Walla Walla River
Fish Habitat Analysis Using the Instream Flow Incremental Methodology

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Washington State
Department of Ecology and Department of Fish and Wildlife

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Fish Habitat Analysis Using the Instream Flow Incremental Methodology

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SUMMARY

The Washington state departments of Ecology and Fish and Wildlife conducted an instream flow study in the Walla Walla River and Mill Creek using the Instream Flow Incremental Methodology (IFIM). The study provided information about the relationship between stream flow and fish habitat, which can be used in developing instream flow requirements for fish. Four key variables of fish habitat were examined:

- depth
- velocity (water movement)
- substrate (material on the stream bottom), and
- cover (material such as logs and boulders that provide shade and/or shelter from predators or fast moving water).

Four sites were chosen for study, each representing a specific stream reach. Field data were collected and entered into the IFIM hydraulic computer model to simulate the distribution of water depths and velocities with respect to substrate and cover under a variety of flows. The simulated habitat parameters were then used to generate the quantity (index) of available habitat at each modeled flow; this index is referred to as "weighted usable area" (WUA).

An IFIM study cannot, in and of itself, determine instream flow levels. The WUA graphs can only show whether an increase or decrease in stream flow will increase or decrease fish habitat based on depth, velocity, substrate, and cover.

Sometimes the maximum amount of available habitat occurs at a flow that is higher than what typically is found during the summer low flow period. This does not mean the model is incorrect. The model determines whether more or less flow makes more or less habitat based on the channel shape – not on the hydrology, which is constantly changing.

Whether an increase in habitat truly results in an increase in fish production will depend upon the many other factors that affect fish survival (such as water quality, dam passage survival, and predation). A discussion of some of the factors to consider when developing a flow regime is included later in this report.

This shortened version of the report does not include the 128 pages of appendices which provide technical details on the calibration of the hydraulic model. Please contact Ecology for a copy of the appendices.

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Introduction

The Department of Ecology (Ecology) is mandated by the Water Resources Act of 1971 (Chapter 90.54 RCW) to maintain base flows[1] "necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values." The Department of Fish and Wildlife (WDFW) is mandated to "preserve, protect, perpetuate, and manage the wildlife and food fish, game fish …" (RCW 77.04.012); part of this mandate is to protect habitat, including stream flows. In determining appropriate base, or instream, flows for fish habitat, Ecology and WDFW often use the Instream Flow Incremental Methodology (IFIM) to generate some of the necessary information.

Four sites were chosen for the current study, each composed of eight or nine transects. Three sites were in the Walla Walla River:

1) just downstream of Mill Creek at River Mile (RM) 32.9
2) downstream of Yellowhawk Creek at RM 36.5
3) immediately downstream of the State Route 125 over-pass at RM 38.7.

A fourth site was in Mill Creek, immediately upstream of the Wallula Road bridge at RM 2.7. Depths and velocities were measured at three to four different flow levels, and substrate was recorded at low flows.

Project Background

Location and Description

The Walla Walla River is located in southeastern Washington and northeastern Oregon. In Washington the river flows through Walla Walla County. The Walla Walla River headwaters and tributaries originate in the Blue Mountains at an elevation of about 6,000 feet and enter the Columbia River at Lake Walula behind McNary Dam at an elevation of about 260 feet. Steep, timbered terrain in the upper elevations and moderate slopes and level terrain at lower elevations characterize the Walla Walla drainage, which covers an area of about 1,760 square miles. The Walla Walla River flows through narrow well-defined canyons in the upper elevations and through broad low gradient valleys in the lower portion of the basin. Major tributaries to the Walla Walla River include the Touchet River, Mill Creek and the North and South Forks of the Walla Walla River.

The climate within the Walla Walla basin varies widely depending on the time of year. Temperatures range from over 100 degrees F in the summer months to below 0 degrees F in the winter, although winter temperatures close to freezing are more typical. Precipitation varies depending on elevation. The upper reaches of the watershed receive about 40 inches of precipitation annually, primarily as snow. Annual precipitation at the mouth of the river is approximately 10 inches per year, usually in the form of rain.

[1] In statute, the term "base flow" is used synonymously with the terms "instream flow" and "minimum instream flow." "Stream flow" refers to the amount of water flowing in a stream.

Water Quality
Monitoring of water quality on the Walla Walla River has indicated excursions (a situation where water quality conditions do not meet the standards) of temperature, pH, fecal coliform, nitrates, and pesticides. Monitoring of the river is conducted by Ecology on a monthly basis at ambient monitoring station 32A070 located at River Mile 15.3, near the town of Touchet. The Walla Walla River is listed on the Ecology's 303(d) list of water bodies which fail to meet state water quality standards.

Hydrology
As precipitation begins to diminish in the spring, stream flow in the Walla Walla River is supplemented by melting snow from the Blue Mountains. As precipitation further diminishes throughout the summer, the higher elevation snow melts away. Some intermittent tributaries dry up in the summer, substantially reducing flow to the Walla Walla River. Other tributaries have minimal flows during the summer months. Human water use is also a cause of low flows. Complete dewatering of some segments of the river and certain tributaries are due largely to water diversions during the summer irrigation season. This dewatering has been documented on the Walla Walla River near the Oregon-Washington border, in the lower Touchet River, and in the lower reaches of Mill Creek (James et al. 2001).

Specific hydrological data is available from the United States Geological Survey (USGS), which provides daily exceedance flow values for the streams and rivers throughout Washington. (Exceedance flows are the flows expected to be exceeded a specific percentage of the time: e.g. the 50 percent exceedance flow would be exceeded 50 percent of the time.) Data from some of the USGS gauge sites within the Walla Walla River basin are graphed in Figures 11-20.

In Figure 11, for example, the flow data for the Walla Walla River near Touchet gauge is portrayed with 10, 50, and 90 percent exceedance flows. The 50 percent exceedance flow is the median flow. Its values are close to but usually lower than the average flow. The 90 percent exceedance flow is exceeded 90 percent of the time. This can be thought of as a 1-in-10-year low flow for a given date. The 10 percent exceedance flow is roughly the 1-in-10-year high flow for a given date. One can expect about 80 percent of the flow values to fall within the 10 to 90 percent exceedance range.

Exceedance flows are a useful tool for looking at the “normal” flow of a river. Although it might seem logical to represent the “normal” flow as a number such as the average monthly flow, such a number is often one that has never been recorded as a daily flow. Averages are frequently skewed toward high numbers because of short-term rain events. It is therefore more appropriate to describe the “normal” flow in the river using the 10 to 90 percent range.

These graphs show the range of flows expected throughout the year based on recorded data. Figure 11 is based upon daily averages from the 1951-2000 period of record obtained from the USGS gauge near Touchet at river mile 18.2, which is downstream from the study sites in this report. The natural or historic flow is unknown since the existing gauge did not start until 1951, over a century after surface and ground water diversions began. The hydrographs in Figures 11 – 20 only show the normal range of river flows with past and existing diversions in use.

While conducting field measurements for the 2000 Walla Walla IFIM study, spot measurements were taken on some of the Walla Walla River tributaries. The results are as follows:

East Little Walla Walla River at Springfield Road	14 cfs	5/24/2000
West Little Walla Walla River at Sweagle Road	1.7 cfs	5/25/2000
Yellowhawk Creek near its mouth	43 cfs	5/24/2000
Stone Creek at Sweagle Road	0.1 cfs (est.)	5/25/2000
Cold Creek at its mouth	0.1 cfs (est.)	5/25/2000
Mill Creek at Sweagle Road	37 cfs	5/25/2000
Mud Creek near its mouth	3 cfs	5/25/2000
Pine Creek near its mouth	7.5 cfs	5/25/2000

Fishery Status

(Note: We relied heavily on the work of James et al. and their 2001 report on the Walla Walla Subbasin for the factual details included in this section.)

Many types of anadromous fish once lived in the Walla Walla basin, including spring and fall chinook as well as coho and chum salmon. Currently the only naturally occurring anadromous fish are summer steelhead. Adult spring chinook have recently been stocked into the basin.

In the reach of the Walla Walla studied (from the Oregon state line downstream to just below where it joins Mill Creek), juvenile steelhead are the primary life stage and species, with some use by juvenile chinook and spawning steelhead. Bull trout have also been found, but in small numbers. Chinook are not likely to spawn to any great extent in this area due to warm water during their spawning season, the fall. Fall chinook use the study area primarily as hatchery stray adults. Summer steelhead and spring chinook are discussed in more detail subsequently.

In the 1992 Washington State Salmon and Steelhead Stock Inventory (SASSI), summer steelhead stock are identified as being "depressed." A depressed stock is defined as one whose production is below expected levels, based on available habitat and natural variation in survival rates, but above where permanent damage is likely.

Steelhead, spring chinook, and bull trout in the Walla Walla basin are listed as threatened under the Endangered Species Act (ESA). Provisions of the ESA prohibit "taking" (i.e. the killing, harassing, or harming) of listed species. Diverting water to the point where fish or their habitats are significantly impacted is considered to be a "taking" of listed species.

Summer Steelhead

Summer steelhead (*Oncorhynchus mykiss*) are found throughout the Walla Walla watershed. Steelhead return after two years of ocean residence, unlike other Columbia basin runs which typically return after one year in saltwater. The spawning migration can begin as early as September with spawning from February to early June.

After steelhead spawn, their eggs remain in nests (redds) in the gravel for a period of several weeks up to several months, depending on temperature. The eggs hatch and young fry about one inch long emerge from the gravel in summer. They rear (feeding and growing) through the remainder of the summer, through the following winter, and for another year in the stream before going to sea in the spring. By this time they are about two years old and about 5 to 12 inches in length. Some rear longer before going to the sea ("outmigration"). Most spend at least one year at sea and return at lengths of about 24 inches or more.

The status of the summer steelhead stock is listed as "depressed" in the SASSI report due mainly to long term degradation of habitat and water withdrawal. Other factors include water quality problems, particularly high water temperatures. Out of basin influences such as migration losses at hydropower facilities along the Columbia River and poor ocean conditions also affect this summer steelhead stock. The number of returning steelhead has declined over the last decade according to the state of Oregon's escapement estimates (James et al. 2001).

Spring Chinook

Spring chinook (*Oncorhynchus tshawytscha*) stock were once abundant in the Walla Walla basin. The last large run was in 1925 and the species was gone by the 1950's. Habitat and passage problems from low flows due primarily to agricultural water diversions and land use practices are believed to have been the major cause of the loss of this species (James et al. 2001).

Ongoing local efforts have repaired and improved habitat and passage throughout the basin. Areas with suitable habitat include the North and South Forks of the Walla Walla River, upper Mill Creek, and upper Touchet River. James et al. reported that some adult spring chinook were transplanted to southern portions of the South Fork Walla Walla River and Mill Creek for spawning.

Spring chinook spawn in the upper reaches of a river system where water remains cool throughout the summer. Adults spawn in late August and September after returning from the ocean in spring or early summer and holding through summer in suitable habitat near the spawning area. The eggs hatch and young fry about 1.5 inches long emerge from the gravel in late winter. They rear (feeding and growing) through the spring, summer, and through the following winter, and then go to sea in the spring when they are about one year old and about 3 to 5 inches in length. Some rear longer before outmigration. Most spend at least one year at sea and return at lengths of about 24 inches or more.

Low Flows as a Limiting Factor

James et al., in their 2001 report on the Walla Walla mainstem, found that insufficient stream flows were a primary factor contributing to the depressed status of key fish species (steelhead, spring chinook, bull trout and lamprey). In lower portions of the Walla Walla, Mill Creek, Dry Creek, and Touchet River, access to higher quality habitat upstream may be limited by low stream flows.

In response to the low flow problem, the Bi-State Policy Group (led by Washington state representative Dave Mastin) developed short-term solutions for five reaches identified as in immediate need of increased flows. These reaches were:

- Walla Walla River at Tumalum
- Mill Creek at Wilbur Avenue
- Cottonwood Creek at Powerline Road
- Dry Creek at Dixie
- South Fork of the Touchet River mouth.

The Bi-State Policy Group's work, along with other actions, required the districts to leave a minimum flow of 13 cfs in the mainstem Walla Walla River past Nursery Bridge (including Tumalum), and 10 cfs past Burlingame Dam for the summer of 2000. The increased flows in these reaches created some habitat improvement, but not enough to significantly increase salmonid survival. For example, the stream flow was ultimately lost subsurface and to evaporation in the area of Tumalum Bridge, which left a significant reach without water during the summer months.

While low stream flows are clearly identified as limiting aquatic productivity, James et al. note several other contributing factors. These include high water temperatures, passage impediments and high sedimentation.

Study Methods

Overview of IFIM

The Instream Flow Incremental Methodology (IFIM) was selected as the best available method for predicting how the quantity of available fish habitat changes in response to incremental changes in stream flow. This methodology was developed by the U.S. Fish and Wildlife Service in the late 1970s (Bovee 1982). The IFIM involves putting site-specific stream flow and habitat data into a group of models collectively called PHABSIM (**P**hysical **HAB**itat **SIM**ulation). PHABSIM was and is the most commonly used hydraulic modeling program within IFIM to predict depths and velocities in streams.

In the 1990's, Thomas R. Payne and Associates (Arcata, CA) rewrote the PHABSIM program creating a version called RHABSIM (**R**iverine **HAB**itat **SIM**ulation). RHABSIM was chosen for the present study because it is a more user-friendly program, compatible with the Windows operating system. PHABSIM and RHABSIM produce similar depth and velocity predictions.

The IFIM is used nationwide and is accepted by most resource managers as the best available tool for determining the relationship between flows and fish habitat (Reiser, et al. 1989). However, the methodology only uses four variables in hydraulic simulation. At certain flows, such as extreme low flows, other variables such as fish passage, food supply (aquatic insects), competition between fish species, and predators (birds, larger fish, etc.) may be of overriding importance. In addition to the PHABSIM or RHABSIM models, IFIM may include water quality, sediment, channel stability, temperature, hydrology, and other variables that affect fish production. These additional variables are not analyzed in this report.

RHABSIM Process: in brief

The process of quantifying how the amount of available fish habitat changes in response to incremental changes in stream flow is as follows:

1. Collect data in the field: velocity, depth, substrate and cover measurements.
2. Enter data into hydraulic model and calibrate.
3. Enter data in habitat preference model.
4. Calculate Weighted Usable Area (WUA): Combine the predicted depths and velocities (from the hydraulic model) with the depths and velocities preferred by fish (from the habitat preference model). This provides what flows the fish prefer based on the depths and velocities they prefer: the WUA.

RHABSIM Process: in detail

The on-site data is collected and entered into HYDSIM (**HYD**raulic **SIM**ulation), a hydraulic computer model which deals with the movement and force of water. Several hydraulic modeling options are available in HYDSIM. Velocity can be calculated by regression and interpolation and extrapolation based on measured velocities at several flows. Alternatively, velocity at a single flow can be used to solve Manning's equation. These are discussed later in this report, in the section titled "Hydraulic Model."

HYDSIM uses multiple transects to predict depths and velocities in a river over a range of flows. It creates a cell for each measured point along the transect or cross-section. Each cell has an average water depth and water velocity associated with a type of substrate or cover for a particular flow. The cell's area is measured in square feet. Fish habitat is defined in the computer model by the variables of velocity, depth, substrate, and/or cover. These are important habitat variables that can be measured, quantified, and predicted.

After the HYDSIM model is calibrated (that is, adjusted to the situation being modeled) and run, its output is entered into another model (HABSIM, **HAB**itat **SIM**ulation) with data describing fish habitat preferences. These preferences vary by fish species and life stage (spawning and juvenile rearing).

The output of the HABSIM model is an index of fish habitat known as Weighted Useable Area (WUA). The preference factor for each variable in a cell is multiplied by the other variables to arrive at a composite, preference factor for that cell. For example, a velocity preference of 1.0 multiplied by a depth preference of 0.9, then multiplied by a substrate preference of 0.8 equals a composite factor of 0.72 for that cell:

velocity 1.0 x depth 0.9 x substrate 0.8 = 0.72, preference factor for that cell

This composite-preference factor is multiplied by the number of square feet of area in that cell.

A summation of all the transect cells' areas results in the total number of square feet of preferred habitat available at a specified flow. The final model result is a listing of units of square feet of habitat per 1,000 feet of stream. The WUA values are listed with their corresponding flows (given in cubic feet per second). See Figures 3 - 6.

Study Site and Transect Selection

Preliminary study sites were selected for the IFIM study with assistance from Glen Mendel and staff from WDFW, who provided local knowledge of fish distribution and habitat characteristics. Mendel and his staff were a valuable resource in site selections for this study. Hal Beecher (WDFW) and Mendel identified reaches of interest by flying over the basin from the Oregon border to the Walla Walla River confluence with the Columbia River in October 1998. These reaches were delineated on topographic maps.

Studies were directed at reaches between the confluence of the Touchet River and the Oregon state line. Within this part of the river are areas typical of the habitats used by salmonids, and areas affected by water management and future management options. Final site selections were made after on-site visits and access was secured with private property owners.

Four sites were chosen for the current study, each composed of eight or nine transects. Depths and velocities were measured at three to four different flow levels, and substrate was recorded at low flows.

Three sites were in the Walla Walla River:

1) just downstream of Mill Creek at River Mile (RM) 32.9
2) downstream of Yellowhawk Creek at RM 36.5
3) immediately downstream of the State Route 125 over-pass at RM 38.7.

A fourth site was in Mill Creek, immediately upstream of the Wallula Road bridge at RM 2.7. (Lower mainstem Walla Walla reaches were not addressed further because present salmonid use is limited to migration.)

The river mile location and the distances between transects are listed on the following page.

Maps indicating the four study sites are displayed in Figures 1 and 2.

Walla Walla River and Mill Creek Study Site Locations

Transect #	Location: Walla Wall River just downstream of SR 125.
1	River Mile **38.7**
2	78 feet upstream of #1
3	98 feet upstream of #2
4	102 feet upstream of #3
5	145 feet upstream of #4
6	89 feet upstream of #5
7	53 feet upstream of #6
8	102 feet upstream of #7

Transect #	Location: Walla Walla River just downstream of Yellowhawk Creek confluence.
1	River Mile **36.5**
2	51 feet upstream of #1
3	60.5 feet upstream of #2
4	97 feet upstream of #3
5	76 feet upstream of #4
6	147.5 feet upstream of #5
7	77 feet upstream of #6
8	75.5 feet upstream of #7

Transect #	Location: Walla Walla River just downstream of Mill Creek confluence.
1	River Mile **32.9**
2	122 feet upstream of #1
3	122 feet upstream of #2
4	100 feet upstream of #3
5	104 feet upstream of #4
6	117 feet upstream of #5
7	102 feet upstream of #6
8	59 feet upstream of #7
9	60 feet upstream of #8

Transect #	Location: Mill Creek just upstream of Wallula Road Bridge.
1	River Mile **2.7**
2	29 feet upstream of #1
3	28 feet upstream of #2
4	25 feet upstream of #3
5	22 feet upstream of #4
6	107 feet upstream of #5
7	105 feet upstream of #6
8	173.5 feet upstream of #7

Figure 1. Upper Walla Walla River IFIM Sites.

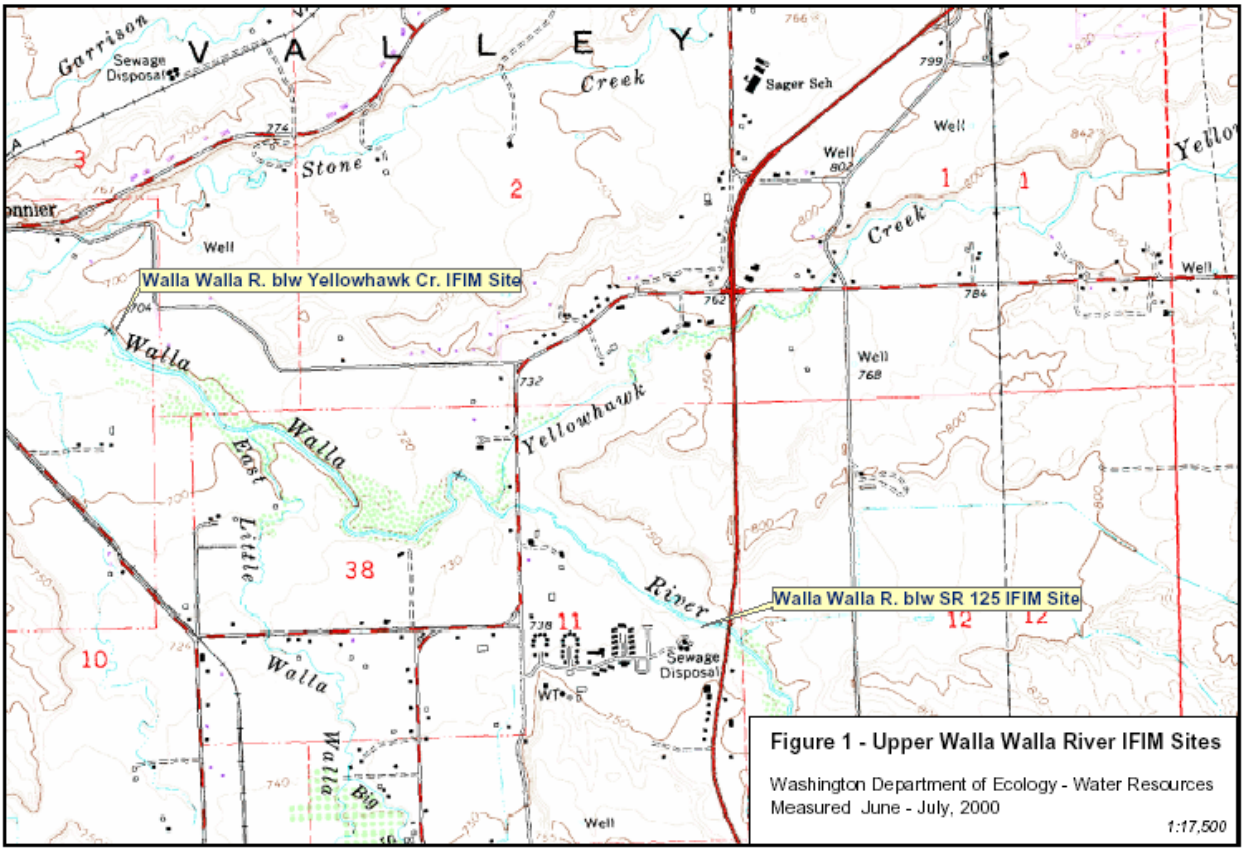
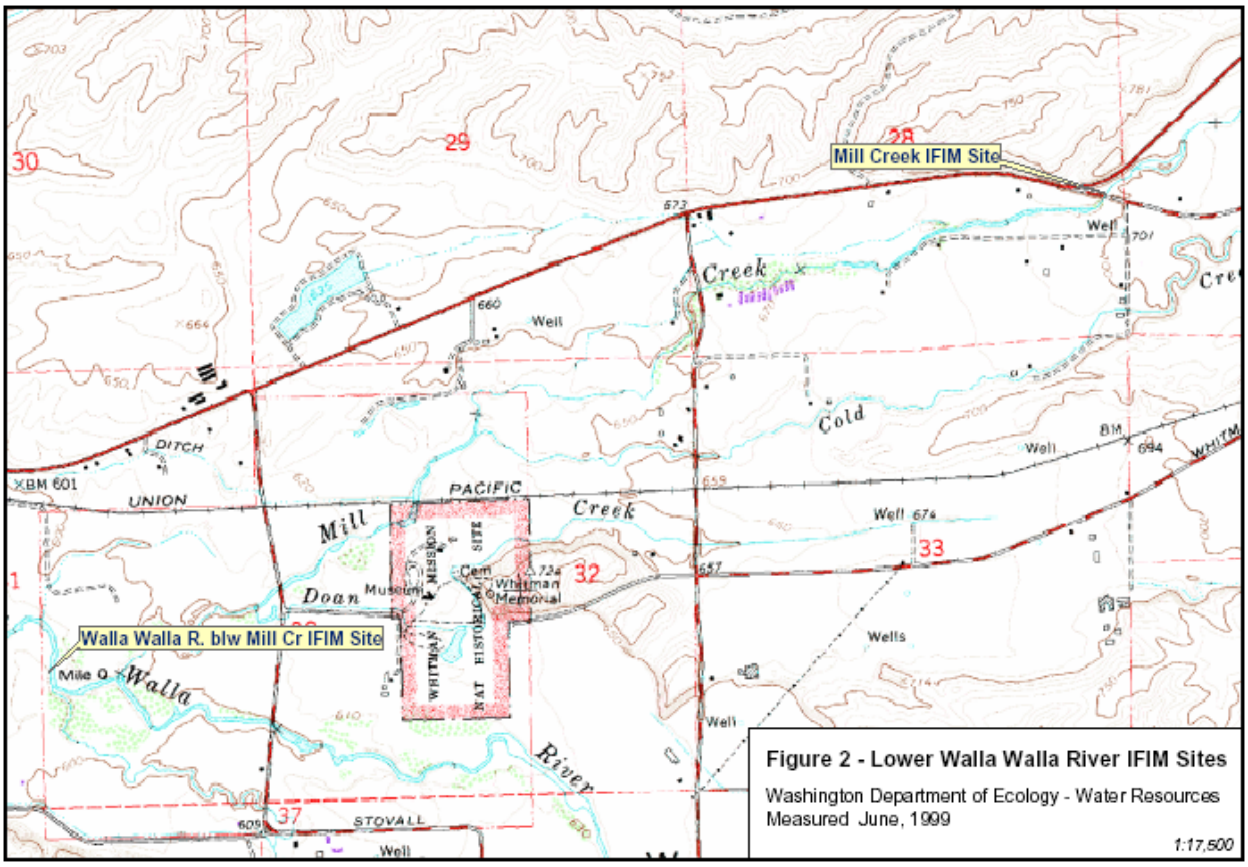


Figure 2. Lower Walla Walla River IFIM Sites.



Field Procedures/Data Collection
IFIM measurements were taken in June and July of 1999 at the following sites and flows:

- Walla Walla River below Mill Creek study site at 180, 70 and 21 cfs
- Mill Creek just upstream of the Wallula Road crossing study site at 56, 25 and 5 cfs.

In June and July of 2000, measurements were taken at :

- Walla Walla River below Yellowhawk Creek at 327, 130, 68 and 46 cfs
- Walla Walla below SR 125 study sites 202, 64, 13 and 6 cfs.

A temporary gauge at each site was used to verify that stream flow rates at each transect remained steady during measurement. Transects were marked using survey hubs and flagging. Water velocity was measured using standard USGS methods with a calibrated Swoffer velocity meter mounted on a top-set wading rod. Depth and velocity were recorded at fixed locations along measuring tapes stretched across transects at each measured flow.

Water surface elevations and stream-bank profiles were surveyed with a survey level and stadia rod. These points were referenced to an arbitrary, fixed benchmark. Substrate composition and cover were assessed by visually estimating the percentage of the two main particle size classes and type of cover present (Appendix D).

Hydraulic Model

This section in brief: The field data is entered into the hydraulic model and calibrated, ensuring that the depths and velocities predicted by the model match the measured depths and velocities as closely as possible.

This section in detail*:*
Calibration Philosophy
Calibration of the hydraulic model involved checking the velocities and depths predicted by the model against velocities and depths measured in the field. This included examining indicators of the model's accuracy such as the Velocity Adjustment Factor (VAF). Input data were changed or manipulated only when doing so would improve the model's ability to extrapolate without reducing the accuracy of predicted depths and velocities at the measured calibration flows.

Calibration of the RHABSIM Version 2 model was done cell by cell for each transect to decide whether the predicted cell velocities adequately represented measured velocities. Generally, if the predicted cell velocity at the calibration flow was within 0.2 feet per second (fps) or 20% of the measured cell velocity, the predicted velocity was considered adequate. Any change to a calibration velocity was usually limited to a change of 0.2 fps or 20% of the measured cell velocity. The 0.2 fps or 20% of the measured cell velocity was thought to be reasonable considering the normal range of velocity measurement error. All cell velocities were reviewed at the highest and lowest extrapolated flows to ensure that extreme cell velocities were not predicted.

Indicators of Model Accuracy
One indicator of the HYDSIM model's accuracy in predicting depths and velocities is the Velocity Adjustment Factor (VAF). See Appendix B for VAFs and other calibration details and data changes for each transect at each site.

The VAF for a three-velocity regression hydraulic model indicates whether the flow predicted from the velocity/discharge regressions matches the flow predicted from the stage/discharge regressions. The velocities predicted from the velocity/discharge regressions for a transect are all multiplied by the same VAF to achieve the flow predicted from the stage/discharge regression. Calculating and comparing the flows predicted from two different regressions gives an indication as to whether or not some of the model's assumptions are being met.

In VAF value ranges (Milhous, et al. 1989):

- 0.9 to 1.1 is considered good,
- 0.85 to 0.9 and 1.1 to 1.15 is fair,
- 0.8 to 0.85 and 1.15 to 1.20 is marginal
- less than 0.8 and more than 1.2 is poor.

The standard extrapolation range is 0.4 times the low measured flow to 2.5 times the high measured flow. The extrapolation range of the model is usually limited when two or more transects have VAFs which fall below 0.8 or above 1.2.

In the case of the single velocity models, velocity simulations are based on Manning's N values calculated for individual cells across each transect. These Manning's N values are derived from a single set of depth and velocity measurements at each transect. The Manning's N values are used at each wetted cell throughout all simulated flows. A VAF based on the ratio between the calculated flow (using Manning's N) and the simulated flow is applied to all predicted velocities.

Since the model uses the same Manning's N value in a particular cell at all simulated flows, Manning's N values were adjusted as needed in order to more reasonably predict simulation velocities. Changes to actual calibration velocities were usually limited to cells at the channel edge where velocity simulation can be problematic.

Site Specific Calibration
For the Mill Creek just upstream of Wallula Road crossing study site a three-velocity regression hydraulic model with eight transects was created with RHABSIM with an extrapolation range of 3 to 135 cfs. The water surface elevations were modeled using a log-log regression of the three measured flows.

For the Walla Walla River below Yellowhawk Creek study site a three-velocity regression hydraulic model with eight transects was created with RHABSIM with an extrapolation range of 15 to 500 cfs. The water surface elevations were modeled using a log-log regression of four measured flows.

For the Walla Walla below SR 125 study site two different one-velocity hydraulic models with eight transects each were created with RHABSIM with an extrapolation range of 3 to 325 cfs.

The first model simulated flows from 3 to 13 cfs using the velocities from the 13 cfs measured flow. The second model simulated flows from 15 to 325 cfs using the velocities from the 64 cfs measured flow. Due to the nature of the hydraulic dynamics of this site it was decided that two one-flow models would be more accurate than a three-velocity regression. The water surface elevations were modeled using a log-log regression of four measured flows.

See Appendix A for the input files showing the distance along the transects with the corresponding bed elevations, velocities, substrate/cover, and water surface elevations. See Appendix B for calibration details, velocity adjustment factors, and changes to data.

For the Walla Walla River below Mill Creek study site a three-velocity regression hydraulic model with nine transects was created with RHABSIM with an extrapolation range of 10 to 350 cfs. The water surface elevations were modeled using a log-log regression of the three measured flows.

Transect Weighting

Transect weighting is the percentage of weight given to one transect's WUA results as compared to all the other transects. It shows which transects have the most effect on the final WUA results.

The table below lists the percent weighting each transect received relative to the whole site. Transect weighting is determined in one of two ways: either the model automatically determines weighting for each transect by using the distance between the transects, or transect weight is set to predetermined levels by specifying distances between transects and upstream weighting (referred to as composite weighting). Composite weighting is done when the transects are located far apart and the distances between the transects would create incorrect weighting, or the investigator wants to increase the weight of a particular type of fish habitat for that site. Transect weighting for the Walla Walla River site was done using the distances between the transects.

Transect Weighting for the Walla Walla River and Mill Creek Study Sites

Transect #	1	2	3	4	5	6	7	8	9
Percent of Study Site									
Walla Walla River below Mill Creek	8%	16%	14%	13%	14%	14%	10%	8%	4%
Walla Walla River below Yellowhawk Creek	4%	10%	13%	15%	19%	19%	13%	6%	N/A
Walla Walla River below SR 125	6%	13%	15%	19%	18%	11%	12%	8%	N/A
Mill Creek at Wallula Rd.	3%	6%	5%	5%	13%	22%	28%	18%	N/A

Habitat Use Model (HABSIM)
The HABSIM program combines the depths and velocities predicted from the HYDSIM hydraulic model with the depths, velocities, cover, and substrate preferences from the habitat-use curves. The HABSIM program calculates WUA for each flow modeled.

Habitat Preference Curves
Habitat preference curves for steelhead and chinook juveniles were developed as composites from several sites around Washington, including upper Mill Creek and two Blue Mountain streams, Asotin Creek and Tucannon River.

Biologists snorkeled stream reaches and marked locations of fish with weighted flags. Depth, velocity, and substrate were measured and recorded at fish locations. Depth, velocity, and substrate used by fish were compared to available habitat as determined from regularly spaced measurements on a grid over the stream reach (Beecher, Caldwell, and DeMond, 2002).

Fish preference curves for the Walla Walla River were agreed to by Ecology (Brad Caldwell) and WDFW (Hal Beecher) on March 13, 2001. Existing agency preference curves were used for chinook and steelhead juvenile substrate and cover as well as steelhead spawning. These preference curves are listed in Appendix C.

Factors to Consider When Developing a Flow Regime

No instream flow recommendations are made in this report. The process of determining instream flows for the Walla Walla basin will require a complex negotiation process, taking into account numerous factors. Instream flows need to be discussed in the context of the long-range water and fishery management objectives desired by the local watershed planning groups, state and federal natural resource agencies and affected Tribes.

Different fish species and life stages exist simultaneously in the river and each has a different flow requirement. Instream flows must include flows necessary for incubation of fish eggs, smolt out-migration, fish passage to spawning grounds, and prevention of stranding of fry and juveniles, for each species. Each fish species and life stage will need to be ranked, and competing life stages balanced against each other. Clearly, no single flow number will simultaneously provide optimum habitat for all fish species and life stages.

Integration of the WUA graphs alone will not show what the instream flow should be. The graphs show whether an increase or decrease in stream flow will increase or decrease fish habitat based on depth, velocity, substrate, and cover. Since only these four variables are considered, it is important to remember that other factors also impact the amount of useable fish habitat. The WUA graph may show that an increase in stream flow will result in increased fish habitat, but fish habitat may not actually be increased if other factors such as water quality are at limiting levels.

It is important to note that sometimes WUA reaches its maximum at a flow that is greater than what typically occurs. This is an indication that low flow may limit the population at that time of

year. It does not mean that the model is incorrect. The model shows how much water provides how much habitat in a given stream channel, regardless of hydrology. The model addresses hydraulics, which is a function of channel shape, but not hydrology.

In addition to WUA, an instream flow recommendation requires the evaluation and incorporation of environmental variables other than habitat that affect fish survival, such as dam passage survival, water temperature, harvest and ocean survival. Water quality, the natural hydrology and sediment load should also be considered. Reaching a conclusion about an appropriate instream flow involves integrating the results of the IFIM study with consideration of these environmental variables.

Under the state's Water Resources Act of 1971 (Ch. 90.54 RCW), which guides Ecology in setting instream flows, an instream flow level must protect and preserve fish and all other environmental values. However, it is important to understand that instream flows set in rule cannot take away existing water rights; instream flows have a priority date like any water right, and therefore only affect water rights that are junior to it. In this way, instream flows are limited in what they can accomplish in protecting instream values, since no existing legal water users can be required by the state to put water in the stream to get the flow up to the calculated instream flow, even if the existing legal diverters are drying up the stream. In fact, instream flow rules serve to protect existing water right users by restricting new upstream diverters.

It is important for the reader to remember that instream flows may differ depending on whether they were determined under state or federal laws. State laws have different goals and objectives than federal laws, and therefore instream flows or target flows may not be the same.

Results

The study results are summarized in three types of graphs (Figures 3 - 10 and Tables 1 - 4):

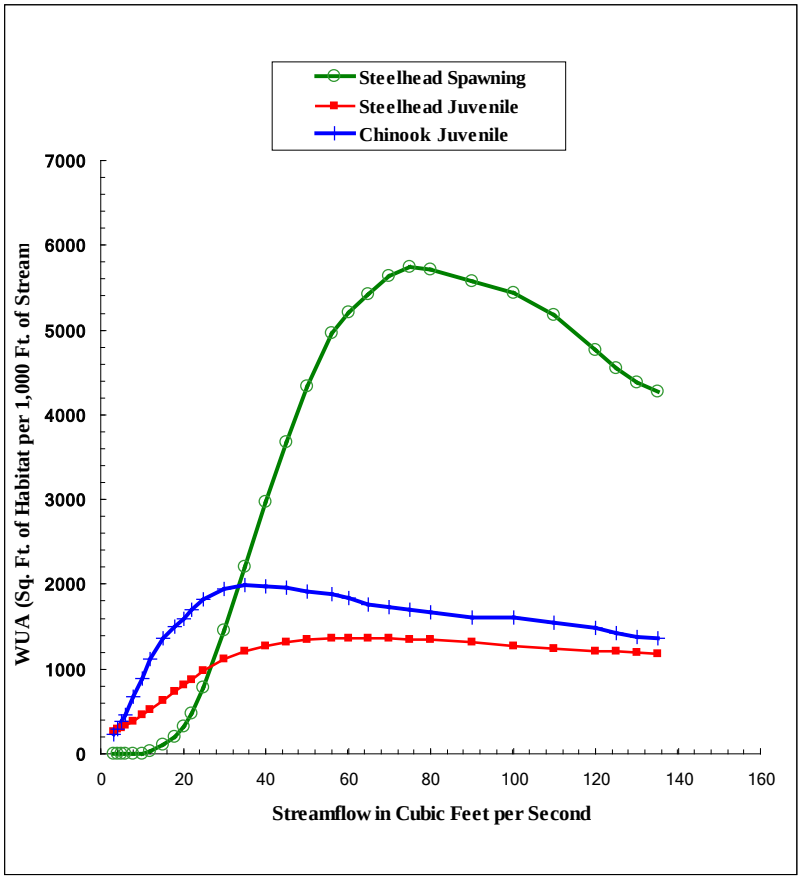
- ***fish habitat (WUA) versus flow graphs*** show the increase or decrease in the amount of fish habitat that results with an increase or decrease in stream flow
- ***percent of peak habitat versus flow tables*** show the percentage of increase or decrease in habitat with a loss or gain of stream flow from the highest possible amount of WUA
- ***wetted stream width versus flow graphs*** show the amount of stream width that is increased or decreased with an increase or decrease in flow.

These tables show whether there is a gain or loss in fish habitat or width for a given increase or decrease in flow.

Hydrographs

Flow Exceedance Probability Hydrographs (Figures 11 – 20), based on data collected from USGS gauges, follow the study results. These hydrographs are presented so that the reader can compare the WUA results to the likelihood that certain stream flows will actually be available. For example, if a specific spawning flow is desired for steelhead in May, will there be enough water for incubating the eggs until they hatch and the fry emerge in July. These are the kinds of questions the hydrographs can help answer. (For additional details, see the section on Hydrology at the beginning of this document, under "Project Background.")

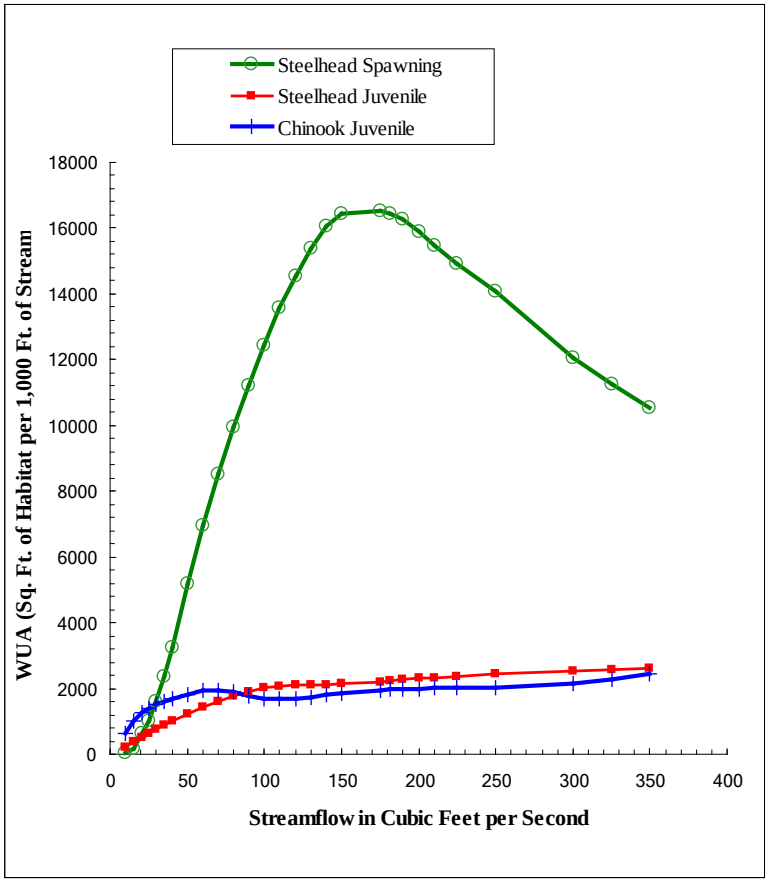
Figure 3. Mill Creek above Wallula Road: Fish Habitat (WUA) vs Flow.



Flow (cfs)	Steelhead Spawning	Steelhead Juvenile	Chinook Juvenile
3	0	261	233
4	0	285	296
5	0	308	376
6	0	333	460
8	0	390	673
10	5	454	889
12	37	519	1124
15	101	621	1359
18	204	733	1507
20	318	807	1591
22	470	879	1693
25	785	978	1816
30	1459	1113	1939
35	2210	1208	1995
40	2967	1275	1980
45	3679	1318	1960
50	4341	1346	1909
56	4959	1367	1885
60	5208	1367	1841
65	5424	1362	1766
70	5635	1359	1726
75	5742	1355	1695
80	5710	1350	1664
90	5577	1312	1615
100	5442	1271	1609
110	5178	1237	1541
120	4769	1214	1480
125	4554	1203	1427
130	4384	1190	1378
135	4275	1177	1356

Table 1. Percent of Peak Habitat vs Flow for Mill Creek.			
Flow (cfs)	**Steelhead Spawning**	**Steelhead Juvenile**	**Chinook Juvenile**
3	0%	19%	12%
4	0%	21%	15%
5	0%	23%	19%
6	0%	24%	23%
8	0%	29%	34%
10	0%	33%	45%
12	1%	38%	56%
15	2%	45%	68%
18	4%	54%	76%
20	6%	59%	80%
22	8%	64%	85%
25	14%	72%	91%
30	25%	81%	97%
35	38%	88%	**100%**
40	52%	93%	99%
45	64%	96%	98%
50	76%	98%	96%
56	86%	**100%**	94%
60	91%	**100%**	92%
65	94%	**100%**	89%
70	98%	99%	87%
75	**100%**	99%	85%
80	99%	99%	83%
90	97%	96%	81%
100	95%	93%	81%
110	90%	90%	77%
120	83%	89%	74%
125	79%	88%	72%
130	76%	87%	69%
135	74%	86%	68%

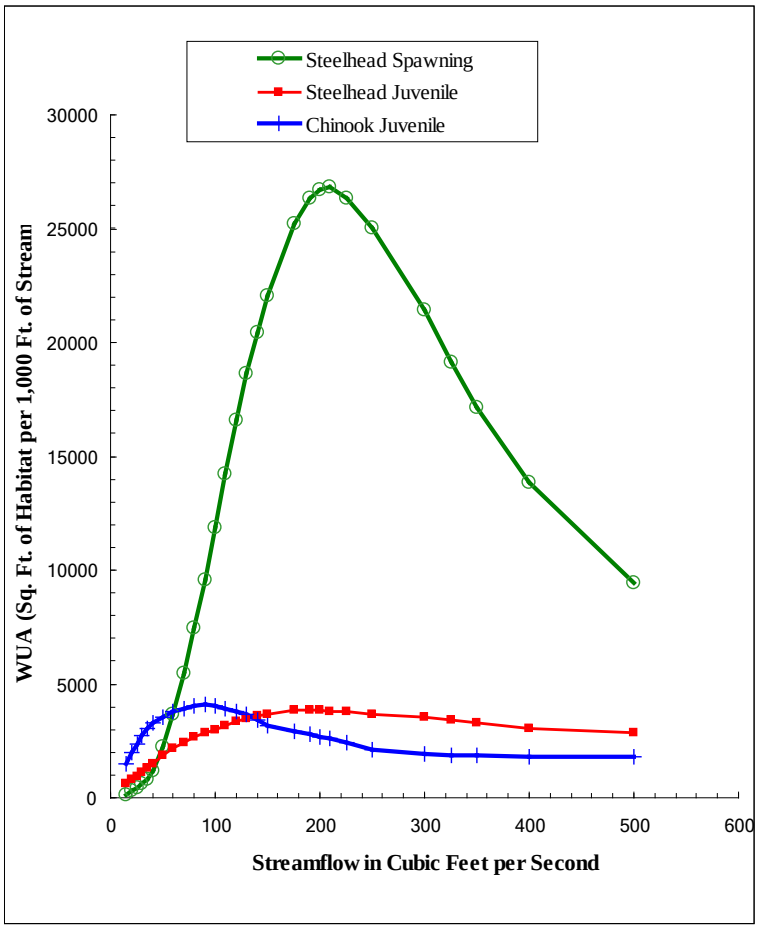
Figure 4. Walla Walla below Mill Creek: Fish Habitat (WUA) vs Flow.



Flow (cfs)	Steelhead Spawning	Steelhead Juvenile	Chinook Juvenile
10	31	231	616
15	182	359	1015
21	625	519	1263
25	1027	629	1392
30	1601	754	1525
35	2366	875	1619
40	3236	994	1685
50	5168	1220	1796
60	6971	1419	1931
70	8519	1617	1954
80	9928	1783	1900
90	11226	1909	1758
100	12446	2019	1688
110	13556	2076	1670
120	14536	2105	1698
130	15372	2112	1732
140	16065	2124	1798
150	16444	2143	1867
175	16513	2204	1947
182	16429	2233	1966
190	16272	2267	1971
200	15889	2308	1980
210	15463	2339	2012
225	14915	2373	2017
250	14085	2430	2034
300	12069	2535	2139
325	11243	2560	2287
350	10540	2613	2432

Table 2. Percent of Peak Habitat vs Flow for Walla Walla River below Mill Creek.			
Flow (cfs)	**Steelhead Spawning**	**Steelhead Juvenile**	**Chinook Juvenile**
10	0%	9%	25%
15	1%	14%	42%
21	4%	20%	52%
25	6%	24%	57%
30	10%	29%	63%
35	14%	33%	67%
40	20%	38%	69%
50	31%	47%	74%
60	42%	54%	79%
70	52%	62%	80%
80	60%	68%	78%
90	68%	73%	72%
100	75%	77%	69%
110	82%	79%	69%
120	88%	81%	70%
130	93%	81%	71%
140	97%	81%	74%
150	**100%**	82%	77%
175	**100%**	84%	80%
182	99%	85%	81%
190	99%	87%	81%
200	96%	88%	81%
210	94%	90%	83%
225	90%	91%	83%
250	85%	93%	84%
300	73%	97%	88%
325	68%	98%	94%
350	64%	**100%**	**100%**

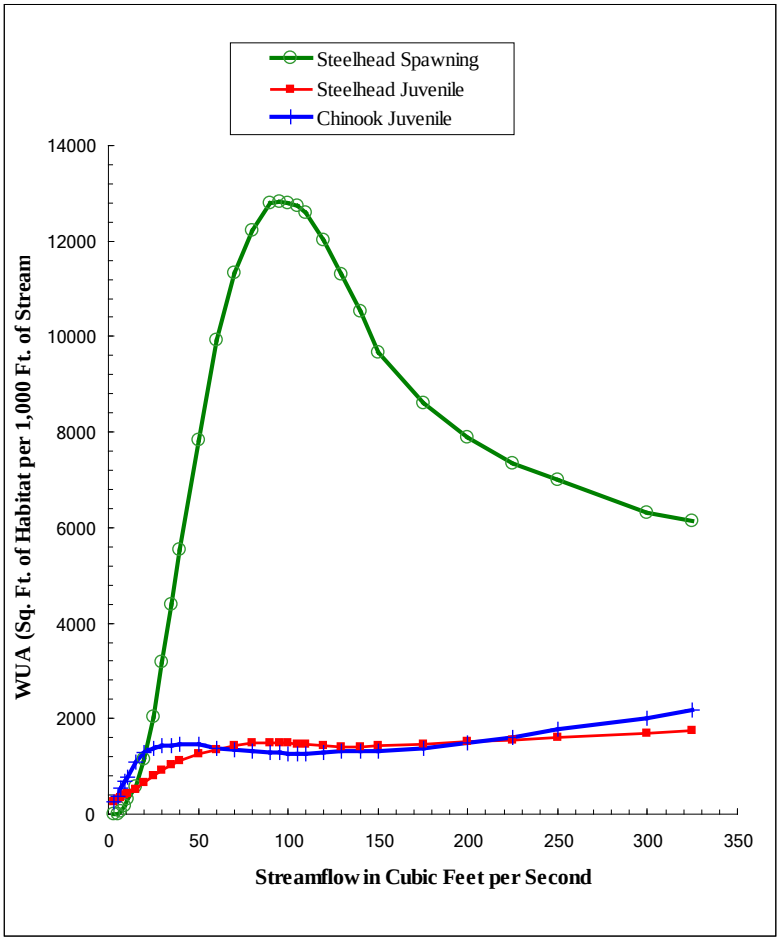
Figure 5. Walla Walla River below Yellowhawk Creek: Fish Habitat (WUA) vs Flow.



Flow (cfs)	Steelhead Spawning	Steelhead Juvenile	Chinook Juvenile
15	155	644	1463
20	285	797	1987
25	438	955	2357
30	608	1125	2763
35	812	1309	3051
40	1153	1491	3271
50	2249	1850	3564
60	3679	2163	3760
70	5454	2436	3913
80	7426	2662	4068
90	9578	2830	4105
100	11866	3002	4029
110	14240	3166	3903
120	16555	3327	3810
130	18650	3472	3641
140	20434	3592	3393
150	22054	3692	3193
175	25237	3850	2940
190	26359	3849	2797
200	26733	3827	2681
210	26839	3808	2592
225	26332	3769	2412
250	25012	3670	2117
300	21416	3524	1901
325	19128	3400	1877
350	17133	3282	1869
400	13835	3069	1828
500	9416	2865	1799

Table 3. Percent of Peak Habitat vs Flow for Walla Walla River below Yellowhawk Creek.			
Flow (cfs)	**Steelhead Spawning**	**Steelhead Juvenile**	**Chinook Juvenile**
15	1%	17%	36%
20	1%	21%	48%
25	2%	25%	57%
30	2%	29%	67%
35	3%	34%	74%
40	4%	39%	80%
50	8%	48%	87%
60	14%	56%	92%
70	20%	63%	95%
80	28%	69%	99%
90	36%	74%	**100%**
100	44%	78%	98%
110	53%	82%	95%
120	62%	86%	93%
130	69%	90%	89%
140	76%	93%	83%
150	82%	96%	78%
175	94%	**100%**	72%
190	98%	**100%**	68%
200	**100%**	99%	65%
210	**100%**	99%	63%
225	98%	98%	59%
250	93%	95%	52%
300	80%	92%	46%
325	71%	88%	46%
350	64%	85%	46%
400	52%	80%	45%
500	35%	74%	44%

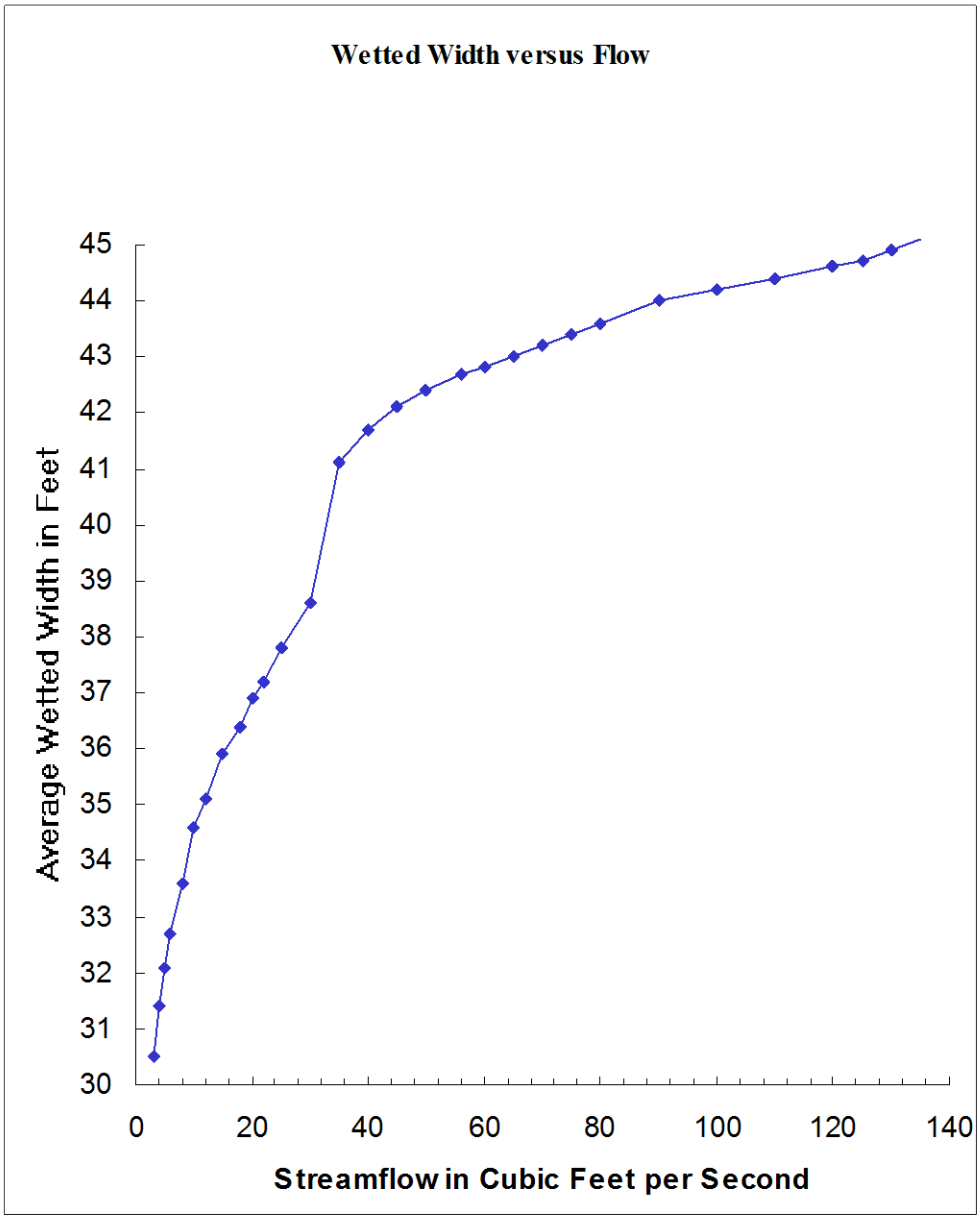
Figure 6. Walla Walla River below HWY 125: Fish Habitat (WUA) vs Flow.



Flow (cfs)	Steelhead Spawning	Steelhead Juvenile	Chinook Juvenile
3	0	261	250
5	11	303	363
7	55	348	541
9	166	391	688
11	328	433	774
15	565	520	1099
20	1144	660	1285
25	2043	796	1382
30	3197	926	1423
35	4394	1031	1445
40	5547	1121	1461
50	7844	1249	1451
60	9940	1348	1375
70	11328	1443	1349
80	12215	1482	1312
90	12796	1493	1292
95	12831	1487	1284
100	12800	1479	1273
105	12739	1472	1263
110	12599	1460	1267
120	12007	1430	1299
130	11309	1414	1323
140	10521	1419	1320
150	9679	1427	1318
175	8611	1476	1390
200	7895	1527	1481
225	7347	1553	1617
250	6990	1609	1765
300	6322	1703	2016
325	6133	1756	2193

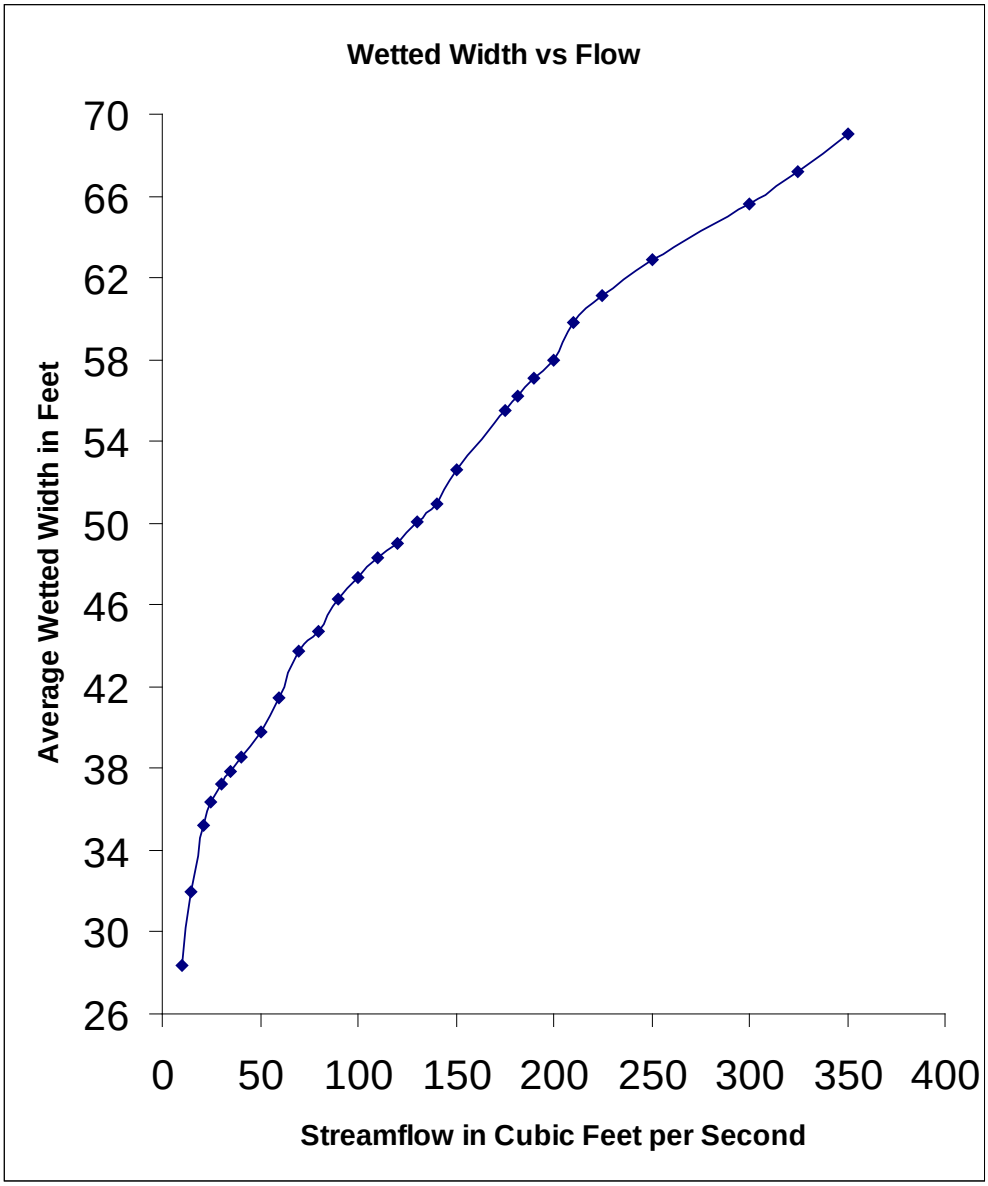
Table 4. Percent of Peak Habitat vs Flow for Walla Walla River below HWY 125.			
Flow (cfs)	**Steelhead Spawning**	**Steelhead Juvenile**	**Chinook Juvenile**
3	0%	15%	11%
5	0%	17%	17%
7	0%	20%	25%
9	1%	22%	31%
11	3%	25%	35%
15	4%	30%	50%
20	9%	38%	59%
25	16%	45%	63%
30	25%	53%	65%
35	34%	59%	66%
40	43%	64%	67%
50	61%	71%	66%
60	77%	77%	63%
70	88%	82%	62%
80	95%	84%	60%
90	**100%**	85%	59%
95	**100%**	85%	59%
100	**100%**	84%	58%
105	99%	84%	58%
110	98%	83%	58%
120	94%	81%	59%
130	88%	81%	60%
140	82%	81%	60%
150	75%	81%	60%
175	67%	84%	63%
200	62%	87%	68%
225	57%	88%	74%
250	54%	92%	80%
300	49%	97%	92%
325	48%	**100%**	**100%**

Figure 7. Average Wetted Width for Mill Creek above Wallula Road.



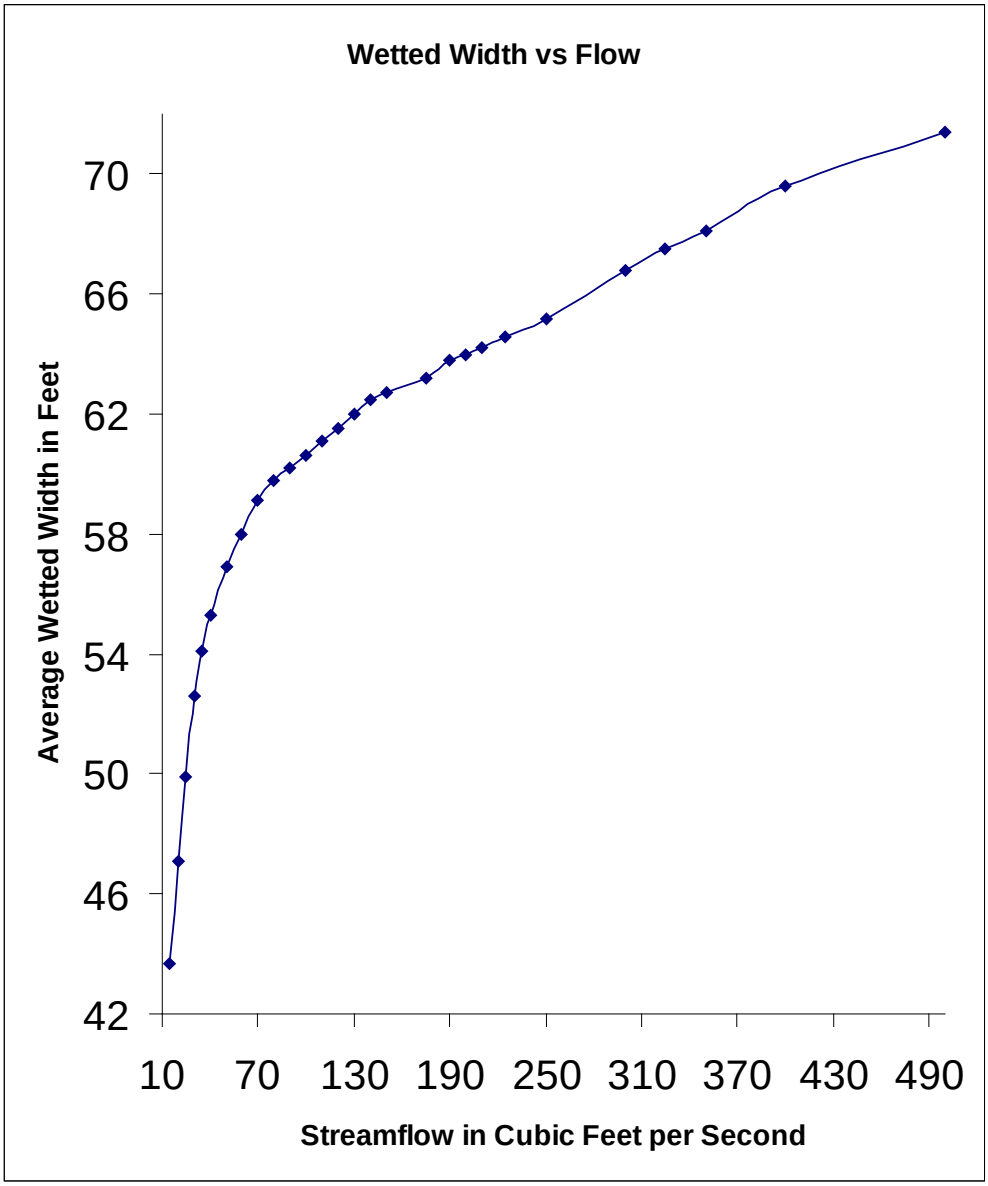
Flow (cfs)	Wetted Width (feet)
3	30.5
4	31.4
5	32.1
6	32.7
8	33.6
10	34.6
12	35.1
15	35.9
18	36.4
20	36.9
22	37.2
25	37.8
30	38.6
35	41.1
40	41.7
45	42.1
50	42.4
56	42.7
60	42.8
65	43
70	43.2
75	43.4
80	43.6
90	44
100	44.2
110	44.4
120	44.6
125	44.7
130	44.9
135	45.1

Figure 8. Average Wetted Width for Walla Walla River below Mill Creek.



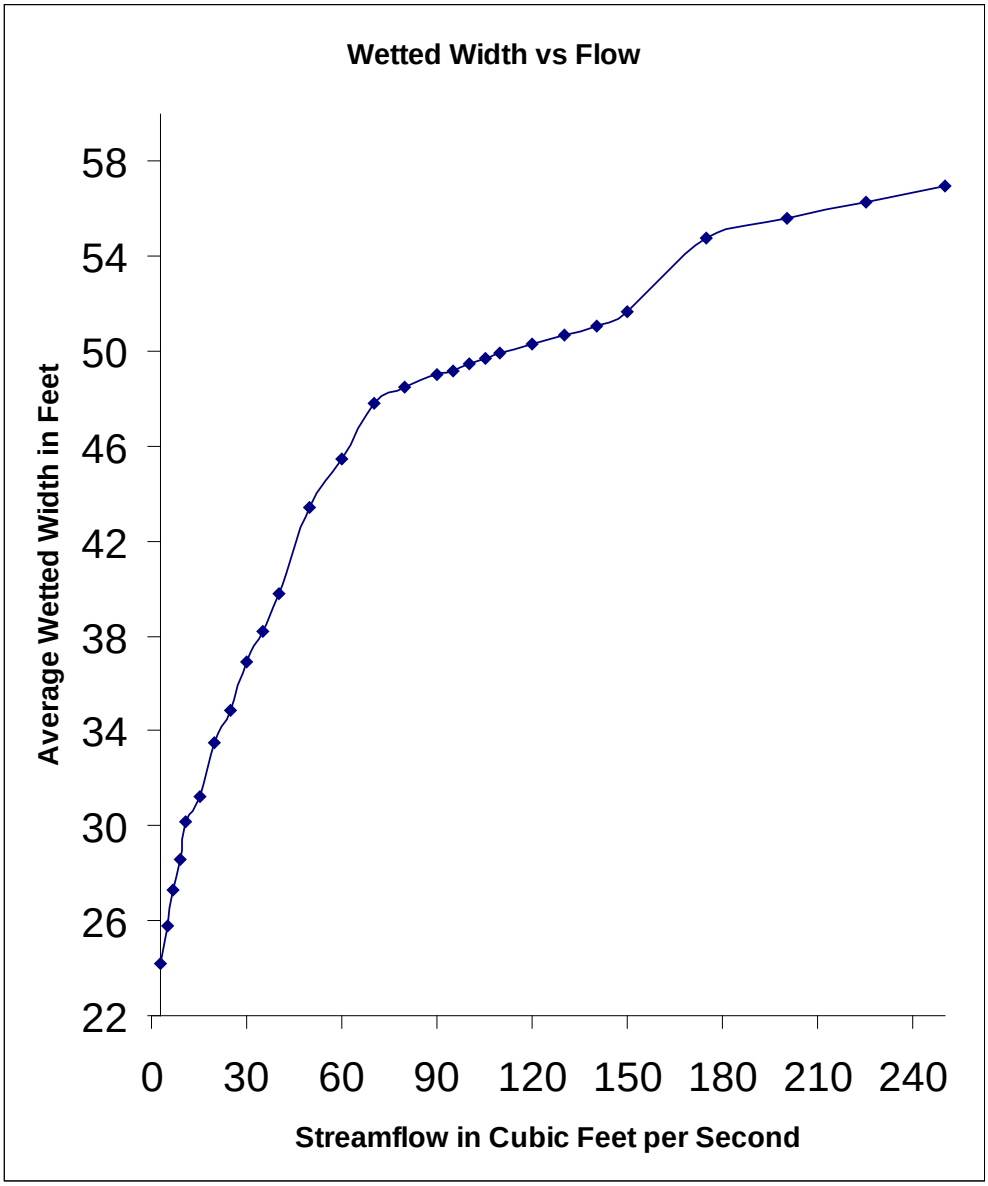
Flow (cfs)	Wetted Width (feet)
10	28.4
15	32
21	35.2
25	36.4
30	37.2
35	37.9
40	38.6
50	39.8
60	41.5
70	43.7
80	44.7
90	46.3
100	47.3
110	48.3
120	49
130	50.1
140	50.9
150	52.6
175	55.5
182	56.2
190	57.1
200	58
210	59.8
225	61.1
250	62.9
300	65.6
325	67.2
350	69

Figure 9. Average Wetted Width for Walla Walla River below Yellowhawk Creek.



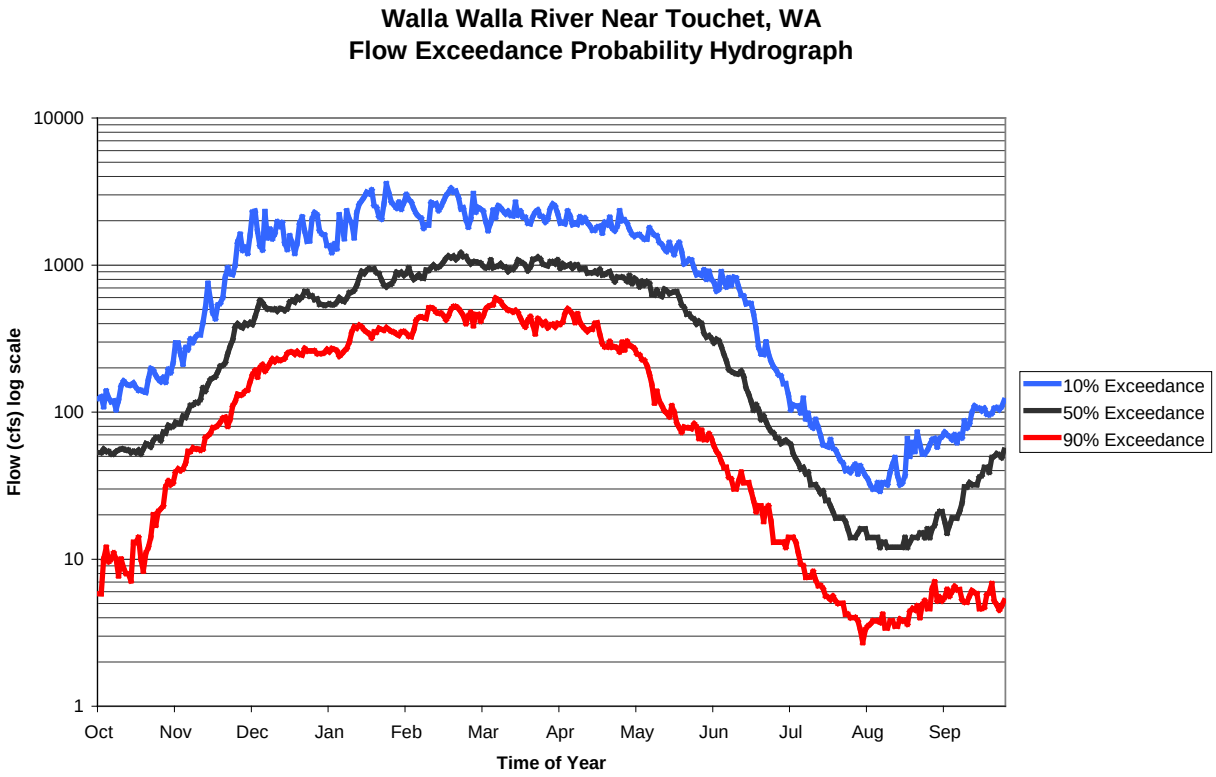
Flow (cfs)	Wetted Width (feet)
15	43.7
20	47.1
25	49.9
30	52.6
35	54.1
40	55.3
50	56.9
60	58
70	59.1
80	59.8
90	60.2
100	60.6
110	61.1
120	61.5
130	62
140	62.5
150	62.7
175	63.2
190	63.8
200	64
210	64.2
225	64.6
250	65.2
300	66.8
325	67.5
350	68.1
400	69.6
500	71.4

Figure 10. Average Wetted Width for Walla Walla River below HWY 125.



Flow (cfs)	Wetted Width (feet)
3	24.2
5	25.8
7	27.3
9	28.6
11	30.2
15	31.2
20	33.5
25	34.9
30	36.9
35	38.2
40	39.8
50	43.4
60	45.5
70	47.8
80	48.5
90	49
95	49.2
100	49.5
105	49.7
110	49.9
120	50.3
130	50.7
140	51.1
150	51.7
175	54.8
200	55.6
225	56.3
250	57
300	58.3
325	58.9

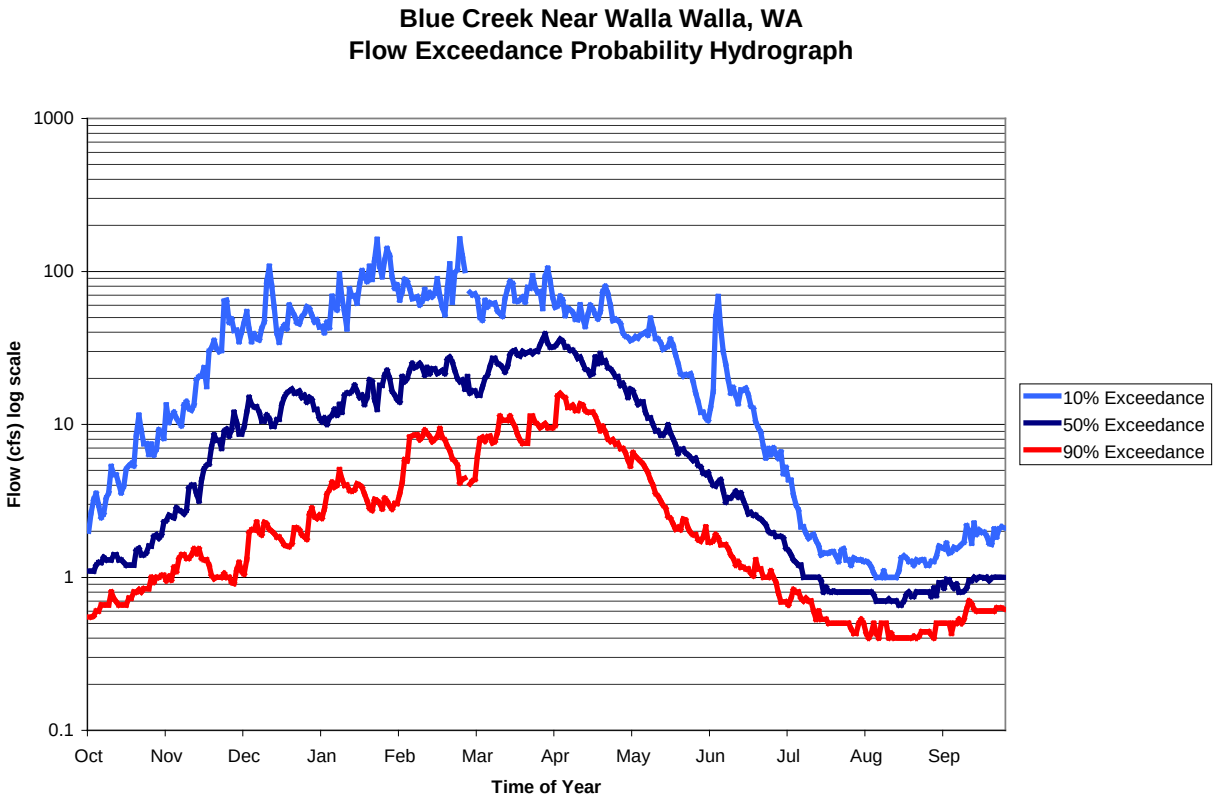
FIGURE 11



USGS Gauge 14018500 WALLA WALLA RIVER NEAR TOUCHET, WASH. (River Mile 18.2, 3.4 miles downstream of Touchet River)

Period of Record: 1951 – 2000

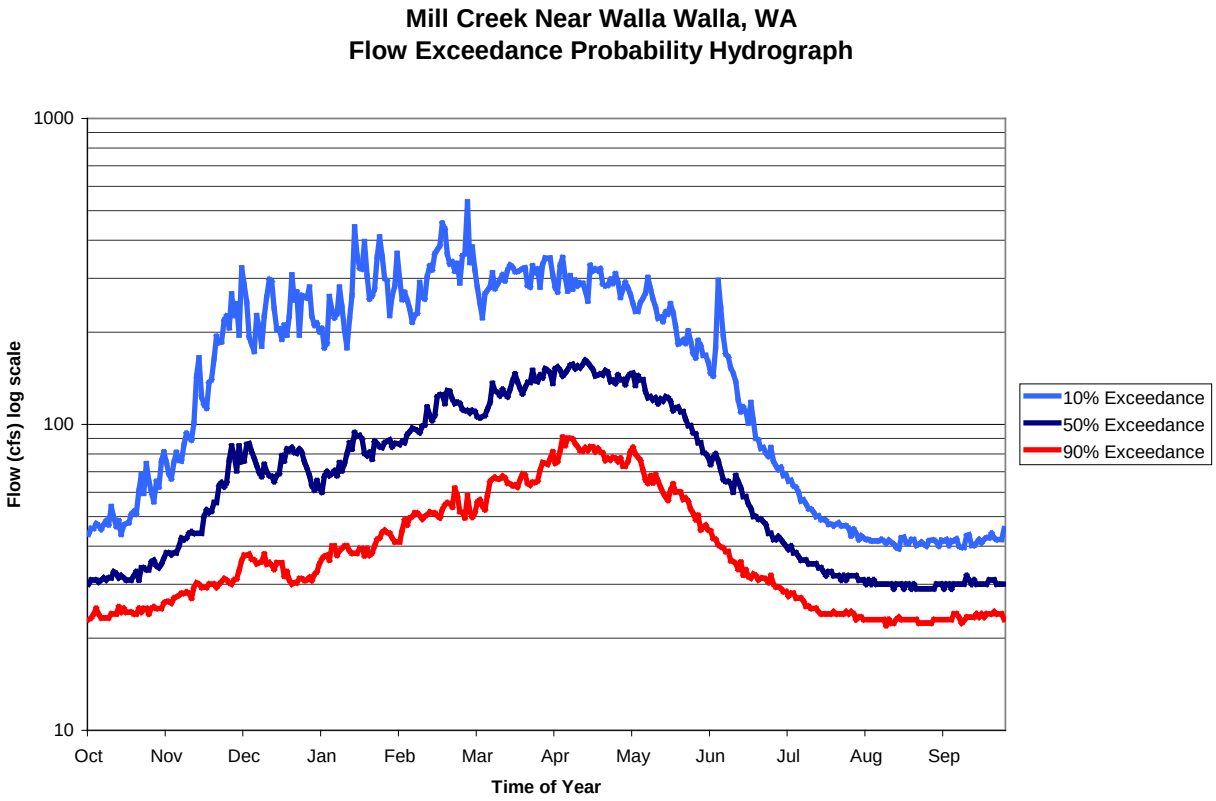
FIGURE 12



USGS Gauge 14013500 BLUE CREEK NEAR WALLA WALLA, WASH. (River Mile 1.0)

Period of Record: 1939 – 1971

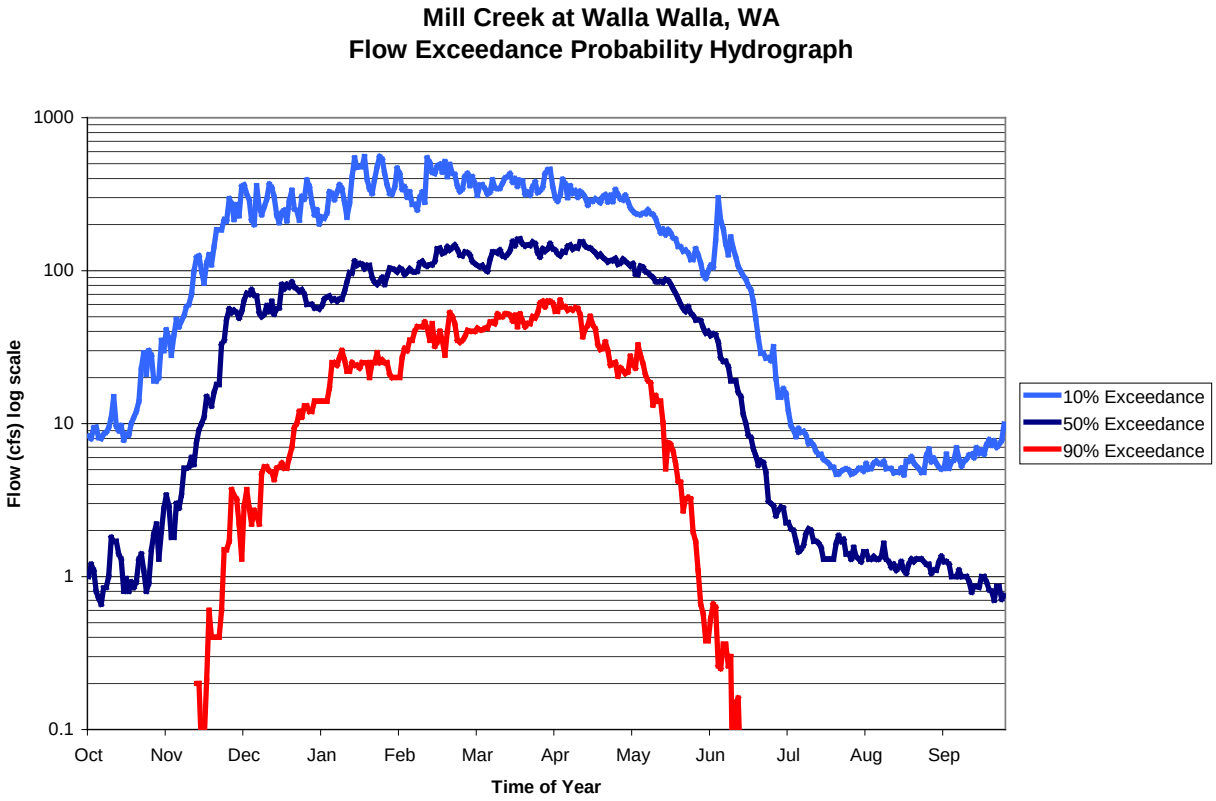
FIGURE 13



USGS Gauge 14013000 MILL CREEK NEAR WALLA WALLA, WASH. (River Mile 21.2, 4.4 miles upstream of Blue Creek, 4 miles downstream of Walla Walla city diversion)

Period of Record: 1913 – 2000

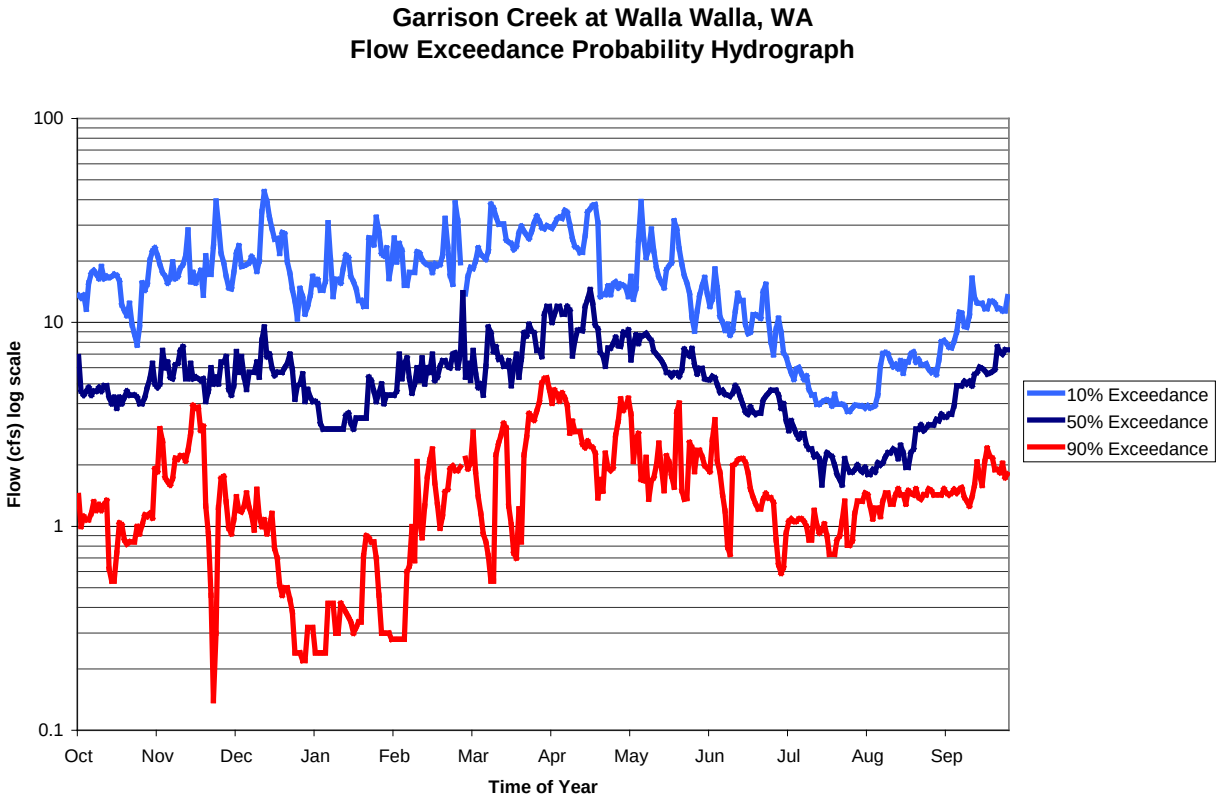
FIGURE 14



USGS Gauge 14015000 MILL CREEK AT WALLA WALLA, WASH. (River Mile 10.5, just downstream of diversion into Yellowhawk Creek)

Period of Record: 1941 – 2000

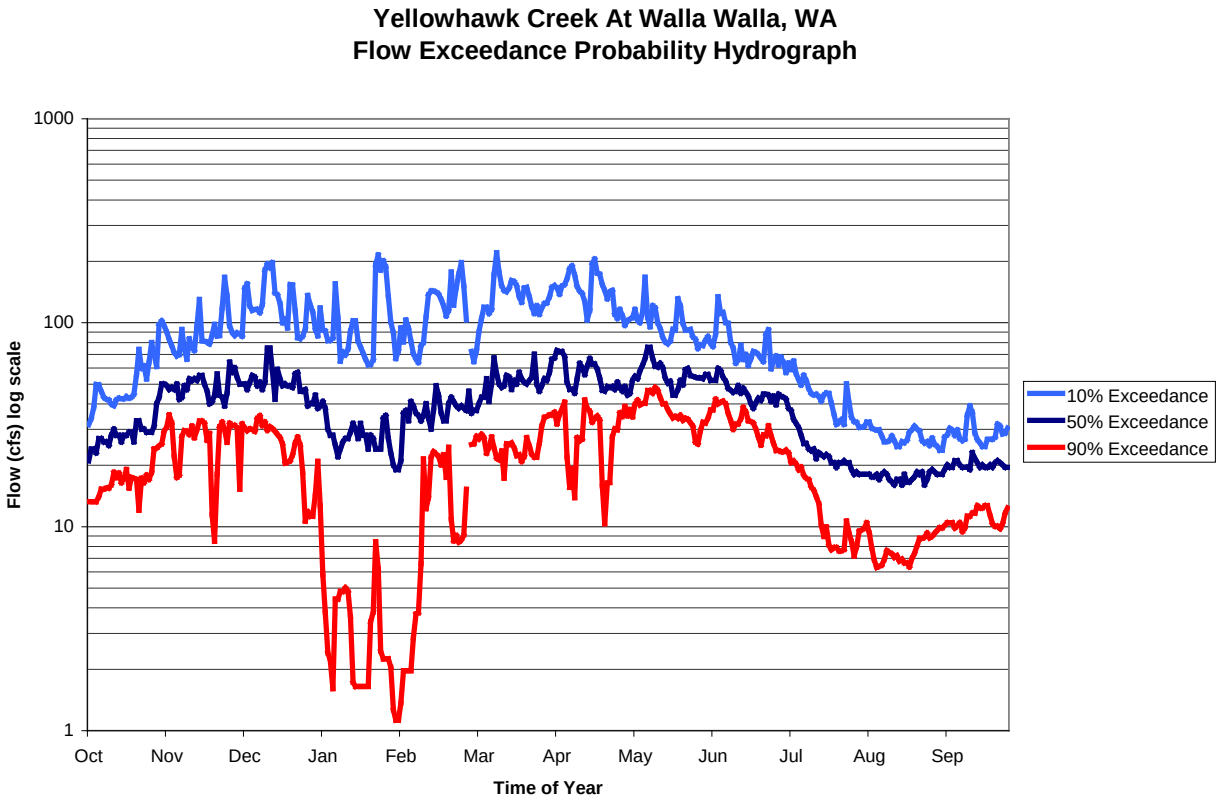
FIGURE 15



USGS Gauge 14014500 GARRISON CR AT WALLA WALLA, WASH. (One mile downstream from diversion from Mill Creek into Garrison Cr)

Period of Record: 1941 – 1952

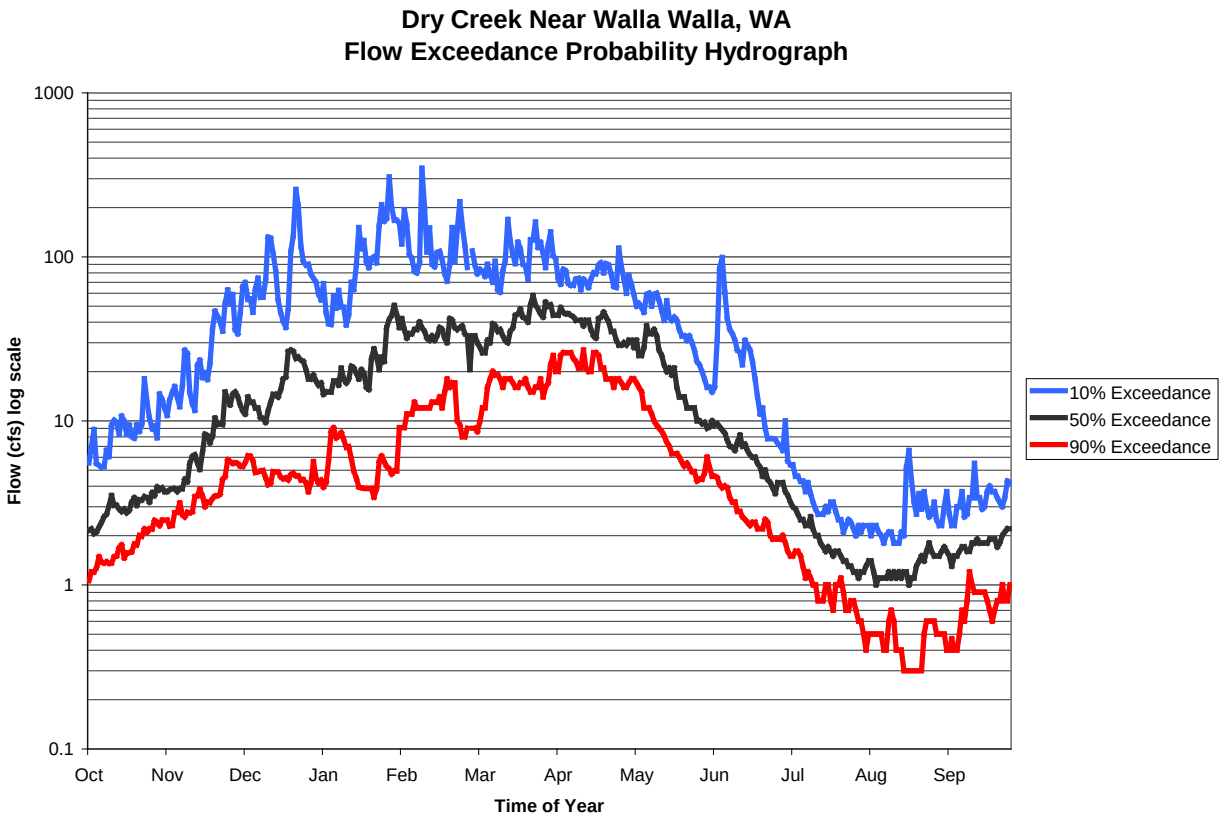
FIGURE 16



USGS Gauge 14014000 YELLOWHAWK CR AT WALLA WALLA, WASH. (One mile downstream from Mill Creek diversion into Yellowhawk, one mile east of Walla Walla)

Period of Record: 1941 – 1952

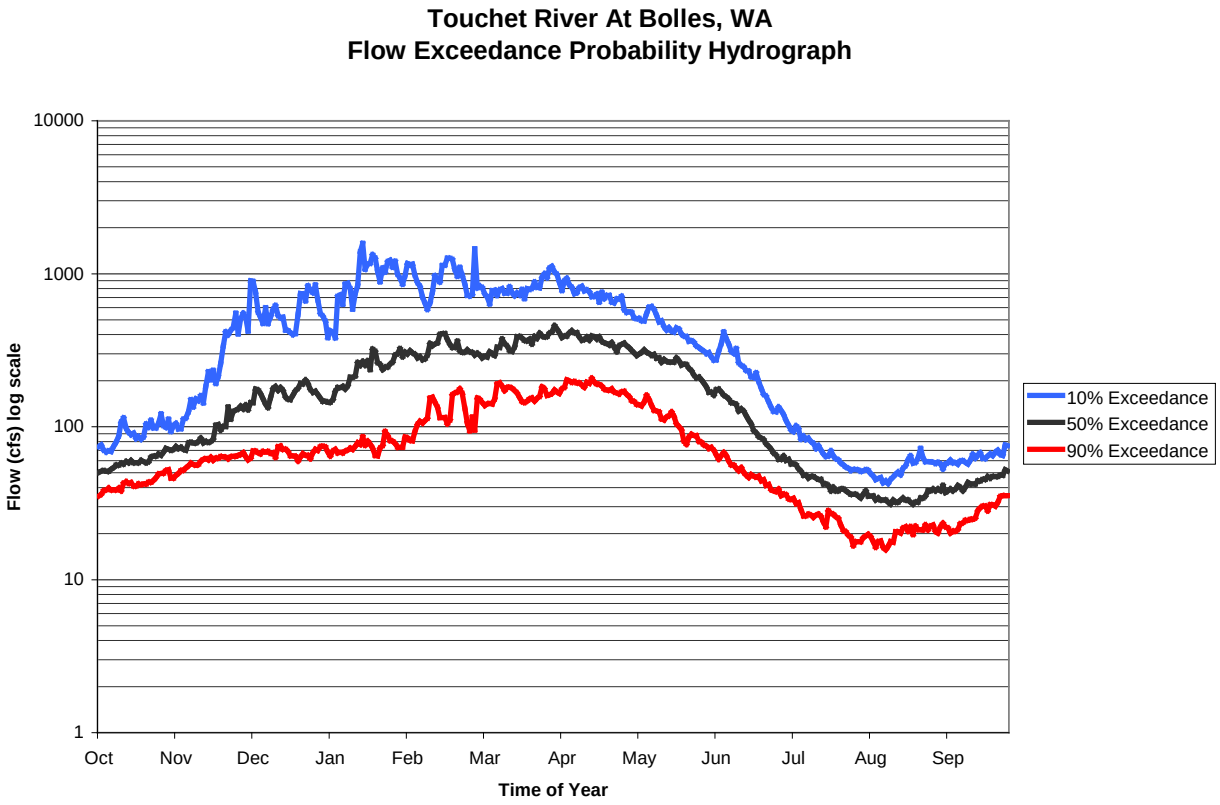
FIGURE 17



USGS Gauge 14016000 DRY CREEK NEAR WALLA WALLA, WASH. (River Mile 22, 1.0 mile downstream of Spring Creek)

Period of Record: 1949 – 1967

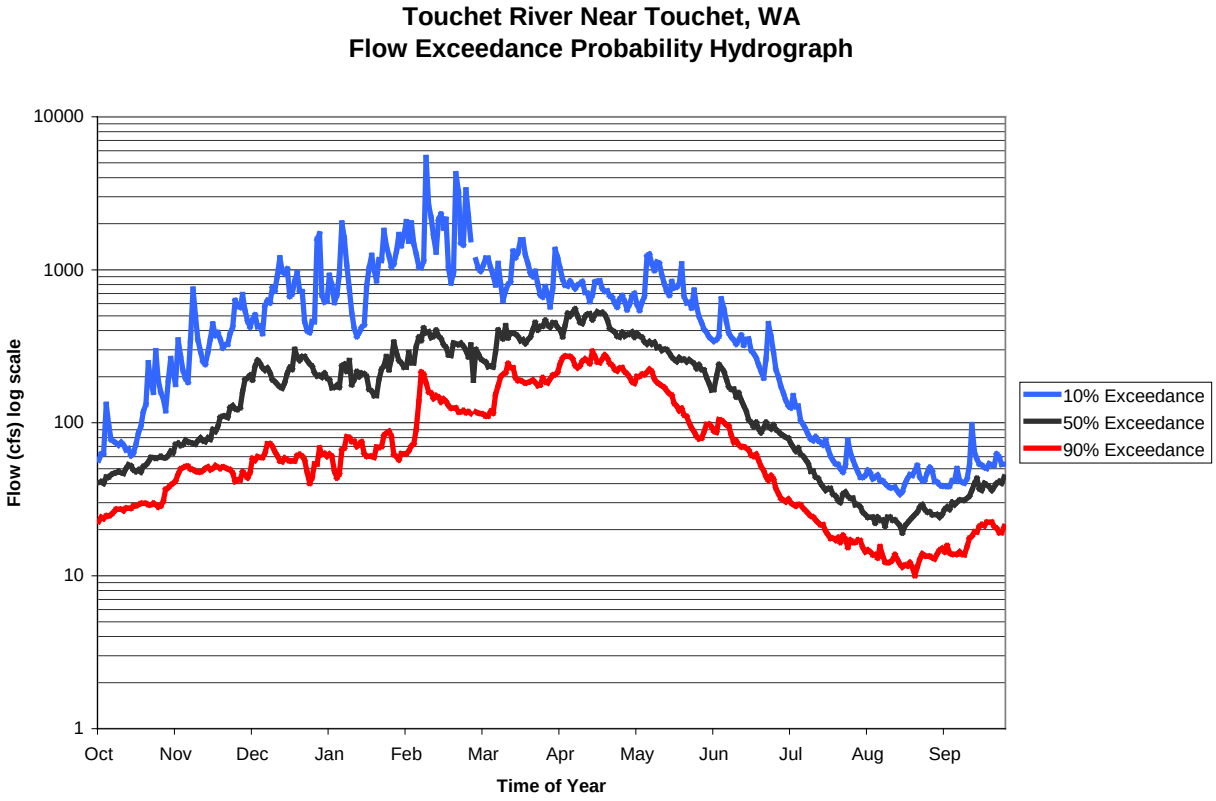
FIGURE 18



USGS Gauge 14017000 TOUCHET RIVER AT BOLLES, WASH. (River Mile 40.1, 2.9 miles downstream of Coppei Creek)

Period of Record: 1924 – 1989

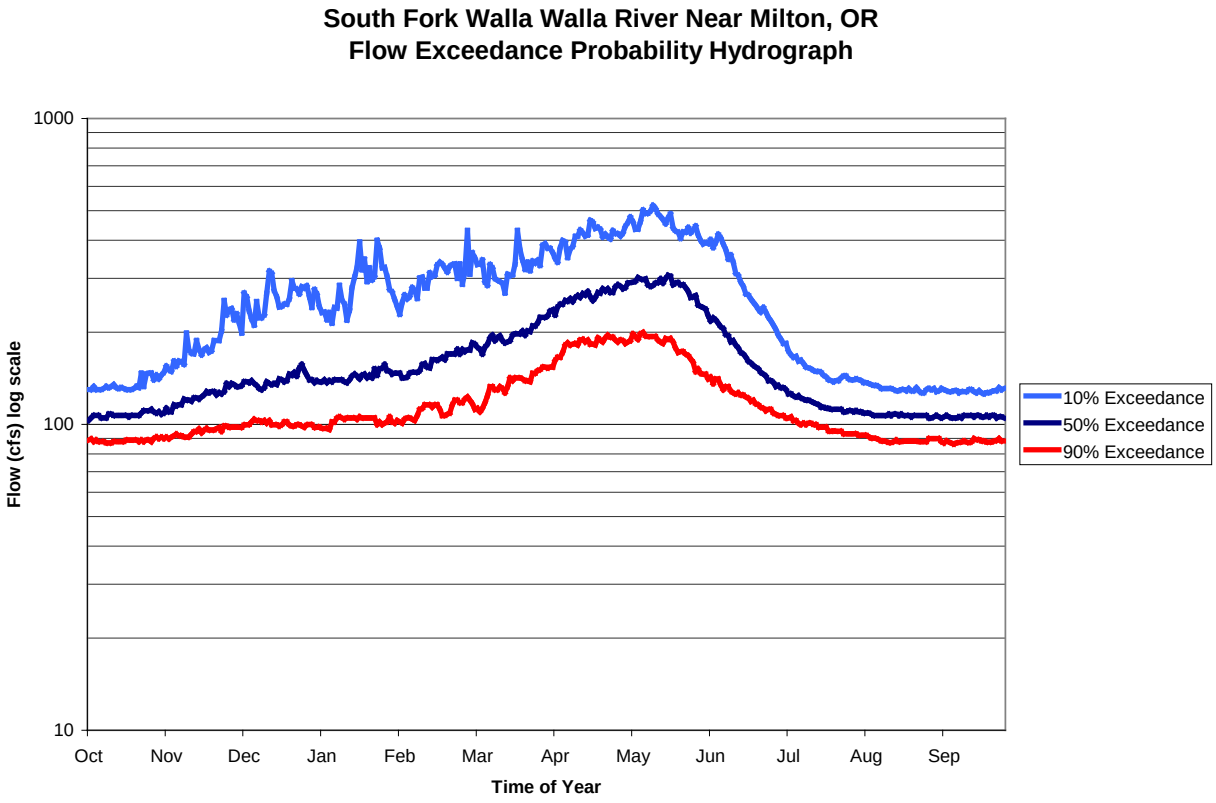
FIGURE 19



USGS Gauge 14017500 TOUCHET R NR TOUCHET, WASH. (River Mile 4.5)

Period of Record: 1941 – 1955

FIGURE 20



USGS Gauge 14010000 SOUTH FORK WALLA WALLA RIVER NEAR MILTON, OREG.

Period of Record: 1903 – 1991

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Appendix A

Input Data for Mill Creek and Walla Walla River study sites.

Mill Cr above Wallula Rd, measured June, July 1999 at 56, 25, 5 cfs by
Beecher, Caldwell, Shedd, Bauersfeld - WDFW,WDOE

SUMMARY DATA: CROSS-SECTION # 1 XS 1.0
Number of Points = 35

X	Y	VEL 1	VEL 2	VEL 3	SUBSTRATE CODE
-5.00	99.60				45.50
0.60	99.16				45.50
4.00	98.55				45.50
4.50	98.31				45.50
4.60	98.10				45.50
5.00	97.95	0.89	0.55	0.05	0.20
6.00	97.98	1.02	0.59	0.05	54.50
7.00	97.91	0.91	0.70	0.10	54.50
8.00	97.85	1.27	0.76	0.24	45.60
9.00	97.84	1.39	0.70	0.33	54.70
10.00	97.77	1.26	0.70	0.43	54.80
11.00	97.71	1.42	0.87	0.48	53.40
12.00	97.61	1.58	0.70	0.57	54.70
13.00	97.51	1.50	0.70	0.51	54.50
14.00	97.31	1.56	0.70	0.54	54.70
15.00	97.31	1.38	0.65	0.43	54.60
16.00	97.18	1.45	0.65	0.33	54.70
17.00	97.01	1.58	0.60	0.24	54.50
18.00	96.76	1.39	0.50	0.18	56.30
19.00	96.53	1.17	0.63	0.10	54.70
20.00	96.31	1.32	0.66	0.10	54.50
21.00	96.04	1.34	0.67	0.10	54.70
22.00	95.80	1.12	0.61	0.10	54.50
23.00	95.50	1.23	0.49	0.10	65.60
24.00	95.21	1.22	0.53	0.10	65.70
25.00	95.06	1.05	0.40	0.10	65.50
26.00	95.00	1.10	0.47	0.09	54.60
27.00	94.96	0.96	0.53	0.03	54.60
28.00	94.96	1.17	0.30	0.03	54.60
29.00	95.06	0.65	0.09	0.02	0.20
30.00	95.10	0.60	0.07	0.01	0.10
30.20	98.10				0.10
31.90	99.17				0.10
33.00	100.00				0.10
37.00	100.45				19.80

SUMMARY DATA: CROSS-SECTION # 2 XS 2.0
Number of Points = 32

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	99.80				23.90	
0.50	99.09				0.70	
3.00	98.90				57.50	
8.00	98.80				65.60	
11.00	98.60				62.70	
13.80	98.55				53.60	
14.00	98.30				53.60	
15.00	98.11				54.60	
16.00	97.95		-0.10		56.50	

17.00	97.85	-0.05	-0.10	-0.01	56.50
18.00	98.10	0.04	-0.18	0.01	56.50
19.00	97.50	0.09		0.01	56.50
20.00	97.50	0.26	0.22	0.02	56.50
21.00	97.40	1.46	0.14	0.10	56.50
22.00	97.40	2.87		0.46	56.50
23.00	97.15	3.86	1.13	0.58	56.50
24.00	97.05	2.77	2.13	0.70	56.50
25.00	96.70	2.29	1.69	0.60	56.50
26.00	96.40	2.46	1.33	0.23	56.50
27.00	95.90	2.19	0.95	0.25	56.50
28.00	95.60	2.71	1.33	0.20	56.50
29.00	95.30	2.77	1.07	0.14	87.90
30.00	95.10	2.06	1.01	0.18	87.90
31.00	94.90	1.20	0.64	0.06	87.90
32.00	95.35	0.30	0.16		87.90
33.00	95.30	0.35		0.01	87.90
34.00	96.50		-0.17		87.90
35.00	96.10		-0.04		87.90
35.90	98.11				88.90
36.10	98.30	-0.18			88.90
38.30	99.24				88.90
40.00	101.00				88.90

SUMMARY DATA: CROSS-SECTION # 3 XS 3.0
Number of Points = 38

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	100.30				14.80	
0.50	100.30				14.80	
3.00	99.36				0.20	
4.00	98.80	0.01			43.80	
5.50	98.70	0.39			53.90	
7.00	98.60	0.67			46.90	
8.50	98.60	0.71			43.90	
10.00	98.70	0.07			43.70	
11.50	99.36				43.60	
13.00	98.67	0.01			71.50	
13.70	98.41				0.10	
14.00	98.67				0.10	
14.50	98.20	1.70	0.80	0.72	67.60	
16.00	97.90	5.62	1.80	1.40	54.60	
17.50	98.15	5.56	3.87	2.71	54.60	
19.00	98.10	3.66	3.66	2.44	54.50	
20.50	98.10	2.63	1.56	0.95	74.70	
22.00	98.05	3.73	1.10	0.43	47.70	
23.50	98.20	2.50		1.10	56.70	
25.00	98.15	3.90	2.72	1.62	64.50	
26.50	98.41	5.29	1.60		64.50	
28.00	98.35	3.25	0.75	0.10	54.50	
29.50	98.55	1.84	0.26		45.60	
30.20	98.70				45.50	
31.00	98.78	1.04			53.70	
32.50	98.45	0.41	0.10		64.50	
34.00	98.00	1.90	0.82	0.10	54.50	
35.50	97.65	2.89	1.55	0.42	46.70	
37.00	97.25	3.19	2.13	0.78	45.70	
38.50	97.00	0.85	0.44	0.10	84.60	
40.00	97.10	-0.25			81.80	
41.50	97.50				81.80	
43.00	97.55				81.80	
43.50	97.65				81.80	
43.60	98.80				81.80	
44.50	98.90				88.90	
46.60	100.80				88.90	
49.60	101.60				81.80	

SUMMARY DATA: CROSS-SECTION # 4 XS 4.0
Number of Points = 36

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-20.00	100.60				10.50	
0.50	100.56				0.60	
2.50	99.41				0.60	
4.00	99.20				54.80	
5.50	99.14	0.06			54.80	
7.00	99.03	0.20			54.80	
8.50	98.98	0.21	-0.01	0.20	54.80	
10.00	98.83	0.67	0.25	0.30	54.80	
11.50	98.68	1.24	0.71	0.24	54.80	
13.00	98.63	2.15	1.06	0.36	54.80	
14.50	98.73	2.29	1.33	0.38	54.80	
16.00	98.88	2.65	1.91	1.92	54.80	
17.50	98.93	3.46	3.13	1.56	54.80	
19.00	98.95	3.29	2.15	1.46	54.80	
20.50	98.85	3.30	1.86	0.79	54.80	
22.00	99.00	3.54	2.61	1.15	54.80	
23.50	98.85	3.92	2.82	1.37	65.50	
25.00	99.00	3.82	2.92	1.50	65.50	
26.50	98.85	3.71	2.56	1.56	64.80	
28.00	98.85	3.19	2.43	1.24	56.60	
29.50	98.85	2.33	1.81	0.75	0.60	
31.00	98.95	1.96	1.39	0.18	0.60	
32.50	99.00	3.38	2.59	0.35	67.90	
34.00	99.05	3.10	1.88	0.33	56.80	
35.50	99.00	2.80	2.17	0.46	65.50	
37.00	99.08	3.18	2.39	1.04	64.80	
38.50	98.98	3.31	3.30	1.43	65.50	
40.00	98.98	1.34	2.48	1.76	54.80	
41.50	98.98	0.66	1.22	0.66	15.50	
43.00	98.83	1.34	0.62	0.10	15.50	
44.50	98.73	1.78	0.60	0.10	15.50	
46.00	98.68	0.69	0.42	0.49	51.60	
47.50	98.78			0.66	15.50	
48.00	99.18				88.90	
49.50	100.82				88.90	
55.00	103.57				81.50	

SUMMARY DATA: CROSS-SECTION # 5 XS 5.0
Number of Points = 39

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	101.50				31.80	
0.50	100.80				31.80	
8.60	99.25				0.80	
9.00	99.35				41.70	
9.20	99.25				41.70	
10.00	99.65				41.70	
11.50	98.25			0.01	0.80	
13.00	98.25			0.01	40.60	
14.50	98.60	0.19		0.02	40.60	
16.00	98.95	0.03			54.70	
16.50	99.03				45.70	
17.00	99.35		0.01		45.70	
17.50	99.43	0.01			45.70	
19.00	99.59	0.40			46.80	
20.50	99.51	0.40			46.80	
22.00	99.52	0.65			46.80	
24.80	99.40	0.80			46.80	
25.00	99.30	1.40			46.80	

26.00	99.21				46.80
26.50	99.15	1.53	0.76	0.10	56.60
28.00	98.95	1.72	0.87	0.37	56.50
29.50	98.85	2.30	0.86	0.55	65.30
31.00	98.65	2.40	0.82	0.50	65.30
32.50	98.60	3.00	0.80	0.47	65.30
34.00	98.20	3.00	0.93	0.41	65.30
35.50	97.90	2.89	1.41	0.42	65.70
37.00	97.65	2.53	1.30	0.28	65.70
38.50	97.70	2.59	1.15	0.19	65.70
40.00	97.70	1.84	1.03	0.15	67.70
41.50	97.80	1.02	0.53	0.06	65.70
43.00	98.05	3.59	2.01	0.54	65.70
44.50	98.45	1.98	0.67		0.60
46.00	99.21	0.14	0.05		0.60
47.50	99.25	0.28			0.60
49.00	99.10	0.54	0.05		0.60
50.60	99.30				0.60
52.00	99.65				0.60
54.30	99.74				11.90
68.00	102.60				11.90

SUMMARY DATA: CROSS-SECTION # 6 XS 6.0
Number of Points = 43

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	101.50				41.50	
0.60	101.40				0.70	
2.00	100.30				51.50	
2.50	100.25	0.01			51.70	
3.00	100.10	1.17			53.50	
3.70	100.00				46.50	
4.00	100.00	2.06	0.86		46.50	
5.00	99.75	2.51	1.32	0.48	56.80	
6.00	99.70	2.86	1.89	0.64	56.70	
7.00	99.60	2.82	2.11	0.81	56.50	
8.00	99.50	3.10	2.27	0.87	56.60	
9.00	99.60	3.40	2.58	1.32	56.60	
10.00	99.55	3.29	1.31	0.50	56.60	
11.00	99.55	3.06	2.39	0.99	56.60	
12.00	99.70	3.19	2.33	0.95	56.70	
13.00	99.80	2.90	1.89	1.06	56.60	
14.00	99.65	3.43	1.97	0.81	56.60	
15.00	99.65	3.14	1.47	1.09	56.60	
16.00	99.75	2.92	2.05	0.89	56.60	
17.00	99.70	2.90	1.98	0.62	56.60	
18.00	99.70	3.00	1.79	0.70	56.60	
19.00	99.70	2.86	2.27	0.86	56.60	
20.00	99.75	2.30	2.29	0.45	56.60	
21.00	99.85	2.50	2.19	0.55	56.60	
22.00	99.85	3.06	1.47	0.48	56.60	
23.00	99.85	2.48	1.78	0.80	56.60	
24.00	99.95	1.90	1.49	0.40	56.60	
25.00	100.00	2.40	1.63	0.15	56.60	
26.00	99.90	2.04	1.52		56.60	
27.00	99.95	2.44	1.22		56.60	
28.00	100.10	2.55	1.45		56.60	
29.00	100.10	2.12	0.86		56.60	
29.90	100.30		0.05		45.90	
30.00	100.40	1.31			45.90	
31.00	100.70				43.80	
32.60	100.90				43.80	
33.00	100.90				43.80	
37.60	100.90				43.80	
40.00	100.80				43.70	
42.60	100.70				53.50	
45.00	101.50				53.50	

48.60	102.20				35.60	
68.60	102.30				35.60	

SUMMARY DATA: CROSS-SECTION # 7 XS 7.0
Number of Points = 47

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	103.50				2.50	
0.60	103.40				0.70	
1.90	101.60				0.10	
2.00	101.50	0.02	0.01		43.50	
2.60	101.40				45.70	
4.00	101.10	0.08	0.24	0.33	45.70	
6.00	101.00	0.10	0.27	0.04	45.90	
8.00	101.30	0.75	0.52	0.10	45.90	
10.00	101.00	0.72	0.36	0.14	46.80	
12.00	100.30	0.37	0.20	0.13	67.60	
14.00	99.90	0.05		0.08	61.70	
16.00	100.10	0.52	0.27	0.10	61.70	
18.00	100.20	0.70	0.32	0.12	54.50	
20.00	100.50	0.90	0.70	0.24	54.50	
22.00	101.10	2.40	1.44	0.60	54.50	
24.00	101.00	3.00	1.79	0.59	46.80	
26.00	101.00	3.20	2.06	0.88	45.70	
28.00	100.90	3.20	2.17	1.14	64.60	
30.00	101.10	2.20	1.43	0.54	46.60	
31.20	101.40	0.02	0.01		46.60	
32.50	101.70				45.70	
33.00	102.20				45.70	
36.00	102.50				46.50	
38.40	102.50				46.50	
41.90	102.40				46.50	
45.90	102.30				46.50	
46.90	101.60				63.70	
48.90	101.20	1.20	0.41		64.50	
50.90	101.00	2.50	1.10		64.50	
52.90	100.90	2.50	1.10		64.50	
54.90	101.00	2.20	1.00		46.70	
56.90	101.20	1.76	0.91		57.50	
58.90	101.10	2.20	0.50		57.70	
60.90	101.20	1.50	0.58		73.60	
62.90	101.30	1.13	0.10		46.50	
64.90	101.40	0.80	0.10		36.70	
66.90	101.50	0.67	0.10		53.50	
67.20	101.50	0.68			53.50	
70.90	101.60	0.40			53.50	
72.90	101.60	0.35			62.50	
74.90	101.60	0.01			62.50	
76.90	101.60				64.50	
77.90	101.60	0.01			64.50	
78.30	101.80				64.50	
78.90	102.00				64.50	
87.40	102.30				64.50	
117.40	103.10				64.50	

SUMMARY DATA: CROSS-SECTION # 8 XS 8.0
Number of Points = 46

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	105.80				54.50	
0.50	105.80				54.50	

3.50	104.00				54.50
4.90	103.40				54.50
5.00	103.40				54.50
6.00	103.10	0.01			54.50
7.00	102.90	0.43	0.15		54.50
8.10	102.80	0.60	0.05		54.50
9.00	102.60	0.72	0.17	0.05	56.70
10.00	102.40	0.41	0.19		0.60
11.00	102.10	0.13	0.07		0.60
12.00	101.90	0.16	0.27	0.10	0.60
13.00	101.90	0.92	0.67	0.20	54.60
14.00	101.80	1.63	0.94	0.30	54.60
15.00	101.80	1.77	1.05	0.30	54.60
16.00	101.80	1.69	0.96	0.26	54.60
17.00	101.80	1.88	1.05	0.40	54.60
18.00	101.90	2.02	1.11	0.34	54.60
19.00	102.00	2.01	0.99	0.30	54.60
20.00	102.10	1.99	0.90	0.30	54.60
21.00	102.00	1.87	1.14	0.28	54.60
22.00	102.10	2.02	1.04	0.37	54.60
23.00	102.10	2.13	1.27	0.45	0.60
24.00	102.10	1.91	1.22	0.37	54.60
25.00	102.00	2.05	1.31	0.45	64.60
26.00	102.10	2.09	1.27	0.38	56.70
27.00	102.00	1.88	1.12	0.32	56.80
28.00	101.90	1.54	0.95	0.39	56.50
29.00	101.90	1.72	0.90	0.34	57.70
30.00	102.00	1.48	0.79	0.25	54.90
31.00	101.90	1.29	0.52	0.25	54.90
32.00	101.90	1.18	0.65	0.24	56.80
33.00	101.90	1.17	0.64	0.20	56.90
34.00	102.00	1.00	0.56	0.12	0.60
35.00	102.00	0.92	0.29		0.60
36.00	102.10	0.12	0.01		0.60
37.00	102.20				0.60
38.00	102.40		0.01		0.60
39.00	102.80				0.60
40.00	103.10				0.60
43.00	103.40				0.60
45.90	103.80				0.60
48.00	103.80				0.60
49.00	103.80				0.60
55.00	103.80				0.60
76.00	103.90				56.60

Walla Walla River below Mill Creek,
measured June 4, 1999 - 180 cfs; June 11 - 70 cfs; July 7 - 21 cfs

SUMMARY DATA: CROSS-SECTION # 1 XS 1.0
Number of Points = 34

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.60	100.10				24.90	
10.60	100.30				43.50	
19.60	98.80				0.60	
24.80	97.90	1.27			0.60	
26.00	97.30				0.60	
27.00	97.00	1.95	0.65		54.50	
29.00	96.90	2.04	0.36		0.60	
31.00	97.00	2.35	1.33		0.90	
33.00	96.90	2.27	1.20	0.36	53.70	
35.00	96.90	1.73	1.07	0.38	47.70	
37.00	97.00	1.49	0.31		0.60	
39.00	96.90	0.18		0.01	0.60	
41.00	96.40	2.96	2.12	0.93	0.60	
43.00	96.40	3.40	2.07	0.92	45.60	
45.00	96.50	2.74	2.10	0.99	54.50	
47.00	96.50	2.73	2.16	1.11	54.50	
49.00	96.50	3.23	2.39	0.92	54.50	
51.00	96.60	2.91	2.28	1.14	54.50	
53.00	96.50	3.64	2.22	1.20	45.80	
55.00	96.50	3.18	2.20	1.23	54.50	
57.00	96.40	3.49	2.06	1.12	54.50	
59.00	96.40	3.04	2.08	1.00	54.50	
61.00	96.30	3.20	2.08	0.97	54.50	
63.00	96.00	2.65	1.75	1.02	64.70	
65.00	96.10	2.23	1.49	0.86	49.60	
67.00	96.30	1.98	1.32	0.92	49.80	
69.00	96.30	1.75	1.33	0.72	69.70	
71.00	96.30	1.68	1.28	0.70	94.90	
73.00	96.20	1.19	0.93	0.48	97.90	
75.00	96.40	0.79	0.08		98.50	
76.70	97.00				81.50	
77.00	97.10	0.08			81.50	
77.50	97.40				0.60	
81.90	101.00				0.60	

SUMMARY DATA: CROSS-SECTION # 2 XS 2.0
Number of Points = 34

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.50	101.80				61.80	
8.50	101.40				61.80	
11.50	99.80				61.80	
16.60	98.10				0.60	
18.60	97.80	0.27			0.60	
20.60	97.60	0.16			0.60	
22.60	97.60	0.32			0.60	
24.60	97.50	0.57			0.60	
26.60	97.50	1.09			0.60	
28.60	97.30	1.30			45.70	
30.60	97.26	2.22	0.93		25.70	
32.60	97.00	2.50	1.78		65.50	
34.60	96.80	3.36	1.75	0.30	65.50	
36.60	96.70	3.42	2.21	0.59	54.70	
38.60	96.70	3.36	2.48	0.40	93.90	
40.60	96.50	5.02	2.56	1.14	54.50	
42.60	96.30	3.70	3.75	2.21	95.50	
44.60	96.00	4.54	4.24	2.27	59.60	

46.60	96.00	5.05	3.80	1.64	94.70
48.60	96.60	2.13	3.38	1.61	99.90
50.60	96.20	2.37	3.03	1.58	64.50
52.60	96.30	3.24	0.65	0.30	99.90
54.60	96.40	0.90	0.58	0.15	95.70
56.60	96.40	1.90	0.35		99.90
58.60	96.90	1.41	0.85	0.10	99.90
60.60	96.90	0.93	0.16		99.90
62.60	97.00	1.41	0.15	0.02	99.90
64.60	97.10	1.63			99.90
65.00	97.40	0.84			99.90
68.60	97.50	0.55			94.60
68.90	97.60				94.60
70.60	98.00				89.80
71.00	98.10				89.80
78.50	103.70				89.80

SUMMARY DATA: CROSS-SECTION # 3 XS 3.0
Number of Points = 41

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.20	101.90				64.50	
10.20	98.80				61.70	
20.20	99.70				10.50	
30.20	99.40				46.50	
33.00	99.00				0.60	
35.00	99.00				64.60	
37.00	98.80	0.12			54.50	
39.00	98.77	0.42			45.60	
41.00	98.65	0.69			45.60	
43.00	98.55	1.04			54.60	
45.00	98.50	1.40	1.30		54.80	
47.00	98.31	1.55	1.50		54.80	
49.00	98.18	1.15		0.40	57.70	
51.00	98.04	1.60	2.39	1.16	46.60	
53.00	98.09	1.97		1.52	64.70	
55.00	97.95	1.70		1.36	58.60	
57.00	97.99	1.74		1.59	64.60	
59.00	97.88	2.00		1.26	56.50	
61.00	97.93	1.80		1.37	57.80	
63.00	97.97	2.20		1.44	57.80	
65.00	97.97	2.50		1.50	56.50	
67.00	97.90	2.20		1.19	54.80	
69.00	97.97	1.60		1.12	64.80	
71.00	98.08	2.00		0.76	46.60	
73.00	98.13	1.40		0.35	54.70	
75.00	98.16	1.10		0.65	54.60	
77.00	98.20	1.20		0.35	54.70	
79.00	98.28	1.20		0.70	54.70	
81.00	98.09	1.20		0.50	54.90	
83.00	97.86	1.85			54.80	
85.00	97.73	2.12		2.59	56.90	
87.00	97.60	2.07		3.15	58.90	
89.00	97.62	1.68		2.16	58.90	
91.00	97.62	1.14	1.40	1.38	56.90	
93.00	97.76	0.47	0.48	1.64	58.60	
94.80	98.20	0.10			85.90	
95.00	98.10				0.10	
96.00	98.65				86.50	
96.50	99.20				0.10	
99.70	102.50				15.80	
109.70	102.50				15.80	

SUMMARY DATA: CROSS-SECTION # 4 XS 4.0

Number of Points = 39

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.20	102.60				25.50	
11.20	99.30				25.50	
20.20	99.60				25.50	
30.20	100.30				25.50	
40.20	99.90				43.80	
43.00	99.60				43.60	
45.00	99.40	0.50			42.80	
47.00	99.20	1.08			45.50	
49.00	99.10	1.17			45.50	
50.00	99.00		0.10		45.50	
51.00	98.98	1.45	0.17		45.50	
53.00	98.80	1.85	0.56		45.50	
55.00	98.60	2.29	0.84		45.50	
57.00	98.50	2.44	1.09		54.60	
59.00	98.40	2.37	1.16	0.47	54.60	
61.00	98.30	2.60	1.26	0.55	45.40	
63.00	98.00	2.71	1.35	0.62	45.50	
65.00	98.00	3.11	1.43	0.77	54.50	
67.00	97.90	3.02	1.62	0.93	54.50	
69.00	97.80	2.89	1.76	0.88	45.50	
71.00	97.90	3.17	1.76	0.99	45.50	
73.00	97.90	2.75	1.68	1.01	45.50	
75.00	98.00	3.28	1.97	0.91	45.50	
77.00	97.90	3.30	1.88	0.98	45.50	
79.00	97.90	3.41	1.71	1.16	45.50	
81.00	97.90	3.67	1.80	1.07	56.70	
83.00	97.90	3.08	1.84	0.73	56.60	
85.00	97.90	3.36	1.70	0.97	56.90	
87.00	97.80	2.74	1.73	0.87	56.80	
89.00	97.90	2.46	1.63	0.80	54.50	
91.00	97.80	2.68	1.46	0.54	54.50	
93.00	97.80	2.39	1.35	0.56	52.80	
95.00	97.70	2.00	0.84		52.60	
97.00	97.70	0.61	0.06		62.50	
98.00	98.10				52.60	
98.60	98.60		0.14		0.10	
100.00	99.00				0.70	
100.30	102.30				0.70	
113.30	102.30				0.70	

SUMMARY DATA: CROSS-SECTION # 5 XS 5.0
Number of Points = 62

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-99.90	101.60				24.60	
0.50	101.60				42.60	
4.50	101.60				51.60	
7.50	100.10				10.50	
12.50	100.00				0.60	
13.50	100.90				54.50	
15.50	100.10				0.60	
16.60	99.60				0.60	
17.60	99.50				0.60	
18.60	99.30				0.60	
19.60	99.30	0.01			0.60	
20.60	99.30	0.01			54.50	
21.60	99.40	0.01			54.50	
22.60	99.40	0.01			54.50	
23.60	99.40	0.01			54.50	
24.60	99.50	0.01			54.50	
25.60	99.60				54.50	
26.20	99.60				54.50	
27.20	99.60				54.50	

28.20	99.70				46.70
29.20	99.70				46.70
30.50	99.80				46.70
31.20	99.70				41.80
33.20	99.70				41.80
34.20	99.70				54.50
35.50	99.70				54.50
37.00	99.70				54.50
38.20	99.10	1.16			54.50
39.20	98.70	1.63	0.51		54.50
40.00	98.60	2.39	0.88		54.50
41.00	98.30	2.88	1.30	0.41	54.50
42.00	98.00	2.98	1.39	0.64	46.80
43.00	97.90	3.18	1.51	0.64	54.50
44.00	97.80	3.10	1.32	0.62	54.50
45.00	97.70	3.17	1.62	0.80	64.50
46.00	97.70	3.40	1.64	0.78	63.80
47.00	97.60	3.56	1.83	0.70	64.70
48.00	97.50	4.03	1.59	0.79	64.70
49.00	97.50	3.20	1.70	0.82	64.70
50.00	97.30	2.89	1.89	0.85	64.70
51.00	97.20	3.61	1.97	0.97	64.70
52.00	97.10	4.04	2.05	1.08	63.70
53.00	96.80	3.42	1.96	0.83	64.70
54.00	96.90	4.25	2.20	0.94	74.70
55.00	96.80	3.94	1.90	0.82	74.70
56.00	96.90	3.66	2.14	0.70	64.50
57.00	96.90	4.24	1.88	0.66	64.50
58.00	97.00	3.94	1.86	0.76	64.50
59.00	97.00	3.89	1.64	0.67	64.50
60.00	97.70	3.84	1.66	0.57	94.70
61.00	97.80	3.33	1.57	0.58	94.70
62.00	97.90	3.21	1.42	0.57	99.90
63.00	98.10	2.81	1.34	0.42	99.90
64.00	98.00	2.23	1.22	0.38	94.80
65.00	98.10	1.77	1.01	0.34	94.80
66.00	98.10	1.36	0.89	0.18	91.50
67.00	98.20	0.26	0.26		91.50
68.00	98.20	0.01			0.10
69.00	98.50				0.10
70.20	99.00				0.60
71.60	102.70				0.60
81.60	103.70				

SUMMARY DATA: CROSS-SECTION # 6 XS 6.0
Number of Points = 55

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.50	101.90				51.60	
40.50	101.20				56.70	
48.00	100.00				0.60	
49.00	99.90	0.05			0.60	
50.00	100.80				0.60	
51.00	100.60				0.60	
52.00	100.40				0.60	
53.00	100.20				0.60	
54.00	99.90				0.60	
55.00	99.90				0.60	
56.00	99.90	0.10			0.60	
57.00	99.70	0.28			0.60	
58.00	99.90				0.60	
59.00	100.00				0.60	
60.50	100.00				0.60	
70.50	100.90				0.60	
78.50	100.60				54.50	
83.00	99.90				43.70	
84.00	99.70	0.11			43.70	

85.50	99.30	3.06			54.50
86.60	98.90	3.16	1.55		56.70
87.00	98.90	3.69	3.26		56.70
88.00	98.70	4.54	3.30	1.00	56.70
89.00	98.50	4.69	3.56	2.09	95.50
90.00	98.10	5.52	3.54	1.27	64.60
91.00	98.20	6.56	4.89	2.91	64.60
92.00	98.10	5.85	3.22	2.17	54.50
93.00	98.10	5.68	4.53	3.09	54.50
94.00	98.20	5.26	4.62	2.59	56.70
95.00	98.20	5.91	4.68	3.54	56.70
96.00	98.30	7.10	4.59	3.13	99.90
97.00	98.40	6.26	3.95	2.99	99.90
98.00	98.40	6.26	3.95	2.05	95.80
99.00	98.50	6.05		1.23	54.60
100.00	98.40	5.91	4.14	2.03	45.70
101.00	98.40	6.59	3.87	1.91	54.50
102.00	98.40	4.77	3.17	2.02	57.80
103.00	98.40	6.04	4.14	1.34	65.50
104.00	98.60	4.70	2.95	2.11	65.50
105.00	98.70	3.77	3.27	1.45	65.50
106.00	98.70	4.55	2.68	0.56	54.70
107.00	98.70	3.22	2.10	0.57	54.50
108.00	98.80	4.08	2.05	0.50	54.50
109.00	98.90	3.34	1.71		54.50
110.00	98.80	2.03	0.90		54.70
111.00	99.10	1.63	0.15		54.70
112.00	99.20	1.22	0.15		0.60
112.50	99.20		0.10		0.60
113.00	99.30	0.40			0.60
114.00	98.60	0.25			0.60
115.00	98.60	0.05			0.60
116.00	98.90				0.60
118.00	101.00				0.60
125.60	102.60				0.60
130.60	101.60				34.80

SUMMARY DATA: CROSS-SECTION # 7 XS 7.0
Number of Points = 67

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-15.00	105.70				15.80	
0.60	105.70				15.80	
3.60	105.70				15.80	
6.60	102.60				54.50	
9.60	101.60				10.50	
11.00	101.30				0.60	
13.00	101.00				0.60	
15.00	101.00	0.17			45.50	
17.00	101.10	0.43			54.60	
19.00	101.00	0.82			46.70	
21.00	100.80	1.14			46.70	
23.00	100.70	1.49			54.60	
25.00	100.50	1.64			54.50	
27.00	100.50	1.64			54.50	
29.00	100.20	1.73	0.81		64.50	
32.40	100.00	2.13	0.98		54.50	
33.00	100.00	2.16	1.12		54.50	
35.00	99.80	2.55	1.22		54.50	
37.00	99.80	2.64	1.41	0.52	54.50	
38.00	99.80	2.99	1.41	0.68	54.50	
41.00	99.60	2.82	1.57	0.89	54.80	
43.00	99.40	2.94	1.67	0.89	65.50	
45.00	99.30	3.25	1.98	1.13	56.90	
47.00	99.00	3.27	2.07	1.17	46.50	
49.00	99.00	3.20	2.14	1.34	54.70	
51.00	98.90	3.42	2.14	1.43	54.60	

53.00	98.90	3.19	2.21	1.23	54.50
55.00	99.00	3.33	2.29	1.40	54.70
57.00	99.10	3.18	2.27	1.21	54.70
59.00	99.10	3.05	1.99	1.24	54.70
61.00	99.40	2.47	1.09	0.75	0.60
63.00	99.90	1.47	0.64	0.10	0.60
64.00	100.00				0.60
66.00	101.40				0.60
70.00	101.20				0.60
80.00	101.90				45.50
90.00	101.30				0.60
93.00	101.00				0.60
95.60	100.80				51.50
96.00	100.70				51.50
96.60	100.40				25.50
97.60	100.60				24.50
98.60	100.40				25.80
99.60	100.40				24.80
100.60	100.40				15.80
101.60	100.50				14.90
102.60	100.60				14.90
103.60	100.50				14.90
104.60	100.50				14.90
105.00	100.50				14.90
105.60	100.60				14.90
106.00	100.50				14.90
106.60	100.50				13.90
107.60	100.70		0.10		10.50
108.60	100.70	0.20	0.10		45.90
109.60	100.70	0.20	0.10		45.90
110.60	100.70	0.53	0.10		45.90
111.60	100.70	0.40	0.10		45.90
112.60	100.60	0.86	0.51	0.20	45.90
113.60	100.60	1.03		0.40	45.50
113.90	100.70				54.70
114.00	100.70				54.70
114.40	100.70				54.70
116.00	101.40				54.80
120.00	103.50				46.80
124.00	104.00				46.90
144.00	104.00				45.70

SUMMARY DATA: CROSS-SECTION # 8 XS 8.0
Number of Points = 46

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.00	103.20				99.90	
3.00	103.20				99.90	
3.70	101.60				0.30	
7.50	99.90	1.56			0.30	
8.00	100.00	2.00	1.00		99.90	
10.00	95.20	3.00	2.35	0.51	56.80	
12.50	95.30	3.31	2.10	0.86	56.80	
15.00	95.80	2.80	0.90	0.77	56.80	
17.50	96.50	2.10	0.27	0.15	45.80	
20.00	97.60	0.79	0.11	0.05	45.80	
22.50	97.70	1.02	0.03	0.02	45.80	
25.00	98.80	0.54	0.10	0.01	45.90	
27.50	99.80	0.64	0.10	0.01	43.60	
28.20	100.00				34.50	
30.00	100.30	0.12			34.80	
32.50	100.60	-0.79			63.70	
34.50	101.30				56.80	
41.00	102.80				62.70	
41.10	102.80				62.70	
64.10	102.30				0.60	
66.10	102.30				0.60	

68.10	102.40				0.60
70.10	102.50				43.60
75.10	102.40				43.80
83.60	101.10				34.50
84.10	101.10	0.20	0.10		43.50
84.60	101.10		0.05		43.50
84.80	101.10				43.60
88.10	101.20				43.60
92.10	101.20				43.60
94.40	101.20				42.50
95.10	101.20				42.50
95.60	101.10	0.67			42.50
96.10	101.10	0.82			42.50
96.80	101.00	0.55	0.50		42.50
97.10	100.90	0.41	0.54		54.70
97.60	100.80	0.49	0.42		0.60
98.10	100.80		0.16		0.60
98.60	100.80		0.07		0.60
99.10	101.00		0.10		0.60
99.60	101.10				0.60
99.80	101.20				0.60
101.10	101.70				0.60
104.10	103.50				0.60
109.70	104.60				53.60
129.70	104.70				34.70

SUMMARY DATA: CROSS-SECTION # 9 XS 9.0
Number of Points = 64

X	Y	VEL 1	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
0.50	102.90				0.30	
5.00	101.50				0.60	
7.00	100.90	0.33			0.60	
8.20	100.40	0.75			54.50	
9.00	100.20	1.20	1.14	1.64	54.50	
11.00	100.00	2.30	2.94	2.68	54.50	
13.00	99.80	3.26		3.67	54.50	
15.00	99.80	4.43	3.63	3.97	54.50	
17.00	99.90	4.18	3.77	3.34	46.70	
19.00	100.00	4.34	3.60	2.53	54.50	
21.00	100.10	4.60	3.47	1.38	54.50	
23.00	100.20	4.50	2.31	2.00	64.50	
25.00	100.30	4.72		1.10	64.50	
27.00	100.20	3.66	2.42	0.85	64.50	
29.00	100.20	3.70	2.39	0.80	54.50	
31.00	100.40	3.92	2.47		64.50	
33.00	100.20	3.51	2.18	0.73	54.50	
35.00	100.40	4.09	2.04		54.50	
37.00	100.30	3.90	2.53	0.60	64.50	
39.00	100.40	3.48	1.82		64.50	
41.00	100.40	3.30	2.07		64.50	
43.00	100.50	2.80	1.74		64.50	
45.00	100.60	2.65	1.67		54.50	
47.00	100.50	2.47	0.30		54.50	
49.00	100.50	1.93	0.88		54.50	
51.00	100.00	1.24	0.59	0.10	54.50	
53.00	99.60	0.98	0.04		54.50	
55.00	99.80	0.02	0.08	0.01	0.60	
57.00	99.70		0.01		34.70	
59.00	99.30	-0.03	-0.02	-0.01	0.60	
61.00	99.80	-0.02			0.60	
62.20	100.50				0.60	
62.70	100.90				40.50	
63.00	101.50				0.60	
69.30	102.80				0.30	
71.00	102.80				0.60	
80.00	102.80				0.60	

83.50	101.80		0.60
84.10	101.50		0.60
84.20	101.40		12.50
85.00	101.00		0.60
86.00	100.70		0.60
88.00	100.10		0.60
90.00	99.70		54.50
92.00	99.70		0.60
94.00	100.40		0.60
96.00	101.10		0.60
96.30	101.40		0.60
98.00	102.20		0.60
105.00	101.90		32.50
108.00	101.70		0.60
109.50	101.40		0.60
110.00	101.40	0.10	0.60
112.00	101.00	0.02	12.50
114.00	101.40		43.70
116.00	101.40		43.70
118.00	101.30	0.01	43.70
120.00	101.00	0.01	0.60
122.00	100.60		0.60
122.90	101.40		0.60
124.00	102.80		0.60
126.00	102.90		0.60
128.00	103.00		0.60
132.30	103.60		0.60

Walla Walla River below Yellowhawk Creek measured 327 cfs on 6/12/00; 130 cfs on 6/21/00; 68 cfs on 6/28/00 and 46 cfs on 7/12/00.

SUMMARY DATA: CROSS-SECTION # 1 XS 1.0
Number of Points = 46

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	98.44				0.80	
0.40	98.29				0.80	
2.40	97.54				0.80	
5.40	95.99				41.50	
7.50	95.40				14.80	
8.30	95.11				14.80	
8.70	94.89				14.80	
9.00	94.87				14.80	
11.00	94.48	0.13			14.80	
13.00	94.66	0.26			14.80	
15.00	95.13	0.58			23.70	
17.00	95.30	1.19			34.80	
19.00	95.13	1.57			34.80	
21.00	95.09	1.84			34.50	
23.00	94.99	2.08	0.86		34.50	
25.00	94.81	2.45	1.28		34.50	
27.00	94.71	2.72	1.92	1.08	34.50	
29.00	94.55	2.74	2.09	1.55	34.50	
31.00	94.34	2.69	2.42	2.11	34.50	
33.00	94.25	2.98	2.74	2.24	34.80	
35.00	94.17	2.96	2.83	2.82	34.80	
37.00	94.08	3.21	2.92	2.77	34.50	
39.00	94.02	3.35	3.05	2.84	35.70	
41.00	93.95	3.33	3.31	2.68	35.70	
43.00	93.84	3.39	1.28	2.90	35.70	
45.00	93.85	3.46	3.29	3.11	35.70	
47.00	93.91	3.37	3.04	2.74	35.70	
49.00	94.11	3.30	2.66	1.97	34.50	
51.00	94.40	2.95	2.13	1.06	34.50	
53.00	94.59	2.67	1.66	0.75	41.80	
55.00	94.79	2.58	1.89		41.80	
57.00	94.87	2.67	1.62		43.70	
59.00	94.84	2.32	1.17		43.70	
61.00	94.85	2.34	1.25		43.70	
63.00	94.89	1.96	0.88		43.70	
65.00	94.95	2.09	1.03		14.60	
67.00	94.87	1.81	0.83		14.60	
69.00	94.84	1.71	0.66		14.60	
71.00	94.85	1.69	0.68		14.60	
73.00	94.76	1.55	0.45	0.29	14.60	
75.00	94.51	1.16	0.40	0.22	14.90	
77.00	94.94	0.50	0.17		11.50	
77.50	95.11				11.50	
78.00	95.40				11.50	
80.00	98.04				0.80	
82.00	100.34				0.80	

SUMMARY DATA: CROSS-SECTION # 2 XS 2.0
Number of Points = 42

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	97.84				0.80	
0.40	97.44				0.80	
2.40	96.14				0.80	
5.40	95.94				11.50	

7.80	95.56				11.50
9.00	95.26	0.46			11.50
11.00	95.17	0.40			13.50
11.40	95.22				13.50
13.00	95.56				34.80
15.00	95.56				34.50
17.00	95.26	0.54			34.50
17.20	95.22				34.50
19.00	95.16	1.01			34.50
21.00	95.14	1.18			34.50
22.00	95.05				34.50
23.00	95.07	1.43	0.65		34.50
25.00	94.97	1.19	0.77		34.50
27.00	94.98	1.56	0.85		34.50
29.00	94.82	1.62	0.58	0.41	34.50
31.00	94.75	1.81	0.84	0.49	34.50
33.00	94.69	1.82	0.98	1.00	34.50
35.00	94.62	1.72	1.04	0.73	34.50
37.00	94.55	1.79	1.24	1.00	34.50
39.00	94.48	1.81	1.17	1.01	34.50
41.00	94.31	1.89	1.25	1.05	34.50
43.00	94.06	2.13	1.25	1.17	45.50
45.00	93.68	2.36	1.56	1.33	45.50
47.00	93.48	2.62	1.55	1.38	45.50
49.00	93.55	2.67	1.63	1.35	45.80
51.00	93.54	2.69	1.63	1.33	45.80
53.00	93.48	2.71	1.70	1.26	45.80
55.00	93.40	2.69	1.64	1.13	45.80
57.00	93.30	2.72	1.61	1.24	45.80
59.00	93.33	2.32	1.34	1.20	54.60
61.00	93.39	2.05	1.14	1.00	45.70
63.00	93.60	1.45	0.94	0.60	48.90
65.00	94.74	0.63	0.19	0.16	0.20
65.20	95.05				0.20
65.40	95.22				0.20
65.70	95.56				0.20
68.60	96.64				0.80
70.60	98.44				0.80

SUMMARY DATA: CROSS-SECTION # 3 XS 3.0
Number of Points = 40

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	96.89				0.80	
0.40	97.29				0.80	
2.40	97.04				0.80	
3.50	95.64				0.20	
3.60	95.37				0.20	
4.00	95.27				34.80	
5.00	94.99	1.16	0.55	0.38	34.80	
7.00	95.10	1.26	0.75	0.41	34.80	
9.00	95.12	1.54	0.81	0.59	34.80	
11.00	95.08	2.25	1.38	1.03	34.80	
13.00	95.00	2.26	1.55	1.13	43.50	
15.00	94.90	2.81	1.89	1.55	35.50	
17.00	94.83	2.56	2.05	1.54	35.50	
19.00	94.91	2.68	1.93	1.84	35.50	
21.00	94.86	2.39	2.09	1.78	35.50	
23.00	94.82	2.61	1.83	1.74	34.60	
25.00	94.96	2.18	1.82	1.71	34.60	
27.00	94.89	2.60	1.86	1.65	35.50	
29.00	94.90	2.45	2.09	1.61	35.50	
31.00	94.88	2.01	1.53	1.41	45.50	
33.00	94.98	2.72	2.51	2.06	45.50	
35.00	95.00	2.29	2.44	2.25	45.50	
37.00	95.00	2.57	2.78	2.60	45.50	
39.00	95.05	3.03	2.70	2.33	45.50	

41.00	95.08	2.34	2.62	2.64	45.90
43.00	94.83	0.49	0.42	0.58	45.50
45.00	94.25	0.22	0.53	0.35	45.50
47.00	93.66	0.82	0.42	0.40	45.50
49.00	93.10	2.05	1.25	0.81	45.50
51.00	92.90	3.00	2.11	1.76	45.50
53.00	92.54	2.69	2.40	1.67	45.50
55.00	92.35	2.17	1.20	0.94	58.80
57.00	93.16	0.96	0.28	0.26	85.70
59.00	93.93	0.03			85.70
61.00	95.20				0.80
61.40	95.27				0.80
61.50	95.37				0.80
62.50	95.79				0.80
64.30	96.89				0.80
68.30	99.94				0.80

SUMMARY DATA: CROSS-SECTION # 4 XS 4.0
Number of Points = 42

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	98.94				0.80	
0.40	97.94				0.80	
5.40	96.44				0.80	
10.40	96.84				0.80	
12.90	96.74				0.80	
15.50	96.20				11.50	
17.30	95.92				14.80	
17.50	95.95	0.60			11.50	
19.60	95.85				15.50	
20.00	95.86	0.89	0.30		15.50	
22.50	95.78	1.02	0.36		14.70	
25.00	95.61	1.47	0.51	0.33	14.70	
27.50	95.43	2.75	1.30	1.01	34.50	
30.00	95.30	2.67	2.19	1.39	34.50	
32.50	95.24	2.63	1.98	2.03	34.50	
35.00	95.24	3.03	2.21	2.15	34.50	
37.50	95.30	2.94	2.32	1.87	35.50	
40.00	95.41	2.68	2.09	2.12	35.50	
42.50	95.34	3.00	2.33	1.78	43.50	
45.00	95.41	2.45	1.94	1.80	43.50	
47.50	95.51	2.42	1.87	1.49	53.50	
50.00	95.59	2.08	1.52	1.00	53.50	
52.50	95.63	2.07	1.27	0.75	53.50	
55.00	95.70	2.25	1.46	0.77	53.50	
57.50	95.65	2.04	1.56	0.54	53.50	
60.00	95.62	1.98	1.80	0.61	53.50	
62.50	95.61	2.31	1.49		53.50	
65.00	95.57	2.21	1.74	0.79	53.50	
67.50	95.47	2.39	1.38	1.45	53.50	
70.00	95.44	2.49	1.72	1.46	53.50	
72.50	95.49	2.81	2.16	2.01	53.50	
75.00	95.41	3.06	2.43	2.16	53.50	
77.50	95.24	2.54	2.32	2.01	53.50	
80.00	95.07	2.74	2.57	2.35	54.50	
82.50	94.95	2.94	2.64	2.39	54.50	
85.00	94.66	2.67	2.25	2.29	45.50	
87.40	94.34		1.57	1.46	0.10	
87.50	94.22		0.93		0.10	
87.60	95.92				0.10	
88.30	95.85				0.10	
88.90	97.14				0.80	
108.90	97.34				0.80	

SUMMARY DATA: CROSS-SECTION # 5 XS 5.0
Number of Points = 45

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	97.74				0.80	
0.40	97.74				0.80	
2.40	97.94				0.80	
4.40	97.29				11.50	
5.50	96.47				61.50	
6.70	96.20				61.50	
7.00	96.16	0.26			61.50	
7.50	96.09				61.50	
9.00	95.93	1.28	0.62		61.50	
11.00	95.58	1.27	0.67	0.34	0.60	
13.00	95.50	2.17	1.46	1.05	0.60	
15.00	95.46	1.89	1.58	1.20	31.50	
17.00	95.40	2.18	1.79	1.37	41.80	
19.00	95.38	2.11	1.56	1.31	43.50	
21.00	95.35	1.90	1.49	1.21	51.90	
23.00	95.35	2.07	1.44	1.15	53.60	
25.00	95.44	1.86	1.48	1.15	51.90	
27.00	95.47	2.07	1.51	1.26	53.60	
29.00	95.49	2.13	1.48	1.17	43.70	
31.00	95.52	1.83	1.33	1.16	34.70	
33.00	95.52	2.01	1.40	1.06	45.50	
35.00	95.53	1.94	1.38	1.20	53.60	
37.00	95.49	1.91	1.37	1.19	53.60	
39.00	95.49	2.13	1.56	1.34	54.50	
41.00	95.44	2.05	1.55	1.09	54.50	
43.00	95.41	2.13	1.57	1.24	53.70	
45.00	95.46	2.08	1.61	1.23	54.50	
47.00	95.45	2.43	1.64	1.24	45.60	
49.00	95.43	2.19	1.68	1.41	45.60	
51.00	95.40	2.56	1.85	1.56	53.90	
53.00	95.40	2.37	1.68	1.62	45.50	
55.00	95.32	2.43	1.91	1.47	54.50	
57.00	95.37	2.57	1.74	1.50	54.50	
59.00	95.43	2.53	1.88	1.51	45.70	
61.00	95.48	2.57	1.81	1.27	51.90	
63.00	95.58	2.40	1.63	1.28	51.90	
65.00	95.54	2.18	1.61	1.25	43.50	
67.00	95.52	1.95	1.27	1.04	41.60	
69.00	95.42	1.49	1.16	0.92	0.20	
71.00	95.60				0.20	
71.90	95.69				0.10	
72.00	96.09				0.10	
74.00	98.04				0.80	
79.00	99.84				0.80	
94.00	99.84				0.80	

SUMMARY DATA: CROSS-SECTION # 6 XS 6.0
Number of Points = 39

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	97.89				0.80	
0.40	96.89				0.80	
2.40	96.84				0.80	
4.40	96.54				0.80	
6.20	96.69				11.50	
7.00	96.49				11.50	
8.50	96.34				11.50	
9.00	96.27	0.16			11.50	
11.00	96.14	0.25			11.50	
13.00	95.69	0.45	0.15		0.60	
15.00	95.55	0.17	0.04	0.10	0.60	
17.00	95.62	0.92	0.28	0.17	41.50	

19.00	95.75	1.32	0.60	0.31	41.50
21.00	95.88	1.65	0.81	0.55	41.60
23.00	95.91	1.80	0.91	0.62	51.70
25.00	95.75	1.91	1.10	0.87	51.80
27.00	95.63	2.19	1.28	0.97	54.50
29.00	95.53	1.91	1.28	0.98	54.50
31.00	95.69	1.91	0.97	0.81	54.50
33.00	95.68	2.23	1.07	0.80	54.50
35.00	95.68	2.01	1.20	0.83	54.50
37.00	95.59	2.15	1.05	0.86	54.50
39.00	95.49	1.94	1.35	1.05	45.70
41.00	95.51	2.18	1.09	1.03	45.70
43.00	95.39	2.39	1.47	1.05	45.70
45.00	95.30	2.23	1.52	1.09	43.90
47.00	95.18	2.21	1.55	1.06	53.90
49.00	95.03	2.23	1.30	1.20	53.80
51.00	94.84	2.14	1.58	1.11	51.80
53.00	94.62	2.32	1.60	1.09	51.80
55.00	94.42	1.93	1.65	1.12	51.80
57.00	94.25	2.04	1.56	1.18	41.80
59.00	94.04	2.07	1.58	1.05	41.80
61.00	94.04	1.63	0.65	0.73	0.20
63.00	94.44	0.28	0.16	0.06	0.10
63.50	94.71				0.10
64.00	94.74				0.10
64.70	97.29				0.80
74.70	98.29				0.80

SUMMARY DATA: CROSS-SECTION # 7 XS 7.0
Number of Points = 37

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	98.15				0.80	
0.40	97.15				0.80	
2.40	97.15				0.80	
4.40	97.55				0.80	
6.40	97.20				0.80	
10.00	96.76				0.80	
11.00	96.60	0.10			0.80	
12.00	96.24				41.50	
13.00	96.18	0.71	0.34		54.50	
15.00	95.89	1.00	0.57	0.21	54.50	
17.00	95.55	1.13	0.80	0.51	45.60	
19.00	95.27	0.94	0.85	0.57	45.50	
21.00	94.88	1.49	0.83	0.65	54.60	
23.00	94.75	1.40	1.03	0.72	64.50	
25.00	94.54	1.56	1.17	0.72	65.50	
27.00	94.63	2.05	1.21	0.80	65.50	
29.00	94.63	1.82	1.20	0.86	54.60	
31.00	94.84	1.98	1.31	1.10	45.50	
33.00	94.83	2.27	1.44	1.00	45.50	
35.00	94.87	2.19	1.47	0.97	45.50	
37.00	94.88	2.57	1.46	0.98	45.50	
39.00	94.93	2.36	1.61	1.01	42.60	
41.00	95.05	2.26	1.53	1.03	42.60	
43.00	95.01	1.93	1.40	0.88	42.60	
45.00	94.95	1.97	1.35	0.79	64.40	
47.00	95.13	1.73	1.12	0.77	64.40	
49.00	95.29	1.56	1.19	0.78	64.40	
51.00	95.34	1.43	1.00	0.66	54.50	
53.00	95.33	1.33	0.69	0.42	41.50	
55.00	95.19	0.96	0.85	0.49	41.50	
57.00	95.15	0.69	0.60	0.39	41.50	
59.00	95.32	0.06	-0.03		11.90	
61.00	95.97	-0.23	-0.09		11.90	
62.50	96.14				11.90	

63.00	96.24			11.90
65.40	97.30			11.90
75.40	99.30			0.80

SUMMARY DATA: CROSS-SECTION # 8 XS 8.0
Number of Points = 51

X	Y	VEL 2	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	100.05		0.80	
0.40	98.20		0.80	
2.40	98.05		0.80	
3.10	96.78		11.50	
5.00	96.53	0.10	11.50	
7.00	96.38	0.10	88.50	
9.00	96.38	0.10	88.50	
11.00	96.03	0.12	88.50	
12.00	95.43	0.17	88.50	
13.00	95.58	0.15	75.50	
14.00	95.63	1.34	75.50	
15.00	96.08	1.06	75.50	
16.00	95.88	0.08	75.50	
18.00	96.53	0.10	11.50	
18.20	96.78		11.50	
20.40	97.90		0.80	
22.40	98.10		11.50	
24.40	98.60		11.50	
26.40	98.55		0.80	
28.40	98.45		0.80	
30.40	97.80		11.50	
32.70	96.78		11.90	
34.00	95.58	0.09	11.90	
36.00	94.63	0.20	11.90	
38.00	94.48	0.08	16.60	
40.00	94.68	0.15	62.50	
42.00	94.63	0.38	58.70	
44.00	94.33	1.04	58.70	
46.00	93.88	1.14	54.50	
48.00	93.58	1.67	54.50	
50.00	93.48	2.13	54.50	
52.00	93.48	2.40	64.50	
54.00	93.43	2.46	64.50	
55.00	93.48	2.47	64.50	
56.00	93.58	2.14	54.50	
57.00	93.68	2.56	43.50	
58.00	93.98	1.70	43.50	
59.00	93.98	1.68	43.50	
60.00	94.18	1.09	43.60	
61.00	94.28	0.39	24.70	
62.00	94.38	0.35	24.70	
63.00	94.38	0.26	24.70	
64.00	94.53	0.18	24.70	
65.00	94.53	0.06	24.70	
67.00	94.63	0.35	24.70	
69.00	95.28	0.09	42.50	
70.70	96.78		0.80	
73.00	97.45		0.80	
75.00	97.65		0.80	
76.00	97.80		0.80	
96.00	97.80		0.80	

Walla Walla River below HWY 125 WUA from 15 to 325 cfs medium flow 1-flow.
Measured 6/12/2000; 6/22/2000; 6/27/2000; 7/11/2000

SUMMARY DATA: CROSS-SECTION # 1 Trans. #1
Number of Points = 34

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	93.59			0.70	
-4.60	93.59			0.70	
0.40	93.59			0.70	
3.80	92.12			56.90	
4.00	92.12			56.90	
6.00	91.79	0.48		53.80	
8.00	91.62	1.22		53.80	
10.00	91.97	0.10		53.60	
12.00	92.12			54.60	
14.00	92.12			54.50	
16.00	92.12			54.50	
18.00	92.09	0.10		54.50	
20.00	91.89	0.91		54.50	
22.00	91.81	1.06		45.70	
24.00	91.77	1.46		45.70	
26.00	91.81	2.22		54.50	
28.00	91.55	1.73	0.55	56.80	
30.00	91.60	2.36	0.55	56.80	
32.00	91.42	2.48	0.74	56.80	
34.00	91.32	2.19	0.59	56.80	
36.00	91.22	2.19	0.73	56.80	
38.00	91.07	1.87	1.00	56.80	
40.00	91.07	2.45	0.80	56.50	
42.00	91.12	2.72	1.31	45.80	
44.00	91.12	2.80	1.51	43.60	
46.00	91.07	2.79	1.58	43.60	
48.00	90.77	2.87	1.36	45.60	
50.00	90.72	2.90	2.23	54.60	
52.00	91.24	2.58	0.96	0.30	
54.00	92.11			35.90	
54.20	92.12			35.90	
58.00	93.29			54.50	
61.00	95.79			0.70	
81.00	96.19			0.70	

SUMMARY DATA: CROSS-SECTION # 2 Trans. 2
Number of Points = 39

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	96.31			0.70	
0.40	96.21			22.90	
10.00	96.01			22.90	
20.00	95.51			22.90	
30.50	92.92			34.60	
32.00	92.13	0.13		43.60	
34.00	91.78	0.25		45.70	
36.00	91.45	0.16		54.60	
38.00	91.26	0.07		54.80	
40.00	91.05	0.11		56.90	
42.00	90.89	0.10		45.80	
46.00	90.98	0.10		45.60	
50.00	91.41	0.10		45.80	
54.00	91.63	0.10		0.40	
58.00	91.16	0.10		0.40	
62.00	89.13	0.10		0.40	
66.00	89.83	0.44	0.19	0.40	
68.00	90.18	1.35	0.38	0.40	

69.00	90.43	1.72	0.38	54.70
70.00	90.58	2.15	0.56	54.50
71.00	90.63	2.16	0.64	45.60
72.00	90.82	2.44	0.76	45.70
73.00	90.83	2.35	0.73	45.50
74.00	90.79	2.43	0.71	54.60
75.00	90.78	2.46	0.80	54.60
76.00	90.78	2.70	0.74	54.60
77.00	90.73	2.47	0.77	45.70
78.00	90.83	2.47	0.69	45.80
79.00	90.93	2.60	0.58	45.60
80.00	90.96	2.57	0.68	46.60
81.00	91.03	2.10	0.50	46.70
82.00	91.08	2.01	0.50	45.70
84.00	91.33	1.55	0.26	45.70
86.00	91.69	1.03		45.90
88.00	92.18	0.39		34.50
89.50	92.38			34.80
95.00	93.36			46.50
100.00	93.99			0.70
110.00	94.44			0.70

SUMMARY DATA: CROSS-SECTION # 3 Trans. 3
Number of Points = 35

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.99			0.70	
0.40	98.49			0.70	
3.10	93.07			13.80	
4.50	92.59	0.38		34.60	
6.50	92.23	0.59		45.70	
8.50	92.11	0.82		45.70	
10.50	92.23	0.73		45.70	
12.50	92.37	0.99		45.80	
14.50	92.54	0.83		45.80	
16.50	92.57	0.86		45.80	
18.50	92.62	0.70		45.80	
20.50	92.64	0.51		45.80	
22.50	92.81	0.15		45.90	
24.50	93.07			45.90	
26.50	93.80			54.50	
28.50	94.07			35.70	
30.50	93.71			35.70	
32.50	93.07			34.80	
34.50	92.86	0.09		34.80	
36.50	92.47	4.34	2.16	45.70	
37.00	92.47	4.55	1.65	45.70	
39.00	92.47	4.08	0.79	0.30	
41.00	92.47	0.41		0.20	
43.00	92.02	4.69	1.65	45.80	
45.00	92.12	4.97	3.12	45.80	
47.00	92.17	4.24	3.23	45.80	
49.00	92.27	4.16	2.26	45.80	
51.00	92.32	3.72	1.90	35.60	
53.00	92.45	3.58	0.91	43.60	
55.00	92.37	3.33	0.76	45.60	
57.00	92.87	0.88		35.70	
57.70	93.07			53.60	
62.00	93.59			53.70	
66.00	94.49			22.90	
76.00	94.89			0.70	

SUMMARY DATA: CROSS-SECTION # 4 Trans. 4
Number of Points = 37

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.99				0.70	
0.40	98.79				0.70	
2.00	94.64				53.50	
4.50	93.52				0.80	
5.50	93.16	1.40			0.80	
7.00	92.94	1.76	0.11		0.80	
8.50	92.67	2.01	0.94	0.45	45.90	
10.00	92.52	2.13	1.21	0.78	45.70	
11.50	92.50	2.24	1.20	0.81	45.80	
13.00	92.44	2.40	1.34	0.89	45.80	
14.50	92.47	2.51	1.29	0.65	45.80	
16.00	92.50	2.63	1.39	0.87	45.80	
17.50	92.55	2.33	0.94	0.81	45.80	
19.00	92.52	2.27	0.89	0.51	45.60	
20.50	92.42	2.65	1.13	0.80	45.60	
22.00	92.52	2.20	0.54	0.27	45.60	
23.50	92.52	2.43	1.02	0.42	45.60	
25.00	92.51	2.12	1.04	0.89	45.80	
26.50	92.56	2.34	0.99	0.73	45.80	
28.00	92.60	2.27	0.79	0.28	45.80	
29.50	92.67	1.69	0.69	0.37	45.80	
31.00	92.85	1.96	0.81	0.23	45.60	
32.50	92.82	1.66	0.34	0.05	45.60	
34.00	92.92	1.22	0.05		45.60	
35.50	93.00	1.16			45.60	
37.00	92.97	1.07			45.70	
38.50	93.00	0.93			45.70	
40.00	93.09	0.94			45.70	
41.50	93.22	0.51			45.70	
43.00	93.24	0.53			45.50	
44.50	93.42	0.25			45.50	
46.50	93.42				45.50	
48.50	93.52				45.50	
57.60	94.24				62.60	
60.60	94.69				0.70	
63.60	94.99				0.70	
83.60	94.99				0.70	

SUMMARY DATA: CROSS-SECTION # 5 Trans. 5
Number of Points = 39

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.29				0.70	
0.40	98.19				0.70	
2.00	95.79				22.50	
4.00	94.04				43.50	
7.00	93.99				34.80	
8.50	93.97				0.80	
10.00	93.91				0.80	
11.50	93.84	0.28			0.80	
13.00	93.85	0.30			34.60	
14.50	93.86	0.70			43.60	
16.00	93.79	0.69			43.80	
17.50	93.76	0.93			43.60	
19.00	93.76	0.71			43.60	
20.50	93.68	1.05			43.80	
22.00	93.67	0.81			45.90	
23.50	93.63	1.20			45.90	
25.00	93.39	1.66			45.90	
26.50	93.37	1.74			45.90	
28.00	93.17	2.08	0.33	0.05	45.70	
29.50	93.11	2.02	0.41	0.10	45.70	
31.00	93.04	2.44	0.30	0.24	45.80	
32.50	92.97	2.50	0.68	0.36	45.80	

34.00	92.99	2.45	0.72	0.50	45.80
35.50	92.79	2.29	0.77	0.37	45.80
37.00	92.74	2.25	0.71	0.22	45.80
38.50	92.69	2.42	0.87	0.47	45.80
40.00	92.59	2.14	1.00	0.43	45.80
41.50	92.67	2.39	1.22	0.65	45.80
43.00	92.74	2.53	0.80	0.67	45.60
44.50	92.69	2.23	1.43	0.79	45.60
46.00	92.59	2.31	1.09	1.03	54.60
47.50	92.63	2.11	0.77	0.62	45.70
49.00	93.20	1.15			45.70
50.50	93.49	0.23			45.90
52.00	93.89				45.60
53.20	93.99				45.50
57.00	95.19				22.90
60.00	95.69				0.70
70.00	95.69				0.70

SUMMARY DATA: CROSS-SECTION # 6 Trans. 6
Number of Points = 39

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.79			0.70	
0.40	98.79			0.70	
1.00	98.49			0.70	
3.00	94.13			0.80	
4.00	93.67	0.32		0.80	
5.50	93.88	0.21		0.80	
7.00	93.98	0.33		45.80	
8.50	93.95	0.23		45.80	
10.00	94.03	0.10		45.80	
11.50	94.03	0.10		45.80	
13.00	94.03	0.10		45.80	
14.50	94.03	0.10		45.80	
16.00	94.03	0.10		45.80	
17.50	94.03	0.84		45.80	
19.00	94.03	0.10		45.80	
20.50	93.88	0.10		45.80	
22.00	93.68	0.10		45.80	
23.50	93.35	0.43	-0.09	45.80	
25.00	92.88	1.77	0.14	45.80	
26.50	92.68	2.37	0.86	45.80	
28.00	92.63	3.85	1.49	45.80	
29.50	92.73	3.36	1.76	45.80	
31.00	92.81	3.31	1.90	45.80	
32.50	92.78	3.37	1.56	45.80	
34.00	92.68	3.32	1.57	45.80	
35.50	92.83	3.45	1.15	45.80	
37.00	93.03	3.08	0.38	45.80	
38.50	93.33	2.70		45.80	
40.00	93.61	2.08		45.80	
41.50	93.68	0.97		45.50	
43.00	93.73	0.94		45.50	
44.50	93.68	0.59		45.50	
46.00	93.78	0.05		45.50	
47.50	93.88	0.15		45.50	
49.00	93.88	0.11		45.50	
50.50	94.03			45.50	
51.50	94.13			45.50	
58.70	95.49			0.70	
68.70	95.24			0.70	

SUMMARY DATA: CROSS-SECTION # 7 Trans. 7
Number of Points = 39

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-3.50	99.31			0.70	
-1.50	98.11			22.90	
0.50	95.61			0.10	
1.70	93.73	0.10		0.10	
2.10	92.43	0.10	-0.09	0.10	
2.60	92.23	0.10	-0.12	0.10	
3.00	91.70	2.25	-0.03	41.50	
4.00	91.60	1.04		51.50	
5.00	91.90	1.84	0.01	51.50	
6.00	91.90	1.82	0.19	54.50	
7.00	91.80	1.80	0.50	54.50	
8.00	91.70	1.87	0.70	54.50	
9.00	91.80	2.31	0.61	45.50	
10.00	91.70	1.94	0.77	45.50	
11.00	91.71	1.65	0.83	43.80	
12.00	91.80	1.71	0.79	43.80	
13.00	92.05	1.78	0.74	43.50	
14.00	92.25	1.54	0.58	43.70	
16.00	92.90	1.44	0.35	53.70	
18.00	93.50	1.10		43.70	
20.00	93.90	0.72		53.70	
22.00	94.25	0.05		53.70	
24.00	94.82			53.70	
25.20	94.82			53.70	
42.00	94.91			22.90	
45.00	94.91			22.90	
50.00	95.61			22.90	
55.00	95.91			22.90	
60.00	95.46			67.80	
63.90	94.82			51.70	
65.00	94.15			51.50	
67.00	93.73			51.50	
69.00	93.35			11.50	
71.00	93.85			0.40	
72.70	94.40				
80.00	95.31			22.90	
83.20	96.01			22.90	
84.20	98.01			0.70	
93.20	99.31			0.70	

SUMMARY DATA: CROSS-SECTION # 8 Trans. 8
Number of Points = 47

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	97.81			0.70	
0.40	96.81			0.70	
1.00	96.30			0.10	
2.00	93.43	0.10		0.10	
3.50	93.12	2.10	2.02	56.80	
5.00	93.12	2.55	3.38	56.80	
6.50	93.42	3.66	3.00	54.50	
8.00	93.52	3.15	1.06	54.50	
9.50	93.82	3.24	1.36	54.50	
11.00	93.92	3.27	1.17	54.50	
12.50	94.04	3.17	2.08	54.50	
13.00	94.12	3.10	1.84	54.50	
14.50	94.02	2.66	0.45	54.50	
16.00	94.20	2.52		54.50	
17.50	94.30	2.46		54.50	
19.00	94.45	2.81		54.50	
21.00	94.32	2.39	0.05	54.50	
23.00	94.32	2.49	0.05	54.50	
25.00	94.37	2.51		54.50	
27.00	94.22	2.63	1.05	56.80	

29.00	94.37	2.36	0.01	56.60
31.00	94.47	1.37		56.60
33.00	94.62	0.64		55.50
35.00	94.82			53.80
37.00	94.82			53.80
39.00	94.72	0.10		53.80
41.00	94.72	0.10		53.80
50.00	96.11			0.70
60.00	96.69			0.70
70.00	96.99			0.70
80.00	97.19			0.70
83.00	96.49			66.90
90.00	94.82			64.40
92.00	94.72			54.50
94.00	94.72			11.90
96.00	94.82			51.50
98.00	94.57			41.50
100.00	94.54			51.40
102.00	94.40			11.90
104.00	94.82			11.90
106.00	94.07			11.90
108.00	93.74			11.90
110.00	94.32			11.90
110.30	94.82			0.70
111.70	97.59			0.70
116.70	97.19			0.70
121.70	97.19			0.70

Walla Walla River below HWY 125, 1-flow low flow
measured 13 cfs on 6/27/2000

SUMMARY DATA: CROSS-SECTION # 1 Trans. #1
Number of Points = 35

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-9.60	93.59			0.70	
-4.60	93.59			0.70	
0.40	93.59			0.70	
3.80	92.12			56.90	
4.00	92.12			56.90	
6.00	91.79	0.48		53.80	
8.00	91.62	1.22		53.80	
10.00	91.97			53.60	
12.00	92.12			54.60	
14.00	92.12			54.50	
16.00	92.12			54.50	
18.00	92.09			54.50	
20.00	91.89	0.91		54.50	
22.00	91.81	1.06		45.70	
24.00	91.77	1.46		45.70	
26.00	91.81	2.22		54.50	
28.00	91.50	1.73	0.55	56.80	
30.00	91.50	2.36	0.55	56.80	
32.00	91.46	2.48	0.74	56.80	
34.00	91.40	2.19	0.59	56.80	
36.00	91.32	2.19	0.73	56.80	
38.00	91.25	1.87	1.00	56.80	
40.00	91.12	2.45	0.80	56.50	
42.00	91.18	2.72	1.31	45.80	
44.00	91.18	2.80	1.51	43.60	
46.00	91.12	2.79	1.58	43.60	
48.00	90.82	2.87	1.36	45.60	
50.00	90.78	2.90	2.23	54.60	
52.00	91.32	2.58	0.96	0.30	
53.00	91.60			35.70	
54.00	92.11			35.90	
54.20	92.12			35.90	
58.00	93.29			54.50	
61.00	95.79			0.70	
81.00	96.19			0.70	

SUMMARY DATA: CROSS-SECTION # 2 Trans. 2
Number of Points = 40

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	96.31			0.70	
0.40	96.21			22.90	
10.00	96.01			22.90	
20.00	95.51			22.90	
30.50	92.92			34.60	
32.00	92.13	0.13		43.60	
34.00	91.83	0.25		45.70	
36.00	91.51	0.16		54.60	
38.00	91.23	0.07		54.80	
40.00	91.04	0.01		56.90	
42.00	90.91			45.80	
46.00	91.03			45.60	
50.00	91.53			45.80	
54.00	91.54			0.40	
58.00	91.12			0.40	
62.00	89.14		0.10	0.40	
66.00	89.72	0.44	0.19	0.40	

68.00	90.32	1.35	0.38	0.40
69.00	90.41	1.72	0.38	54.70
70.00	90.60	2.15	0.56	54.50
71.00	90.83	2.16	0.64	45.60
72.00	90.86	2.44	0.76	45.70
73.00	90.86	2.35	0.73	45.50
74.00	90.87	2.43	0.71	54.60
75.00	90.84	2.46	0.80	54.60
76.00	90.78	2.70	0.74	54.60
77.00	90.85	2.47	0.77	45.70
78.00	91.00	2.47	0.69	45.80
79.00	90.95	2.60	0.58	45.60
80.00	91.12	2.57	0.68	46.60
81.00	91.15	2.10	0.50	46.70
82.00	91.23	2.01	0.50	45.70
84.00	91.36	1.55	0.26	45.70
86.00	91.79	1.03	0.05	45.90
86.90	91.96			45.90
88.00	92.18	0.39		34.50
89.50	92.38			34.80
95.00	93.36			46.50
100.00	93.99			0.70
110.00	94.44			0.70

SUMMARY DATA: CROSS-SECTION # 3 Trans. 3
Number of Points = 38

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.99			0.70	
0.40	98.49			0.70	
3.10	93.07			13.80	
4.20	92.62			34.60	
4.50	92.57	0.38		34.60	
6.50	92.24	0.59		45.70	
8.50	92.14	0.82		45.70	
10.50	92.24	0.73		45.70	
12.50	92.42	0.99		45.80	
14.50	92.51	0.83		45.80	
16.50	92.52	0.86		45.80	
18.50	92.58	0.70		45.80	
20.50	92.57	0.51	0.03	45.80	
22.30	92.62			45.90	
24.50	93.07			45.90	
26.50	93.80			54.50	
28.50	94.07			35.70	
30.50	93.71			35.70	
32.50	93.07			34.80	
34.50	92.86	0.09		34.80	
35.00	92.62			34.80	
36.50	92.34	4.34	2.16	45.70	
37.00	92.37	4.55	1.65	45.70	
39.00	92.44	4.08	0.79	0.30	
39.70	92.62			0.20	
41.00	92.47	0.41	0.03	0.20	
43.00	91.94	4.69	1.65	45.80	
45.00	91.97	4.97	3.12	45.80	
47.00	92.08	4.24	3.23	45.80	
49.00	92.27	4.16	2.26	45.80	
51.00	92.37	3.72	1.90	35.60	
53.00	92.47	3.58	0.91	43.60	
55.00	92.38	3.33	0.76	45.60	
57.00	92.87	0.88		35.70	
57.70	93.07			53.60	
62.00	93.59			53.70	
66.00	94.49			22.90	
76.00	94.89			0.70	

SUMMARY DATA: CROSS-SECTION # 4 Trans. 4
Number of Points = 39

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.99				0.70	
0.40	98.79				0.70	
2.00	94.64				53.50	
4.50	93.52				0.80	
5.50	93.16	1.40			0.80	
5.70	93.06				0.80	
7.00	92.98	1.76	0.11		0.80	
8.50	92.76	2.01	0.94	0.45	45.90	
10.00	92.55	2.13	1.21	0.78	45.70	
11.50	92.41	2.24	1.20	0.81	45.80	
13.00	92.41	2.40	1.34	0.89	45.80	
14.50	92.46	2.51	1.29	0.65	45.80	
16.00	92.46	2.63	1.39	0.87	45.80	
17.50	92.52	2.33	0.94	0.81	45.80	
19.00	92.54	2.27	0.89	0.51	45.60	
20.50	92.47	2.65	1.13	0.80	45.60	
22.00	92.55	2.20	0.54	0.27	45.60	
23.50	92.60	2.43	1.02	0.42	45.60	
25.00	92.56	2.12	1.04	0.89	45.80	
26.50	92.57	2.34	0.99	0.73	45.80	
28.00	92.60	2.27	0.79	0.28	45.80	
29.50	92.66	1.69	0.69	0.37	45.80	
31.00	92.86	1.96	0.81	0.23	45.60	
32.50	92.82	1.66	0.34	0.05	45.60	
34.00	92.94	1.22	0.05		45.60	
35.50	93.01	1.16			45.60	
37.00	92.94	1.07			45.70	
38.50	93.02	0.93			45.70	
40.00	93.09	0.94			45.70	
40.30	93.06				45.70	
41.50	93.22	0.51			45.70	
43.00	93.24	0.53			45.50	
44.50	93.42	0.25			45.50	
46.50	93.42				45.50	
48.50	93.52				45.50	
57.60	94.24				62.60	
60.60	94.69				0.70	
63.60	94.99				0.70	
83.60	94.99				0.70	

SUMMARY DATA: CROSS-SECTION # 5 Trans. 5
Number of Points = 40

X	Y	VEL 2	VEL 3	VEL 4	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.29				0.70	
0.40	98.19				0.70	
2.00	95.79				22.50	
4.00	94.04				43.50	
7.00	93.99				34.80	
8.50	93.97				0.80	
10.00	93.91				0.80	
11.50	93.84	0.28			0.80	
13.00	93.85	0.30			34.60	
14.50	93.86	0.70			43.60	
16.00	93.79	0.69			43.80	
17.50	93.76	0.93			43.60	
19.00	93.76	0.71			43.60	
20.50	93.68	1.05			43.80	
22.00	93.67	0.81			45.90	

23.50	93.63	1.20			45.90
24.00	93.43				45.90
25.00	93.38	1.66	0.05		45.90
26.50	93.31	1.74	0.05		45.90
28.00	93.25	2.08	0.33	0.05	45.70
29.50	93.10	2.02	0.41	0.10	45.70
31.00	93.02	2.44	0.30	0.24	45.80
32.50	92.99	2.50	0.68	0.36	45.80
34.00	92.93	2.45	0.72	0.50	45.80
35.50	92.85	2.29	0.77	0.37	45.80
37.00	92.75	2.25	0.71	0.22	45.80
38.50	92.73	2.42	0.87	0.47	45.80
40.00	92.64	2.14	1.00	0.43	45.80
41.50	92.68	2.39	1.22	0.65	45.80
43.00	92.68	2.53	0.80	0.67	45.60
44.50	92.71	2.23	1.43	0.79	45.60
46.00	92.63	2.31	1.09	1.03	54.60
47.50	92.65	2.11	0.77	0.62	45.70
49.00	93.21	1.15	0.05		45.70
50.40	93.43				45.90
52.00	93.89				45.60
53.20	93.99				45.50
57.00	95.19				22.90
60.00	95.69				0.70
70.00	95.69				0.70

SUMMARY DATA: CROSS-SECTION # 6 Trans. 6
Number of Points = 42

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	98.79			0.70	
0.40	98.79			0.70	
1.00	98.49			0.70	
3.00	94.13			0.80	
4.00	93.67	0.32		0.80	
5.50	93.88	0.01		0.80	
7.00	93.98	0.33		45.80	
8.50	93.95	0.23		45.80	
10.00	94.03			45.80	
11.50	94.03			45.80	
13.00	94.03			45.80	
14.50	94.03			45.80	
16.00	94.03			45.80	
17.50	94.03	0.84		45.80	
19.00	94.03			45.80	
20.50	93.88			45.80	
21.20	93.61			45.80	
22.00	93.55			45.80	
23.50	93.21	0.43	-0.09	45.80	
25.00	92.82	1.77	0.14	45.80	
26.50	92.74	2.37	0.86	45.80	
28.00	92.66	3.85	1.49	45.80	
29.50	92.71	3.36	1.76	45.80	
31.00	92.78	3.31	1.90	45.80	
32.50	92.76	3.37	1.56	45.80	
34.00	92.69	3.32	1.57	45.80	
35.50	93.04	3.45	1.15	45.80	
37.00	93.12	3.08	0.38	45.80	
38.50	93.40	2.70	0.03	45.80	
39.60	93.53		0.03	45.80	
40.00	93.61	2.08		45.80	
40.50	93.61			45.80	
41.50	93.68	0.97		45.50	
43.00	93.73	0.94		45.50	
44.50	93.68	0.59		45.50	
46.00	93.78	0.05		45.50	
47.50	93.88	0.15		45.50	

49.00	93.88	0.11		45.50	
50.50	94.03			45.50	
51.50	94.13			45.50	
58.70	95.49			0.70	
68.70	95.24			0.70	

SUMMARY DATA: CROSS-SECTION # 7 Trans. 7
Number of Points = 40

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-3.50	99.31			0.70	
-1.50	98.11			22.90	
0.50	95.61			0.10	
1.70	93.73			0.10	
2.10	92.43		-0.09	0.10	
2.60	92.23		-0.12	0.10	
3.00	92.30	2.25	-0.03	41.50	
4.00	92.03	1.04	0.10	51.50	
5.00	91.98	1.84	0.10	51.50	
6.00	91.93	1.82	0.19	54.50	
7.00	91.81	1.80	0.50	54.50	
8.00	91.82	1.87	0.70	54.50	
9.00	91.73	2.31	0.61	45.50	
10.00	91.73	1.94	0.77	45.50	
11.00	91.73	1.65	0.83	43.80	
12.00	91.74	1.71	0.79	43.80	
13.00	91.91	1.78	0.74	43.50	
14.00	92.20	1.54	0.58	43.70	
16.00	92.73	1.44	0.35	53.70	
18.00	93.43	1.10	0.05	43.70	
18.70	93.73			53.70	
20.00	93.90	0.72		53.70	
22.00	94.25	0.05		53.70	
24.00	94.82			53.70	
25.20	94.82			53.70	
42.00	94.91			22.90	
45.00	94.91			22.90	
50.00	95.61			22.90	
55.00	95.91			22.90	
60.00	95.46			67.80	
63.90	94.82			51.70	
65.00	94.15			51.50	
67.00	93.73			51.50	
67.30	93.73			51.50	
69.00	93.59			11.50	
70.70	93.73				
80.00	95.31			22.90	
83.20	96.01			22.90	
84.20	98.01			0.70	
93.20	99.31			0.70	

SUMMARY DATA: CROSS-SECTION # 8 Trans. 8
Number of Points = 47

X	Y	VEL 2	VEL 3	ATTRIBUTE 1	ATTRIBUTE 2
-19.60	97.81			0.70	
0.40	96.81			0.70	
1.00	96.30			0.10	
2.00	93.43		0.05	0.10	
3.50	93.09	2.10	2.02	56.80	
5.00	93.29	2.55	3.38	56.80	
6.50	93.54	3.66	3.00	54.50	

8.00	93.69	3.15	1.06	54.50
9.50	94.01	3.24	1.36	54.50
11.00	94.14	3.27	1.17	54.50
12.50	94.12	3.17	2.08	54.50
13.00	94.14	3.10	1.84	54.50
14.50	94.19	2.66	0.45	54.50
16.00	94.20	2.52	0.01	54.50
17.50	94.30	2.46		54.50
19.00	94.45	2.81		54.50
21.00	94.19	2.39	0.05	54.50
23.00	94.19	2.49	0.05	54.50
25.00	94.37	2.51		54.50
27.00	94.09	2.63	1.05	56.80
29.00	94.19	2.36	0.01	56.60
30.90	94.24			56.60
31.00	94.47	1.37		56.60
33.00	94.62	0.64		55.50
35.00	94.82			53.80
37.00	94.82			53.80
39.00	94.72			53.80
41.00	94.72			53.80
42.00	94.82			52.90
50.00	96.11			0.70
60.00	96.69			0.70
70.00	96.99			0.70
80.00	97.19			0.70
83.00	96.49			66.90
90.00	94.82			64.40
92.00	94.72			54.50
94.00	94.72			11.90
96.00	94.82			51.50
98.00	94.57			41.50
100.00	94.54			51.40
102.00	94.40			11.90
104.00	94.82			11.90
110.00	94.32			11.90
110.30	94.82			0.70
111.70	97.59			0.70
116.70	97.19			0.70
121.70	97.19			0.70

Appendix B

Calibration Details

Mill Cr above Wallula Rd, measured June, July 1999 at 56, 25, 5 cfs by
Beecher, Caldwell, Shedd, Bauersfeld - WDFW,WDOE

CROSS-SECTION # 1 XS 1.0
Number of Points = 35

Thalweg Elevation = 94.96
Highest Point Elevation = 100.45
Lowest Bank Elevation = 99.6
SZF Elevation = 97.8

Number of Stage/Discharge CalSets = 3 Active CalSets: 1 2 3
Number of Velocity Sets = 3 Active VelSets: 1 2 3

>---------- CAL/VEL SET 1 ----------<
Stage = 98.55
WSEL = 98.55
Given Flow = 56.00
Calculated Flow = 57.40
CalcFlow/GivenFlow ratio = 1.02

>---------- CAL/VEL SET 2 ----------<
Stage = 98.31
WSEL = 98.31
Given Flow = 22.00
Calculated Flow = 21.44
CalcFlow/GivenFlow ratio = 0.97

>---------- CAL/VEL SET 3 ----------<
Stage = 98.10
WSEL = 98.10
Given Flow = 6.00
Calculated Flow = 4.83
CalcFlow/GivenFlow ratio = 0.81

CROSS-SECTION # 2 XS 2.0
Number of Points = 32

Thalweg Elevation = 94.9
Highest Point Elevation = 101
Lowest Bank Elevation = 99.8
SZF Elevation = 97.8

Number of Stage/Discharge CalSets = 3 Active CalSets: 1 2 3
Number of Velocity Sets = 3 Active VelSets: 1 2 3

>---------- CAL/VEL SET 1 ----------<
Stage = 98.51
WSEL = 98.51
Given Flow = 56.00
Calculated Flow = 59.51
CalcFlow/GivenFlow ratio = 1.06

>---------- CAL/VEL SET 2 ----------<
Stage = 98.28
WSEL = 98.28
Given Flow = 22.00
Calculated Flow = 23.63
CalcFlow/GivenFlow ratio = 1.07
.

>------------ CAL/VEL SET 3 ------------<
Stage = 98.11
WSEL = 98.11
Given Flow = 6.00
Calculated Flow = 5.19
CalcFlow/GivenFlow ratio = 0.86

CROSS-SECTION # 3 XS 3.0
Number of Points = 38

Thalweg Elevation = 97
Highest Point Elevation = 101.6
Lowest Bank Elevation = 100.3
SZF Elevation = 97.8

Number of Stage/Discharge CalSets = 3 Active CalSets: 1 2 3
Number of Velocity Sets = 3 Active VelSets: 1 2 3

>------------ CAL/VEL SET 1 ------------<
Stage = 98.88
WSEL = 98.88
Given Flow = 56.00
Calculated Flow = 59.00
CalcFlow/GivenFlow ratio = 1.05

>------------ CAL/VEL SET 2 ------------<
Stage = 98.60
WSEL = 98.60
Given Flow = 22.00
Calculated Flow = 20.20
CalcFlow/GivenFlow ratio = 0.92

>------------ CAL/VEL SET 3 ------------<
Stage = 98.41
WSEL = 98.41
Given Flow = 6.00
Calculated Flow = 7.03
CalcFlow/GivenFlow ratio = 1.17

CROSS-SECTION # 4 XS 4.0
Number of Points = 36

Thalweg Elevation = 98.63
Highest Point Elevation = 103.57
Lowest Bank Elevation = 100.6
SZF Elevation = 98.63

Number of Stage/Discharge CalSets = 3 Active CalSets: 1 2 3
Number of Velocity Sets = 3 Active VelSets: 1 2 3

>------------ CAL/VEL SET 1 ------------<
Stage = 99.41
WSEL = 99.41
Given Flow = 56.00
Calculated Flow = 47.75
CalcFlow/GivenFlow ratio = 0.85

>------------ CAL/VEL SET 2 ------------<
Stage = 99.19
WSEL = 99.19
Given Flow = 22.00
Calculated Flow = 18.78
CalcFlow/GivenFlow ratio = 0.85

>------------ CAL/VEL SET 3 ------------<
Stage = 99.15
WSEL = 99.15
Given Flow = 6.00

Calculated Flow = 7.95
CalcFlow/GivenFlow ratio = 1.32

CROSS-SECTION # 5 XS 5.0
Number of Points = 39

Thalweg Elevation = 97.65
Highest Point Elevation = 102.6
Lowest Bank Elevation = 101.5
SZF Elevation = 98.57
SZF *less* than at previous (downstream) XS

Number of Stage/Discharge CalSets = 3 Active CalSets: 1 2 3
Number of Velocity Sets = 3 Active VelSets: 1 2 3

>---------- CAL/VEL SET 1 ----------<
Stage = 99.63
WSEL = 99.63
Given Flow = 56.00
Calculated Flow = 63.65
CalcFlow/GivenFlow ratio = 1.14

>---------- CAL/VEL SET 2 ----------<
Stage = 99.35
WSEL = 99.35
Given Flow = 22.00
Calculated Flow = 22.21
CalcFlow/GivenFlow ratio = 1.01

>---------- CAL/VEL SET 3 ----------<
Stage = 99.21
WSEL = 99.21
Given Flow = 6.00
Calculated Flow = 5.23
CalcFlow/GivenFlow ratio = 0.87

CROSS-SECTION # 6 XS 6.0
Number of Points = 43

Thalweg Elevation = 99.5
Highest Point Elevation = 102.3
Lowest Bank Elevation = 101.5
SZF Elevation = 99.55

Number of Stage/Discharge CalSets = 3 Active CalSets: 1 2 3
Number of Velocity Sets = 3 Active VelSets: 1 2 3

>---------- CAL/VEL SET 1 ----------<
Stage = 100.50
WSEL = 100.50
Given Flow = 56.00
Calculated Flow = 52.68
CalcFlow/GivenFlow ratio = 0.94

>---------- CAL/VEL SET 2 ----------<
Stage = 100.20
WSEL = 100.20
Given Flow = 22.00
Calculated Flow = 20.78
CalcFlow/GivenFlow ratio = 0.94

>---------- CAL/VEL SET 3 ----------<
Stage = 100.07
WSEL = 100.07
Given Flow = 6.00
Calculated Flow = 5.78
CalcFlow/GivenFlow ratio = 0.96

```
--------------------------------------------------------------------------------
CROSS-SECTION #   7  XS 7.0
Number of Points = 47

     Thalweg Elevation = 99.9
Highest Point Elevation = 103.5
  Lowest Bank Elevation = 103.1
        SZF Elevation = 99.9

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
        Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
         Stage = 101.69
          WSEL = 101.69
    Given Flow = 56.00
Calculated Flow = 46.67
CalcFlow/GivenFlow ratio = 0.83

>------------  CAL/VEL SET 2  ------------<
         Stage = 101.52
          WSEL = 101.52
    Given Flow = 22.00
Calculated Flow = 18.76
CalcFlow/GivenFlow ratio = 0.85

>------------  CAL/VEL SET 3  ------------<
         Stage = 101.43
          WSEL = 101.43
    Given Flow = 6.00
Calculated Flow = 5.07
CalcFlow/GivenFlow ratio = 0.85
--------------------------------------------------------------------------------
CROSS-SECTION #   8  XS 8.0
Number of Points = 46

     Thalweg Elevation = 101.8
Highest Point Elevation = 105.8
  Lowest Bank Elevation = 103.9
        SZF Elevation = 101.95

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
        Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
         Stage = 103.36
          WSEL = 103.36
    Given Flow = 56.00
Calculated Flow = 55.25
CalcFlow/GivenFlow ratio = 0.99

>------------  CAL/VEL SET 2  ------------<
         Stage = 103.07
          WSEL = 103.07
    Given Flow = 22.00
Calculated Flow = 24.22
CalcFlow/GivenFlow ratio = 1.10

>------------  CAL/VEL SET 3  ------------<
         Stage = 102.76
          WSEL = 102.76
    Given Flow = 6.00
Calculated Flow = 5.52
CalcFlow/GivenFlow ratio = 0.92
```

```
Mill Cr above Wallula Rd, measured  June, July 1999 at 56, 25, 5 cfs by
Beecher, Caldwell, Shedd, Bauersfeld - WDFW,WDOE
--------------------------------------------------------------------------------
Vel Calibration Set: 1
```

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	98.55	57.40	1.09
2 XS 2.0	98.51	59.51	1.14
3 XS 3.0	98.88	59.00	1.66
4 XS 4.0	99.41	47.75	2.05
5 XS 5.0	99.63	63.65	1.07
6 XS 6.0	100.50	52.68	2.30
7 XS 7.0	101.69	46.67	1.03
8 XS 8.0	103.36	55.25	1.16
	AVERAGE	55.24	1.44

Vel Calibration Set: 2

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	98.31	21.44	0.53
2 XS 2.0	98.28	23.63	0.51
3 XS 3.0	98.60	20.20	1.10
4 XS 4.0	99.19	18.78	1.55
5 XS 5.0	99.35	22.21	0.51
6 XS 6.0	100.20	20.78	1.66
7 XS 7.0	101.52	18.76	0.63
8 XS 8.0	103.07	24.22	0.67
	AVERAGE	21.25	0.90

Vel Calibration Set: 3

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	98.10	4.83	0.21
2 XS 2.0	98.11	5.19	0.18
3 XS 3.0	98.41	7.03	0.76
4 XS 4.0	99.15	7.95	0.77
5 XS 5.0	99.21	5.23	0.21
6 XS 6.0	100.07	5.78	0.62
7 XS 7.0	101.43	5.07	0.20
8 XS 8.0	102.76	5.52	0.23
	AVERAGE	5.82	0.40

Mill Cr above Wallula Rd, measured June, July 1999 at 56, 25, 5 cfs by
Beecher, Caldwell, Shedd, Bauersfeld - WDFW,WDOE

CROSS-SECTION # 1 XS 1.0
Points = 35 Slope = .000172 SZF = 97.8

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	98.55	56.0	29	30.4	49.9	26.9	1.64	1.85
2	98.31	22.0	28	29.4	43.5	26.0	1.48	1.67
3	98.10	6.0	26	28.7	38.1	25.6	1.33	1.49

CROSS-SECTION # 2 XS 2.0
Points = 32 Slope = .021404 SZF = 97.8

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth

1	98.51	56.0	24	25.6	39.8	22.8	1.55	1.75
2	98.28	22.0	22	24.7	34.7	22.0	1.40	1.58
3	98.11	6.0	20	23.5	31.0	20.9	1.32	1.49

CROSS-SECTION # 3 XS 3.0
Points = 38 Slope = .044717 SZF = 97.8

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	98.88	56.0	31	40.2	28.4	38.3	0.71	0.74
2	98.60	22.0	21	29.7	18.6	28.2	0.63	0.66
3	98.41	6.0	17	26.2	13.6	25.1	0.52	0.54

CROSS-SECTION # 4 XS 4.0
Points = 36 Slope = .014043 SZF = 98.63

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	99.41	56.0	31	46.1	22.3	45.7	0.48	0.49
2	99.19	22.0	30	44.0	12.5	43.8	0.28	0.28
3	99.15	6.0	29	42.9	10.7	42.7	0.25	0.25

CROSS-SECTION # 5 XS 5.0
Points = 39 Slope = .007132 SZF = 98.57

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	99.63	56.0	33	46.6	37.6	45.2	0.81	0.83
2	99.35	22.0	26	35.0	26.5	33.9	0.76	0.78
3	99.21	6.0	19	29.2	22.1	28.3	0.76	0.78

CROSS-SECTION # 6 XS 6.0
Points = 43 Slope = .010542 SZF = 99.55

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	100.50	56.0	32	28.9	19.4	28.6	0.67	0.68
2	100.20	22.0	28	26.9	11.1	26.8	0.41	0.41
3	100.07	6.0	25	24.7	7.7	24.6	0.31	0.31

CROSS-SECTION # 7 XS 7.0
Points = 47 Slope = .009515 SZF = 99.9

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	101.69	56.0	35	62.6	37.9	61.9	0.61	0.61
2	101.52	22.0	28	50.9	28.2	50.4	0.55	0.56
3	101.43	6.0	25	47.1	23.9	46.7	0.51	0.51

CROSS-SECTION # 8 XS 8.0
Points = 46 Slope = .0102 SZF = 101.95

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	103.36	56.0	35	37.9	42.4	37.5	1.12	1.13
2	103.07	22.0	33	34.1	32.1	33.8	0.94	0.95
3	102.76	6.0	30	30.9	22.1	30.6	0.71	0.72

Mill Cr above Wallula Rd, measured June, July 1999 at 56, 25, 5 cfs by
Beecher, Caldwell, Shedd, Bauersfeld - WDFW,WDOE

Units: U.S.

```
Number of Calibration Flows: 30
--------------------------------------------------------------------------------
CROSS-SECTION #   1  XS 1.0
Points = 35
 Slope = .000172
   SZF = 97.8

Weighting Factor = .5
Cross-section represents   2.962% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .1437759
Log/Log Regression B =  .4101268
WSL = 0.1438 * Flow ^ 0.4101 + 97.80

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   2  XS 2.0
Points = 32
 Slope = .021404
   SZF = 97.8

Weighting Factor = .5
Cross-section represents   5.822% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .1574379
Log/Log Regression B =  .3702801
WSL = 0.1574 * Flow ^ 0.3703 + 97.80

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   3  XS 3.0
Points = 38
 Slope = .044717
   SZF = 97.8

Weighting Factor = .5
Cross-section represents   5.414% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3769343
Log/Log Regression B =  .2566822
WSL = 0.3769 * Flow ^ 0.2567 + 97.80

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0
```

```
--------------------------------------------------------------------------------
CROSS-SECTION #   4  XS 4.0
Points = 36
 Slope = .014043
   SZF = 98.63

Weighting Factor = .5
Cross-section represents   4.801% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3239062
Log/Log Regression B =  .2132566
WSL = 0.3239 * Flow ^ 0.2133 + 98.63

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   5  XS 5.0
Points = 39
 Slope = .007132
   SZF = 98.57

Weighting Factor = .5
Cross-section represents  13.177% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .4059818
Log/Log Regression B =  .2321308
WSL = 0.4060 * Flow ^ 0.2321 + 98.57

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   6  XS 6.0
Points = 43
 Slope = .010542
   SZF = 99.55

Weighting Factor = .5
Cross-section represents  21.655% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .2983315
Log/Log Regression B =  .2798142
WSL = 0.2983 * Flow ^ 0.2798 + 99.55

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   7  XS 7.0
```

Points = 47
 Slope = .009515
   SZF = 99.9

Weighting Factor = .5
Cross-section represents 28.447% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A = 1.322654
Log/Log Regression B = 7.307747E-02
WSL = 1.3227 * Flow ^ 0.0731 + 99.90

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

CROSS-SECTION #   8 XS 8.0
Points = 46
 Slope = .0102
   SZF = 101.95

Weighting Factor = .5
Cross-section represents 17.722% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A = .5194024
Log/Log Regression B = .2482487
WSL = 0.5194 * Flow ^ 0.2482 + 101.95

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

Mill Cr above Wallula Rd, measured June, July 1999 at 56, 25, 5 cfs by
Beecher, Caldwell, Shedd, Bauersfeld - WDFW,WDOE

Velocity Adjustment Factor table for XS # 1 XS 1.0

WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
98.03	3.00	2.46	1.2186
98.05	4.00	3.24	1.2356
98.08	5.00	4.03	1.2417
98.10	6.00	4.83	1.2419
98.14	8.00	6.49	1.2333
98.17	10.00	8.20	1.2193
98.20	12.00	9.97	1.2032
98.24	15.00	12.73	1.1779
98.27	18.00	15.61	1.1530
98.29	20.00	17.59	1.1369

98.31	22.00	19.62	1.1213
98.34	25.00	22.75	1.0990
98.38	30.00	28.18	1.0645
98.42	35.00	33.88	1.0331
98.45	40.00	39.83	1.0043
98.49	45.00	46.01	0.9780
98.52	50.00	52.43	0.9537
98.55	56.00	60.42	0.9268
98.57	60.00	65.92	0.9101
98.60	65.00	72.99	0.8905
98.62	70.00	80.26	0.8722
98.64	75.00	87.73	0.8549
98.67	80.00	95.40	0.8386
98.71	90.00	111.30	0.8086
98.75	100.00	127.95	0.7816
98.79	110.00	145.32	0.7570
98.82	120.00	163.38	0.7345
98.84	125.00	172.67	0.7239
98.86	130.00	182.12	0.7138
98.87	135.00	191.75	0.7041

Velocity Adjustment Factor table for XS # 2 XS 2.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
98.04	3.00	2.53	1.1875
98.06	4.00	3.42	1.1683
98.09	5.00	4.33	1.1540
98.11	6.00	5.25	1.1437
98.14	8.00	7.13	1.1228
98.17	10.00	9.06	1.1044
98.20	12.00	11.03	1.0877
98.23	15.00	14.08	1.0650
98.26	18.00	17.23	1.0447
98.28	20.00	19.38	1.0322
98.29	22.00	21.56	1.0204
98.32	25.00	24.90	1.0039
98.35	30.00	30.64	0.9790
98.39	35.00	36.58	0.9568
98.42	40.00	42.70	0.9367
98.44	45.00	49.00	0.9185
98.47	50.00	55.45	0.9016
98.50	56.00	63.41	0.8831
98.52	60.00	68.83	0.8717
98.54	65.00	75.74	0.8582
98.56	70.00	82.79	0.8455
98.58	75.00	89.97	0.8336
98.60	80.00	97.28	0.8224
98.63	90.00	112.26	0.8017
98.67	100.00	127.72	0.7830
98.70	110.00	143.63	0.7659
98.73	120.00	159.97	0.7501
98.74	125.00	168.29	0.7428
98.75	130.00	176.72	0.7356
98.77	135.00	185.24	0.7288

Velocity Adjustment Factor table for XS # 3 XS 3.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF

98.30	3.00	2.89	1.0377
98.34	4.00	3.96	1.0093
98.37	5.00	5.00	1.0004
98.40	6.00	6.01	0.9989
98.44	8.00	8.04	0.9952
98.48	10.00	10.00	1.0001
98.51	12.00	11.93	1.0061
98.56	15.00	14.80	1.0136
98.59	18.00	17.65	1.0197
98.61	20.00	19.56	1.0227
98.63	22.00	21.47	1.0248
98.66	25.00	24.36	1.0264
98.70	30.00	29.26	1.0254
98.74	35.00	34.26	1.0215
98.77	40.00	39.37	1.0160
98.80	45.00	44.64	1.0080
98.83	50.00	50.02	0.9995
98.86	56.00	56.62	0.9890
98.88	60.00	61.11	0.9818
98.90	65.00	66.82	0.9727
98.92	70.00	72.64	0.9636
98.94	75.00	78.58	0.9544
98.96	80.00	84.63	0.9453
99.00	90.00	97.09	0.9270
99.03	100.00	110.02	0.9090
99.06	110.00	123.43	0.8912
99.09	120.00	137.33	0.8738
99.10	125.00	144.46	0.8653
99.11	130.00	151.72	0.8569
99.13	135.00	159.10	0.8485

Velocity Adjustment Factor table for XS # 4 XS 4.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
99.04	3.00	3.32	0.9042
99.07	4.00	4.42	0.9054
99.09	5.00	5.54	0.9023
99.10	6.00	6.59	0.9110
99.13	8.00	8.59	0.9311
99.16	10.00	10.52	0.9504
99.18	12.00	12.40	0.9678
99.21	15.00	15.15	0.9902
99.23	18.00	17.83	1.0093
99.24	20.00	19.60	1.0204
99.26	22.00	21.35	1.0304
99.27	25.00	23.95	1.0438
99.30	30.00	28.24	1.0624
99.32	35.00	32.48	1.0775
99.34	40.00	36.70	1.0898
99.36	45.00	40.91	1.1001
99.38	50.00	45.10	1.1087
99.39	56.00	50.12	1.1174
99.41	60.00	53.46	1.1222
99.42	65.00	57.65	1.1275
99.43	70.00	61.84	1.1320
99.44	75.00	66.03	1.1358
99.45	80.00	70.23	1.1391
99.48	90.00	78.65	1.1443
99.49	100.00	87.11	1.1479
99.51	110.00	95.62	1.1504
99.53	120.00	104.16	1.1520
99.54	125.00	108.45	1.1526

99.54	130.00	112.76	1.1529
99.55	135.00	117.07	1.1532

Velocity Adjustment Factor table for XS # 5 XS 5.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
99.09	3.00	2.50	1.2007
99.13	4.00	3.40	1.1779
99.16	5.00	4.32	1.1571
99.19	6.00	5.26	1.1405
99.23	8.00	7.19	1.1123
99.26	10.00	9.18	1.0894
99.29	12.00	11.22	1.0697
99.33	15.00	14.37	1.0439
99.36	18.00	17.61	1.0223
99.38	20.00	19.81	1.0096
99.40	22.00	22.04	0.9980
99.43	25.00	25.45	0.9822
99.46	30.00	31.27	0.9592
99.50	35.00	37.26	0.9393
99.53	40.00	43.41	0.9215
99.55	45.00	49.72	0.9050
99.58	50.00	56.18	0.8900
99.60	56.00	64.12	0.8734
99.62	60.00	69.51	0.8631
99.64	65.00	76.37	0.8511
99.66	70.00	83.34	0.8399
99.68	75.00	90.42	0.8295
99.69	80.00	97.61	0.8196
99.72	90.00	112.30	0.8014
99.75	100.00	127.40	0.7850
99.78	110.00	142.89	0.7698
99.80	120.00	158.78	0.7558
99.82	125.00	166.87	0.7491
99.83	130.00	175.05	0.7426
99.84	135.00	183.34	0.7364

Velocity Adjustment Factor table for XS # 6 XS 6.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
99.96	3.00	2.83	1.0586
99.99	4.00	3.79	1.0554
100.02	5.00	4.77	1.0489
100.04	6.00	5.73	1.0477
100.08	8.00	7.64	1.0475
100.12	10.00	9.60	1.0421
100.15	12.00	11.54	1.0401
100.19	15.00	14.44	1.0386
100.22	18.00	17.34	1.0380
100.24	20.00	19.27	1.0377
100.26	22.00	21.20	1.0376
100.28	25.00	24.10	1.0376
100.32	30.00	28.93	1.0370
100.36	35.00	33.77	1.0364
100.39	40.00	38.61	1.0360
100.42	45.00	43.46	1.0355
100.44	50.00	48.31	1.0351

100.47	56.00	54.13	1.0345
100.49	60.00	58.03	1.0340
100.51	65.00	62.90	1.0334
100.53	70.00	67.78	1.0328
100.55	75.00	72.66	1.0322
100.57	80.00	77.56	1.0315
100.60	90.00	87.38	1.0300
100.63	100.00	97.24	1.0284
100.66	110.00	107.13	1.0267
100.69	120.00	117.07	1.0250
100.70	125.00	122.06	1.0241
100.71	130.00	127.07	1.0231
100.73	135.00	132.09	1.0220

Velocity Adjustment Factor table for XS # 7 XS 7.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
101.33	3.00	3.52	0.8519
101.36	4.00	4.43	0.9039
101.39	5.00	5.31	0.9419
101.41	6.00	6.18	0.9711
101.44	8.00	7.88	1.0148
101.47	10.00	9.55	1.0470
101.49	12.00	11.19	1.0722
101.51	15.00	13.62	1.1011
101.53	18.00	16.03	1.1230
101.55	20.00	17.62	1.1349
101.56	22.00	19.21	1.1450
101.57	25.00	21.60	1.1576
101.60	30.00	25.57	1.1733
101.62	35.00	29.57	1.1835
101.63	40.00	33.61	1.1900
101.65	45.00	37.69	1.1939
101.66	50.00	41.81	1.1958
101.68	56.00	46.83	1.1958
101.68	60.00	50.22	1.1947
101.69	65.00	54.52	1.1923
101.70	70.00	58.88	1.1888
101.71	75.00	63.33	1.1843
101.72	80.00	67.85	1.1791
101.74	90.00	77.14	1.1667
101.75	100.00	86.81	1.1519
101.76	110.00	96.88	1.1354
101.78	120.00	107.38	1.1175
101.78	125.00	112.80	1.1082
101.79	130.00	118.34	1.0985
101.79	135.00	124.00	1.0887

Velocity Adjustment Factor table for XS # 8 XS 8.0
WSLs based on Log/Log Regression

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
102.63	3.00	2.90	1.0341
102.68	4.00	3.87	1.0323
102.72	5.00	4.85	1.0303
102.76	6.00	5.84	1.0282
102.82	8.00	7.81	1.0240
102.87	10.00	9.80	1.0202

102.91	12.00	11.81	1.0163
102.97	15.00	14.83	1.0112
103.01	18.00	17.89	1.0064
103.04	20.00	19.93	1.0034
103.07	22.00	21.99	1.0006
103.10	25.00	25.09	0.9965
103.16	30.00	30.30	0.9901
103.21	35.00	35.56	0.9842
103.25	40.00	40.88	0.9786
103.29	45.00	46.24	0.9732
103.32	50.00	51.65	0.9680
103.36	56.00	58.22	0.9619
103.39	60.00	62.64	0.9579
103.41	65.00	68.21	0.9530
103.44	70.00	73.83	0.9481
103.47	75.00	79.52	0.9432
103.49	80.00	85.25	0.9384
103.54	90.00	96.91	0.9287
103.58	100.00	108.82	0.9189
103.62	110.00	121.00	0.9091
103.65	120.00	133.46	0.8992
103.67	125.00	139.80	0.8941
103.69	130.00	146.22	0.8891
103.71	135.00	152.72	0.8840

Changes to Mill Creek study site measured velocities (feet per second) during calibration.

Distance T!	Velocity measured	high flow entered	Velocity measured	medium flow entered	Velocity measured	low flow entered
5	0.89	0.89	0.55	0.55	0	0.05
6	1.02	1.02	0.59	0.59	0	0.05
9	1.39	1.39	0.78	0.7	0.33	0.33
10	1.26	1.26	0.74	0.7	0.43	0.43
12	1.58	1.58	0.84	0.7	0.57	0.57
13	1.5	1.5	0.8	0.7	0.51	0.51
14	1.56	1.56	0.82	0.7	0.54	0.54
15	1.38	1.38	0.76	0.65	0.43	0.35
16	1.45	1.45	0.73	0.65	0.33	0.33
17	1.58	1.58	0.7	0.6	0.24	0.24
18	1.39	1.39	0.6	0.5	0.18	0.18
19	1.17	1.17	0.63	0.63	0.07	0.1
20	1.32	1.32	0.66	0.66	0.01	0.1
21	1.34	1.34	0.67	0.67	0.03	0.1
22	1.12	1.12	0.61	0.61	0.01	0.1
23	1.23	1.23	0.49	0.49	0.09	0.1
25	1.05	1.05	0.4	0.4	0.05	0.1
27	0.96	0.96	0.53	0.53	0.02	0.03
28	1.17	1.17	0.3	0.3	0.01	0.03
29	0.65	0.65	0.09	0.09	0	0.02
30	0.6	0.6	0.07	0.07	0	0.01

T2 Distance	Velocity measured	high flow entered	Velocity measured	medium flow entered	Velocity measured	low flow entered
16	0	0	-0.15	-0.1	0	0
17	0	-0.05	-0.22	-0.1	0	-0.01
18	0.04	0.04	-0.18	-0.18	0	0.01
19	0.09	0.09	-0.16	0	-0.01	0.01
20	0.26	0.26	0.22	0.22	-0.02	0.02
21	1.46	1.46	0.14	0.14	0.07	0.1

22	2.87	2.87	0.25	0	0.46	0.46
24	2.77	2.77	2.13	2.13	0.85	0.7
25	2.29	2.29	1.69	1.69	0.7	0.6
27	2.19	2.19	0.95	0.95	0.335	0.25
31	1.35	1.2	0.64	0.64	0.06	0.06
33	0.35	0.35	-0.19	0	0	0.01
34	-0.66	0	-0.17	-0.17	0	0
35	-0.3	0	-0.04	-0.04	0	0

T3	high flow		medium flow		low flow	
Distance	measured	entered	measured	entered	measured	entered
4	0	0.01	0	0		
13	0	0.01				
14.5	1.7	1.7	0.85	0.8	0.72	0.72
16	5.62	5.62	1.95	1.8	1.32	1.4
23.5	2.5	2.5	0.66	0	1.1	1.1
26.5	5.29	5.29	1.67	1.6	0	0
28	3.25	3.25	0.75	0.75	0.01	0.1
32.5	0.41	0.41	0	0.1	0	0
34	2.05	1.9	0.82	0.82	0.01	0.1
38.5	0.85	0.85	0.44	0.44	0.01	0.1
40	-0.25	-0.25	-0.06	0	0	0

T4	Velocity	high flow	Velocity	medium flow	Velocity	low flow
Distance	measured	entered	measured	entered	measured	entered
7	0.2	0.2	-0.01	0		

T5	Velocity	high flow	Velocity	medium flow	Velocity	low flow
Distance	measured	entered	measured	entered	measured	entered
14.5	0.19	0.19	0	0	0.01	0.02
17			0	0.01		
17.5	0	0.01				
19	0.32	0.4				
20.5	0.35	0.4				
22	0.56	0.65				
23.5	0.72	0.8	0	0		
25	1.31	1.4	0	0		
26.5	1.53	1.53	0.76	0.76	0	0.1
29.5	2.17	2.3	0.86	0.86	0.48	0.55
31	2.23	2.4	0.82	0.82	0.39	0.5
32.5	2.74	3	0.94	0.8	0.47	0.47
34	2.71	3	0.93	0.93	0.41	0.41
40	1.84	1.84	1.03	1.03	0.03	0.15
41.5	1.02	1.02	0.53	0.53	0.06	0.06

T6	Velocity	high flow	Velocity	medium flow	Velocity	low flow
Distance	measured	entered	measured	entered	measured	entered
2.5		0.01				
3	1.17	1.17	vp	0		
10	3.29	3.29	1.31	1.31	0.57	0.5
20	2.65	2.3	2.29	2.29	0.31	0.45
21	2.9	2.5	2.19	2.19	0.55	0.55
24	1.99	1.9	1.49	1.49	0.32	0.4
26	2.04	2.04	1.52	1.52	0.01	0
27	2.44	2.44	1.22	1.22	0.01	0
29.9			0	0.05		

T7	Velocity	high flow	Velocity	medium flow	Velocity	low flow
Distance	measured	entered	measured	entered	measured	entered
2	0	0.02	0	0.01		
8	0.81	0.75	0.52	0.52	0.01	0.1
16	0.52	0.52	0.27	0.27	0.01	0.1
20	1	0.9	0.7	0.7	0.24	0.24
22	2.53	2.4	1.44	1.44	0.6	0.6
24	3.11	3	1.79	1.79	0.59	0.59

26	3.63	3.2	2.06	2.06	0.88	0.88
28	3.6	3.2	2.17	2.17	1.14	1.14
30	2.48	2.2	1.43	1.43	0.54	0.54
32	0	0.02	0	0.01		
48.9	1.33	1.2	0.41	0.41		
50.9	2.97	2.5	1.21	1.1		
52.9	2.83	2.5	1.16	1		
54.9	2.49	2.2	1	1		
58.9	2.38	2.2	0.68	0.5		
60.9	1.59	1.5	0.58	0.58		
65.4	0.87	0.8	0	0.1		
67.4	0.67	0.67	0	0.1		
69.4	0.68	0.68				

T8						
Distance	Velocity measured	high flow entered	Velocity measured	medium flow entered	Velocity measured	low flow entered
6	0	0.01	0	0		
7	0.43	0.43	0	0.15		
8	0.6	0.6	0.01	0.05		

```
Walla Walla River below Mill Creek,
measured June 4, 1999 - 180 cfs; June 11 - 70 cfs; July 7 - 21 cfs
--------------------------------------------------------------------------------
CROSS-SECTION #   1  XS 1.0
Number of Points = 34

      Thalweg Elevation = 96
Highest Point Elevation = 101
  Lowest Bank Elevation = 100.1
          SZF Elevation = 96.01

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 97.93
           WSEL = 97.93
     Given Flow = 182.00
Calculated Flow = 166.27
CalcFlow/GivenFlow ratio = 0.91

>------------  CAL/VEL SET 2  ------------<
          Stage = 97.39
           WSEL = 97.39
     Given Flow = 70.00
Calculated Flow = 67.61
CalcFlow/GivenFlow ratio = 0.97
reading.

>------------  CAL/VEL SET 3  ------------<
          Stage = 97.01
           WSEL = 97.01
     Given Flow = 21.00
Calculated Flow = 20.31
CalcFlow/GivenFlow ratio = 0.97

--------------------------------------------------------------------------------
CROSS-SECTION #   2  XS 2.0
Number of Points = 34

      Thalweg Elevation = 96
Highest Point Elevation = 103.7
  Lowest Bank Elevation = 101.8
          SZF Elevation = 96.01

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 98.10
           WSEL = 98.10
     Given Flow = 182.00
Calculated Flow = 158.89
CalcFlow/GivenFlow ratio = 0.87

>------------  CAL/VEL SET 2  ------------<
          Stage = 97.48
           WSEL = 97.48
     Given Flow = 70.00
Calculated Flow = 67.63
CalcFlow/GivenFlow ratio = 0.97

>------------  CAL/VEL SET 3  ------------<
          Stage = 97.07
           WSEL = 97.07
     Given Flow = 21.00
Calculated Flow = 18.64
CalcFlow/GivenFlow ratio = 0.89
.

--------------------------------------------------------------------------------
```

```
CROSS-SECTION #   3  XS 3.0
Number of Points = 41

      Thalweg Elevation = 97.6
Highest Point Elevation = 102.5
  Lowest Bank Elevation = 101.9
          SZF Elevation = 97.7

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 99.13
           WSEL = 99.13
     Given Flow = 182.00
Calculated Flow = 96.08
CalcFlow/GivenFlow ratio = 0.53

>------------  CAL/VEL SET 2  ------------<
          Stage = 98.64
           WSEL = 98.64
     Given Flow = 70.00
Calculated Flow = 7.54
CalcFlow/GivenFlow ratio = 0.11

>------------  CAL/VEL SET 3  ------------<
          Stage = 98.29
           WSEL = 98.29
     Given Flow = 21.00
Calculated Flow = 22.74
CalcFlow/GivenFlow ratio = 1.08
--------------------------------------------------------------------------------
CROSS-SECTION #   4  XS 4.0
Number of Points = 39

      Thalweg Elevation = 97.7
Highest Point Elevation = 102.6
  Lowest Bank Elevation = 102.3
          SZF Elevation = 97.7

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 99.56
           WSEL = 99.56
     Given Flow = 182.00
Calculated Flow = 196.14
CalcFlow/GivenFlow ratio = 1.08

>------------  CAL/VEL SET 2  ------------<
          Stage = 98.99
           WSEL = 98.99
     Given Flow = 70.00
Calculated Flow = 65.75
CalcFlow/GivenFlow ratio = 0.94


>------------  CAL/VEL SET 3  ------------<
          Stage = 98.60
           WSEL = 98.60
     Given Flow = 21.00
Calculated Flow = 19.93
CalcFlow/GivenFlow ratio = 0.95

--------------------------------------------------------------------------------
CROSS-SECTION #   5  XS 5.0
Number of Points = 62

      Thalweg Elevation = 96.8
Highest Point Elevation = 103.7
```

```
  Lowest Bank Elevation = 101.6
          SZF Elevation = 97.7

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 99.64
           WSEL = 99.64
     Given Flow = 182.00
Calculated Flow = 192.48
CalcFlow/GivenFlow ratio = 1.06

>------------  CAL/VEL SET 2  ------------<
          Stage = 99.07
           WSEL = 99.07
     Given Flow = 70.00
Calculated Flow = 69.86
CalcFlow/GivenFlow ratio = 1.00
>------------  CAL/VEL SET 3  ------------<
          Stage = 98.66
           WSEL = 98.66
     Given Flow = 21.00
Calculated Flow = 21.66
CalcFlow/GivenFlow ratio = 1.03

--------------------------------------------------------------------------------
CROSS-SECTION #   6  XS 6.0
Number of Points = 55

      Thalweg Elevation = 98.1
Highest Point Elevation = 102.6
  Lowest Bank Elevation = 101.6
          SZF Elevation = 98.1

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 99.92
           WSEL = 99.92
     Given Flow = 182.00
Calculated Flow = 188.36
CalcFlow/GivenFlow ratio = 1.03
>------------  CAL/VEL SET 2  ------------<
          Stage = 99.25
           WSEL = 99.25
     Given Flow = 70.00
Calculated Flow = 65.55
CalcFlow/GivenFlow ratio = 0.94
>------------  CAL/VEL SET 3  ------------<
          Stage = 98.84
           WSEL = 98.84
     Given Flow = 21.00
Calculated Flow = 19.88
CalcFlow/GivenFlow ratio = 0.95
--------------------------------------------------------------------------------
CROSS-SECTION #   7  XS 7.0
Number of Points = 67

      Thalweg Elevation = 98.9
Highest Point Elevation = 105.7
  Lowest Bank Elevation = 104
          SZF Elevation = 98.9

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 101.21
           WSEL = 101.21
```

```
     Given Flow = 181.70
Calculated Flow = 189.49
CalcFlow/GivenFlow ratio = 1.04
>------------  CAL/VEL SET 2  ------------<
          Stage = 100.52
           WSEL = 100.52
     Given Flow = 70.00
Calculated Flow = 68.47
CalcFlow/GivenFlow ratio = 0.98
>------------  CAL/VEL SET 3  ------------<
          Stage = 100.04
           WSEL = 100.04
     Given Flow = 21.00
Calculated Flow = 23.80
CalcFlow/GivenFlow ratio = 1.13

--------------------------------------------------------------------------------
CROSS-SECTION #   8  XS 8.0
Number of Points = 46

      Thalweg Elevation = 95.2
Highest Point Elevation = 104.7
  Lowest Bank Elevation = 103.2
          SZF Elevation = 98.9

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 101.31
           WSEL = 101.31
     Given Flow = 182.00
Calculated Flow = 177.40
CalcFlow/GivenFlow ratio = 0.97

>------------  CAL/VEL SET 2  ------------<
          Stage = 100.58
           WSEL = 100.58
     Given Flow = 70.00
Calculated Flow = 68.04
CalcFlow/GivenFlow ratio = 0.97

>------------  CAL/VEL SET 3  ------------<
          Stage = 100.04
           WSEL = 100.04
     Given Flow = 21.00
Calculated Flow = 24.11
CalcFlow/GivenFlow ratio = 1.15
--------------------------------------------------------------------------------
CROSS-SECTION #   9  XS 9.0
Number of Points = 64

      Thalweg Elevation = 99.3
Highest Point Elevation = 103.6
  Lowest Bank Elevation = 102.9
          SZF Elevation = 99.3

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 1 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 101.31
           WSEL = 101.31
     Given Flow = 182.00
Calculated Flow = 166.59
CalcFlow/GivenFlow ratio = 0.92

>------------  CAL/VEL SET 2  ------------<
          Stage = 100.66
           WSEL = 100.66
     Given Flow = 70.00
```

```
Calculated Flow = 42.05
CalcFlow/GivenFlow ratio = 0.60
>------------  CAL/VEL SET 3  ------------<
          Stage = 100.43
           WSEL = 100.43
     Given Flow = 21.00
Calculated Flow = 20.93
CalcFlow/GivenFlow ratio = 1.00

         ---------------------------------------------------------------------------


Walla Walla River below Mill Creek,
measured June 4, 1999 - 180 cfs; June 11 - 70 cfs; July 7 - 21 cfs
-------------------------------------------------------------------------------
CROSS-SECTION #   1  XS 1.0
Points = 34   Slope = .00065   SZF = 96.01

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     97.93      182.0   30       54.2       71.7     53.5       1.32    1.34
 2     97.39       70.0   28       52.1       43.3     51.7       0.83    0.84
 3     97.01       21.0   26       50.0       24.0     49.8       0.48    0.48
-------------------------------------------------------------------------------

CROSS-SECTION #   2  XS 2.0
Points = 34   Slope = .0014   SZF = 96.01

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     98.10      182.0   28       54.9       62.5     54.4       1.14    1.15
 2     97.48       70.0   20       41.5       31.3     41.1       0.76    0.76
 3     97.07       21.0   16       32.2       16.8     31.9       0.52    0.53
-------------------------------------------------------------------------------

CROSS-SECTION #   3  XS 3.0
Points = 41   Slope = .0026   SZF = 97.7

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     99.13      182.0   35       69.7       63.4     69.1       0.91    0.92
 2     98.64       70.0   28       55.1       33.2     54.8       0.60    0.61
 3     98.29       21.0   25       48.2       15.4     48.0       0.32    0.32
-------------------------------------------------------------------------------

CROSS-SECTION #   4  XS 4.0
Points = 39   Slope = .0018   SZF = 97.7

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     99.56      182.0   32       66.3       77.0     65.3       1.16    1.18
 2     98.99       70.0   26       49.8       45.4     49.5       0.91    0.92
 3     98.60       21.0   22       43.9       27.3     43.6       0.62    0.63
-------------------------------------------------------------------------------

CROSS-SECTION #   5  XS 5.0
Points = 62   Slope = .0012   SZF = 97.7

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     99.64      182.0   45       45.7       64.1     44.4       1.40    1.44
 2     99.07       70.0   32       32.7       43.4     32.0       1.33    1.36
 3     98.66       21.0   30       30.4       30.6     29.9       1.01    1.03
-------------------------------------------------------------------------------

CROSS-SECTION #   6  XS 6.0
Points = 55   Slope = .0025   SZF = 98.1

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     99.92      182.0   41       39.7       42.3     38.6       1.07    1.10
```

2	99.25	70.0	31	31.1	20.4	30.4	0.66	0.67
3	98.84	21.0	24	24.1	9.2	23.8	0.38	0.39

CROSS-SECTION # 7 XS 7.0
Points = 67 Slope = .0075 SZF = 98.9

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	101.21	181.7	54	80.1	83.6	79.1	1.04	1.06
2	100.52	70.0	31	47.5	38.9	47.1	0.82	0.83
3	100.04	21.0	18	32.5	21.3	32.3	0.66	0.66

CROSS-SECTION # 8 XS 8.0
Points = 46 Slope = .0033 SZF = 98.9

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	101.31	182.0	32	52.7	94.5	48.1	1.79	1.97
2	100.58	70.0	12	30.6	70.5	26.4	2.31	2.68
3	100.04	21.0	11	25.3	57.7	21.3	2.28	2.72

CROSS-SECTION # 9 XS 9.0
Points = 64 Slope = .0066 SZF = 99.3

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	101.31	182.0	42	79.2	79.7	77.2	1.01	1.03
2	100.66	70.0	34	64.7	34.4	63.8	0.53	0.54
3	100.43	21.0	28	54.1	20.7	53.5	0.38	0.39

Walla Walla River below Mill Creek,
measured June 4, 1999 - 180 cfs; June 11 - 70 cfs; July 7 - 21 cfs

Vel Calibration Set: 1

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	97.93	166.27	2.01
2 XS 2.0	98.10	158.89	1.94
3 XS 3.0	99.13	96.08	1.23
4 XS 4.0	99.56	196.14	2.07
5 XS 5.0	99.64	192.48	2.03
6 XS 6.0	99.92	188.36	3.24
7 XS 7.0	101.21	189.49	1.12
8 XS 8.0	101.31	177.40	0.63
9 XS 9.0	101.31	166.59	1.81
	AVERAGE	170.19	1.79

Vel Calibration Set: 2

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	97.39	67.61	1.32
2 XS 2.0	97.48	67.63	1.63
3 XS 3.0	98.64	7.54	0.25
4 XS 4.0	98.99	65.75	1.26
5 XS 5.0	99.07	69.86	1.38
6 XS 6.0	99.25	65.55	2.61
7 XS 7.0	100.52	68.47	0.94
8 XS 8.0	100.58	68.04	0.58
9 XS 9.0	100.66	42.05	1.30
	AVERAGE	58.06	1.25

Vel Calibration Set: 3

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	97.01	20.31	0.65
2 XS 2.0	97.07	18.64	0.77
3 XS 3.0	98.29	22.74	1.13
4 XS 4.0	98.60	19.93	0.67
5 XS 5.0	98.66	21.66	0.58
6 XS 6.0	98.84	19.88	1.69
7 XS 7.0	100.04	23.80	0.78
8 XS 8.0	100.04	24.11	0.22
9 XS 9.0	100.43	20.93	0.91
	AVERAGE	21.33	0.82

Walla Walla River below Mill Creek,
measured June 4, 1999 - 180 cfs; June 11 - 70 cfs; July 7 - 21 cfs
---
Units: U.S.

Number of Calibration Flows: 30

CROSS-SECTION # 1 XS 1.0
Points = 34
Slope = .00065
SZF = 96.01

Weighting Factor = .5
Cross-section represents 7.761% of Total Reach.

>>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A = .3928961
Log/Log Regression B = .3022349
WSL = 0.3929 * Flow ^ 0.3022 + 96.01

>>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

CROSS-SECTION # 2 XS 2.0
Points = 34
Slope = .0014
SZF = 96.01

Weighting Factor = .5
Cross-section represents 15.522% of Total Reach.

>>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A = .3991299
Log/Log Regression B = .3149627
WSL = 0.3991 * Flow ^ 0.3150 + 96.01

>>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N

```
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   3  XS 3.0
Points = 41
 Slope = .0026
   SZF = 97.7

Weighting Factor = .5
Cross-section represents  14.122% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .1681048
Log/Log Regression B =  .4095118
WSL = 0.1681 * Flow ^ 0.4095 + 97.70

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   4  XS 4.0
Points = 39
 Slope = .0018
   SZF = 97.7

Weighting Factor = .5
Cross-section represents  12.977% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3184817
Log/Log Regression B =  .3362746
WSL = 0.3185 * Flow ^ 0.3363 + 97.70

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   5  XS 5.0
Points = 62
 Slope = .0012
   SZF = 97.7

Weighting Factor = .5
Cross-section represents  14.059% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3519302
Log/Log Regression B =  .3256498
WSL = 0.3519 * Flow ^ 0.3256 + 97.70

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
```

```
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   6  XS 6.0
Points = 55
 Slope = .0025
   SZF = 98.1

Weighting Factor = .5
Cross-section represents  13.931% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .2035672
Log/Log Regression B =  .4171208
WSL = 0.2036 * Flow ^ 0.4171 + 98.10

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   7  XS 7.0
Points = 67
 Slope = .0075
   SZF = 98.9

Weighting Factor = .5
Cross-section represents  10.242% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .4148377
Log/Log Regression B =  .3273452
WSL = 0.4148 * Flow ^ 0.3273 + 98.90

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   8  XS 8.0
Points = 46
 Slope = .0033
   SZF = 98.9

Weighting Factor = .5
Cross-section represents   7.570% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .393422
Log/Log Regression B =  .3463276
WSL = 0.3934 * Flow ^ 0.3463 + 98.90

   >>> Velocity Calibrations <<<
```

Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

CROSS-SECTION # 9 XS 9.0
Points = 64
Slope = .0066
SZF = 99.3

Weighting Factor = .5
Cross-section represents 3.817% of Total Reach.

>>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A = .4501571
Log/Log Regression B = .2818518
WSL = 0.4502 * Flow ^ 0.2819 + 99.30

>>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

Walla Walla River below Mill Creek,
measured June 4, 1999 - 180 cfs; June 11 - 70 cfs; July 7 - 21 cfs

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Velocity Adjustment Factor table for XS # 1 XS 1.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
96.80	10.00	9.60	1.0385	9.97
96.90	15.00	14.52	1.0182	14.79
97.00	21.00	20.33	1.0092	20.52
97.05	25.00	24.31	1.0001	24.32
97.11	30.00	29.14	0.9965	29.04
97.16	35.00	33.91	0.9950	33.74
97.21	40.00	38.63	0.9946	38.42
97.29	50.00	47.97	0.9954	47.75
97.36	60.00	57.22	0.9966	57.02
97.43	70.00	66.39	0.9979	66.25
97.49	80.00	75.52	0.9991	75.45
97.54	90.00	84.62	0.9999	84.62
97.59	100.00	93.71	1.0005	93.76
97.64	110.00	102.80	1.0007	102.87
97.68	120.00	111.91	1.0005	111.97
97.72	130.00	121.04	1.0000	121.04
97.76	140.00	130.20	0.9992	130.10
97.80	150.00	139.39	0.9981	139.13
97.88	175.00	162.60	0.9942	161.66
97.90	182.00	169.22	0.9925	167.95
97.93	190.00	176.95	0.9898	175.14
97.96	200.00	186.63	0.9865	184.10
97.99	210.00	196.38	0.9831	193.06
98.03	225.00	211.18	0.9777	206.47
98.09	250.00	236.35	0.9679	228.77

98.21	300.00	288.79	0.9460	273.20
98.27	325.00	316.16	0.9341	295.34
98.32	350.00	344.36	0.9218	317.44
98.41	400.00	403.33	0.8963	361.50
98.50	450.00	465.98	0.8700	405.43

Velocity Adjustment Factor table for XS # 2 XS 2.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
96.83	10.00	10.59	0.8531	9.03
96.95	15.00	14.79	0.9162	13.55
97.05	21.00	19.73	0.9612	18.97
97.11	25.00	22.93	0.9844	22.58
97.18	30.00	26.92	1.0062	27.09
97.23	35.00	30.90	1.0228	31.60
97.29	40.00	34.95	1.0332	36.11
97.38	50.00	43.07	1.0480	45.14
97.46	60.00	51.31	1.0555	54.16
97.53	70.00	59.75	1.0574	63.18
97.60	80.00	68.43	1.0551	72.20
97.66	90.00	77.32	1.0504	81.22
97.71	100.00	86.41	1.0443	90.24
97.76	110.00	95.69	1.0373	99.26
97.81	120.00	105.16	1.0297	108.28
97.86	130.00	114.82	1.0216	117.30
97.90	140.00	124.67	1.0133	126.32
97.94	150.00	134.70	1.0047	135.34
98.04	175.00	160.62	0.9829	157.88
98.07	182.00	168.10	0.9768	164.19
98.09	190.00	176.76	0.9697	171.41
98.13	200.00	187.76	0.9609	180.42
98.16	210.00	198.96	0.9521	189.44
98.21	225.00	216.13	0.9391	202.96
98.28	250.00	245.72	0.9177	225.50
98.42	300.00	308.67	0.8766	270.58
98.48	325.00	342.07	0.8569	293.12
98.54	350.00	376.77	0.8378	315.65
98.64	400.00	450.15	0.8013	360.72
98.74	450.00	528.95	0.7672	405.79

Velocity Adjustment Factor table for XS # 3 XS 3.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
98.13	10.00	14.47	0.8030	11.62
98.21	15.00	18.29	0.8765	16.03
98.28	21.00	22.47	0.9315	20.93
98.33	25.00	25.17	0.9548	24.03
98.38	30.00	28.29	0.9815	27.77
98.42	35.00	31.26	1.0037	31.37
98.46	40.00	34.10	1.0227	34.88
98.53	50.00	39.69	1.0487	41.63
98.60	60.00	44.96	1.0699	48.10
98.66	70.00	49.99	1.0873	54.35
98.71	80.00	54.84	1.1017	60.42
98.76	90.00	59.55	1.1139	66.33

98.81	100.00	64.14	1.1243	72.11
98.85	110.00	68.62	1.1332	77.77
98.89	120.00	73.02	1.1410	83.32
98.93	130.00	77.33	1.1480	88.78
98.97	140.00	81.57	1.1541	94.15
99.01	150.00	85.75	1.1597	99.44
99.09	175.00	95.94	1.1712	112.37
99.12	182.00	98.74	1.1739	115.91
99.14	190.00	101.91	1.1769	119.94
99.17	200.00	105.84	1.1803	124.91
99.20	210.00	109.72	1.1834	129.84
99.24	225.00	115.48	1.1876	137.14
99.31	250.00	124.90	1.1936	149.08
99.44	300.00	143.22	1.2027	172.26
99.50	325.00	152.17	1.2062	183.55
99.55	350.00	160.99	1.2091	194.65
99.66	400.00	178.32	1.2135	216.39
99.75	450.00	195.40	1.2158	237.56

Velocity Adjustment Factor table for XS # 4 XS 4.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
98.39	10.00	9.11	0.9703	8.84
98.49	15.00	13.99	0.9708	13.58
98.59	21.00	19.93	0.9729	19.39
98.64	25.00	23.94	0.9743	23.33
98.70	30.00	28.96	0.9772	28.30
98.75	35.00	33.99	0.9801	33.31
98.80	40.00	39.07	0.9822	38.37
98.89	50.00	49.24	0.9869	48.60
98.96	60.00	59.48	0.9911	58.95
99.03	70.00	69.82	0.9941	69.40
99.09	80.00	80.24	0.9964	79.95
99.15	90.00	90.76	0.9979	90.56
99.20	100.00	101.37	0.9989	101.25
99.25	110.00	112.09	0.9993	112.01
99.29	120.00	122.90	0.9993	122.82
99.34	130.00	133.80	0.9991	133.68
99.38	140.00	144.79	0.9987	144.59
99.42	150.00	155.88	0.9979	155.55
99.51	175.00	184.06	0.9950	183.14
99.53	182.00	192.06	0.9940	190.90
99.56	190.00	201.26	0.9927	199.80
99.59	200.00	212.85	0.9911	210.95
99.62	210.00	224.65	0.9888	222.14
99.67	225.00	242.53	0.9854	238.98
99.74	250.00	272.77	0.9795	267.18
99.87	300.00	334.98	0.9675	324.08
99.93	325.00	366.95	0.9613	352.75
99.98	350.00	399.51	0.9550	381.55
100.09	400.00	466.36	0.9424	439.50
100.18	450.00	535.55	0.9297	497.88

Velocity Adjustment Factor table for XS # 5 XS 5.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow

98.44	10.00	10.60	0.9499	10.07
98.55	15.00	15.58	0.9739	15.17
98.65	21.00	21.57	0.9888	21.32
98.70	25.00	25.56	0.9951	25.44
98.77	30.00	30.57	1.0007	30.59
98.82	35.00	35.59	1.0045	35.75
98.87	40.00	40.63	1.0072	40.92
98.96	50.00	50.75	1.0104	51.28
99.04	60.00	60.95	1.0118	61.67
99.10	70.00	71.22	1.0120	72.07
99.17	80.00	81.58	1.0113	82.50
99.22	90.00	92.00	1.0102	92.93
99.28	100.00	102.48	1.0088	103.39
99.33	110.00	113.02	1.0073	113.85
99.37	120.00	123.62	1.0057	124.33
99.42	130.00	134.27	1.0040	134.81
99.46	140.00	144.97	1.0023	145.30
99.50	150.00	155.72	1.0005	155.81
99.59	175.00	182.80	0.9961	182.10
99.62	182.00	190.44	0.9949	189.47
99.64	190.00	199.21	0.9934	197.89
99.68	200.00	210.22	0.9915	208.43
99.71	210.00	221.30	0.9895	218.98
99.75	225.00	238.11	0.9861	234.81
99.82	250.00	266.52	0.9801	261.21
99.95	300.00	324.44	0.9682	314.12
100.01	325.00	353.84	0.9626	340.61
100.07	350.00	383.47	0.9574	367.12
100.18	400.00	443.38	0.9478	420.21
100.27	450.00	504.01	0.9392	473.38

Velocity Adjustment Factor table for XS # 6 XS 6.0

WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
98.63	10.00	9.00	1.0342	9.31
98.73	15.00	13.80	1.0234	14.12
98.82	21.00	19.64	1.0160	19.95
98.88	25.00	23.53	1.0142	23.87
98.94	30.00	28.74	1.0015	28.78
99.00	35.00	33.81	0.9973	33.72
99.05	40.00	38.87	0.9949	38.67
99.14	50.00	49.00	0.9925	48.64
99.22	60.00	59.13	0.9918	58.65
99.30	70.00	69.29	0.9917	68.71
99.37	80.00	79.59	0.9902	78.81
99.43	90.00	89.92	0.9892	88.95
99.49	100.00	100.29	0.9882	99.11
99.55	110.00	110.72	0.9872	109.31
99.60	120.00	121.21	0.9861	119.53
99.65	130.00	131.75	0.9850	129.77
99.70	140.00	142.35	0.9837	140.03
99.75	150.00	153.01	0.9824	150.31
99.86	175.00	179.91	0.9788	176.10
99.88	182.00	187.51	0.9777	183.34
99.92	190.00	196.24	0.9764	191.62
99.96	200.00	207.23	0.9747	201.99
99.99	210.00	218.29	0.9728	212.36
100.05	225.00	235.04	0.9699	227.96
100.14	250.00	263.35	0.9645	254.01
100.30	300.00	321.50	0.9528	306.32
100.37	325.00	351.36	0.9465	332.57

100.44	350.00	381.77	0.9400	358.87
100.58	400.00	444.27	0.9265	411.63
100.70	450.00	509.23	0.9123	464.56

Velocity Adjustment Factor table for XS # 7 XS 7.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
99.78	10.00	11.83	0.9528	11.27
99.91	15.00	17.21	0.9673	16.65
100.02	21.00	23.47	0.9801	23.01
100.09	25.00	27.58	0.9864	27.21
100.16	30.00	32.65	0.9929	32.42
100.23	35.00	37.78	0.9954	37.60
100.29	40.00	42.80	0.9989	42.75
100.39	50.00	52.73	1.0049	52.99
100.48	60.00	62.54	1.0096	63.14
100.57	70.00	72.40	1.0115	73.23
100.64	80.00	82.35	1.0111	83.26
100.71	90.00	92.39	1.0093	93.25
100.77	100.00	102.54	1.0064	103.19
100.83	110.00	112.74	1.0032	113.10
100.89	120.00	122.99	0.9999	122.97
100.94	130.00	133.27	0.9966	132.81
100.99	140.00	143.57	0.9934	142.62
101.04	150.00	153.93	0.9901	152.41
101.15	175.00	180.05	0.9817	176.76
101.18	182.00	187.41	0.9794	183.56
101.21	190.00	195.84	0.9769	191.31
101.25	200.00	206.40	0.9738	200.98
101.29	210.00	216.97	0.9708	210.64
101.34	225.00	232.88	0.9665	225.09
101.43	250.00	259.51	0.9599	249.09
101.58	300.00	312.98	0.9484	296.83
101.66	325.00	339.76	0.9435	320.58
101.72	350.00	366.58	0.9391	344.26
101.85	400.00	420.24	0.9314	391.43
101.96	450.00	474.19	0.9245	438.38

Velocity Adjustment Factor table for XS # 8 XS 8.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 1

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
99.77	10.00	13.30	0.8922	11.86
99.91	15.00	18.11	0.9524	17.25
100.03	21.00	24.70	0.9529	23.54
100.10	25.00	28.41	0.9733	27.65
100.18	30.00	32.95	0.9930	32.72
100.25	35.00	37.42	1.0081	37.72
100.31	40.00	41.84	1.0200	42.67
100.43	50.00	50.58	1.0367	52.43
100.52	60.00	59.24	1.0473	62.05
100.61	70.00	67.87	1.0540	71.54
100.69	80.00	76.46	1.0584	80.92
100.77	90.00	85.06	1.0607	90.22
100.84	100.00	93.68	1.0614	99.44

100.90	110.00	102.37	1.0607	108.58
100.97	120.00	111.11	1.0590	117.67
101.02	130.00	119.92	1.0565	126.69
101.08	140.00	128.80	1.0533	135.67
101.13	150.00	137.77	1.0495	144.59
101.25	175.00	160.44	1.0390	166.71
101.29	182.00	166.81	1.0362	172.85
101.32	190.00	174.09	1.0331	179.86
101.36	200.00	183.23	1.0292	188.58
101.41	210.00	192.43	1.0252	197.27
101.47	225.00	206.34	1.0189	210.24
101.56	250.00	229.90	1.0080	231.72
101.74	300.00	279.10	0.9825	274.21
101.82	325.00	304.50	0.9696	295.24
101.89	350.00	330.46	0.9567	316.15
102.03	400.00	384.14	0.9310	357.63
102.16	450.00	440.27	0.9056	398.72

Velocity Adjustment Factor table for XS # 9 XS 9.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
100.16	10.00	8.28	1.0810	8.95
100.27	15.00	12.67	1.0538	13.35
100.36	21.00	17.63	1.0559	18.62
100.42	25.00	21.65	1.0217	22.12
100.47	30.00	26.27	1.0085	26.49
100.53	35.00	31.13	0.9910	30.85
100.57	40.00	35.75	0.9845	35.20
100.66	50.00	45.18	0.9712	43.88
100.73	60.00	54.29	0.9678	52.54
100.79	70.00	63.22	0.9677	61.18
100.85	80.00	72.02	0.9692	69.81
100.90	90.00	80.73	0.9714	78.43
100.95	100.00	89.38	0.9737	87.03
100.99	110.00	97.96	0.9761	95.62
101.04	120.00	106.51	0.9784	104.21
101.07	130.00	115.03	0.9805	112.78
101.11	140.00	123.54	0.9823	121.35
101.15	150.00	132.03	0.9840	129.91
101.23	175.00	153.28	0.9870	151.29
101.25	182.00	159.24	0.9876	157.26
101.28	190.00	166.06	0.9881	164.09
101.30	200.00	174.61	0.9886	172.62
101.33	210.00	183.18	0.9889	181.15
101.37	225.00	196.09	0.9890	193.93
101.43	250.00	217.77	0.9882	215.20
101.55	300.00	261.96	0.9837	257.68
101.60	325.00	284.52	0.9802	278.89
101.65	350.00	307.43	0.9761	300.08
101.74	400.00	354.40	0.9661	342.40
101.82	450.00	403.05	0.9544	384.66

Walla Walla River below Mill Creek. Shows where changes were made to measured velocities for calibration.
Shows only cells where changes were made.

calibration	flow (cfs)		182			70			21
T1	measured	entered		measured	entered		measured	entered	

Distance						
29	2.24	2.04	0.16	0.36	0	0

T2 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
24.6	0.57	0.57	0.01			
26.6	1.09	1.09	0			
28.6	1.3	1.3	0.02	0		
31.7					0	
32.6	2.26	2.5	1.78	1.78	0	0
34.6	3.36	3.36	1.75	1.75	0.15	0.3
38.6	3.36	3.36	2.48	2.48	0.4	0
52.6	3.24	3.24	0.49	0.65	0.74	0.3
56.6	1.9	1.9	0.29	0.35	0	0
58.6	1.41	1.41	0.85	0.85	0	0.1
62.6	1.41	1.41	-0.02	0.15	0	0.02
64.6	1.63	1.63	-0.03	0	0	
65		0.84		0	0	
66.6	0.84		0			

T3 Distance	measured	entered	measured	entered	measured	entered
10.2					2.176	2.72
43	1.04	1.04	0.01	0		
45	1.69	1.4	1.35	1.3		
47	1.6	1.55	1.58	1.5	0.1	0
49	1.56	1.15	1.43	0	0.36	0.4
51	1.83	1.6	2.39	2.39	1.16	1.16
53	1.97	1.97	2.77	0	1.52	1.52
55	1.93	1.7	2.4	0	1.36	1.36
57	1.74	1.74	2.63	0	1.59	1.59
59	2.28	2	2.73	0	1.26	1.26
61	2.02	1.8	3.15	0	1.37	1.37
63	2.47	2.2	2.78	0	1.44	1.44
65	2.72	2.5	2.83	0	1.5	1.5
67	2.43	2.2	2.5	0	1.19	1.19
69	1.78	1.6	2.55	0	1.12	1.12
71	2.18	2	2.31	0	0.76	0.76
73	1.8	1.4	1.86	0	0.35	0.35
75	1.33	1.1	2.41	0	0.65	0.65
77	1.43	1.2	2.36	0	0.35	0.35
79	1.4	1.2	1.98	0	0.5	0.7
81	1.45	1.2	1.86	0	0.5	0.5
83	1.85	1.85	2.51	0	0.01	0
85	2.12	2.12	2.94	0	2.59	2.3
87	2.07	2.07	3.26	0	3.15	3
89	1.68	1.68	3.05	0	2.16	2.16
94.8		0.1			0	0

T4 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
11.2	0.97					
50			0	0.1		
51	1.59	1.45	0.01	0.17		

T5 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
19.6	0	0.01	0	0		
20.6	0	0.01	0	0		
21.6	0	0.01	0	0		
22.6	0	0.01	0	0		
23.6	0	0.01	0	0		
24.6	0	0.01	0	0		

T6 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
99	6.05	6.05	1.46	0	1.23	1.23

109	3.34	3.34	1.71	1.71	0.1	0
111	1.63	1.63	0	0.15		
112	1.22	1.22	0	0.15		
112.5			0	0.1		
114	0.33	0.25	0	0	0	0
115	0	0.05				

T7 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
35	2.55	2.55	1.22	1.22	0.11	0

T8 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
8		2		1		0
10	3.21	3	2.345	2.35	0.51	0.51
12.5	3.31	3.31	2.095	2.1	0.86	0.86
15	2.64	2.8	0.895	0.9	0.77	0.77
17.5	1.99	2.1	0.265	0.27	0.15	0.15
20	0.79	0.79	0.11	0.11	-0.1	0.05
25	0.54	0.54	-0.17	0.1	-0.01	0.01
27.5	0.64	0.64	-0.24	0.1	0	0.01
30	0.12	0.12	-0.03	0		
83.6						-0.01

T9 Distance	measured Velocity	entered	measured Velocity	entered	measured Velocity	entered
8.2		0.75				
13	3.26	3.26	3.72	0	3.67	3.67
23	4.35	4.5	2.31	2.31	2.15	2
25	4.72	4.72	3.51	0	1.1	1.1
29	3.78	3.7	2.39	2.39	0.71	0.8
31	3.92	3.92	2.47	2.47	0.65	0
35	4.09	4.09	2.04	2.04	0.05	0
37	4.11	3.9	2.53	2.53	0.55	0.6
39	3.48	3.48	1.82	1.82	0.37	0
41	3.3	3.3	2.07	2.07	0.05	0
47	2.47	2.47	0.14	0.3	0	0
55	0.02	0.02	0.08	0.08	0	0.01
59	-0.08	-0.03	-0.01	-0.02	0	-0.01

```
Walla Walla River below Yellowhawk Creek measured 327 cfs on 6/12/00; 130 cfs on
6/21/00; 68 cfs on 6/28/00 and 46 cfs on 7/12/00.
--------------------------------------------------------------------------------
CROSS-SECTION #   1  XS 1.0
Number of Points = 46

      Thalweg Elevation = 93.84
Highest Point Elevation = 100.34
  Lowest Bank Elevation = 98.44
          SZF Elevation = 93.84

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 95.95
           WSEL = 95.95
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

Cal/Vel Set OK

>------------  CAL/VEL SET 2  ------------<
          Stage = 95.40
           WSEL = 95.40
     Given Flow = 130.00
Calculated Flow = 138.35
CalcFlow/GivenFlow ratio = 1.06

>------------  CAL/VEL SET 3  ------------<
          Stage = 95.11
           WSEL = 95.11
     Given Flow = 68.00
Calculated Flow = 73.54
CalcFlow/GivenFlow ratio = 1.08

>------------  CAL/VEL SET 4  ------------<
          Stage = 94.89
           WSEL = 94.89
     Given Flow = 46.00
Calculated Flow = 47.33
CalcFlow/GivenFlow ratio = 1.03
--------------------------------------------------------------------------------
CROSS-SECTION #   2  XS 2.0
Number of Points = 42

      Thalweg Elevation = 93.3
Highest Point Elevation = 98.44
  Lowest Bank Elevation = 97.84
          SZF Elevation = 93.84

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 96.07
           WSEL = 96.07
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

Cal/Vel Set OK

>------------  CAL/VEL SET 2  ------------<
          Stage = 95.56
           WSEL = 95.56
```

```
     Given Flow = 130.00
Calculated Flow = 138.02
CalcFlow/GivenFlow ratio = 1.06
>------------  CAL/VEL SET 3  ------------<
          Stage = 95.22
           WSEL = 95.22
     Given Flow = 68.00
Calculated Flow = 63.91
CalcFlow/GivenFlow ratio = 0.94

>------------  CAL/VEL SET 4  ------------<
          Stage = 95.05
           WSEL = 95.05
     Given Flow = 46.00
Calculated Flow = 44.71
CalcFlow/GivenFlow ratio = 0.97
--------------------------------------------------------------------------------
CROSS-SECTION #   3  XS 3.0
Number of Points = 40

      Thalweg Elevation = 92.35
Highest Point Elevation = 99.94
  Lowest Bank Elevation = 96.89
          SZF Elevation = 93.84

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 96.17
           WSEL = 96.17
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

Cal/Vel Set OK

>------------  CAL/VEL SET 2  ------------<
          Stage = 95.64
           WSEL = 95.64
     Given Flow = 130.00
Calculated Flow = 130.39
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 3  ------------<
          Stage = 95.38
           WSEL = 95.38
     Given Flow = 68.00
Calculated Flow = 70.32
CalcFlow/GivenFlow ratio = 1.03

>------------  CAL/VEL SET 4  ------------<
          Stage = 95.27
           WSEL = 95.27
     Given Flow = 46.00
Calculated Flow = 45.28
CalcFlow/GivenFlow ratio = 0.98

--------------------------------------------------------------------------------
CROSS-SECTION #   4  XS 4.0
Number of Points = 42

      Thalweg Elevation = 94.22
Highest Point Elevation = 98.94
  Lowest Bank Elevation = 97.34
          SZF Elevation = 94.22

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
```

```
          Stage = 96.72
           WSEL = 96.72
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 96.20
           WSEL = 96.20
     Given Flow = 130.00
Calculated Flow = 132.58
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 3  ------------<
          Stage = 95.92
           WSEL = 95.92
     Given Flow = 68.00
Calculated Flow = 69.43
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 95.85
           WSEL = 95.85
     Given Flow = 46.00
Calculated Flow = 53.07
CalcFlow/GivenFlow ratio = 1.15

--------------------------------------------------------------------------------
CROSS-SECTION #   5  XS 5.0
Number of Points = 45

      Thalweg Elevation = 95.32
Highest Point Elevation = 99.84
  Lowest Bank Elevation = 97.74
          SZF Elevation = 95.32

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 96.99
           WSEL = 96.99
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 96.47
           WSEL = 96.47
     Given Flow = 130.00
Calculated Flow = 130.22
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 3  ------------<
          Stage = 96.20
           WSEL = 96.20
     Given Flow = 68.00
Calculated Flow = 69.22
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 96.09
           WSEL = 96.09
     Given Flow = 46.00
Calculated Flow = 47.10
CalcFlow/GivenFlow ratio = 1.02

--------------------------------------------------------------------------------
CROSS-SECTION #   6  XS 6.0
Number of Points = 39
```

```
      Thalweg Elevation = 94.04
Highest Point Elevation = 98.29
  Lowest Bank Elevation = 97.89
          SZF Elevation = 95.32

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 97.25
           WSEL = 97.25
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 96.69
           WSEL = 96.69
     Given Flow = 130.00
Calculated Flow = 134.05
CalcFlow/GivenFlow ratio = 1.03

>------------  CAL/VEL SET 3  ------------<
          Stage = 96.34
           WSEL = 96.34
     Given Flow = 68.00
Calculated Flow = 64.53
CalcFlow/GivenFlow ratio = 0.95

>------------  CAL/VEL SET 4  ------------<
          Stage = 96.22
           WSEL = 96.22
     Given Flow = 46.00
Calculated Flow = 43.18
CalcFlow/GivenFlow ratio = 0.94

--------------------------------------------------------------------------------
CROSS-SECTION #   7  XS 7.0
Number of Points = 37

      Thalweg Elevation = 94.54
Highest Point Elevation = 99.3
  Lowest Bank Elevation = 98.15
          SZF Elevation = 95.32

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 97.33
           WSEL = 97.33
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 96.76
           WSEL = 96.76
     Given Flow = 130.00
Calculated Flow = 130.03
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 3  ------------<
          Stage = 96.40
           WSEL = 96.40
     Given Flow = 68.00
Calculated Flow = 69.23
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 96.24
```

```
          WSEL = 96.24
     Given Flow = 46.00
Calculated Flow = 41.10
CalcFlow/GivenFlow ratio = 0.89

--------------------------------------------------------------------------------
CROSS-SECTION #   8  XS 8.0
Number of Points = 51

      Thalweg Elevation = 93.43
Highest Point Elevation = 100.05
  Lowest Bank Elevation = 97.8
          SZF Elevation = 95.32

Number of Stage/Discharge CalSets  = 4   Active CalSets: 1 2 3 4
          Number of Velocity Sets  = 1   Active VelSets: 2

>------------  CAL/VEL SET 1  ------------<
          Stage = 97.35
           WSEL = 97.35
     Given Flow = 327.00
Calculated Flow = 327.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 96.78
           WSEL = 96.78
     Given Flow = 130.00
Calculated Flow = 111.00
CalcFlow/GivenFlow ratio = 0.85

>------------  CAL/VEL SET 3  ------------<
          Stage = 96.42
           WSEL = 96.42
     Given Flow = 68.00
Calculated Flow = 64.46
CalcFlow/GivenFlow ratio = 0.95

>------------  CAL/VEL SET 4  ------------<
          Stage = 96.26
           WSEL = 96.26
     Given Flow = 46.00
Calculated Flow = 43.95
CalcFlow/GivenFlow ratio = 0.96
```

Walla Walla River below Yellowhawk Creek measured 327 cfs on 6/12/00; 130 cfs on 6/21/00; 68 cfs on 6/28/00 and 46 cfs on 7/12/00.

CROSS-SECTION # 1 XS 1.0
Points = 46 Slope = .0025 SZF = 93.84

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	95.95	327.0	40	73.7	94.7	72.9	1.29	1.30
2	95.40	130.0	38	71.0	55.3	70.5	0.78	0.78
3	95.11	68.0	33	64.5	35.5	64.1	0.55	0.55
4	94.89	46.0	27	54.7	22.3	54.4	0.41	0.41

CROSS-SECTION # 2 XS 2.0
Points = 42 Slope = .0025 SZF = 93.84

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	96.07	327.0	37	64.6	96.9	63.6	1.50	1.52
2	95.56	130.0	32	56.8	66.1	55.9	1.16	1.18
3	95.22	68.0	27	50.4	48.1	49.7	0.95	0.97
4	95.05	46.0	21	42.4	40.4	41.8	0.95	0.97

CROSS-SECTION # 3 XS 3.0
Points = 40 Slope = .0025 SZF = 93.84

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	96.17	327.0	35	61.8	97.9	60.0	1.58	1.63
2	95.64	130.0	33	60.0	66.4	58.6	1.11	1.13
3	95.38	68.0	33	59.0	51.3	57.9	0.87	0.89
4	95.27	46.0	29	58.4	44.9	57.4	0.77	0.78

CROSS-SECTION # 4 XS 4.0
Points = 42 Slope = .0025 SZF = 94.22

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	96.72	327.0	36	82.6	94.8	80.1	1.15	1.18
2	96.20	130.0	34	75.0	55.5	73.0	0.74	0.76
3	95.92	68.0	31	72.0	35.4	70.2	0.49	0.50
4	95.85	46.0	28	69.0	30.6	67.3	0.44	0.45

CROSS-SECTION # 5 XS 5.0
Points = 45 Slope = .0025 SZF = 95.32

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	96.99	327.0	38	69.1	99.5	68.1	1.44	1.46
2	96.47	130.0	37	67.5	64.4	66.9	0.95	0.96
3	96.20	68.0	36	65.8	46.5	65.4	0.71	0.71
4	96.09	46.0	33	64.9	39.4	64.5	0.61	0.61

CROSS-SECTION # 6 XS 6.0
Points = 39 Slope = .0025 SZF = 95.32

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	97.25	327.0	36	70.2	113.8	67.9	1.62	1.68
2	96.69	130.0	33	62.9	77.6	61.1	1.23	1.27
3	96.34	68.0	30	57.4	57.3	55.9	1.00	1.02
4	96.22	46.0	29	56.0	50.7	54.6	0.90	0.93

CROSS-SECTION # 7 XS 7.0
Points = 37 Slope = .0025 SZF = 95.32

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	97.33	327.0	34	65.3	115.6	64.6	1.77	1.79
2	96.76	130.0	29	54.7	82.4	54.2	1.51	1.52
3	96.40	68.0	28	52.2	63.4	51.8	1.22	1.22
4	96.24	46.0	26	51.3	55.2	51.0	1.08	1.08

CROSS-SECTION # 8 XS 8.0
Points = 51 Slope = .0025 SZF = 95.32

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	97.35	327.0	38	60.6	133.3	57.8	2.20	2.31
2	96.78	130.0	34	55.2	101.7	53.1	1.84	1.92
3	96.42	68.0	32	50.1	83.4	48.4	1.66	1.72
4	96.26	46.0	30	45.9	76.0	44.3	1.66	1.72

Walla Walla River below Yellowhawk Creek measured 327 cfs on 6/12/00; 130 cfs on 6/21/00; 68 cfs on 6/28/00 and 46 cfs on 7/12/00.

Vel Calibration Set: 2

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	95.40	138.35	1.99
2 XS 2.0	95.56	138.02	1.48
3 XS 3.0	95.64	125.44	1.70
4 XS 4.0	96.20	131.17	1.92
5 XS 5.0	96.47	130.22	1.76
6 XS 6.0	96.69	134.05	1.41
7 XS 7.0	96.76	130.03	1.28
8 XS 8.0	96.78	111.00	0.83
	AVERAGE	129.78	1.55

Vel Calibration Set: 3

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	95.11	73.54	1.47
2 XS 2.0	95.22	64.10	0.95
3 XS 3.0	95.38	70.43	1.33
4 XS 4.0	95.92	69.71	1.62
5 XS 5.0	96.20	69.34	1.30
6 XS 6.0	96.34	64.53	0.93
7 XS 7.0	96.40	69.32	0.89
8 XS 8.0	96.42	0.00	0.00
	AVERAGE	60.12	1.06

Vel Calibration Set: 4

XS	Given WSL	FLOW	AVG VEL
1 XS 1.0	94.89	47.33	1.15
2 XS 2.0	95.05	44.76	0.90
3 XS 3.0	95.27	48.65	1.28
4 XS 4.0	95.85	51.93	1.36
5 XS 5.0	96.09	47.10	1.11
6 XS 6.0	96.22	43.18	0.71
7 XS 7.0	96.24	41.10	0.63
8 XS 8.0	96.26	0.00	0.00
	AVERAGE	40.51	0.89

Walla Walla River below Yellowhawk Creek measured 327 cfs on 6/12/00; 130 cfs on 6/21/00; 68 cfs on 6/28/00 and 46 cfs on 7/12/00.

Units: U.S.

Number of Calibration Flows: 28

CROSS-SECTION # 1 XS 1.0
Points = 46
Slope = .0025
SZF = 93.84

Weighting Factor = .5
Cross-section represents 4.363% of Total Reach.

```
   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .2821374
Log/Log Regression B =  .3496611
WSL = 0.2821 * Flow ^ 0.3497 + 93.84

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   2  XS 2.0
Points = 42
 Slope = .0025
   SZF = 93.84

Weighting Factor = .5
Cross-section represents   9.538% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3682681
Log/Log Regression B =  .3128904
WSL = 0.3683 * Flow ^ 0.3129 + 93.84

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   3  XS 3.0
Points = 40
 Slope = .0025
   SZF = 93.84

Weighting Factor = .5
Cross-section represents  13.473% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .5353628
Log/Log Regression B =  .2524563
WSL = 0.5354 * Flow ^ 0.2525 + 93.84

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   4  XS 4.0
Points = 42
 Slope = .0025
   SZF = 94.22

Weighting Factor = .5
```

```
Cross-section represents  14.799% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .6655015
Log/Log Regression B =  .2270677
WSL = 0.6655 * Flow ^ 0.2271 + 94.22

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   5  XS 5.0
Points = 45
 Slope = .0025
   SZF = 95.32

Weighting Factor = .5
Cross-section represents  19.119% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .1656354
Log/Log Regression B =  .3985559
WSL = 0.1656 * Flow ^ 0.3986 + 95.32

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   6  XS 6.0
Points = 39
 Slope = .0025
   SZF = 95.32

Weighting Factor = .5
Cross-section represents  19.204% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .1950782
Log/Log Regression B =  .3968959
WSL = 0.1951 * Flow ^ 0.3969 + 95.32

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   7  XS 7.0
Points = 37
 Slope = .0025
   SZF = 95.32
```

```
Weighting Factor = .5
Cross-section represents  13.045% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .1993106
Log/Log Regression B =  .4013721
WSL = 0.1993 * Flow ^ 0.4014 + 95.32

   >>> Velocity Calibrations <<<
Vel Calculation Method: Regression calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
IOC14: No control of B in Vel = CellQ ^ B
BMAX = 0

--------------------------------------------------------------------------------
CROSS-SECTION #   8  XS 8.0
Points = 51
 Slope = .0025
   SZF = 95.32

Weighting Factor = .5
Cross-section represents   6.459% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .2082091
Log/Log Regression B =  .3954292
WSL = 0.2082 * Flow ^ 0.3954 + 95.32

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2
```

```
Walla Walla River below Yellowhawk Creek measured 327 cfs on 6/12/00; 130 cfs on
6/21/00; 68 cfs on 6/28/00 and 46 cfs on 7/12/00.

--------------------------------------------------------------------------------
Velocity Adjustment Factor table for XS # 1 XS 1.0
WSLs based on Log/Log Regression
*Dual-Rating Method*

VELs based on Regression calibration
Calibration Set Used: 4
```

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
94.57	15.00	22.06	0.7367	16.25
94.64	20.00	26.90	0.8013	21.55
94.71	25.00	31.35	0.8556	26.82
94.77	30.00	35.69	0.8987	32.07
94.82	35.00	40.02	0.9323	37.31
94.86	40.00	44.24	0.9614	42.53
94.95	50.00	53.18	0.9953	52.93
95.02	60.00	62.41	1.0142	63.30
95.09	70.00	71.71	1.0268	73.63
95.15	80.00	81.31	1.0322	83.93
95.20	90.00	91.26	1.0323	94.21
95.25	100.00	101.51	1.0291	104.46

95.30	110.00	112.06	1.0235	114.70
95.34	120.00	123.09	1.0148	124.91
95.39	130.00	134.41	1.0052	135.12
95.43	140.00	146.04	0.9949	145.30
95.47	150.00	157.96	0.9843	155.47
95.56	175.00	188.97	0.9570	180.85
95.61	190.00	208.40	0.9407	196.04
95.64	200.00	221.69	0.9299	206.15
95.67	210.00	235.23	0.9193	216.26
95.71	225.00	256.04	0.9037	231.40
95.79	250.00	291.99	0.8787	256.58
95.91	300.00	368.57	0.8325	306.82
95.97	325.00	409.14	0.8112	331.88
96.03	350.00	451.21	0.7910	356.90
96.13	400.00	539.75	0.7538	406.84
96.32	500.00	733.98	0.6899	506.37

Velocity Adjustment Factor table for XS # 2 XS 2.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 4

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
94.70	15.00	15.16	0.9237	14.01
94.78	20.00	19.97	0.9435	18.84
94.85	25.00	24.75	0.9584	23.72
94.91	30.00	29.50	0.9703	28.62
94.96	35.00	34.23	0.9801	33.55
95.01	40.00	39.06	0.9857	38.50
95.09	50.00	48.77	0.9937	48.46
95.17	60.00	58.57	0.9985	58.48
95.23	70.00	68.51	1.0006	68.55
95.29	80.00	78.61	1.0008	78.67
95.35	90.00	88.82	1.0001	88.83
95.40	100.00	99.12	0.9990	99.02
95.44	110.00	109.49	0.9977	109.24
95.49	120.00	119.93	0.9963	119.50
95.53	130.00	130.44	0.9949	129.77
95.57	140.00	141.02	0.9933	140.08
95.61	150.00	151.70	0.9915	150.40
95.69	175.00	178.63	0.9870	176.31
95.74	190.00	194.94	0.9844	191.91
95.77	200.00	205.87	0.9828	202.33
95.80	210.00	216.84	0.9812	212.77
95.85	225.00	233.38	0.9789	228.45
95.91	250.00	261.13	0.9752	254.66
96.03	300.00	317.36	0.9684	307.33
96.09	325.00	345.81	0.9652	333.76
96.14	350.00	374.46	0.9621	360.26
96.24	400.00	432.39	0.9561	413.43
96.41	500.00	550.45	0.9453	520.36

Velocity Adjustment Factor table for XS # 3 XS 3.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 4

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
94.90	15.00	14.17	1.0675	15.13
94.98	20.00	18.79	1.0729	20.16
95.05	25.00	23.96	1.0514	25.19

95.10	30.00	30.02	1.0068	30.22
95.15	35.00	35.72	0.9868	35.25
95.20	40.00	41.26	0.9762	40.28
95.28	50.00	51.95	0.9688	50.33
95.35	60.00	62.25	0.9699	60.37
95.40	70.00	72.25	0.9746	70.42
95.46	80.00	82.03	0.9808	80.46
95.51	90.00	91.62	0.9877	90.50
95.55	100.00	101.06	0.9948	100.53
95.59	110.00	110.37	1.0018	110.57
95.63	120.00	119.57	1.0086	120.60
95.67	130.00	128.67	1.0152	130.63
95.70	140.00	137.70	1.0216	140.66
95.74	150.00	146.65	1.0276	150.69
95.81	175.00	168.76	1.0415	175.77
95.85	190.00	181.88	1.0491	190.81
95.88	200.00	190.58	1.0538	200.83
95.90	210.00	199.24	1.0583	210.85
95.94	225.00	212.16	1.0647	225.89
96.00	250.00	233.56	1.0744	250.94
96.10	300.00	275.97	1.0908	301.04
96.15	325.00	297.02	1.0978	326.08
96.19	350.00	318.00	1.1041	351.12
96.27	400.00	359.80	1.1150	401.19
96.41	500.00	443.03	1.1315	501.30

Velocity Adjustment Factor table for XS # 4 XS 4.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 4

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
95.45	15.00	13.09	1.3298	17.40
95.53	20.00	18.65	1.2257	22.86
95.60	25.00	24.22	1.1657	28.24
95.66	30.00	29.96	1.1203	33.57
95.71	35.00	35.73	1.0872	38.85
95.76	40.00	41.46	1.0633	44.09
95.84	50.00	52.83	1.0311	54.47
95.91	60.00	64.12	1.0099	64.75
95.97	70.00	75.40	0.9939	74.94
96.02	80.00	86.71	0.9808	85.05
96.07	90.00	98.05	0.9698	95.09
96.11	100.00	109.44	0.9602	105.08
96.16	110.00	120.88	0.9515	115.02
96.19	120.00	132.38	0.9436	124.91
96.23	130.00	143.96	0.9360	134.75
96.26	140.00	155.62	0.9289	144.56
96.30	150.00	167.34	0.9222	154.33
96.37	175.00	197.01	0.9066	178.61
96.41	190.00	215.05	0.8979	193.09
96.44	200.00	227.19	0.8923	202.71
96.46	210.00	239.41	0.8868	212.30
96.50	225.00	257.91	0.8788	226.65
96.55	250.00	289.19	0.8660	250.45
96.65	300.00	353.49	0.8422	297.70
96.69	325.00	386.52	0.8309	321.16
96.74	350.00	420.13	0.8201	344.54
96.81	400.00	489.21	0.7993	391.03
96.95	500.00	634.56	0.7614	483.13

Velocity Adjustment Factor table for XS # 5 XS 5.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 4

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
95.81	15.00	15.20	1.0224	15.54
95.87	20.00	20.48	1.0081	20.65
95.92	25.00	25.73	1.0003	25.74
95.96	30.00	31.00	0.9940	30.82
96.00	35.00	36.22	0.9906	35.88
96.04	40.00	41.43	0.9883	40.94
96.11	50.00	51.80	0.9852	51.03
96.17	60.00	62.14	0.9831	61.10
96.22	70.00	72.46	0.9818	71.14
96.27	80.00	82.76	0.9808	81.17
96.32	90.00	93.03	0.9801	91.18
96.36	100.00	103.29	0.9795	101.17
96.40	110.00	113.54	0.9790	111.16
96.44	120.00	123.78	0.9786	121.13
96.47	130.00	134.00	0.9783	131.09
96.51	140.00	144.23	0.9779	141.05
96.54	150.00	154.45	0.9776	150.99
96.62	175.00	180.00	0.9767	175.81
96.66	190.00	195.32	0.9763	190.68
96.69	200.00	205.54	0.9759	200.59
96.72	210.00	215.76	0.9756	210.49
96.75	225.00	231.09	0.9751	225.33
96.82	250.00	256.65	0.9742	250.03
96.93	300.00	307.86	0.9724	299.35
96.98	325.00	333.52	0.9714	323.97
97.03	350.00	359.22	0.9703	348.57
97.12	400.00	410.75	0.9682	397.70
97.29	500.00	514.39	0.9637	495.72

Velocity Adjustment Factor table for XS # 6 XS 6.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 4

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
95.89	15.00	15.19	0.8952	13.60
95.96	20.00	19.73	0.9291	18.33
96.02	25.00	24.28	0.9521	23.12
96.07	30.00	28.86	0.9683	27.94
96.12	35.00	33.47	0.9800	32.79
96.16	40.00	38.12	0.9884	37.68
96.24	50.00	47.54	0.9993	47.51
96.31	60.00	57.13	1.0050	57.42
96.37	70.00	66.89	1.0076	67.39
96.43	80.00	76.80	1.0082	77.42
96.48	90.00	86.86	1.0074	87.50
96.53	100.00	97.07	1.0057	97.63
96.58	110.00	107.42	1.0034	107.79
96.62	120.00	117.92	1.0006	117.99
96.67	130.00	128.55	0.9974	128.22
96.71	140.00	139.32	0.9940	138.49
96.75	150.00	150.22	0.9904	148.78
96.84	175.00	178.03	0.9809	174.62
96.89	190.00	195.08	0.9750	190.20
96.92	200.00	206.60	0.9710	200.62
96.95	210.00	218.24	0.9671	211.05
96.99	225.00	235.90	0.9611	226.74
97.07	250.00	265.91	0.9513	252.97
97.20	300.00	327.91	0.9324	305.74
97.26	325.00	359.86	0.9233	332.25

97.31	350.00	392.42	0.9144	358.85
97.42	400.00	459.34	0.8975	412.26
97.62	500.00	599.94	0.8665	519.84

Velocity Adjustment Factor table for XS # 7 XS 7.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on Regression calibration
Calibration Set Used: 4

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
95.91	15.00	14.74	0.9176	13.53
95.98	20.00	19.28	0.9466	18.25
96.05	25.00	23.94	0.9613	23.01
96.10	30.00	28.62	0.9723	27.82
96.15	35.00	33.30	0.9808	32.66
96.20	40.00	38.04	0.9868	37.53
96.28	50.00	47.56	0.9954	47.34
96.35	60.00	57.21	1.0003	57.23
96.42	70.00	66.98	1.0031	67.19
96.48	80.00	76.87	1.0044	77.21
96.53	90.00	86.87	1.0047	87.27
96.59	100.00	96.97	1.0043	97.38
96.63	110.00	107.18	1.0033	107.54
96.68	120.00	117.49	1.0020	117.73
96.73	130.00	127.90	1.0005	127.95
96.77	140.00	138.39	0.9987	138.21
96.81	150.00	148.98	0.9967	148.50
96.90	175.00	175.83	0.9915	174.34
96.96	190.00	192.19	0.9881	189.91
96.99	200.00	203.20	0.9859	200.32
97.02	210.00	214.28	0.9836	210.76
97.07	225.00	231.04	0.9801	226.44
97.15	250.00	259.35	0.9743	252.68
97.29	300.00	317.31	0.9627	305.47
97.35	325.00	346.91	0.9570	332.00
97.41	350.00	376.90	0.9515	358.61
97.53	400.00	438.03	0.9407	412.07
97.73	500.00	564.59	0.9206	519.77

Velocity Adjustment Factor table for XS # 8 XS 8.0
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
95.93	15.00	62.03	0.2217	13.75
96.00	20.00	65.63	0.2804	18.40
96.06	25.00	68.80	0.3351	23.06
96.12	30.00	71.70	0.3867	27.73
96.17	35.00	74.37	0.4357	32.41
96.22	40.00	76.87	0.4825	37.09
96.30	50.00	81.45	0.5707	46.48
96.37	60.00	85.61	0.6529	55.89
96.44	70.00	89.47	0.7301	65.32
96.50	80.00	93.09	0.8032	74.77
96.55	90.00	96.52	0.8727	84.23
96.61	100.00	99.79	0.9390	93.70
96.66	110.00	102.92	1.0026	103.18
96.70	120.00	105.92	1.0637	112.67
96.75	130.00	108.82	1.1227	122.18
96.79	140.00	111.63	1.1796	131.68

96.83	150.00	114.36	1.2347	141.20
96.92	175.00	120.87	1.3653	165.02
96.98	190.00	124.58	1.4395	179.34
97.01	200.00	126.99	1.4874	188.89
97.04	210.00	129.35	1.5342	198.44
97.09	225.00	132.80	1.6023	212.78
97.17	250.00	138.34	1.7111	236.71
97.31	300.00	148.77	1.9133	284.64
97.37	325.00	153.72	2.0079	308.64
97.43	350.00	158.51	2.0987	332.66
97.55	400.00	167.70	2.2706	380.76
97.75	500.00	184.79	2.5823	477.17

Walla Walla River below Yellowhawk Creek changes to measured velocities.

Transect 1	Station	Vel Set	Original Vel	Changed Vel
	23	2	2.28	2.08
	23	3	0.46	0.86
	25	4	0.1	0
	27	4	0.88	1.08
	51	4	0.96	1.06
	53	2	2.87	2.67
	53	3	1.46	1.66
	53	4	0.35	0.75
	55	4	0.1	0
	57	4	0.05	0
	59	4	0.05	0
	61	3	1.05	1.25
	61	4	0.05	0
	63	4	0.05	0
	65	4	0.05	0
	67	3	0.63	0.83
	67	4	0.05	0
	69	2	1.91	1.71
	69	3	0.46	0.66
	69	4	0.05	0
	71	2	1.89	1.69
	71	3	0.28	0.68
	71	4	0.05	0
	73	2	1.75	1.55
	73	4	0.05	0

Transect 2	Station	Vel Set	Original Vel	Changed Vel
	19	3	0.05	0
	21	3	0.1	0
	23	3	0.45	0.65
	23	4	0.05	0
	25	4	0.1	0
	27	4	0.1	0
	29	3	0.38	0.58
	29	4	0.21	0.41

Transect 3	Station	Vel Set	Original Vel	Changed Vel
	15	4	1.35	1.55
	25	4	1.61	1.71
	49	2	2.45	2.05
	49	4	0.61	0.81
	51	2	3.1	3
	51	4	1.56	1.76
	55	2	2.57	2.17

		55	4	0.74	0.94
		59	3	0.04	0
		59	4	-0.12	0
Transect 4	Station		Vel Set	Original Vel	Changed Vel
		22.5	3	0.16	0.36
		22.5	4	0.05	0
		25	2	1.67	1.47
		25	4	0.23	0.33
		27.5	2	3.15	2.75
		27.5	4	0.91	1.01
		52.5	2	2.27	2.07
		55	2	2.45	2.25
		57.5	2	2.24	2.04
		60	2	2.18	1.98
		65	4	0.59	0.79
		80	3	2.77	2.57
		80	4	2.55	2.35
		82.5	4	2.59	2.39
		85	2	2.47	2.67
		85	3	2.05	2.25
		85	4	2.49	2.29
Transect 5	Station		Vel Set	Original Vel	Changed Vel
		9	3	0.42	0.62
Transect 6					
	No Changes				
Transect 7	Station		Vel Set	Original Vel	Changed Vel
		13	3	0.14	0.34
Transect 8	Station		Vel Set	Original Vel	Changed Vel
		5	2	0	0.1
		7	2	0	0.1
		9	2	0	0.1
		18	2	0	0.1
		38	2	-0.08	0.08
		40	2	-0.15	0.15
		67	2	-0.35	0.35
		69	2	-0.09	0.09

```
Walla Walla River below HWY 125 WUA from 15 to 325 cfs medium flow 1-flow.
Measured 6/12/2000; 6/22/2000; 6/27/2000; 7/11/2000
--------------------------------------------------------------------------------
CROSS-SECTION #   1  Trans. #1
Number of Points = 34

      Thalweg Elevation = 90.72
Highest Point Elevation = 96.19
  Lowest Bank Elevation = 93.59
          SZF Elevation = 90.75

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 92.63
           WSEL = 92.63
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 92.12
           WSEL = 92.12
     Given Flow = 64.00
Calculated Flow = 65.24
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 3  ------------<
          Stage = 91.60
           WSEL = 91.60
     Given Flow = 13.00
Calculated Flow = 13.66
CalcFlow/GivenFlow ratio = 1.05

--------------------------------------------------------------------------------
CROSS-SECTION #   2  Trans. 2
Number of Points = 39

      Thalweg Elevation = 89.13
Highest Point Elevation = 96.31
  Lowest Bank Elevation = 94.44
          SZF Elevation = 90.75

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 92.89
           WSEL = 92.92
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 92.38
           WSEL = 92.38
     Given Flow = 64.00
Calculated Flow = 69.96
CalcFlow/GivenFlow ratio = 1.09

>------------  CAL/VEL SET 3  ------------<
          Stage = 91.96
           WSEL = 91.96
     Given Flow = 13.00
Calculated Flow = 13.33
CalcFlow/GivenFlow ratio = 1.03

--------------------------------------------------------------------------------
CROSS-SECTION #   3  Trans. 3
```

```
Number of Points = 35

      Thalweg Elevation = 92.02
Highest Point Elevation = 98.99
  Lowest Bank Elevation = 94.89
          SZF Elevation = 92.02

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 93.61
           WSEL = 93.61
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 93.07
           WSEL = 93.07
     Given Flow = 64.00
Calculated Flow = 66.33
CalcFlow/GivenFlow ratio = 1.04

>------------  CAL/VEL SET 3  ------------<
          Stage = 92.62
           WSEL = 92.62
     Given Flow = 13.00
Calculated Flow = 11.55
CalcFlow/GivenFlow ratio = 0.89


--------------------------------------------------------------------------------
CROSS-SECTION #   4  Trans. 4
Number of Points = 37

      Thalweg Elevation = 92.42
Highest Point Elevation = 98.99
  Lowest Bank Elevation = 94.99
          SZF Elevation = 92.45

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 94.03
           WSEL = 94.03
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 93.52
           WSEL = 93.52
     Given Flow = 64.00
Calculated Flow = 61.35
CalcFlow/GivenFlow ratio = 0.96

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.06
           WSEL = 93.06
     Given Flow = 13.00
Calculated Flow = 12.69
CalcFlow/GivenFlow ratio = 0.98

--------------------------------------------------------------------------------
CROSS-SECTION #   5  Trans. 5
Number of Points = 39

      Thalweg Elevation = 92.59
Highest Point Elevation = 98.29
```

```
  Lowest Bank Elevation = 95.69
          SZF Elevation = 92.62

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 1  ------------<
          Stage = 94.61
           WSEL = 94.61
     Given Flow = 202.00
Calculated Flow = 202.00

CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 93.99
           WSEL = 93.99
     Given Flow = 64.00
Calculated Flow = 63.53
CalcFlow/GivenFlow ratio = 0.99

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.43
           WSEL = 93.43
     Given Flow = 13.00
Calculated Flow = 11.03
CalcFlow/GivenFlow ratio = 0.85

--------------------------------------------------------------------------------
CROSS-SECTION #   6  Trans. 6
Number of Points = 39

      Thalweg Elevation = 92.63
Highest Point Elevation = 98.79
  Lowest Bank Elevation = 95.24
          SZF Elevation = 92.65

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 94.81
           WSEL = 94.84
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 94.13
           WSEL = 94.13
     Given Flow = 64.00
Calculated Flow = 63.84
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.61
           WSEL = 93.61
     Given Flow = 13.00
Calculated Flow = 13.72
CalcFlow/GivenFlow ratio = 1.06

--------------------------------------------------------------------------------
CROSS-SECTION #   7  Trans. 7
Number of Points = 39

      Thalweg Elevation = 91.6
Highest Point Elevation = 99.31
  Lowest Bank Elevation = 99.31
          SZF Elevation = 92.65

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
```

```
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 94.98
           WSEL = 94.98
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 94.40
           WSEL = 94.40
     Given Flow = 64.00
Calculated Flow = 62.22
CalcFlow/GivenFlow ratio = 0.97

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.74
           WSEL = 93.73
     Given Flow = 13.00
Calculated Flow = 11.49
CalcFlow/GivenFlow ratio = 0.88

--------------------------------------------------------------------------------
CROSS-SECTION #   8  Trans. 8
Number of Points = 47

      Thalweg Elevation = 93.12
Highest Point Elevation = 97.81
  Lowest Bank Elevation = 97.19
          SZF Elevation = 93.12

Number of Stage/Discharge CalSets  = 3   Active CalSets: 1 2 3
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 1  ------------<
          Stage = 95.37
           WSEL = 95.37
     Given Flow = 202.00
Calculated Flow = 202.00
CalcFlow/GivenFlow ratio = 1.00

>------------  CAL/VEL SET 2  ------------<
          Stage = 94.81
           WSEL = 94.82
     Given Flow = 64.00
Calculated Flow = 61.60
CalcFlow/GivenFlow ratio = 0.96

>------------  CAL/VEL SET 3  ------------<
          Stage = 94.24
           WSEL = 94.24
     Given Flow = 13.00
Calculated Flow = 15.85
CalcFlow/GivenFlow ratio = 1.22

--------------------------------------------------------------------------------


Walla Walla River below HWY 125 WUA from 15 to 325 cfs medium flow 1-flow.
Measured 6/12/2000; 6/22/2000; 6/27/2000; 7/11/2000
--------------------------------------------------------------------------------
CROSS-SECTION #   1  Trans. #1
Points = 34   Slope = .0025   SZF = 90.75

       Calib      Given  Wet     Wetted     Wetted   Wetted     Hydrau     Avg
CAL    Stage       Flow  Cnt      Perim       Area     Wdth     Radius   Depth
 1     92.63      202.0   28       53.8       55.4     53.2       1.03    1.04
 2     92.12       64.0   22       46.6       29.0     46.2       0.62    0.63
 3     91.60       13.0   12       25.4       10.8     25.2       0.42    0.43
--------------------------------------------------------------------------------
```

CROSS-SECTION # 2 Trans. 2
Points = 39 Slope = .0025 SZF = 90.75

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	92.89	202.0	31	63.0	111.2	61.8	1.77	1.80
2	92.38	64.0	30	59.0	80.6	58.0	1.37	1.39
3	91.96	13.0	28	55.0	57.1	54.1	1.04	1.05

CROSS-SECTION # 3 Trans. 3
Points = 35 Slope = .0025 SZF = 92.02

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	93.61	202.0	28	55.3	55.3	54.4	1.00	1.02
2	93.07	64.0	23	47.0	28.0	46.6	0.60	0.60
3	92.62	13.0	18	34.5	9.4	34.4	0.27	0.27

CROSS-SECTION # 4 Trans. 4
Points = 37 Slope = .0025 SZF = 92.45

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	94.03	202.0	30	51.9	55.2	51.6	1.06	1.07
2	93.52	64.0	28	44.2	30.8	44.0	0.70	0.70
3	93.06	13.0	22	33.4	13.2	33.3	0.40	0.40

CROSS-SECTION # 5 Trans. 5
Points = 39 Slope = .0025 SZF = 92.62

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	94.61	202.0	33	52.4	63.1	51.8	1.20	1.22
2	93.99	64.0	30	46.5	31.8	46.2	0.69	0.69
3	93.43	13.0	17	25.6	13.3	25.4	0.52	0.52

CROSS-SECTION # 6 Trans. 6
Points = 39 Slope = .0025 SZF = 92.65

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	94.81	202.0	34	53.3	62.5	52.4	1.17	1.19
2	94.13	64.0	32	48.9	28.2	48.5	0.58	0.58
3	93.61	13.0	11	17.9	11.9	17.7	0.67	0.67

CROSS-SECTION # 7 Trans. 7
Points = 39 Slope = .0025 SZF = 92.65

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	94.98	202.0	29	61.9	65.8	59.0	1.06	1.11
2	94.40	64.0	23	31.7	44.0	29.4	1.39	1.50
3	93.74	13.0	19	22.8	27.1	21.1	1.19	1.29

CROSS-SECTION # 8 Trans. 8
Points = 47 Slope = .0025 SZF = 93.12

CAL	Calib Stage	Given Flow	Wet Cnt	Wetted Perim	Wetted Area	Wetted Wdth	Hydrau Radius	Avg Depth
1	95.37	202.0	36	69.4	66.4	66.8	0.96	0.99
2	94.81	64.0	30	59.2	30.8	57.5	0.52	0.54
3	94.24	13.0	14	20.4	9.3	19.6	0.46	0.48

Walla Walla River below HWY 125 WUA from 15 to 325 cfs medium flow 1-flow.
Measured 6/12/2000; 6/22/2000; 6/27/2000; 7/11/2000

Vel Calibration Set: 2

XS	Given WSL	FLOW with angles	FLOW w/o angles	AVG. VEL w/ Angles	AVG. VEL w/o angles
1 Trans. #1	92.12	65.24	65.24	1.79	1.79
2 Trans. 2	92.38	69.96	69.96	1.29	1.29
3 Trans. 3	93.07	66.33	66.33	2.16	2.16
4 Trans. 4	93.52	61.35	61.35	1.70	1.70
5 Trans. 5	93.99	63.53	63.53	1.45	1.45
6 Trans. 6	94.13	63.84	63.84	1.21	1.21
7 Trans. 7	94.40	62.22	62.22	1.09	1.09
8 Trans. 8	94.81	62.39	62.39	1.65	1.65
	AVERAGE	64.36	64.36	1.54	1.54

Vel Calibration Set: 3

XS	Given WSL	FLOW with angles	FLOW w/o angles	AVG. VEL w/ Angles	AVG. VEL w/o angles
1 Trans. #1	91.60	13.66	13.66	1.11	1.11
2 Trans. 2	91.96	13.33	13.33	0.35	0.35
3 Trans. 3	92.62	11.55	11.55	1.02	1.02
4 Trans. 4	93.06	12.69	12.69	0.76	0.76
5 Trans. 5	93.43	11.03	11.03	0.65	0.65
6 Trans. 6	93.61	13.72	13.72	0.97	0.97
7 Trans. 7	93.74	11.43	11.43	0.34	0.34
8 Trans. 8	94.24	15.85	15.85	1.24	1.24
	AVERAGE	12.91	12.91	0.81	0.81

Walla Walla River below HWY 125 WUA from 15 to 325 cfs medium flow 1-flow.
Measured 6/12/2000; 6/22/2000; 6/27/2000; 7/11/2000

Units: U.S.

Number of Calibration Flows: 25

CROSS-SECTION # 1 Trans. #1
Points = 34
Slope = .0025
SZF = 90.75

Weighting Factor = .5
Cross-section represents 5.847% of Total Reach.

>>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A = .4055642
Log/Log Regression B = .2901398
WSL = 0.4056 * Flow ^ 0.2901 + 90.75

>>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet: 2

```
--------------------------------------------------------------------------------
CROSS-SECTION #   2  Trans. 2
Points = 39
 Slope = .0025
   SZF = 90.75

Weighting Factor = .5
Cross-section represents  13.193% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .7031806
Log/Log Regression B =  .2074807
WSL = 0.7032 * Flow ^ 0.2075 + 90.75

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------
CROSS-SECTION #   3  Trans. 3
Points = 35
 Slope = .0025
   SZF = 92.02

Weighting Factor = .5
Cross-section represents  14.993% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .2409271
Log/Log Regression B =  .3550084
WSL = 0.2409 * Flow ^ 0.3550 + 92.02

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------
CROSS-SECTION #   4  Trans. 4
Points = 37
 Slope = .0025
   SZF = 92.45

Weighting Factor = .5
Cross-section represents  18.516% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .2508974
Log/Log Regression B =  .3473145
WSL = 0.2509 * Flow ^ 0.3473 + 92.45

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------
```

```
CROSS-SECTION #   5  Trans. 5
Points = 39
 Slope = .0025
   SZF = 92.62

Weighting Factor = .5
Cross-section represents  17.541% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3497339
Log/Log Regression B =  .327787
WSL = 0.3497 * Flow ^ 0.3278 + 92.62

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------
CROSS-SECTION #   6  Trans. 6
Points = 39
 Slope = .0025
   SZF = 92.65

Weighting Factor = .5
Cross-section represents  10.645% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .4451779
Log/Log Regression B =  .2949748
WSL = 0.4452 * Flow ^ 0.2950 + 92.65

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------
CROSS-SECTION #   7  Trans. 7
Points = 39
 Slope = .0025
   SZF = 92.65

Weighting Factor = .5
Cross-section represents  11.619% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .5373862
Log/Log Regression B =  .2788187
WSL = 0.5374 * Flow ^ 0.2788 + 92.65

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------
CROSS-SECTION #   8  Trans. 8
Points = 47
```

```
 Slope = .0025
   SZF = 93.12

Weighting Factor = .5
Cross-section represents   7.646% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .5839433
Log/Log Regression B =  .2545553
WSL = 0.5839 * Flow ^ 0.2546 + 93.12

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Log/Log Regression Vels from Two-Stage/Discharge Method (IOC8=2).
Vels calibrated to VelSet:  2

--------------------------------------------------------------------------------



Walla Walla River below HWY 125 WUA from 15 to 325 cfs medium flow 1-flow.
Measured 6/12/2000; 6/22/2000; 6/27/2000; 7/11/2000

--------------------------------------------------------------------------------
Velocity Adjustment Factor table for XS # 1 Trans. #1
WSLs based on Log/Log Regression
*Dual-Rating Method*

VELs based on 1-vel calibration
Calibration Set Used: 2

     WSL      Calib. Flow     Calc Flow        VAF     Dual CalFlow
-------------------------------------------------------------------
      91.64         15.00         19.74      0.7962         15.71
      91.72         20.00         24.80      0.8403         20.84
      91.78         25.00         29.54      0.8783         25.95
      91.84         30.00         34.17      0.9082         31.04
      91.89         35.00         38.73      0.9323         36.11
      91.93         40.00         43.19      0.9532         41.17
      92.01         50.00         51.77      0.9899         51.25
      92.08         60.00         59.94      1.0226         61.30
      92.14         70.00         67.94      1.0497         71.31
      92.20         80.00         75.72      1.0737         81.30
      92.25         90.00         83.24      1.0966         91.27
      92.27         95.00         86.90      1.1076         96.25
      92.29        100.00         90.51      1.1183        101.22
      92.31        105.00         94.06      1.1289        106.19
      92.34        110.00         97.57      1.1392        111.15
      92.38        120.00        104.42      1.1594        121.06
      92.41        130.00        111.09      1.1789        130.96
      92.45        140.00        117.59      1.1978        140.85
      92.49        150.00        123.94      1.2161        150.72
      92.56        175.00        139.19      1.2598        175.35
      92.64        200.00        153.67      1.3009        199.91
      92.70        225.00        167.51      1.3397        224.42
      92.76        250.00        180.79      1.3767        248.88
      92.87        300.00        205.91      1.4457        297.67
      92.92        325.00        217.85      1.4781        322.01


--------------------------------------------------------------------------------
Velocity Adjustment Factor table for XS # 2 Trans. 2
WSLs based on Log/Log Regression
*Dual-Rating Method*

VELs based on 1-vel calibration
```

Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
91.98	15.00	42.48	0.3708	15.75
92.06	20.00	47.20	0.4439	20.95
92.12	25.00	51.23	0.5102	26.14
92.17	30.00	54.81	0.5715	31.32
92.22	35.00	58.06	0.6285	36.49
92.26	40.00	61.04	0.6825	41.66
92.33	50.00	66.37	0.7832	51.98
92.39	60.00	71.09	0.8762	62.28
92.45	70.00	75.35	0.9631	72.57
92.50	80.00	79.27	1.0452	82.85
92.54	90.00	82.89	1.1233	93.11
92.56	95.00	84.61	1.1611	98.24
92.58	100.00	86.28	1.1981	103.37
92.60	105.00	87.90	1.2343	108.49
92.61	110.00	89.47	1.2699	113.61
92.65	120.00	92.48	1.3392	123.85
92.68	130.00	95.35	1.4062	134.09
92.71	140.00	98.09	1.4713	144.31
92.74	150.00	100.71	1.5345	154.53
92.80	175.00	106.82	1.6856	180.06
92.86	200.00	112.43	1.8283	205.55
92.91	225.00	117.62	1.9641	231.02
92.96	250.00	122.49	2.0937	256.46
93.05	300.00	131.41	2.3385	307.29
93.08	325.00	135.52	2.4548	332.68

Velocity Adjustment Factor table for XS # 3 Trans. 3
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
92.65	15.00	16.72	0.8219	13.74
92.72	20.00	22.34	0.8312	18.57
92.78	25.00	27.76	0.8448	23.45
92.83	30.00	33.00	0.8600	28.38
92.87	35.00	38.08	0.8755	33.34
92.91	40.00	43.09	0.8898	38.34
92.99	50.00	52.63	0.9200	48.42
93.05	60.00	61.69	0.9499	58.60
93.11	70.00	70.39	0.9782	68.85
93.16	80.00	78.75	1.0054	79.18
93.21	90.00	86.84	1.0314	89.56
93.23	95.00	90.78	1.0439	94.77
93.26	100.00	94.67	1.0563	99.99
93.28	105.00	98.50	1.0683	105.23
93.30	110.00	102.28	1.0801	110.48
93.34	120.00	109.70	1.1031	121.01
93.38	130.00	116.94	1.1252	131.58
93.41	140.00	124.02	1.1464	142.18
93.45	150.00	130.95	1.1670	152.82
93.53	175.00	147.72	1.2156	179.57
93.60	200.00	163.86	1.2601	206.49
93.67	225.00	179.59	1.3005	233.57
93.73	250.00	194.78	1.3389	260.79
93.85	300.00	223.86	1.4097	315.59
93.90	325.00	237.84	1.4428	343.15

Velocity Adjustment Factor table for XS # 4 Trans. 4
WSLs based on Log/Log Regression

Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
93.09	15.00	20.99	0.6923	14.53
93.16	20.00	25.92	0.7490	19.42
93.22	25.00	30.56	0.7956	24.31
93.27	30.00	34.94	0.8361	29.21
93.31	35.00	39.11	0.8723	34.12
93.35	40.00	43.12	0.9052	39.03
93.43	50.00	50.70	0.9639	48.87
93.49	60.00	57.86	1.0149	58.72
93.55	70.00	64.72	1.0598	68.59
93.60	80.00	71.31	1.1003	78.46
93.65	90.00	77.66	1.1377	88.35
93.67	95.00	80.75	1.1553	93.29
93.69	100.00	83.79	1.1724	98.24
93.71	105.00	86.79	1.1890	103.19
93.73	110.00	89.75	1.2050	108.14
93.77	120.00	95.53	1.2357	118.05
93.81	130.00	101.17	1.2648	127.96
93.85	140.00	106.68	1.2925	137.88
93.88	150.00	112.06	1.3190	147.81
93.96	175.00	125.05	1.3805	172.64
94.03	200.00	137.46	1.4367	197.49
94.10	225.00	149.39	1.4885	222.37
94.16	250.00	160.91	1.5367	247.27
94.27	300.00	183.08	1.6229	297.13
94.32	325.00	193.85	1.6615	322.08

Velocity Adjustment Factor table for XS # 5 Trans. 5
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
93.47	15.00	21.63	0.6039	13.06
93.55	20.00	26.68	0.6644	17.73
93.62	25.00	31.36	0.7166	22.47
93.69	30.00	35.80	0.7618	27.27
93.74	35.00	40.07	0.8018	32.13
93.79	40.00	44.21	0.8375	37.02
93.88	50.00	52.28	0.8976	46.93
93.96	60.00	60.16	0.9468	56.96
94.03	70.00	67.83	0.9891	67.09
94.09	80.00	75.32	1.0265	77.32
94.15	90.00	82.62	1.0605	87.63
94.18	95.00	86.21	1.0766	92.81
94.20	100.00	89.74	1.0921	98.01
94.23	105.00	93.23	1.1072	103.22
94.25	110.00	96.68	1.1218	108.45
94.30	120.00	103.45	1.1499	118.95
94.34	130.00	110.06	1.1767	129.51
94.39	140.00	116.53	1.2024	140.12
94.43	150.00	122.87	1.2272	150.78
94.52	175.00	138.17	1.2855	177.61
94.61	200.00	152.79	1.3396	204.68
94.68	225.00	166.83	1.3904	231.96
94.76	250.00	180.35	1.4385	259.44
94.89	300.00	206.10	1.5278	314.89
94.95	325.00	218.41	1.5697	342.84

Velocity Adjustment Factor table for XS # 6 Trans. 6
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
93.64	15.00	26.99	0.5804	15.66
93.73	20.00	32.19	0.6449	20.76
93.80	25.00	37.01	0.6981	25.84
93.86	30.00	41.52	0.7442	30.89
93.92	35.00	45.77	0.7851	35.93
93.97	40.00	49.81	0.8223	40.95
94.06	50.00	57.45	0.8871	50.97
94.14	60.00	64.75	0.9411	60.93
94.21	70.00	71.71	0.9882	70.87
94.27	80.00	78.36	1.0309	80.78
94.33	90.00	84.73	1.0700	90.66
94.36	95.00	87.82	1.0885	95.59
94.38	100.00	90.85	1.1065	100.52
94.41	105.00	93.83	1.1238	105.44
94.43	110.00	96.75	1.1407	110.36
94.48	120.00	102.45	1.1731	120.19
94.52	130.00	107.98	1.2039	129.99
94.56	140.00	113.34	1.2333	139.78
94.60	150.00	118.56	1.2615	149.56
94.69	175.00	131.03	1.3276	173.95
94.77	200.00	142.80	1.3885	198.27
94.85	225.00	153.98	1.4452	222.52
94.92	250.00	164.66	1.4985	246.73
95.04	300.00	184.75	1.5967	294.99
95.10	325.00	194.26	1.6425	319.06

Velocity Adjustment Factor table for XS # 7 Trans. 7
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
93.79	15.00	37.11	0.3618	13.42
93.89	20.00	40.57	0.4471	18.14
93.97	25.00	43.64	0.5250	22.91
94.04	30.00	46.38	0.5977	27.73
94.10	35.00	48.90	0.6663	32.58
94.15	40.00	51.23	0.7313	37.46
94.25	50.00	55.48	0.8529	47.32
94.33	60.00	59.31	0.9655	57.26
94.41	70.00	62.82	1.0712	67.29
94.47	80.00	66.07	1.1711	77.38
94.53	90.00	69.12	1.2664	87.53
94.56	95.00	70.57	1.3124	92.62
94.59	100.00	71.99	1.3576	97.73
94.62	105.00	73.37	1.4018	102.85
94.64	110.00	74.71	1.4452	107.98
94.69	120.00	77.31	1.5298	118.27
94.74	130.00	79.79	1.6117	128.60
94.78	140.00	82.18	1.6911	138.97
94.82	150.00	84.48	1.7682	149.38
94.92	175.00	89.94	1.9515	175.52
95.00	200.00	95.09	2.1226	201.84
95.08	225.00	99.97	2.2839	228.32
95.16	250.00	104.61	2.4370	254.93
95.29	300.00	113.30	2.7231	308.52

95.35	325.00	117.40	2.8574	335.47

Velocity Adjustment Factor table for XS # 8 Trans. 8
WSLs based on Log/Log Regression
Dual-Rating Method

VELs based on 1-vel calibration
Calibration Set Used: 2

WSL	Calib. Flow	Calc Flow	VAF	Dual CalFlow
94.28	15.00	15.64	1.1193	17.50
94.37	20.00	19.77	1.1546	22.82
94.45	25.00	24.32	1.1529	28.04
94.51	30.00	29.17	1.1374	33.17
94.56	35.00	34.04	1.1234	38.24
94.61	40.00	38.87	1.1128	43.26
94.70	50.00	48.34	1.0993	53.14
94.78	60.00	57.46	1.0943	62.88
94.84	70.00	66.28	1.0936	72.49
94.90	80.00	74.88	1.0949	81.99
94.96	90.00	83.22	1.0983	91.40
94.98	95.00	87.29	1.1007	96.07
95.01	100.00	91.29	1.1034	100.73
95.03	105.00	95.24	1.1063	105.37
95.05	110.00	99.12	1.1096	109.99
95.10	120.00	106.73	1.1166	119.18
95.14	130.00	114.12	1.1243	128.31
95.17	140.00	121.32	1.1324	137.39
95.21	150.00	128.34	1.1409	146.42
95.29	175.00	145.17	1.1628	168.79
95.37	200.00	161.09	1.1852	190.92
95.44	225.00	176.25	1.2076	212.84
95.50	250.00	190.74	1.2298	234.56
95.61	300.00	218.01	1.2730	277.53
95.67	325.00	230.92	1.2939	298.79

Walla Walla River below HWY 125 changes to measured velocities for the medium flow model.

Transect 1	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	10	2	0	0.1		
	18	2	0	0.1		
	26	2			0.0153	0.018

Transect 2	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	40	2	0.01	0.11		
	42	2	0	0.1		
	46	2	0	0.1		
	50	2	0	0.1		
	54	2	0	0.1		
	58	2	0	0.1		
	62	2	0	0.1		

Transect 3	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	36.5	2			0.0122	0.013
	37	2			0.116	0.0135
	39	2			0.013	0.017
	45	2			0.0145	

Transect 4	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	No Changes					

Transect 5	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	No Changes					

Transect 6	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	5.5	2	0.01	0.21		
	10	2	0	0.1		
	11.5	2	0	0.1		
	13	2	0	0.1		
	14.5	2	0	0.1		
	16	2	0	0.1		
	17.5	2			0.019	0.023
	19	2	0	0.1		
	20.5	2	0	0.1		
	22	2	0	0.1		

Transect 7	Station	Vel Set	Original Vel	Changed Vel	Original N	Changed N
	1.7	2	0	0.1		
	2.1	2	0	0.1		
	2.6	2	0	0.1		
	65	2			0.418	1
	67	2			0.418	1

		69	2			0.418	1
		71	2			0.418	1

Transect 8	Station		Vel Set	Original Vel		Changed Vel	Original N	Changed N
		2	2		0	0.1		
		39	2		0	0.1		
		41	2		0	0.1		
		92	2				0.1593	1
		94	2				0.1593	1
		96	2				0.1593	1
		98	2				0.1593	1
		100	2				0.1593	1
		102	2				0.1593	1
		104	2				0.1593	1
		106	2				0.1593	1
		108	2				0.1593	1
		110	2				0.1593	1

```
Walla Walla River below HWY 125, 1-flow low flow
measured 13 cfs on 6/27/2000
--------------------------------------------------------------------------------
CROSS-SECTION #   1  Trans. #1
Number of Points = 35

      Thalweg Elevation = 90.78
Highest Point Elevation = 96.19
  Lowest Bank Elevation = 93.59
          SZF Elevation = 90.78

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 91.60
           WSEL = 91.60
     Given Flow = 13.00
Calculated Flow = 12.18
CalcFlow/GivenFlow ratio = 0.94

Cal/Vel Set OK

>------------  CAL/VEL SET 4  ------------<
          Stage = 91.55
           WSEL = 91.55
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   2  Trans. 2
Number of Points = 40

      Thalweg Elevation = 89.14
Highest Point Elevation = 96.31
  Lowest Bank Elevation = 94.44
          SZF Elevation = 90.78

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 91.96
           WSEL = 91.96
     Given Flow = 13.00
Calculated Flow = 13.41
CalcFlow/GivenFlow ratio = 1.03

>------------  CAL/VEL SET 4  ------------<
          Stage = 91.87
           WSEL = 91.87
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   3  Trans. 3
Number of Points = 38

      Thalweg Elevation = 91.94
Highest Point Elevation = 98.99
  Lowest Bank Elevation = 94.89
          SZF Elevation = 91.94

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
```

```
          Stage = 92.62
           WSEL = 92.62
     Given Flow = 13.00
Calculated Flow = 13.30
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 92.51
           WSEL = 92.51
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   4  Trans. 4
Number of Points = 39

      Thalweg Elevation = 92.41
Highest Point Elevation = 98.99
  Lowest Bank Elevation = 94.99
          SZF Elevation = 92.41

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 2  ------------<
          Stage = 0.00
           WSEL = 0.00
     Given Flow = 60.06
Calculated Flow = 0.00

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.06
           WSEL = 93.06
     Given Flow = 13.00
Calculated Flow = 12.54
CalcFlow/GivenFlow ratio = 0.96

>------------  CAL/VEL SET 4  ------------<
          Stage = 92.96
           WSEL = 92.96
     Given Flow = 6.00
Calculated Flow = 6.20
CalcFlow/GivenFlow ratio = 1.03

--------------------------------------------------------------------------------
CROSS-SECTION #   5  Trans. 5

Number of Points = 40

      Thalweg Elevation = 92.63
Highest Point Elevation = 98.29
  Lowest Bank Elevation = 95.69
          SZF Elevation = 92.63

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.47
           WSEL = 93.43
     Given Flow = 13.00
Calculated Flow = 11.53
CalcFlow/GivenFlow ratio = 0.89

Stage (93.47) not equal to WSEL (93.43)

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.35
           WSEL = 93.35
     Given Flow = 6.00
```

```
Calculated Flow = 5.75
CalcFlow/GivenFlow ratio = 0.96

--------------------------------------------------------------------------------
CROSS-SECTION #   6  Trans. 6
Number of Points = 42

      Thalweg Elevation = 92.66
Highest Point Elevation = 98.79
  Lowest Bank Elevation = 95.24
          SZF Elevation = 92.66

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.61
           WSEL = 93.61
     Given Flow = 13.00
Calculated Flow = 13.36
CalcFlow/GivenFlow ratio = 1.03

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.53
           WSEL = 93.53
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   7  Trans. 7
Number of Points = 40

      Thalweg Elevation = 91.73
Highest Point Elevation = 99.31
  Lowest Bank Elevation = 99.31
          SZF Elevation = 92.66

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.73
           WSEL = 93.73
     Given Flow = 13.00
Calculated Flow = 12.02
CalcFlow/GivenFlow ratio = 0.92

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.54
           WSEL = 93.54
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   8  Trans. 8
Number of Points = 47

      Thalweg Elevation = 93.09
Highest Point Elevation = 97.81
  Lowest Bank Elevation = 97.19
          SZF Elevation = 93.09

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 94.24
           WSEL = 94.24
     Given Flow = 13.00
```

```
Calculated Flow = 13.32
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.95
           WSEL = 93.95
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00
```

```
Walla Walla River below HWY 125, 1-flow low flow
measured 13 cfs on 6/27/2000
--------------------------------------------------------------------------------
CROSS-SECTION #   1  Trans. #1
Number of Points = 35

      Thalweg Elevation = 90.78
Highest Point Elevation = 96.19
  Lowest Bank Elevation = 93.59
          SZF Elevation = 90.78

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 91.60
           WSEL = 91.60
     Given Flow = 13.00
Calculated Flow = 12.18
CalcFlow/GivenFlow ratio = 0.94

Cal/Vel Set OK

>------------  CAL/VEL SET 4  ------------<
          Stage = 91.55
           WSEL = 91.55
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   2  Trans. 2
Number of Points = 40

      Thalweg Elevation = 89.14
Highest Point Elevation = 96.31
  Lowest Bank Elevation = 94.44
          SZF Elevation = 90.78

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 91.96
           WSEL = 91.96
     Given Flow = 13.00
Calculated Flow = 13.41
CalcFlow/GivenFlow ratio = 1.03

>------------  CAL/VEL SET 4  ------------<
          Stage = 91.87
           WSEL = 91.87
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   3  Trans. 3
```

```
Number of Points = 38

      Thalweg Elevation = 91.94
Highest Point Elevation = 98.99
  Lowest Bank Elevation = 94.89
          SZF Elevation = 91.94

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 92.62
           WSEL = 92.62
     Given Flow = 13.00
Calculated Flow = 13.30
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 92.51
           WSEL = 92.51
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   4  Trans. 4
Number of Points = 39

      Thalweg Elevation = 92.41
Highest Point Elevation = 98.99
  Lowest Bank Elevation = 94.99
          SZF Elevation = 92.41

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 2  ------------<
          Stage = 0.00
           WSEL = 0.00
     Given Flow = 60.06
Calculated Flow = 0.00

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.06
           WSEL = 93.06
     Given Flow = 13.00
Calculated Flow = 12.54
CalcFlow/GivenFlow ratio = 0.96

>------------  CAL/VEL SET 4  ------------<
          Stage = 92.96
           WSEL = 92.96
     Given Flow = 6.00
Calculated Flow = 6.20
CalcFlow/GivenFlow ratio = 1.03

--------------------------------------------------------------------------------
CROSS-SECTION #   5  Trans. 5

Number of Points = 40

      Thalweg Elevation = 92.63
Highest Point Elevation = 98.29
  Lowest Bank Elevation = 95.69
          SZF Elevation = 92.63

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 3   Active VelSets: 2 3 4

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.47
```

```
           WSEL = 93.43
     Given Flow = 13.00
Calculated Flow = 11.53
CalcFlow/GivenFlow ratio = 0.89

Stage (93.47) not equal to WSEL (93.43)

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.35
           WSEL = 93.35
     Given Flow = 6.00
Calculated Flow = 5.75
CalcFlow/GivenFlow ratio = 0.96

--------------------------------------------------------------------------------
CROSS-SECTION #   6  Trans. 6
Number of Points = 42

      Thalweg Elevation = 92.66
Highest Point Elevation = 98.79
  Lowest Bank Elevation = 95.24
          SZF Elevation = 92.66

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.61
           WSEL = 93.61
     Given Flow = 13.00
Calculated Flow = 13.36
CalcFlow/GivenFlow ratio = 1.03

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.53
           WSEL = 93.53
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   7  Trans. 7
Number of Points = 40

      Thalweg Elevation = 91.73
Highest Point Elevation = 99.31
  Lowest Bank Elevation = 99.31
          SZF Elevation = 92.66

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 93.73
           WSEL = 93.73
     Given Flow = 13.00
Calculated Flow = 12.02
CalcFlow/GivenFlow ratio = 0.92

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.54
           WSEL = 93.54
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00

--------------------------------------------------------------------------------
CROSS-SECTION #   8  Trans. 8
Number of Points = 47

      Thalweg Elevation = 93.09
```

```
Highest Point Elevation = 97.81
  Lowest Bank Elevation = 97.19
          SZF Elevation = 93.09

Number of Stage/Discharge CalSets  = 2   Active CalSets: 3 4
          Number of Velocity Sets  = 2   Active VelSets: 2 3

>------------  CAL/VEL SET 3  ------------<
          Stage = 94.24
           WSEL = 94.24
     Given Flow = 13.00
Calculated Flow = 13.32
CalcFlow/GivenFlow ratio = 1.02

>------------  CAL/VEL SET 4  ------------<
          Stage = 93.95
           WSEL = 93.95
     Given Flow = 6.00
Calculated Flow = 6.00
CalcFlow/GivenFlow ratio = 1.00
```

```
Walla Walla River below HWY 125, 1-flow low flow
measured 13 cfs on 6/27/2000
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Vel Calibration Set: 3
```

XS	Given WSL	FLOW with angles	FLOW w/o angles	AVG. VEL w/ Angles	AVG. VEL w/o angles
1 Trans. #1	91.60	12.18	12.18	1.07	1.07
2 Trans. 2	91.96	13.41	13.41	0.36	0.36
3 Trans. 3	92.62	13.30	13.30	0.92	0.92
4 Trans. 4	93.06	12.54	12.54	0.76	0.76
5 Trans. 5	93.47	10.86	10.86	0.66	0.66
6 Trans. 6	93.61	13.36	13.36	0.83	0.83
7 Trans. 7	93.73	12.02	12.02	0.36	0.36
8 Trans. 8	94.24	13.32	13.32	1.17	1.17
AVERAGE		12.62	12.62	0.77	0.77

```
--------------------------------------------------------------------------------
Vel Calibration Set: 4
```

XS	Given WSL	FLOW with angles	FLOW w/o angles	AVG. VEL w/ Angles	AVG. VEL w/o angles
1 Trans. #1	91.55	0.00	0.00	0.00	0.00
2 Trans. 2	91.87	0.00	0.00	0.00	0.00
3 Trans. 3	92.51	0.00	0.00	0.00	0.00
4 Trans. 4	92.96	6.20	6.20	0.52	0.52
5 Trans. 5	93.35	5.75	5.75	0.41	0.41
6 Trans. 6	93.53	0.00	0.00	0.00	0.00
7 Trans. 7	93.54	0.00	0.00	0.00	0.00
8 Trans. 8	93.95	0.00	0.00	0.00	0.00
AVERAGE		1.49	1.49	0.12	0.12

```
Walla Walla River below HWY 125, 1-flow low flow
measured 13 cfs on 6/27/2000
--------------------------------------------------------------------------------
Units: U.S.

Number of Calibration Flows: 7
--------------------------------------------------------------------------------
```

```
CROSS-SECTION #   1  Trans. #1
Points = 35
 Slope = .0025
   SZF = 90.78

Weighting Factor = .5
Cross-section represents   5.847% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .6655506
Log/Log Regression B =  8.136201E-02
WSL = 0.6656 * Flow ^ 0.0814 + 90.78

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   2  Trans. 2
Points = 40
 Slope = .0025
   SZF = 90.78

Weighting Factor = .5
Cross-section represents  13.193% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .9069548
Log/Log Regression B =  .1026053
WSL = 0.9070 * Flow ^ 0.1026 + 90.78

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   3  Trans. 3
Points = 38
 Slope = .0025
   SZF = 91.94

Weighting Factor = .5
Cross-section represents  14.993% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3786902
Log/Log Regression B =  .2282209
WSL = 0.3787 * Flow ^ 0.2282 + 91.94

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   4  Trans. 4
Points = 39
 Slope = .0025
   SZF = 92.41
```

```
Weighting Factor = .5
Cross-section represents  18.516% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .3734517
Log/Log Regression B =  .2160565
WSL = 0.3735 * Flow ^ 0.2161 + 92.41

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   5  Trans. 5
Points = 40
 Slope = .0025
   SZF = 92.63

Weighting Factor = .5
Cross-section represents  17.541% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .5037211
Log/Log Regression B =  .1993739
WSL = 0.5037 * Flow ^ 0.1994 + 92.63

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   6  Trans. 6
Points = 42
 Slope = .0025
   SZF = 92.66

Weighting Factor = .5
Cross-section represents  10.645% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .7095469
Log/Log Regression B =  .113777
WSL = 0.7095 * Flow ^ 0.1138 + 92.66

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   7  Trans. 7
Points = 40
 Slope = .0025
   SZF = 92.66

Weighting Factor = .5
Cross-section represents  11.619% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
```

```
Log/Log Regression A =  .5594124
Log/Log Regression B =  .2528419
WSL = 0.5594 * Flow ^ 0.2528 + 92.66

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration

Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3

--------------------------------------------------------------------------------
CROSS-SECTION #   8  Trans. 8
Points = 47
 Slope = .0025
   SZF = 93.09

Weighting Factor = .5
Cross-section represents   7.646% of Total Reach.

   >>> WSL Calibrations <<<
WSL Calculation Method: Log/Log Regression
Log/Log Regression A =  .4385797
Log/Log Regression B =  .3758269
WSL = 0.4386 * Flow ^ 0.3758 + 93.09

   >>> Velocity Calibrations <<<
Vel Calculation Method: 1-vel calibration
Vel Algorithm: Manning's N
Use Given N's: Yes
Use N-min/N-max: No
Vels calibrated to VelSet:  3
```

```
Walla Walla River below HWY 125, 1-flow low flow
measured 13 cfs on 6/27/2000

--------------------------------------------------------------------------------
Velocity Adjustment Factor table for XS # 1 Trans. #1
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

     WSL      Calib. Flow     Calc Flow        VAF
-------------------------------------------------
      91.51          3.00          8.43      0.3557
      91.54          5.00          9.59      0.5214
      91.55          6.00         10.04      0.5976
      91.56          7.00         10.44      0.6707
      91.58          9.00         11.11      0.8098
      91.59         11.00         11.68      0.9415
      91.60         13.00         12.18      1.0674


--------------------------------------------------------------------------------
Velocity Adjustment Factor table for XS # 2 Trans. 2
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

     WSL      Calib. Flow     Calc Flow        VAF
-------------------------------------------------
      91.80          3.00         11.00      0.2727
```

91.85	5.00	12.03	0.4157
91.87	6.00	12.42	0.4831
91.89	7.00	12.76	0.5485
91.92	9.00	13.34	0.6747
91.94	11.00	13.82	0.7959
91.96	13.00	14.24	0.9132

Velocity Adjustment Factor table for XS # 3 Trans. 3
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
92.43	3.00	5.34	0.5618
92.49	5.00	7.37	0.6785
92.51	6.00	8.30	0.7229
92.53	7.00	9.18	0.7629
92.57	9.00	10.79	0.8340
92.59	11.00	12.27	0.8963
92.62	13.00	13.64	0.9527

Velocity Adjustment Factor table for XS # 4 Trans. 4
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
92.88	3.00	6.19	0.4848
92.94	5.00	7.94	0.6294
92.96	6.00	8.68	0.6915
92.98	7.00	9.35	0.7491
93.01	9.00	10.54	0.8537
93.04	11.00	11.60	0.9483
93.06	13.00	12.55	1.0356

Velocity Adjustment Factor table for XS # 5 Trans. 5
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
93.26	3.00	6.29	0.4771
93.32	5.00	7.78	0.6427
93.35	6.00	8.39	0.7150
93.37	7.00	8.94	0.7827
93.41	9.00	9.92	0.9073
93.44	11.00	10.77	1.0212
93.47	13.00	11.53	1.1271

Velocity Adjustment Factor table for XS # 6 Trans. 6
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF

93.46	3.00	9.68	0.3099
93.51	5.00	10.84	0.4613
93.53	6.00	11.28	0.5318
93.55	7.00	11.67	0.5998
93.57	9.00	12.33	0.7300
93.59	11.00	12.88	0.8541
93.61	13.00	13.36	0.9734

Velocity Adjustment Factor table for XS # 7 Trans. 7
WSLs based on Log/Log Regression

VELs based on 1-vel calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
93.40	3.00	8.51	0.3524
93.50	5.00	9.53	0.5244
93.54	6.00	9.95	0.6032
93.57	7.00	10.32	0.6786
93.64	9.00	10.96	0.8209
93.69	11.00	11.53	0.9544
93.73	13.00	12.03	1.0809

Velocity Adjustment Factor table for XS # 8 Trans. 8
WSLs based on Log/Log Regression

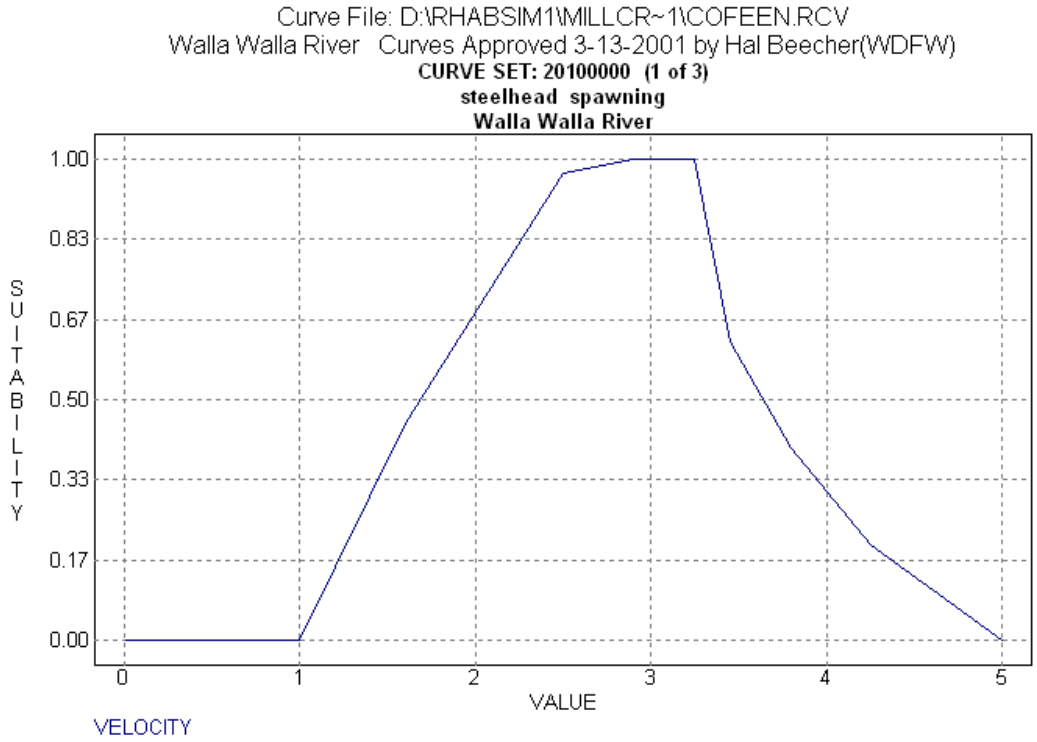
VELs based on 1-vel calibration
Calibration Set Used: 3

WSL	Calib. Flow	Calc Flow	VAF
93.75	3.00	3.03	0.9888
93.89	5.00	5.03	0.9937
93.95	6.00	5.98	1.0033
94.00	7.00	6.90	1.0143
94.09	9.00	8.80	1.0224
94.17	11.00	10.81	1.0171
94.24	13.00	13.32	0.9758

Walla Walla River below HWY 125 data changes to measured velocities for the low flow model.

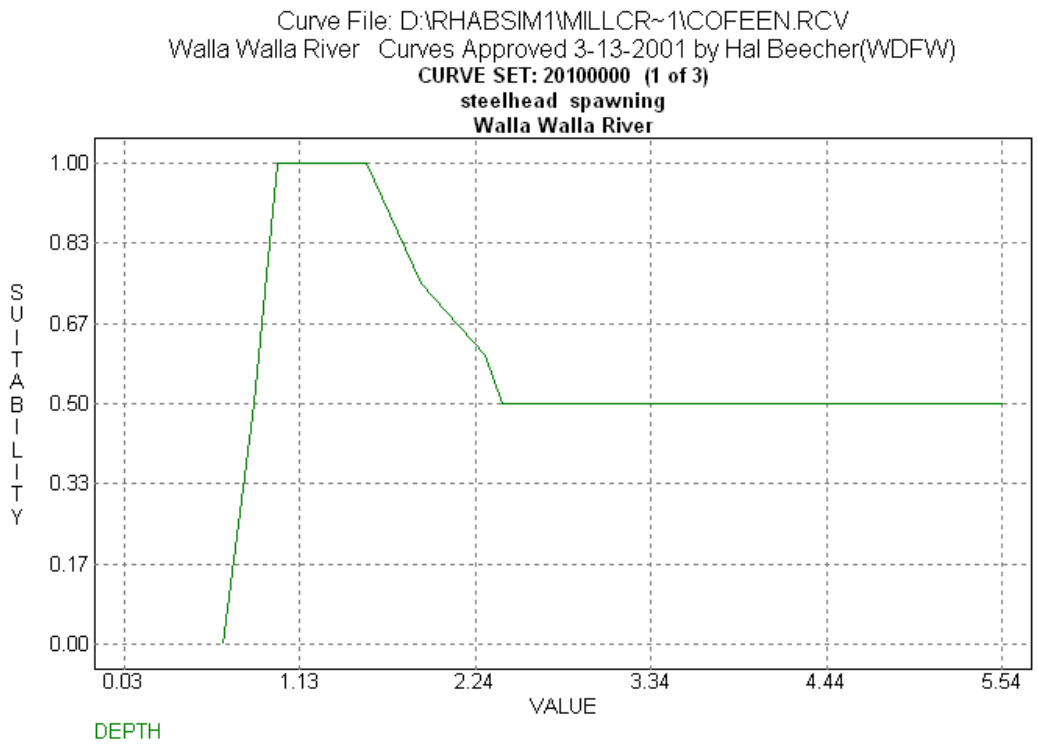
Transect 1	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		26		3			0.029	0.08
Transect 2	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		62		3	0	0.1		
		86		3	0	0.05		
Transect 3	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		20.5		3	0	0.03		
		35		3			0.0147	0.05
		41		3	0	0.03		
Transect 4			No Changes					
Transect 5	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		25		3	0	0.05		
		26.5		3	0	0.05		
		49		3	0	0.05		
Transect 6	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		38.5		3	0	0.03		
		39.6		3	0	0.03		
Transect 7	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		4		3	0	0.1		
		5		3	0.01	0.1		
		18		3	0	0.05		
Transect 8	Station		Vel Set		Original Vel	Changed Vel	Original N	Changed N
		2		3	0	0.05		
		16		3	0	0.01		

Appendix C
Fish Habitat Preference Curves



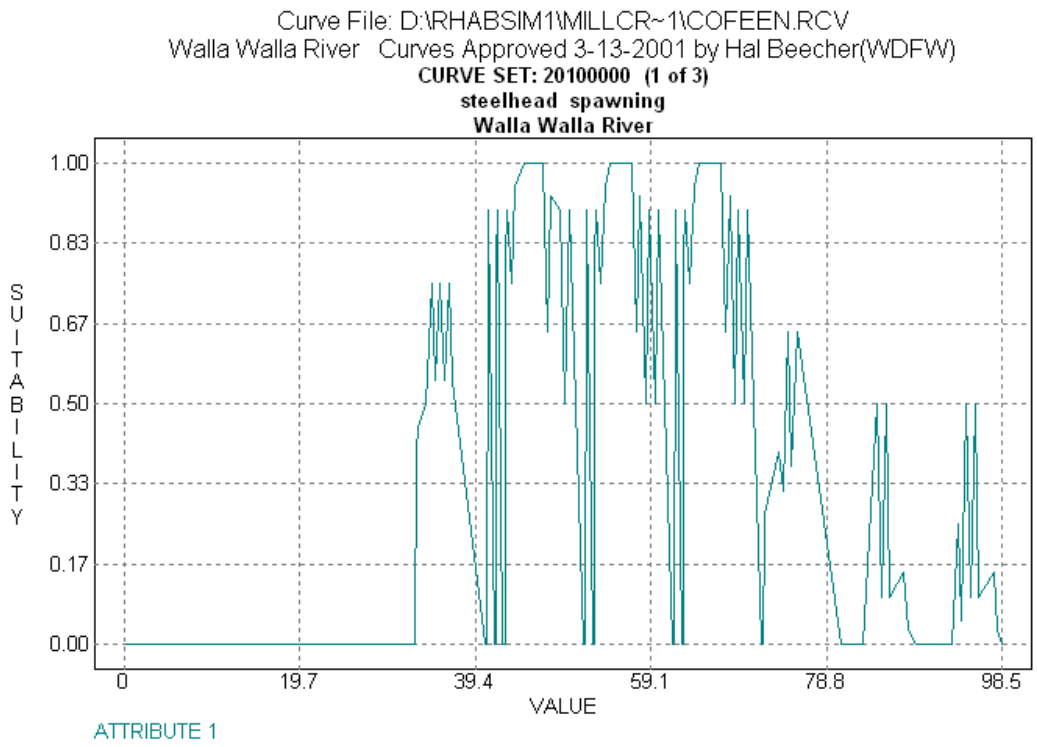
Velocity	Suitability	Velocity	Suitability
0.00	0.000	99.00	0.000
1.00	0.000		
1.60	0.450		
2.50	0.970		
2.90	1.000		
3.25	1.000		
3.45	0.620		
3.80	0.400		
4.25	0.200		
5.00	0.000		

The velocity value is in feet per second.

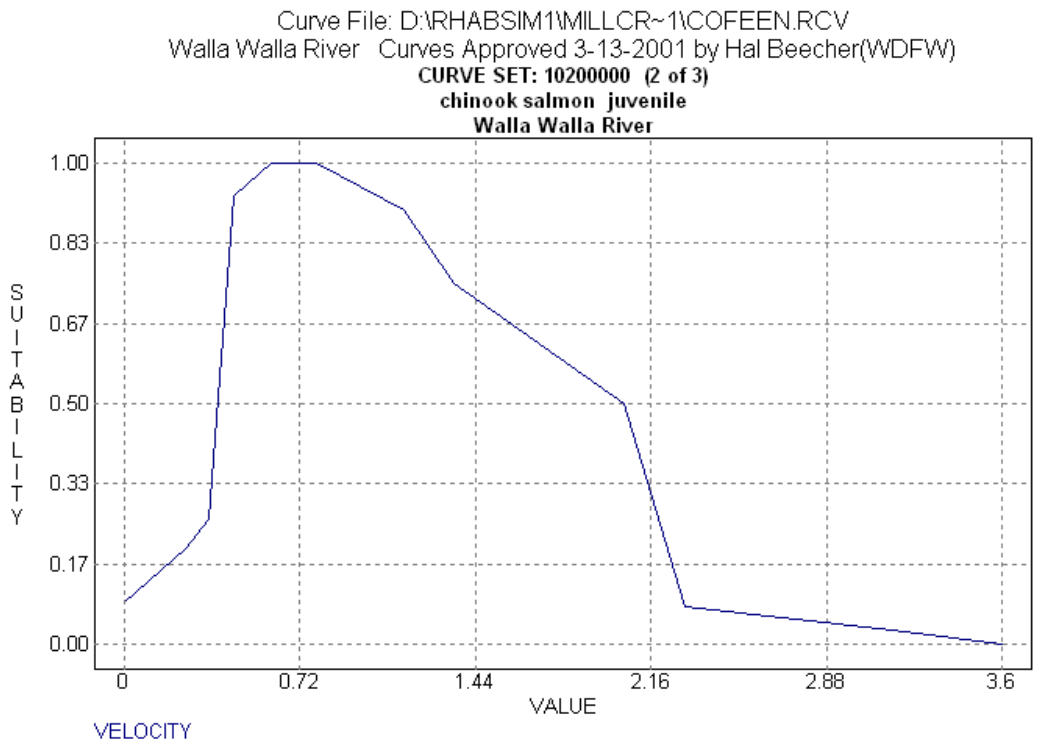


The Depth value is in feet.

Depth	Suitability
0.00	0.000
0.65	0.000
0.85	0.500
1.00	1.000
1.55	1.000
1.90	0.750
2.30	0.600
2.40	0.500
9.90	0.500

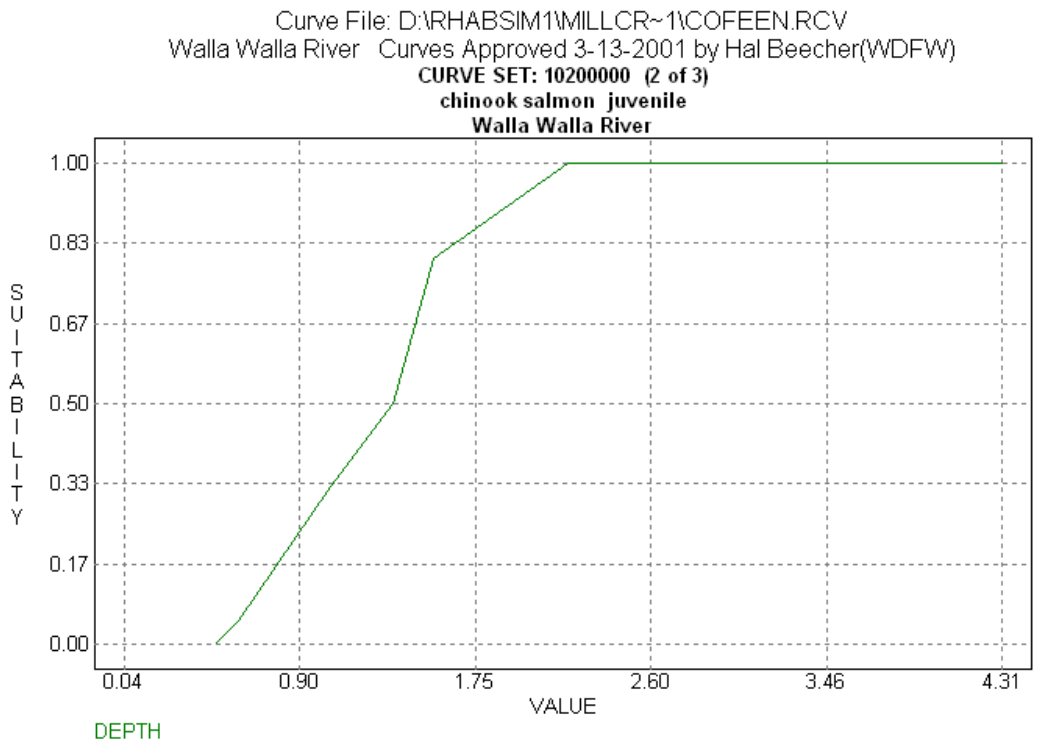


See Appendix D for description of attribute 1 values with are substrate\cover codes.



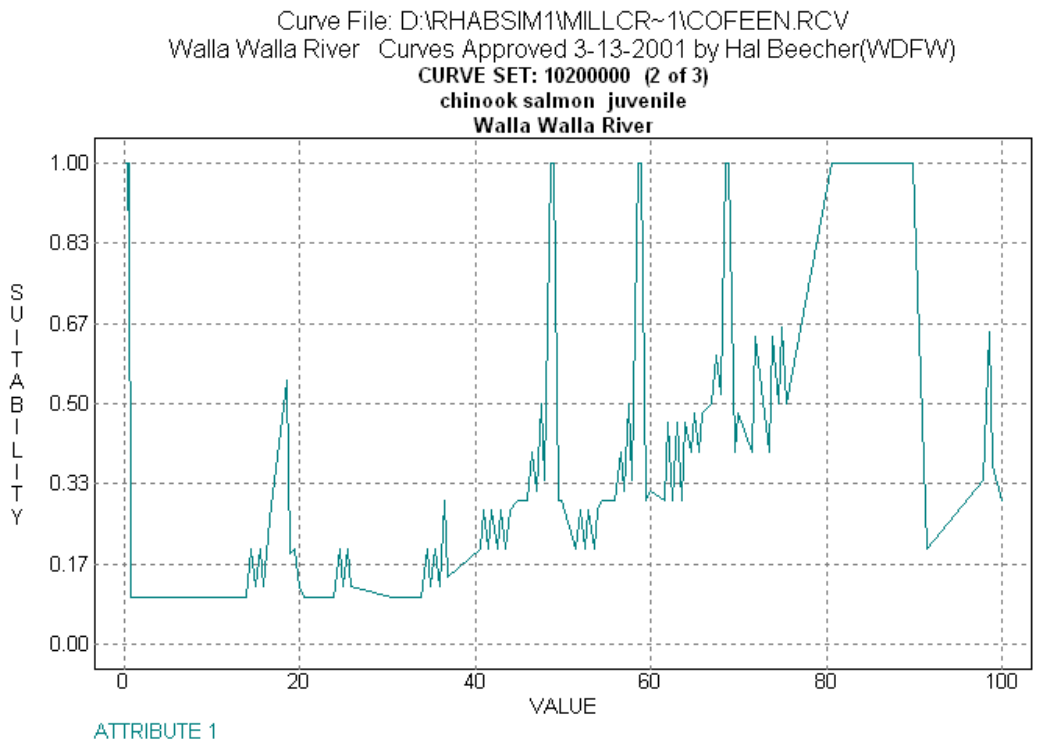
Velocity	Suitability	Velocity	Suitability
0.00	0.090	3.60	0.000
0.25	0.200	9.99	0.000
0.35	0.260		
0.45	0.930		
0.60	1.000		
0.79	1.000		
1.15	0.900		
1.35	0.750		
2.05	0.500		
2.30	0.080		
3.15	0.030		

The velocity value is in feet per second.

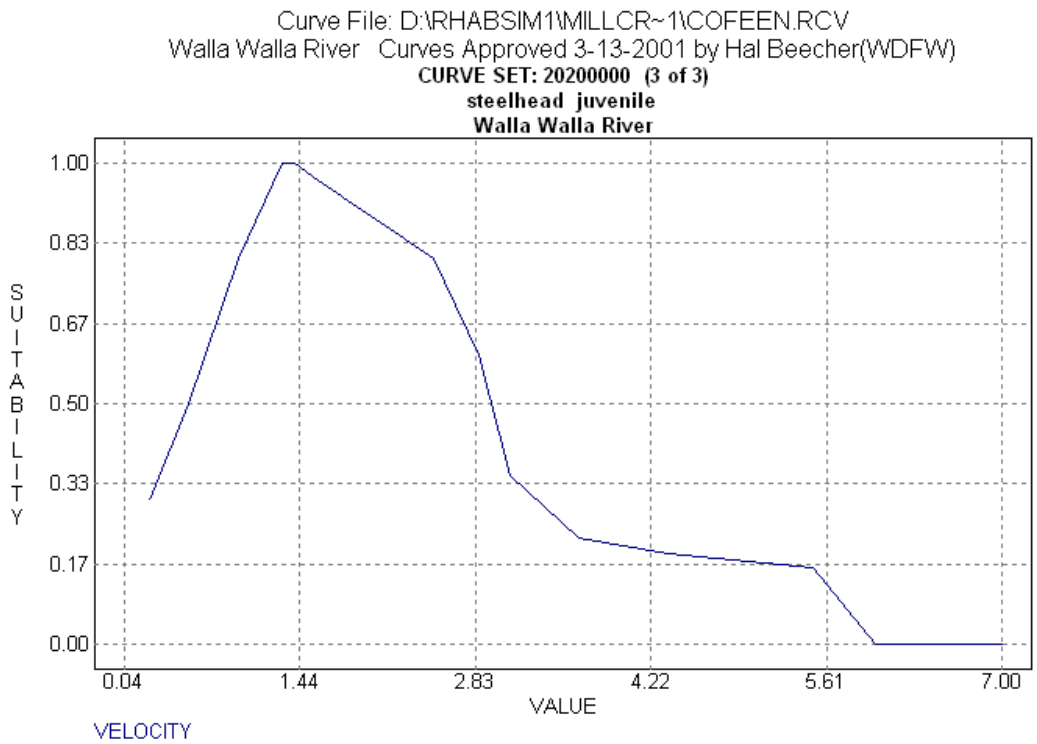


The depth value is in feet.

Depth	Suitability
0.00	0.000
0.49	0.000
0.60	0.050
1.05	0.330
1.35	0.500
1.55	0.800
2.20	1.000
20.00	1.000

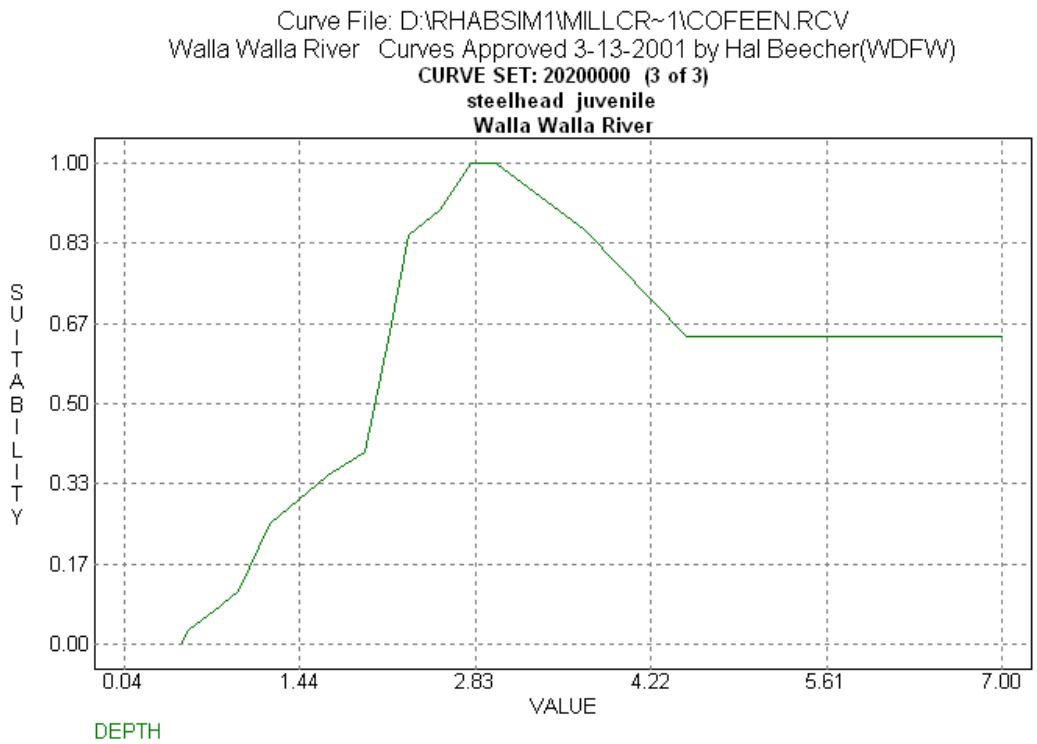


The attribute 1 value is the substrate\cover code. See Appendix D for a description of the code.



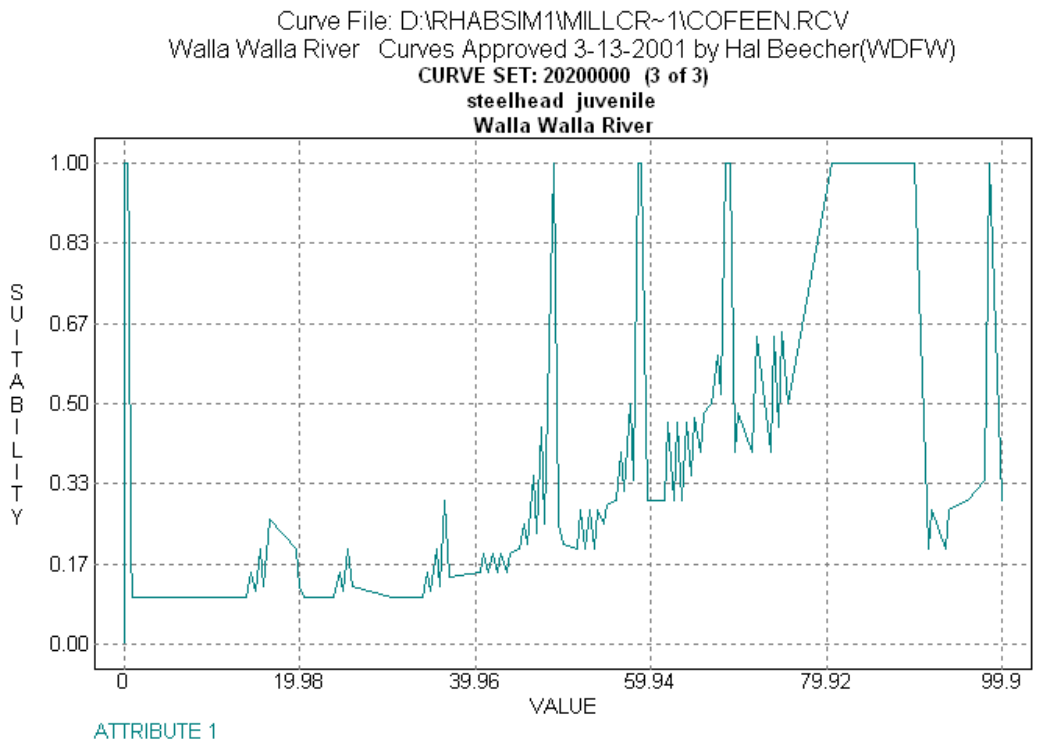
Velocity	Suitability	Velocity	Suitability
0.00	0.230	4.35	0.190
0.25	0.300	5.50	0.160
0.55	0.500	6.00	0.000
0.95	0.800	9.99	0.000
1.30	1.000		
1.39	1.000		
1.55	0.970		
2.50	0.800		
2.85	0.600		
3.10	0.350		
3.65	0.220		

The velocity value is in feet per second.



Depth	Suitability	Depth	Suitability
0.49	0.000	2.55	0.900
0.55	0.030	2.80	1.000
0.75	0.070	2.99	1.000
0.95	0.110	3.70	0.860
1.20	0.250	4.50	0.640
1.65	0.350		
1.95	0.400		
2.15	0.650		
2.30	0.850		

The depth value is in feet.



The attribute value is the substrate\cover code. See Appendix D for a description of the code.

Appendix D
Substrate and Cover Code

Department of Fish and Wildlife and Department of Ecology
Instream Flow Studies Substrate and Cover Code Application

The three-digit code used describes the dominant substrate (the first number), the subdominant substrate (the second number), and the percent of only the dominant substrate (the third number). The percent of the subdominant substrate can be determined by subtraction. For example: a code of 43.6 for steelhead spawning is 60% medium gravel and 40% small gravel for a combined value of 0.8 = [(0.6 x 1.0) + (0.4 x 0.5)]. Dominant substrate is determined by the largest quantity of a certain substrate, not by the size of the substrate. The sum of the percent dominant and the percent subdominant will total 100 percent. The coding will not allow the dominant percent to be less than 50 percent, nor greater than 90 percent. The value of the dominant substrate is multiplied by the percent of the dominant substrate, and that product is added to the product of the subdominant substrate value times the percent of subdominant substrate. The sum of the two products will be a number between 0.0 and 1.0. Overhanging vegetation should be counted as cover if it is within 3 feet of the water surface. Cover values should be incorporated with the substrate values for the salmon and steelhead juvenile life stages.

Type of Substrate or Cover and Corresponding Value for Fish Species and Lifestage

Code	SubstrateSize In Inches	Chinook and Steelhead Juvenile Rearing	Steelhead Spawning
0	Detritus	.1	0
1	Silt, Clay	.1	0
2	Sand	.1	0
3	Small Gravel .1-0.5	.1	.5
4	Medium Gravel .5-1.5	.3	1.0
5	Large Gravel. 1.5-3.0	.3	1.0
6	Small Cobble 3.0-6.0	.5	1.0
7	Large Cobble 6.0-12.0	.7	.3
8	Boulder	1.0	0
9	Bedrock	.3	0
0.1	Undercut Bank	1.0	0
0.2	Overhanging Vegetation	1.0	0
0.3	Root Wad	1.0	0
0.4	Log Jam	1.0	0
0.5	Log Instream	.8	0
0.6	Submerged Vegetation	1.0	0
0.8	Grass/Bushes Up on Bank	.1	0
0.9	Fine Organic Substrate	.1	0