - ft/sec
0.00
50.00
100.00
150.00
200.00
300.00
350.00
400.00
450.00
500.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
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
350.00
400.00
450.00
500.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
Stage - feet
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
300.00
350.00
400.00
450.00
500.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett