Summary of 2007 California District ADCP Check Measurements
Sacramento River at Colusa, CA
May 30, 2007

Introduction

To ensure that the best possible discharge measurements are collected and that all acoustic discharge measurement equipment is properly functioning, the USGS Office of Surface Water recommends that all acoustic Doppler current profilers (ADCP) used for measuring discharge be checked at least one time per year at a stable gage. In 2007 12 units were tested; 4 from USGS hydrodynamics group, 3 from the California Department of Water Resources, and 1 each from the USGS Sacramento, Redding and Ukiah field offices, U.C. Davis, and the Yurok Tribe Environmental Program.

The 2007 ADCP check was conducted at USGS gaging station 11389500, the Sacramento River at Colusa, CA (Figure 1). This station was selected by the USGS Sacramento Field Office staff because it has a strong rating and has been very consistent over time. General information regarding this station can be obtained from the Station Information Page available through NWIS Web[1]. The testing location is a wide and shallow site, the channel width is on the order of 300 feet, and the depth ranges from 5 feet to a maximum of approximately 11 feet (Figure 2). Channel characteristics at this location lend particular importance to boat operation to minimize pitch and roll variations and maintain proper transducer depth. Problems in either of these areas can produce biased measurements.

Figure 1: USGS Station 11389500, Sacramento River at Colusa, CA

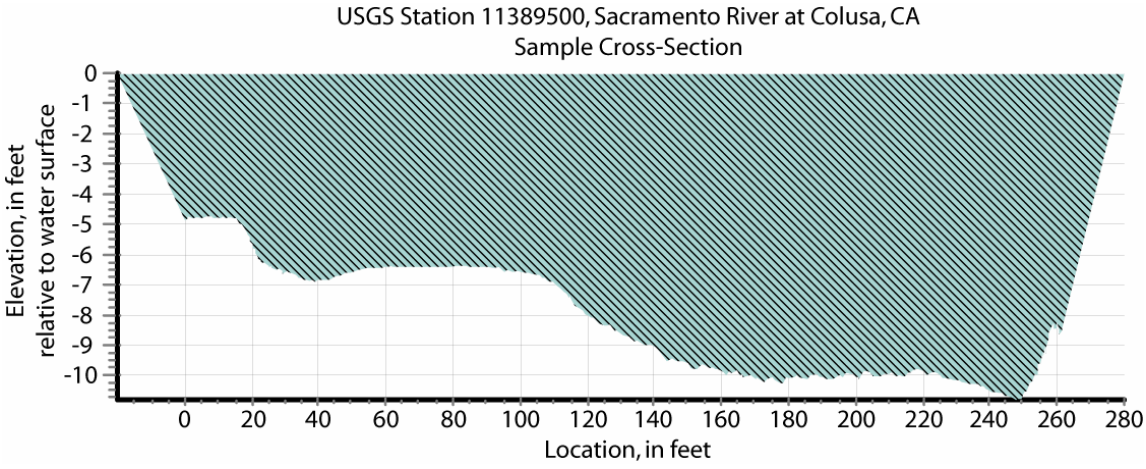


Figure 2: USGS Station 11389500, Sacramento River at Colusa, CA, sample cross-section acquired from downward-looking ADCP.

[1] http://waterdata.usgs.gov/nwisweb/local/state/ca/text/11389500-manu.html.

Results for the twelve units tested were generally good and suggest that there are no overwhelming problems with any of the units (Table 1). Specific details associated with each unit will follow in the results section.

Table 1: Mean deviations from calculated flow for each unit

ADCP Unit	Mean difference from Gage	
	Bottom Tracking	GPS
#1681	+1.6%	No Data
#5434	+2.4%	No Data
#1974	-3.9%	+0.2%
#3475	-3.0%	-0.7%
#7332	-1.4%	-1.2%
#2342	+1.1%	2.8%
#7151	-4.1%	-3.1%
#3015	-3.7%	-3.2%
#2577	-1.0%	-0.3%
#3317	-0.5%	+0.9%
#481	+0.3%	+1.2%
#902	+0.6%	-3.4%

General issues that will be discussed include procedures prior to and during measurements followed by a synopsis of the results associated with each. The data can be found in an Appendix A: Summary of Results, 2007 ADCP Check.

Prior to measurement:

A number of procedures should be carried out prior to deployment of any ADCP unit to ensure proper operation and collection the best possible discharge measurements.

- *Note Serial Number*: Noting which unit deployed allows for tracking of performance over time and increases repeatability of measurements
- *Synchronize Clocks*: Flows can vary greatly with time, especially in areas of tidal influence. It is important to confirm that the clock used for the measurement is synchronized to the datalogger clock for consistency between measurements.
- *ADCP Self Test*: The self test is an automated procedure that needs to be performed prior to deployment of an ADCP unit to ensure that it is functioning properly.
- *Compass Calibration*: The compass calibration and subsequent evaluation ensure collection of reliable location and directional data. Proper operation is indicated by an error of less than 0.5˚ during the compass evaluation.
- *Bottom Check*: A bottom check should be carried out to determine if there a moving bottom. A moving bottom dictates use of GPS rather than bottom tracking during measurements.
- *Thermistor Check*: Temperature data collected by the ADCP should be verified by a thermistor.
- *Transducer Depth*: Transducer depth should be measured and noted as the unit is deployed. Depth should remain constant throughout the deployment to ensure consistency in the data. Transducer depth can be affected by boat operations and by movement within the boat.

- *Ambiguity Velocity (WV)*: The default WV value of 170 is insufficient to allow three transmission code repeats. A WV value of 175 should be used to provide a little cushion for adjustments in speed of sound for water conditions.

Table 2 summarizes procedures by each of the seven groups prior to deployment of ADCP units.

Table 2: Setup Procedures

☑ - Procedure Completed X – Procedure Not Completed NFN – No Field Notes

	Note Serial #	Synch. Clocks	Self Test	Compass Cal.	Bottom Check	Thermistor Check	Transducer Depth Noted	WV >170
U.C. Davis								
#1681	☑	NFN	X	X	X	NFN	NFN	☑
Yurok Tribe Environmental Program								
#5434	☑	X	☑	☑	☑	☑	☑	☑
DWR								
#1974	☑	☑	☑	☑	☑	☑	☑	☑
#3475	☑	☑	☑	☑	☑	☑	☑	☑
#7332	☑	X	☑	☑	☑	X	☑	☑
USGS Redding Field Office								
#2342	☑	☑	☑	☑	☑	☑	☑	☑
USGS Ukiah Field Office								
#7151	☑	NFN	☑	☑	☑	NFN	NFN	X
USGS Sacramento Field Office								
#3015	☑	☑	☑	☑	☑	☑	☑	X
USGS Hydrodynamics								
#2577	☑	☑	☑	☑	☑	☑	☑	☑
#3317	☑	☑	☑	☑	☑	☑	☑	☑
#481	☑	☑	☑	X	X	☑	☑	☑
#902	☑	☑	☑	X	X	☑	☑	☑

Field Procedures:

During ADCP measurements, certain protocols should be observed to ensure the highest possible quality of data. At the beginning and ending of each transect, a range finder should be used to measure the distance to the bank and the ADCP unit should be held in a stationary position for the recording of ~10 ensembles to allow for an accurate estimate of the edge flow to be computed. Edge locations should be as close as possible to the bank while maintaining a minimum of 2 – 3 good bins in the profile.

Figure 3: ADCP testing in action.

Transects should be made in between five and ten minutes with the boat speed maintained approximately at or below the

velocity of the water. Care should be taken by the boat operator during transects to maintain a straight path, perpendicular to the direction of flow, and minimize pitch and roll of the instrument as this can affect the accuracy of data collected.

Thorough notes should be kept regarding flow conditions (including boat wakes), bottom conditions, and surrounding features to identify the exact transecting location.

An appropriate range finder was utilized by all crews except the U.C. Davis group to determine edge location. Each of the crews hovered near the edge at the beginning and ending of each transect while maintaining 2-3 good bins in the measurement profile.

Figure 4: ADCP testing: Range finder used to determine edge estimate. "End-of-transect" marker buoys also deployed for use.

Measurement Results and Observations:

Results from the 2007 ADCP check were generally good and indicated that each unit was operating normally. The detailed results for each individual measurement are tabulated in Appendix A: Summary of Results, 2007 ADCP Check. Mean differences between the measured discharge and the discharge recorded at the gage were less than 5% for each unit and standard deviations of each measurement group were low.

Although the differences between the discharge reported at the gage and the measured discharge were within 5%, there are biases with some of the groups of measurements. Instrumentation errors are generally random and are scattered evenly about the reported station mean flow. As discussed in the introduction, this location is wide and shallow (Figure 2). It is likely that inaccurately measuring the correct transducer depth is responsible for the measurement biases seen in the data. Although in this case the biases are small, they are obvious and correctable. Care needs to be given to accurately measuring the initial transducer depth and then maintaining a consistent transducer depth throughout the duration of the measurements.

In order to illustrate the impact that small inaccuracies in transducer depth measurements can have on the final discharge results, measurements collected by system SN 481 were modified during post-processing to reflect a three-inch error in the entered transducer depth in the user configuration file (Table 3).

Table 3: Comparison of Measurement Results with Incorrect Transducer Depth

	Initial Configuration File		Modified Configuration File: Three-inch transducer depth error	
Gage Discharge (cfs)	Measured Discharge (cfs)	Difference (Measured - Gage) (cfs)	Measured Discharge (cfs)	Difference (Measured - Gage) (cfs)
6900	6841	-59	7093	193
6900	6836	-64	7088	188
6900	6922	22	7176	276
6900	7011	111	7265	365
6900	6923	23	7170	270
6900	6990	90	7243	343
Average		**21 cfs (0.3%)**		**273 cfs (4.0%)**

System SN 481 was selected because it reported the lowest difference on average between the gage-reported discharge and the measured discharge: 21 cfs, or 0.3%. Initially the ADCP measurements were randomly distributed about the discharge values reported by the gage. However, upon introducing a modest three-inch error in the transducer depth, the results were no longer randomly distributed around the reported discharge at the gage, but were consistently measuring several hundred cubic feet per second above the reported discharge values at the gage (Figure 5). While the results are still within the threshold for good data, these errors are controllable and attention to minimizing this type of error is very important.

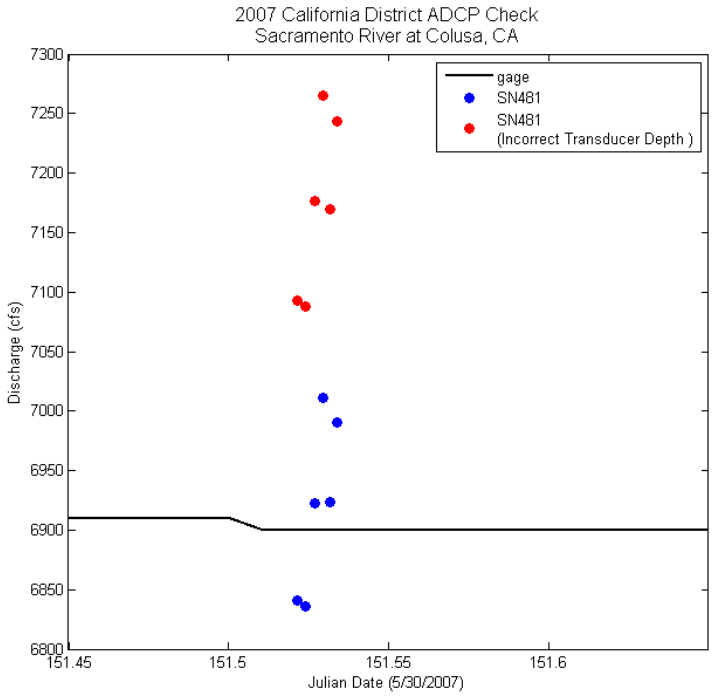


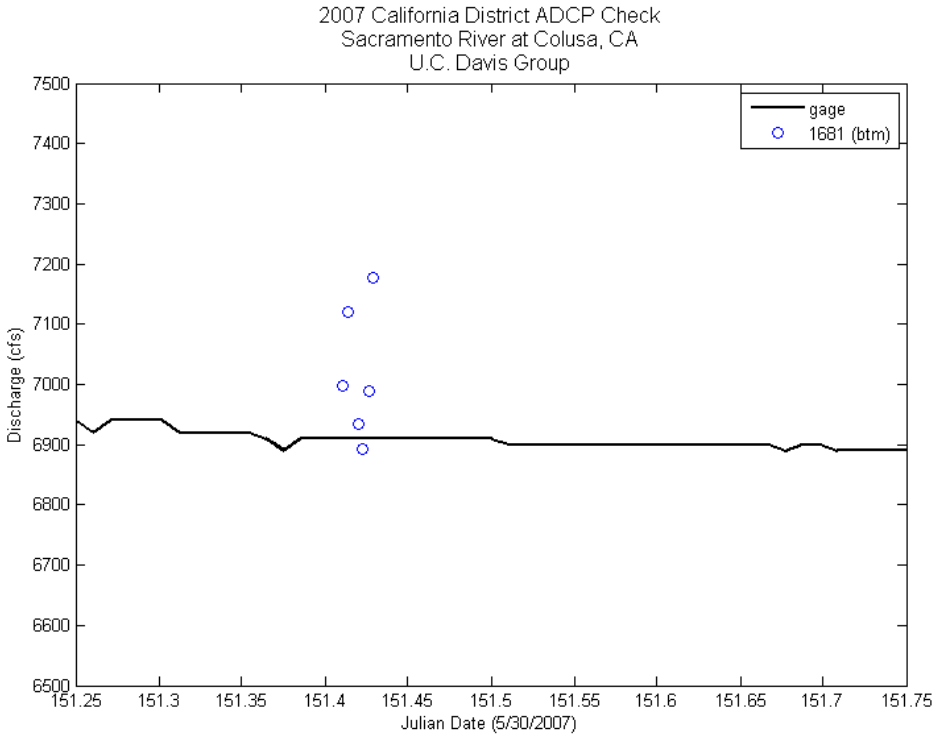
Figure 5: Comparison of measurements made by SN481 using both the initial and modified configuration file

U.C. Davis:

U.C. Davis #1681: The U.C. Davis group collected six measurements with this unit. This unit performed very well in bottom tracking mode with a mean difference of 109 cfs (1.6 %) from the gage-reported discharge and a standard deviation of 110 cfs between the measurements. The maximum difference, in bottom tracking mode, from the gage-reported discharge was 268 cfs (3.9 %). No GPS data was collected with this unit.

Observations:

- Measurement times average 4 minutes per transect.
- Boat operation was good throughout measurements. Pitch and roll was steady during all transects and boat speeds were maintained below water speeds.
- No field notes were submitted with measurement data.

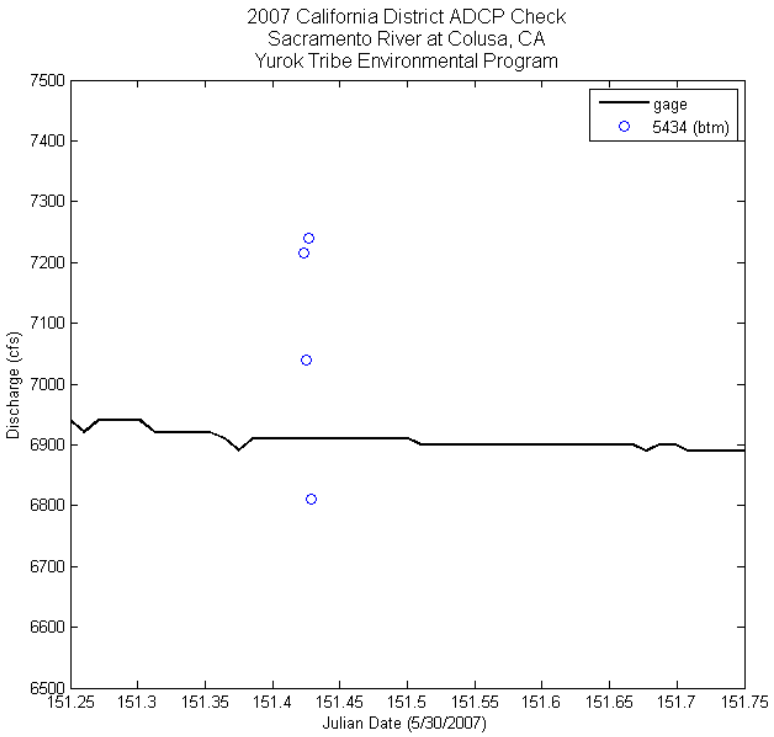


Yurok Tribe Environmental Program (Tested by the USGS Eureka Field Office):

Yurok #5434: Four measurements were collected with this unit. This unit performed very well in bottom tracking mode with a mean difference of 167 cfs (2.4 %) from the gage-reported discharge and a standard deviation of 199 cfs between the measurements. The maximum difference, in bottom tracking mode, from the gage-reported discharge was 330 cfs (4.8 %). No GPS data was collected with this unit.

Observations:

- Measurement times averaged approximately 3 minutes.
- Boat speeds were maintained at or below water speeds but two measurements showed variation to pitch and roll values.



Department of Water Resources:

DWR collected 8 measurements with each of 3 units: #1974, # 3475 and #7332.

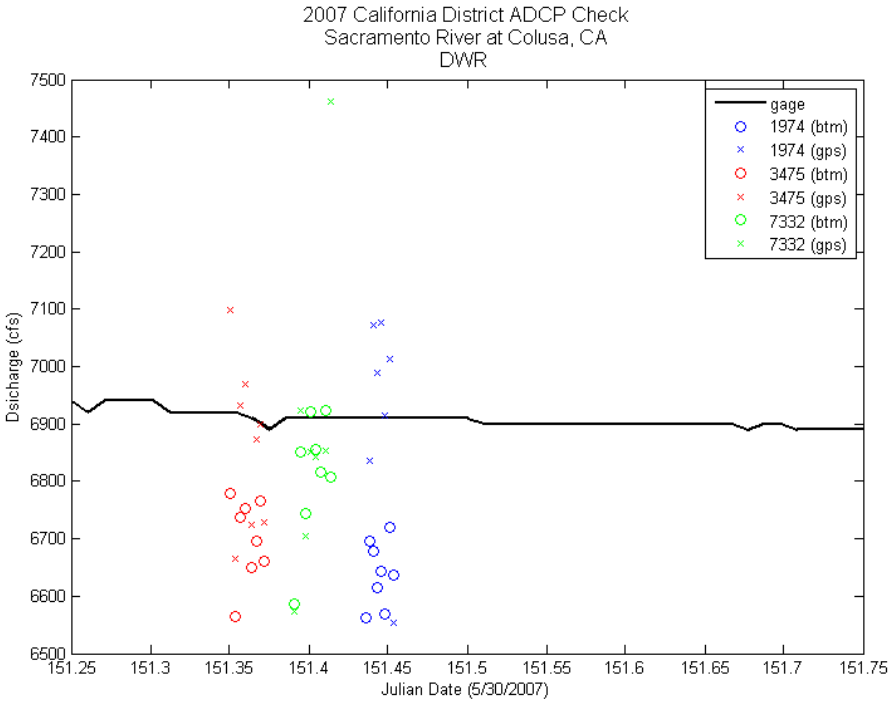
DWR #1974: Overall this unit performed well in bottom tracking mode and very well in GPS mode with a mean difference from the gage-reported discharge of -270 cfs (-3.9 %) in bottom tracking mode and 12 cfs (0.2 %) in GPS mode. Maximum differences between the measured and gage-reported discharges were -348 cfs (-5.0 %) and -357 cfs (-5.2 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 57 cfs in bottom tracking mode and 184 cfs in GPS mode.

DWR #3475: Overall this unit performed well in bottom tracking mode and very well in GPS mode with a mean difference from the gage-reported discharge of -210 cfs (-3.0 %) in bottom tracking mode and -49 cfs (-0.7 %) in GPS mode. Maximum differences between the measured and gage-reported discharges were -356 cfs (-5.1 %) and -255 cfs (-3.7 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 74 cfs in bottom tracking mode and 144 cfs in GPS mode.

DWR #7332: Overall this unit performed very well in bottom tracking mode and fairly well in GPS mode with a mean difference from the gage-reported discharge of -97 cfs (-1.4 %) in bottom tracking mode and -83 cfs (-1.2 %) in GPS mode. Maximum differences between the measured and gage-reported discharges were -323 cfs (-4.7 %) and -449 cfs (-7.2 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 109 cfs in bottom tracking mode and 309 cfs in GPS mode.

Observations:

- Measurements were consistently completed in less than 5 minutes with all units. 16 out of 24 measurements spanned less than 4 minutes.
- Boat operation was generally good during measurements. There were periods of varying pitch and roll during measurements. Boat speeds were consistently at or below the speed of the water.
- Field notes were thorough in identifying transect locations, site conditions, and in noting periods of wake/wave influence on measurements.



USGS - Field Offices

The USGS Field Offices collected a total of 4 measurements with each of 3 units: Redding #2342, Ukiah #7151, and Sacramento #3015.

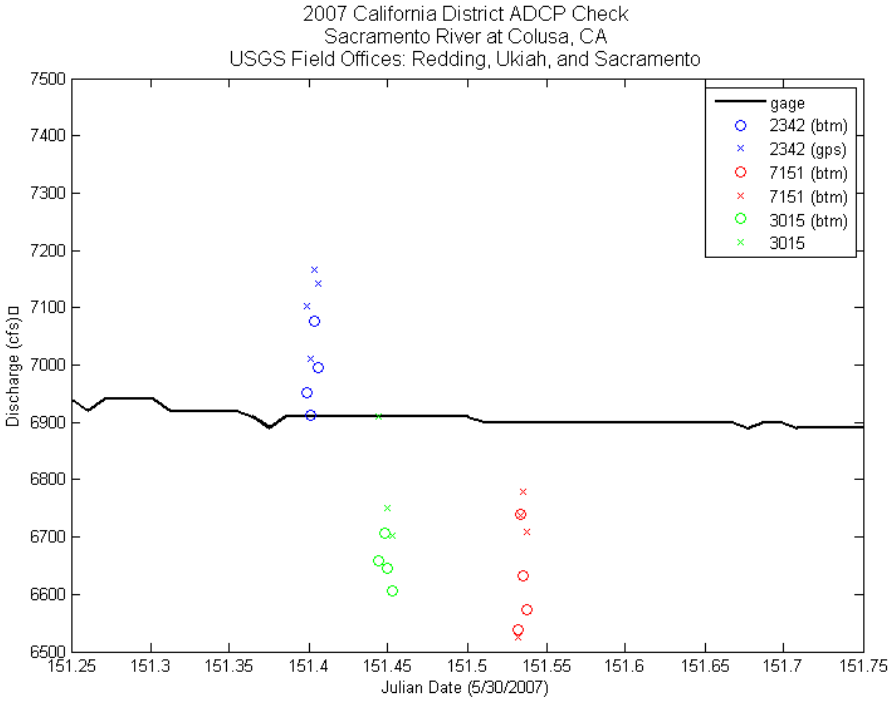
Redding #2342: Overall this unit performed very well in bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of 75 cfs (1.1%) in bottom tracking mode and 195 cfs (2.8%) in GPS mode. Maximum differences between the measured and gage-reported discharges were 168 cfs (2.4 %) and 256 cfs (3.7%) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 71 cfs in bottom tracking mode and 68 cfs in GPS mode

Ukiah #7151: Overall this unit performed well in both bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of -280 cfs (-4.1%) in bottom tracking mode and -212 cfs (-3.1 %) in GPS mode. Maximum differences between the measured and gage-reported discharges were -362 cfs (5.2%) and -374 cfs (-5.4 %) in bottom tracking mode and GPS mode, respectively. The standard deviation of the measurements was good in both modes; 88 cfs in bottom tracking mode and 112 cfs in GPS mode.

Sacramento #3015: Overall this unit performed well in both bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of -255 cfs (-3.7%) in bottom tracking mode and -218 cfs (-3.2 %) in GPS mode. Maximum differences between the measured and gage-reported were -304 cfs (4.4%) and -504 cfs (-7.3 %) in bottom tracking mode and GPS mode, respectively. The standard deviation of the measurements was good in both modes; 42 cfs in bottom tracking mode and 210 cfs in GPS mode.

Observations:

- Measurements made with each unit averaged just more than three minutes each.
- Boat operation was fairly good for each group. Boat speeds were consistently maintained below water speed. Some instances of increased pitch and roll values possibly indicate crew movement within the boat during measurements.
- Field notes were taken by the Redding and Sacramento field office crews. Field notes were not submitted by the Ukiah field office.



USGS - Hydrodynamics Group

The USGS Hydrodynamics Group collected 6 measurements with each of 4 units: #2577, # 3317, SN481, and SN902.

Hydrodynamics #2577: Overall this unit performed very well in bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of -69 cfs (-1.0%) in bottom tracking mode and -23 cfs (-0.3%) in GPS mode. Maximum differences between the measured and gage-reported discharges were -346 cfs (-5.0 %) and -240 cfs (3.5 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 171 cfs in bottom tracking mode and 179 cfs in GPS mode.

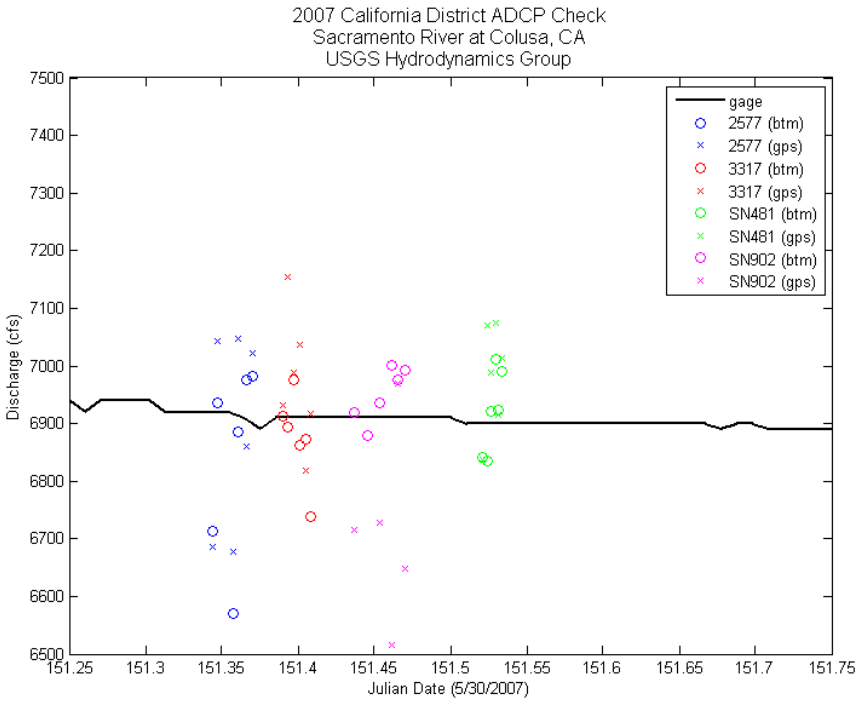
Hydrodynamics #3317: Overall this unit performed very well in bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of -34 cfs (-0.5 %) in bottom tracking mode and 65 cfs (0.9 %) in GPS mode. Maximum differences between the measured and gage reported discharges were -172 cfs (-2.5 %) and -244 cfs (3.5 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 79 cfs in bottom tracking mode and 115 cfs in GPS mode.

Hydrodynamics SN481: Overall this unit performed very well in bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of 21 cfs (0.3%) in bottom tracking mode and 84 cfs (1.2%) in GPS mode. Maximum differences between the measured and gage-reported discharges were 111 cfs (1.6%) and 176 cfs (2.5 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 73 cfs in bottom tracking mode and 93 cfs in GPS mode.

Hydrodynamics SN902: Overall this unit performed very well in bottom tracking mode and GPS mode with a mean difference from the gage-reported discharge of 41 cfs (0.6%) in bottom tracking mode and -236 cfs (-3.4 %) in GPS mode. Maximum differences between the measured and gage-reported discharges were -91 cfs (-2.5 %) and -442 cfs (-6.4 %) in bottom tracking and GPS modes, respectively. The standard deviation of the measurements was good in both modes; 48 cfs in bottom tracking mode and 179 cfs in GPS mode.

Observations:

- 12 out of 24 measurements spanned more than 5 minutes. 6 out of 24 measurements spanned less than 4 minutes.
- Boat operation was good for all transects. Pitch and roll was maintained within 1 degree of zero on all but one measurement and boat speeds were consistently at or below the speed of the water.
- Notes were thorough regarding transecting locations, site conditions and in noting wave/wake influence on measurements.


2007 California District ADCP Check
Sacramento River at Colusa, CA
USGS Hydrodynamics Group
Discharge (cfs)
Julian Date (5/30/2007)
gage
2577 (btm)
2577 (gps)
3317 (btm)
3317 (gps)
SN481 (btm)
SN481 (gps)
SN902 (btm)
SN902 (gps)
7500
7400
7300
7200
7100
7000
6900
6800
6700
6600
6500
151.25
151.3
151.35
151.4
151.45
151.5
151.55
151.6
151.65
151.7
151.75

Summary of Results

Discharge Comparisons
2007 ADCP Check
Sacramento River at Colusa, CA (COL), 5/30/2007

	Q_{gage} (cfs)	$Q_{doppler(BTM)}$ (cfs)	$Q_{doppler(GPS)}$ (cfs)	**Difference (BTM)** $Q_{doppler} - Q_{gage}$	**Difference (GPS)** $Q_{doppler} - Q_{gage}$	**Percent Difference (BTM)** $(Q_{doppler} - Q_{gage}) / Q_{gage}$	**Percent Difference (GPS)** $(Q_{doppler} - Q_{gage}) / Q_{gage}$
U.C. Davis					**1681**		
	6910	6998	No Data	88	N/A	1.3%	N/A
	6910	7120	No Data	210	N/A	3.0%	N/A
	6910	6934	No Data	24	N/A	0.3%	N/A
	6910	6892	No Data	-18	N/A	-0.3%	N/A
	6910	6990	No Data	80	N/A	1.2%	N/A
	6910	7178	No Data	268	N/A	3.9%	N/A
			Max	**268**		**3.9%**	
			Mean	**109**		**1.6%**	
			Std. Dev.	**110**		**1.6%**	
Yurok Tribe Environmetnal Program					**5434**		
	6910	7216	No Data	306	N/A	4.4%	N/A
	6910	7038	No Data	128	N/A	1.9%	N/A
	6910	7240	No Data	330	N/A	4.8%	N/A
	6910	6811	No Data	-99	N/A	-1.4%	N/A
			Max	**330**		**4.8%**	
			Mean	**167**		**2.4%**	
			Std. Dev.	**199**		**2.9%**	
DWR					**1974**		
	6910	6562	No Data	-348	N/A	-5.0%	N/A
	6910	6697	6837	-213	-73	-3.1%	-1.1%
	6910	6678	7071	-232	161	-3.4%	2.3%
	6910	6615	6989	-295	79	-4.3%	1.1%
	6910	6643	7076	-267	166	-3.9%	2.4%
	6910	6569	6916	-341	6	-4.9%	0.1%
	6910	6720	7014	-190	104	-2.7%	1.5%
	6910	6638	6553	-272	-357	-3.9%	-5.2%
			Max	**-348**	**-357**	**-5.0%**	**-5.2%**
			Mean	**-270**	**12**	**-3.9%**	**0.2%**
			Std. Dev.	**57**	**184**	**0.8%**	**2.7%**
DWR					**3475**		
	6920	6780	7099	-140	179	-2.0%	2.6%
	6920	6564	6665	-356	-255	-5.1%	-3.7%
	6918	6738	6932	-180	15	-2.6%	0.2%
	6914	6754	6969	-161	54	-2.3%	0.8%
	6911	6649	6724	-262	-186	-3.8%	-2.7%
	6906	6695	6874	-211	-32	-3.1%	-0.5%

6901	6765	6899	-136	-2	-2.0%	0.0%
6895	6661	6728	-234	-167	-3.4%	-2.4%
		Max	**-356**	**-255**	**-5.1%**	**-3.7%**
		Mean	**-210**	**-49**	**-3.0%**	**-0.7%**
		Std. Dev.	**74**	**144**	**1.1%**	**2.1%**

DWR				**7332**		
6910	6587	6573	-323	-337	-4.7%	-4.9%
6910	6851	6924	-59	14	-0.9%	0.2%
6910	6743	6704	-167	-206	-2.4%	-3.0%
6910	6922	6850	12	-60	0.2%	-0.9%
6910	6856	6842	-54	-68	-0.8%	-1.0%
6910	6816	6411	-94	-499	-1.4%	-7.2%
6910	6923	6853	13	-57	0.2%	-0.8%
6910	6808	7462	-102	552	-1.5%	8.0%
		Max	**-323**	**-499**	**-4.7%**	**-7.2%**
		Mean	**-97**	**-83**	**-1.4%**	**-1.2%**
		Std. Dev.	**109**	**309**	**1.6%**	**4.5%**

USGS Redding Field Office				**2342**		
6910	6953	7103	43	193	0.6%	2.8%
6910	6912	7010	2	100	0.0%	1.5%
6910	7078	7166	168	256	2.4%	3.7%
6910	6996	7143	86	233	1.2%	3.4%
		Max	**168**	**256**	**2.4%**	**3.7%**
		Mean	**75**	**195**	**1.1%**	**2.8%**
		Std. Dev.	**71**	**68**	**1.0%**	**1.0%**

USGS Ukiah Field Office				**7151**		
6900	6538	6526	-362	-374	-5.2%	-5.4%
6900	6739	6738	-161	-162	-2.3%	-2.4%
6900	6633	6780	-267	-120	-3.9%	-1.7%
6900	6573	6709	-327	-191	-4.7%	-2.8%
		Max	**-362**	**-374**	**-5.2%**	**-5.4%**
		Mean	**-280**	**-212**	**-4.1%**	**-3.1%**
		Std. Dev.	**88**	**112**	**1.3%**	**1.6%**

USGS Sacramento Field Office				**3015**		
6910	6659	6910	-251	0	-3.6%	0.0%
6910	6707	6406	-203	-504	-2.9%	-7.3%
6910	6646	6750	-264	-160	-3.8%	-2.3%
6910	6606	6702	-304	-208	-4.4%	-3.0%
		Max	**-304**	**-504**	**-4.4%**	**-7.3%**
		Mean	**-255**	**-218**	**-3.7%**	**-3.2%**
		Std. Dev.	**42**	**210**	**0.6%**	**3.0%**

USGS Hydrodynamics				**2577**		
6920	6712	6686	-208	-234	-3.0%	-3.4%
6920	6935	7044	15	124	0.2%	1.8%
6917	6571	6677	-346	-240	-5.0%	-3.5%
6913	6886	7048	-27	135	-0.4%	2.0%
6907	6976	6860	69	-47	1.0%	-0.7%
6899	6982	7021	83	122	1.2%	1.8%

		Max	**-346**	**-240**	**-5.0%**	**-3.5%**
		Mean	**-69**	**-23**	**-1.0%**	**-0.3%**
		Std. Dev.	**171**	**179**	**2.5%**	**2.6%**
USGS Hydrodynamics				**3317**		
6910	6913	6932	3	22	0.0%	0.3%
6910	6894	7154	-16	244	-0.2%	3.5%
6910	6976	6988	66	78	1.0%	1.1%
6910	6861	7038	-49	128	-0.7%	1.8%
6910	6873	6819	-37	-91	-0.5%	-1.3%
6910	6738	6917	-172	7	-2.5%	0.1%
		Max	**-172**	**244**	**-2.5%**	**3.5%**
		Mean	**-34**	**65**	**-0.5%**	**0.9%**
		Std. Dev.	**79**	**115**	**1.1%**	**1.7%**
USGS Hydrodynamics				**SN481**		
6900	6841	6837	-59	-63	-0.9%	-0.9%
6900	6836	7071	-64	171	-0.9%	2.5%
6900	6922	6989	22	89	0.3%	1.3%
6900	7011	7076	111	176	1.6%	2.5%
6900	6923	6916	23	16	0.3%	0.2%
6900	6990	7014	90	114	1.3%	1.7%
		Max	**111**	**176**	**1.6%**	**2.5%**
		Mean	**21**	**84**	**0.3%**	**1.2%**
		Std. Dev.	**73**	**93**	**1.1%**	**1.3%**
USGS Hydrodynamics				**SN902**		
6910	6919	6715	9	-195	0.1%	-2.8%
6910	6880	6468	-30	-442	-0.4%	-6.4%
6910	6935	6728	25	-182	0.4%	-2.6%
6910	7001	6515	91	-395	1.3%	-5.7%
6910	6976	6970	66	60	1.0%	0.9%
6910	6993	6647	83	-263	1.2%	-3.8%
		Max	**91**	**-442**	**1.3%**	**-6.4%**
		Mean	**41**	**-236**	**0.6%**	**-3.4%**
		Std. Dev.	**48**	**179**	**0.7%**	**2.6%**