WASHINGTON DEPARTMENT OF ECOLOGY

ENVIRONMENTAL ASSESSMENT PROGRAM

FRESHWATER MONITORING UNIT

STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 19C060

STATION NAME: West Twin River

WATER YEAR: 2012

AUTHOR: Casey Clishe

Introduction

Watershed Description

The West Twin River station is a stand-alone, continuously recording gaging station that has been operating since June 2004 in Water Resource Inventory Area (WRIA) 19. Like the other two drainages within the Strait of Juan de Fuca complex (East Twin River and Deep Creek) , West Twin River is very dynamic and carries substantial loads of bed material and large woody debris during precipitation--driven storm events which typically occur from November through February. The basin geology is composed of Crescent Formation volcanic rock in the upper watershed, marine sedimentary rock in the lower watershed, and terraces of glacial deposits in the lower floodplain (ONF 2002).

Gage Location

The gaging station is located in Clallam County, Washington approximately 20 miles west of Port Angeles. The station is on the left bank approximately 0.2 miles upstream from the mouth.

Table 1. Basin Area and Legal Description

Drainage Area (square miles)	12.7
Latitude (degrees, minutes, seconds)	48 09 47
Longitude (degrees, minutes, seconds)	123 57 10

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	51
Median Annual Discharge (cfs)	26
Maximum Daily Mean Discharge (cfs)	299
Minimum Daily Mean Discharge (cfs)	1.9
Maximum Instantaneous Discharge (cfs)	364
Minimum Instantaneous Discharge (cfs)	1.5
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	148
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	4.6
Number of Days Discharge is Greater Than Range of Ratings	18
Number of Days Discharge is Less Than Range of Ratings	0
Number of Un-Reported Days	18
Number of Days Qualified as Estimates	69
Number of Modeled Days	0

Note: Statistics displayed in Table 2 may not include values in which the predicted discharge exceeds the range of ratings.

Table 2 Discussion (Discharge Statistics)

Eighteen total days were not factored into the discharge statistics reported in Table 2. These 18 days were some of the highest discharge values recorded during the water, year so actual values were higher than those reported in the table. A high number of days were quality coded estimated due to exceedances of the logger drift error thresholds. The exceedances typically occur during baseflow periods when small differences between the primary gage index and the continuous stage record result in large percent differences in discharge. The largest hydrologic event of the year peaked on November 23, 2011. A series of moderately large events continued throughout the fall and winter months. The steady decline to baseflow conditions began in early May. While less pronounced than past years, the diurnal oscillation in discharge caused by evapotranspiration appeared again in late September.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	10.5
Potential Weighted Rating Error (% of discharge)	8.5
Total Potential Error (% of discharge)	19.0

Table 3 Discussion (Error Analysis)

Total Potential Error (TPE) is the cumulative value of the potential logger drift error and the potential weighed rating error. Error surrounding any predicted discharge value is acquired in a number of ways, ranging from variability in the quality of any particular discrete discharge measurement to the operational performance of a datalogger and the sonde measuring stage. Total Potential Error defines the expected range for any predicted discharge value. For example, if the TPE is 10.0 % and the predicted discharge value is 100 cfs, the range in which the actual predicted value lies is 90 to 110 cfs. For 53 of the recorded days, the agreement between the stage on the logger and discrete observations of the primary gage index met standards defining stable drift. Sixty--nine days were quality coded as estimated due to logger drift error exceedances. The average potential logger drift error was reduced during the water year, probably due to repositioning of the slant pipe housing the pressure transducer. While the evapotranspiration signal re-appeared in late summer, the magnitude of the signal was less.

Table 4. Stage Record Summary

Minimum Recorded Stage (feet)	2.68
Maximum Recorded Stage (feet)	7.08
Range of Recorded Stage (feet)	4.40

Table 4 Discussion (Stage Record)

The stage record for WY2012 is continuous and complete. One gap in the stage record was filled using regressed, well-correlated stage data from an adjacent station. Discrepancies between the observed primary gage index and the continuous stage record were reconciled by automated adjustments of the data using the data shift function. Once again, a period of evapotranspiration was recorded in the stage signal during late August and September. While the recorded signal appears to be accurate, the small differences between the observed primary gage index and the logged stage value during baseflow periods resulted in large differences in the percentage of discharge.

Table 5. Rating Table Summary

Rating Table No.	112	121	102
Period of Ratings	10/01-10/22	10/22-11/26	11/22-12/28
Range of Ratings (cfs)	0.001-331	2.8-331	0.001-397
No. of Defining Measurements	7	4	7
Rating Error (%)	11.4	5.5	9.0

Rating Table No.	902	103	903
Period of Ratings	12/27-04/10	03/28-05/01	04/29-08/20
Range of Ratings (cfs)	0.001-381	0.001-397	0.001-381
No. of Defining Measurements	12	7	12
Rating Error (%)	8.9	9.0	8.9

Rating Table No.	13	14	
Period of Ratings	07/10-08/21	08/21-09/30	
Range of Ratings (cfs)	2.3-9.3	0.001-531	
No. of Defining Measurements	1	3	
Rating Error (%)	4.7	11.0	

Table 5 Discussion (Rating Tables)

Eight ratings were required to predict discharge for the water year. The very large number of ratings required to predict discharge at West Twin River speaks to the extremely dynamic nature of the channel geometry. Substrate and large woody debris is mobilized during virtually all moderate and large storm events. During the water year the ratings shifted primarily back and forth between pre-existing curves. Two new ratings, 13 and 14 were created to predict discharge later in the year.

Table 6. Model Summary

Model Type (Slope conveyance, other, none)	none
Range of Modeled Stage (feet)	
Range of Modeled Discharge (cfs)	
Valid Period for Model	
Model Confidence	

Table 6 Discussion (Modeled Data)

Table 7. Survey Type and Date (station, cross section, longitudinal)

Type	Date

Table 7 Discussion (Surveys)

Activities Completed

Due to channel filling and migration, the station was again moved to a new location approximately 50 meters upstream on August 21, 2012.