

Washington State Department of Ecology

Stream Discharge Technical Notes

Station ID: 05A105

Station Name: South Fork Stillaguamish River at Jordan Road bridge

Water Year: 2023

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Watershed Description

The basin above this gage covers 181 square miles of steep forested terrain in the North Cascade Mountains. The mean elevation for the basin is 2,450 feet. Elevations range from about 196 feet at the gage to 6,690 feet at the highest point of the headwaters. The mean slope in the basin is over 43%. Forest canopy covers 74% of the basin. Mean annual precipitation for the basin is 95.5 inches. Basin statistics are provided by the United States Geological Survey.

- Drainage area (square miles) = 181

Gage Location

The gage house is on the left bank of the South Fork Stillaguamish River at the south end of the Jordan Road bridge near Granite Falls. The primary gage index is a wire weight gage mounted on the downstream bridge rail.

- Latitude (decimal degrees) = 48.095249° N
- Longitude (decimal degrees) = -121.974555° W

Location Photograph(s)



Figure 1: South Fork Stillaguamish River looking downstream toward the boulder control structure.

Discharge Summary

Discharge is the volumetric flow rate of water that passes through a given cross-sectional area of a creek or river, and is measured in cubic feet per second (cfs). The following section summarizes the streamflow conditions at the gage location during the reported water year.

Table 1: Discharge statistics

Discharge attribute	Number in cfs or number of days
Mean annual discharge	1120 cfs
Median annual discharge	720 cfs
Maximum daily mean discharge	11900 cfs
Minimum daily mean discharge	111 cfs
Maximum instantaneous discharge	24800 cfs
Minimum instantaneous discharge	98 cfs
Discharge equaled or exceeded 10% of recorded time	2430 cfs
Discharge equaled or exceeded 90% of recorded time	130 cfs
Days discharge is greater than range of ratings	0 days
Days discharge is less than range of ratings	0 days
Un-reported days	0 days
Days qualified as estimates	0 days
Modeled days	0 days

Note: Table 1 may not include values in which the predicted discharge exceeds the range of ratings.

Discussion of discharge statistics

No days were greater than the range of ratings. No days were less than the range of ratings. No days were unreported in water year 2023.

There were no estimated days in water year 2023.

Error Analysis Summary

The following section outlines the main component sources of potential error in the annual discharge record at this station. Logger drift is an undesired change in the continuous stage sensor that is not a function of real changes in the water surface elevation. Weighted rating error is the difference between discharges predicted by the rating curve and measured discharges adjusted to the maximum degree of possible error, based on the field observed measurement quality rating.

Table 2: Summary of errors

Error type	Percent of discharge
Potential logger drift error	1.4%
Potential weighted rating error	9.6%
Total potential error	11%

Discussion of error analysis

The small amount of error that exists for logger drift likely stems from turbulence below the radar gage that measures stage. One other potentially small influence on logger drift error may be from bridge vibrations or flexing when a heavy truck goes across it and the stage happens to be measured during this time.

The weighted rating error comes from difficulty in measuring at higher flows. During higher flows there is a great deal of turbulence and standing waves that make obtaining good quality measurements difficult.

Stage Record Summary

Stage is the height of the water surface in a creek, river, or lake above a known datum. The table below summarizes the range of stage observed at this gage during the water year.

Table 3: Summary of recorded stages

Stage record	Feet	Date
Minimum recorded stage	4.60 feet	09/18/2023
Maximum recorded stage	14.74 feet	11/05/2022
Range of recorded stage	10.14 feet	

Discussion of stage record

Typically, lowest flows in the western part of Washington State occur from late September to early October. The minimum recorded stage occurred in late September which falls within the normal range. Maximum recorded stage occurred at the beginning of November 2022 during a large rain event that occurred during water year 2023.

Ratings Summary

Rating curves are developed to define the relationship between observed stage and measured discharge at a gaging station for a specific period. The table below lists which ratings were used during the water year, followed by a discussion of notable aspects of rating development and progression through the year.

Table 4: Rating summary table

Rating number	Period of ratings	Range of ratings in cfs	Number of defining measurements	Rating error (percent)
3	10/1/22 to 9/30/23	45 to 42,800	44	9.6%

Discussion of rating(s)

Rating 3 is a carryover from water year 2022 due to stable control conditions during water year 2023.

High Flow Model Summary

In cases where it is not practical to measure the entire range of discharge at a gaging station, a hydrologic model is developed to estimate discharges significantly greater than the measured range.

- Model type (slope conveyance, other, none) = none
- Range of modeled stage (feet) =
- Range of modeled discharge (cfs) =
- Valid period for model =
- Model confidence =

Discussion of modeled data

Survey Type and Date

Periodic surveys are conducted to establish or validate gage datum continuity, reference marks, and gage height indices. In addition, channel shape and slope are surveyed to develop high flow models.

Table 5: Types of surveys conducted with dates

Survey Type	Date
Levels	2/1/2023

Discussion of surveys

A periodic survey to validate gage datum continuity, reference marks, and gage height indices was conducted. An attempt was made to update the gage datum to North American Vertical Datum of 1988 (NAVD88) but the location of the NAVD88 monument and the type of survey equipment available made it impossible.

Activities Completed

In water year 2023, seven flow measurements and an additional two site visits were conducted.

Appendix