National Park Service
U.S. Department of the Interior

Natural Resource Program Center

Seepage Investigation of Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek: September 22, 23, and 24, 2004

Great Sand Dunes National Park and Preserve Colorado

Natural Resource Report NPS/NRPC/WRD/NRTR—2007/071

ON THE COVER
Medano Creek, Great Sand Dunes National Park and Preserve (NPS, 2004)

Seepage Investigation of Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek: September 22, 23, and 24, 2004

Great Sand Dunes National Park and Preserve Colorado

Natural Resouree Report NPS/NRPC/WRD/NRTR—2007/071

James J. Harte
National Park Serviee
Natural Resourees Program Center
Water Resourees Division

Andrew D. Valdez
National Park Serviee
Great Sand Dunes National Park and Preserve

Sharla A. Stevenson
Colorado State University
Watershed Seienee Program

Deeember 2007

U.S. Department of the Interior
National Park Serviee
Natural Resouree Program Center
Fort Collins, Colorado

The Natural Resource Publication series addresses natural resource topics that are of interest and applicability to a broad readership in the National Park Service and to others in the management of natural resources, including the scientific community, the public, and the NPS conservation and environmental constituencies. Manuscripts are peer-reviewed to ensure that the information is scientifically credible, technically accurate, and appropriately written for the intended audience and is designed and published in a professional manner.

The Natural Resources Technical Reports series is used to disseminate the peer-reviewed results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service's mission. The reports provide contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations. Current examples of such reports include the results of research that address natural resource management issues, natural resource inventory and monitoring activities, resource assessment reports, scientific literature reviews, and peer reviewed proceedings of technical workshops, conferences, or symposia.

Views, statements, findings, conclusions, recommendations, and data in this report are solely those of the author(s) and do not necessarily reflect views and policies of the U.S. Department of the Interior, NPS. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the National Park Service.

Printed copies of reports in these series may be produced in a limited quantity and they are only available as long as the supply lasts. This report is also available from the Water Resources Division website (http://www.nature.nps.gov/water/wrdpub.cfm) on the internet, or by sending a request to the address on the back cover.

Please cite this publication as:

Harte, J. J., A. D. Valdez, and S. A. Stevenson. 2007. Seepage investigation of Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek, September 22, 23, and 24, 2004, Great Sand Dunes National Park and Preserve Colorado. Natural Resource Technical Report NPS/NRPC/WRD/NRTR—2007/071. National Park Service, Fort Collins, Colorado.

NPS D-93, December 2007

CONTENTS

FIGURES

TABLES

EXECUTIVE SUMMARY

On November 22, 2000, Congress passed the Great Sand Dunes National Park and Preserve Act of 2000, which directed the National Park Service to obtain a state appropriative water right for the purpose of "*maintaining ground water levels, surface water levels, and stream flows on, across, and under the national park and preserve, in order to accomplish the purposes of the national park and preserve and to protect park resources and uses.*" In December 2004, the US Department of Justice, with the National Park Service (NPS), filed a water right claim with the State of Colorado for Great Sand Dunes National Park and Preserve (GRSA). A trial to address protests to the NPS claim is scheduled to begin in 2008.

This seepage investigation was initiated to quantify base flows and identify "gaining" and "losing" stream reaches in Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek in support of the water right claim and to provide input data and calibration corroboration for a ground water model under construction for GRSA. Seepage investigation methodology, consisting of discharge measurements made simultaneously at multiple cross sections along a given reach of stream, was used to determine base discharge and identify stream reaches where the stream was "gaining" or "losing" discharge. Seepage investigations were conducted on Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek on September 22, 23, and 24, 2004.

The results of this seepage investigation indicate that, for the period of September 22, 23, and 24, 2004, from upstream to downstream within the measured reaches, Deadman Creek was a losing stream, Sand Creek was a losing stream, Big Spring Creek was a gaining stream, and Little Spring Creek neither gained nor lost discharge. This report is a summary of the September 2004 seepage investigation. In addition to the value of the discharge data presented, it is intended to serve as a field guide for future seepage investigations on these stream reaches.

ACKNOWLEDGEMENTS

The authors would like to thank Fred Bunch and Katie Hagaman (Great Sand Dunes National Park and Preserve), Christie Heikes (Adams State College), Julie Laufmann (U.S. Forest Service), and Mark Wondzell and Bill Hansen (National Park Service, Natural Resources Program Center, Water Resources Division) for their participation in the September 2004 Great Sand Dunes National Park and Preserve Seepage Investigation.

Introduction

In December 2004, the US Department of Justice and the National Park Service filed a water right claim with the State of Colorado for Great Sand Dunes National Park and Preserve (GRSA) for the purpose of "*maintaining ground water levels, surface water levels, and stream flows on, across, and under the national park and preserve, in order to accomplish the purposes of the national park and preserve and to protect park resources and uses.*" This seepage investigation was initiated to quantify base flows and identify gaining and losing stream reaches in Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek in support of the water right claim and to provide input data and calibration corroboration for a ground water model under construction for GRSA.

Seepage investigation methodology, consisting of discharge measurements made simultaneously at multiple cross sections along a given reach of stream, was used to determine base discharge and identify stream reaches where the stream was gaining or losing discharge. Seepage investigations were conducted on Deadman Creek, Sand Creek, Big Spring Creek, and Little Spring Creek on September 22, 23, and 24, 2004.

The discharge data collected during this seepage investigation describe stream discharge at discrete stream cross sections at a "point in time". The discharges measured during the seepage investigation are a product of the local hydrogeology, current and past climate conditions, and current surface water and ground water conditions.

The results of this seepage investigation indicate that, for the period of September 22, 23, and 24, 2004, from upstream to downstream within the measured reaches, Deadman Creek was a losing stream, Sand Creek was a losing stream, Big Spring Creek was a gaining stream, and Little Spring Creek neither gained nor lost discharge (Table 1 and Figure 1). This report is a summary of the September 22, 23, and 24, 2004, seepage investigation. In addition to the value of the discharge data presented it is intended to serve as a field guide for future seepage investigations on these stream reaches.

Table 1. -- Summary of discharge measurements made during the September 22, 23, and 24, 2004, seepage investigation, Great Sand Dunes National Park and Preserve.

Station ID[1] (cross section)	Location	Date	Start Time (24 hr)	End Time (24 hr)	Gage Height Start/End (ft.)	Discharge (cfs)[2]	Discharge Average (cfs)
SC #1	Sand Creek	09/22/04	0957 1129	1043 1207	.36/.36 .36/.36	12 13	13
SC #2	Sand Creek	09/22/04	1000 1130	1100 1226	.53/.53 .53/.53	9.6 9.5	9.6
SC #3	Sand Creek	09/22/04	1000 1134	1043 1216	.73/.73 .73/.73	6.3 6.2	6.3
SC #4	Sand Creek	09/22/04	1000 1130	1024 1153	.80/.79 .79/.79	5.5 5.5	5.5
SC #5	Sand Creek	09/22/04	1045	1045	0/0	0.0	0.0
DC #1	Deadman Creek	09/22/04	1458 1549 1630	1532 1617 1701	.56/.56 .56/.56 .55/.56	8.5 8.4 8.3	8.4
DC #2	Deadman Creek	09/22/04	1458 1627	1530 1700	.42/.42 .41/.41	5.4 5.3	5.3
DC #3	Deadman Creek	09/22/04	1500 1630	1526 1654	.28/.28 .27/.27	3.8 3.5	3.6
DC #4	Deadman Creek	09/22/04	1500 1630	1535 1700	.25/.27 .27/.27	1.5 1.4	1.4
BS #1	Big Spring Creek	09/23/04	1510 1600	1510 1600	.36/.36 .36/.36	0.2 0.2	0.2
BS #2	Big Spring Creek	09/23/04	1500 1606	1539 1653	.50/.50 .50/.50	4.0 3.8	3.9
BS #3	Big Spring Creek	09/23/04	1458 1559	1537 1637	.43/.43 .43/.43	5.3 5.6	5.4
LS #1	Little Spring Creek	09/24/04	0845 0945	0910 1008	.73/.73 .73/.73	1.1 1.2	1.1
LS #2	Little Spring Creek	09/24/04	0844 0946	0927 1028	.40/.40 .41/.41	1.2 1.2	1.2
LS #3	Little Spring Creek	09/24/04	0843 0944	0915 1008	.33/.33 .33/.33	1.2 1.3	1.2

[1] Stations are listed from upstream to downstream.
[2] Discharge measured at Station BS#1 with a portable 3-inch Parshall flume.

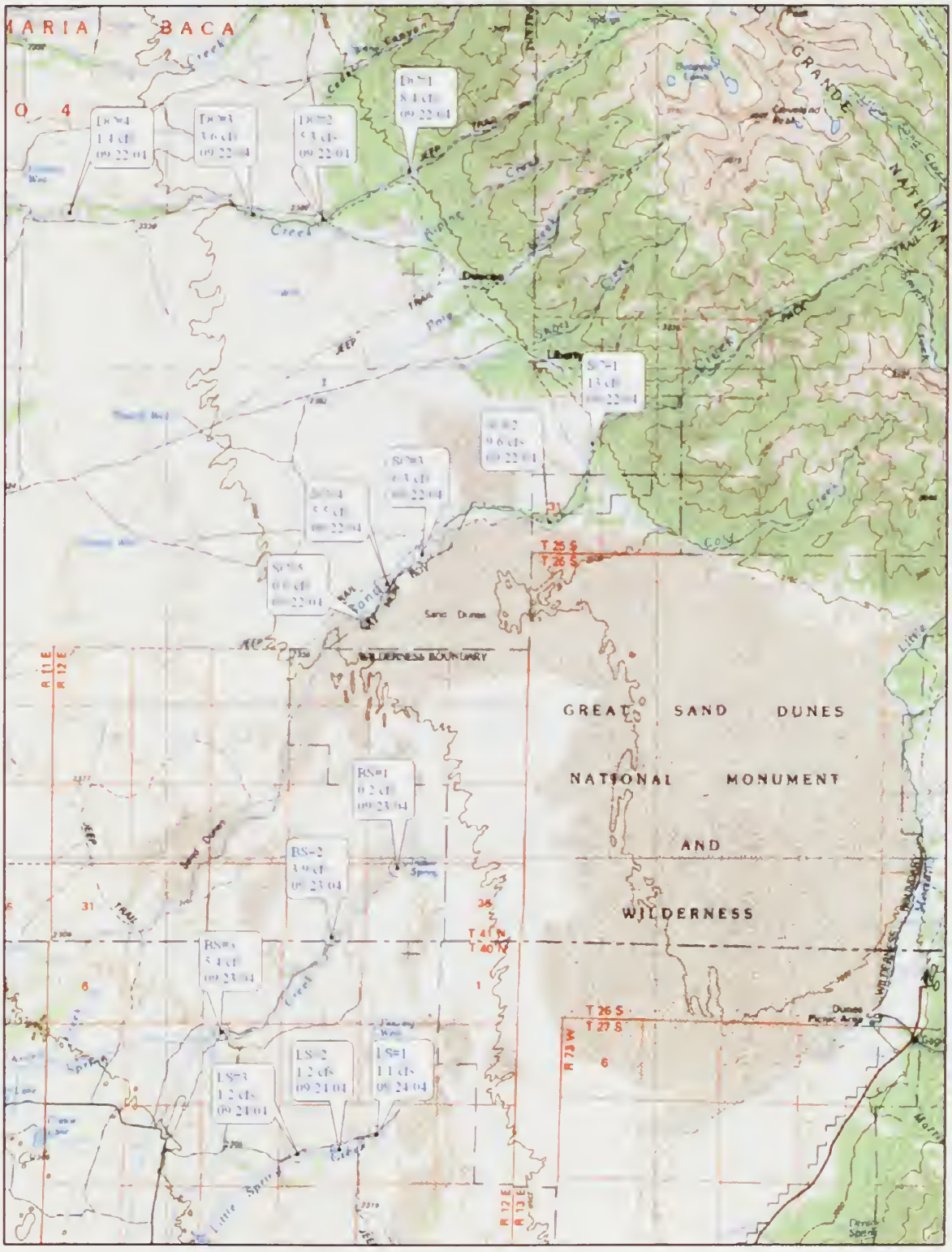


Figure 1 -- Discharge summary for September 22, 23, and 24, 2004, Seepage Investigation, Great Sand Dunes National Park and Preserve

Previous Investigations

Emery et al. (1971) made discharge measurements on Deadman Creek on July 6, 1967. Discharge was about 7 cfs at the canyon mouth and 1 cfs at a point about 3.7 miles downstream of the canyon mouth. The discharge had gone completely subsurface at a point about 8 miles downstream of the canyon mouth.

Simultaneous discharge measurements at various cross sections along the same stream reach have never been made in the park in the past. The Colorado Division of Water Resources (CDWR) made discrete discharge measurements at several cross sections during the same day on Big Spring Creek during June and October 1991 and September 1992 (Table 2 and Figure 2). GRSA staff has made periodic, discrete, hand discharge measurements at seven documented cross sections on Big Spring Creek in the past. Summary discharge data are available from GRSA.

The CDWR maintains continuous recording stage gages at flumes on Deadman Creek near Crestone, Big Spring Creek, and Little Spring Creek, all within GRSA, and publishes annual discharge summaries for those gages. The periods of record are Water Year (WY) 1999 to present for the Deadman Creek near Crestone gage and WY 2000 to present for the Big Spring Creek and Little Spring Creek gages. GRSA maintains a continuous recording stage gage at a flume on Sand Creek near Liberty, within GRSA. The period of record is WY1993 to present, and data records are maintained by GRSA. The CDWR maintains a website displaying "real-time" discharge hydrographs for the continuous recording stage gages at Deadman Creek near Crestone and Sand Creek near Liberty.

Table 2. -- Summary of discharge measurements (cfs) made by the CDWR and the NPS during seepage investigations on Big Spring Creek, Great Sand Dunes National Park and Preserve.

CDWR Sta. ID	NPS Sta. ID	CDWR 06/25/91	CDWR 10/08/91	CDWR 06/11/92	NPS 09/23/04
MP0		(Initial	Point	of	Spring)
MP1		(First	Point	of Surface	Flow)
MP2	BS#1	.11	.16	.15	0.2
MP3		.72	.85	.86	
MP4		2.79	2.79	2.93	
MP5	BS#2	3.59	4.73	4.02	3.9
MP6		4.77	4.91	5.32	
MP7		5.42	5.8	5.83	
MP8	BS#3	4.92	6.53	6.81	5.4

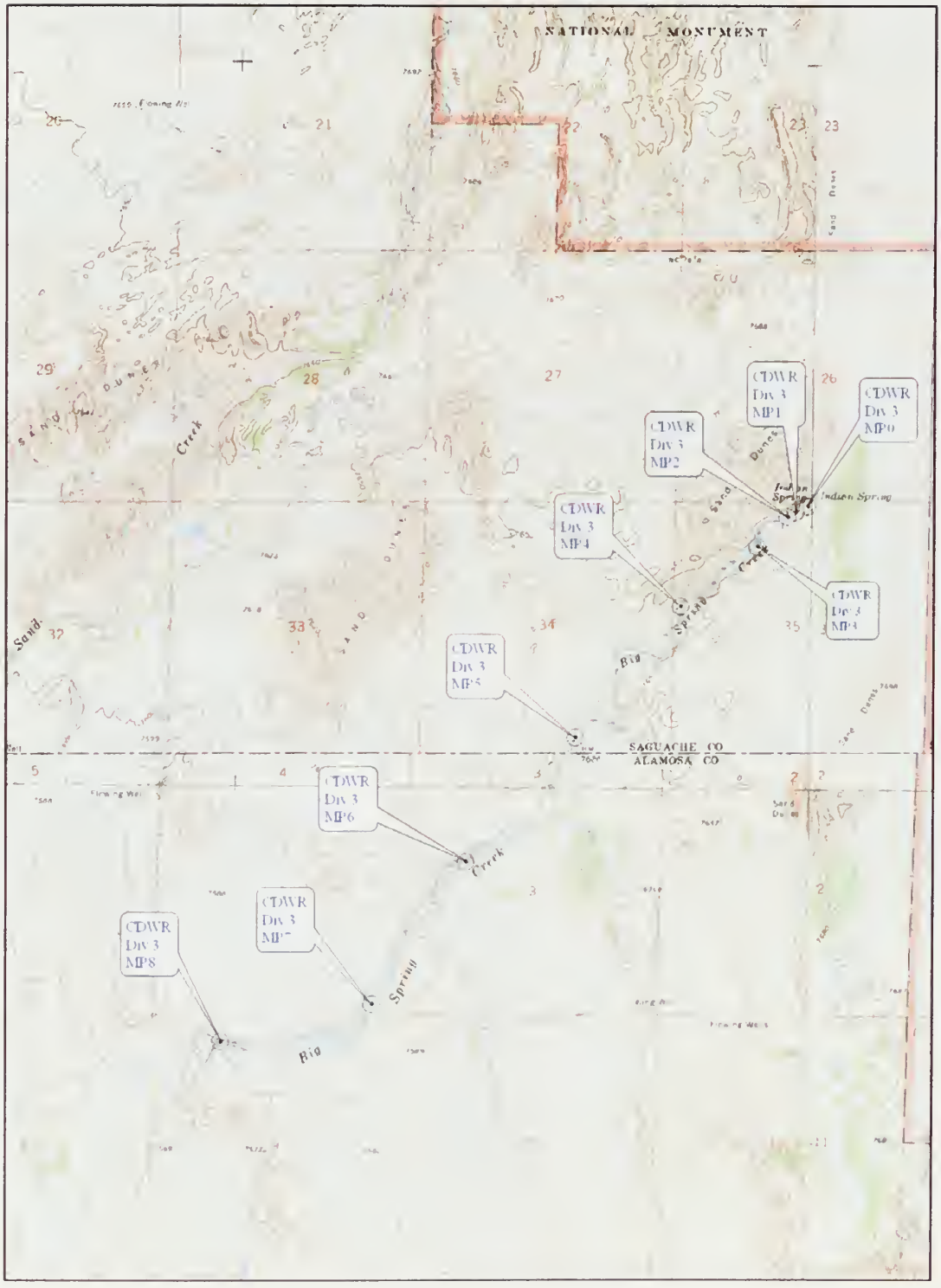


Figure 2. -- Big Spring Creek June and October 1991, and September 1992, discharge measuring points, CDWR Division III, Great Sand Dunes National Park and Preserve.

Study Area Description

Great Sand Dunes National Park and Preserve is located in south-central Colorado along the eastern edge of the San Luis Valley. The crest of the Sangre de Cristo Mountains forms the east boundary of the park/preserve, and the main dune field lies at the foot of the mountains. The Nature Conservancy's Zapata Ranch borders the park on the south, San Luis Lakes State Park and the Baca National Wildlife Refuge border the park on the west, and the Crestone residential area borders the park on the north. The park includes five prominent streams: Deadman Creek, Sand Creek, Medano Creek, Big Spring Creek, and Little Spring Creek (Figure 3).

The prominent geologic and geomorphic features of the park include the Sangre de Cristo Mountains, the main dune field, the sand sheet, and the sabkha (a landscape of sand cemented into a fragile crust by the alkaline minerals of a high water table, see Figure 3). The main dune field is the active dune field that occupies about 30 square miles starting near the foot of the Sangre de Cristo Mountains. Some of the active dunes are as high as 750 feet above the surrounding topography (Rupert and Plummer, 2004). The sand sheet is lower in elevation than the main dune field, contains some mobile dunes, but is largely held in-place by vegetation. The sabkha is lower in elevation than the sand sheet and generally occupies an area west of the sand sheet and closer to the center of the San Luis Valley.

The main surface water features in the park are Deadman Creek, Sand Creek, Big Spring Creek, Little Spring Creek, and Medano Creek (Figure 3). Deadman Creek headwaters in the Sangre de Cristo Mountains, flows generally west across lands administered by the US Forest Service, then flows for approximately 3.5 miles across GRSA lands, and terminates in the sabkha in the Baca National Wildlife Refuge. Sand Creek headwaters in the Sangre de Cristo Mountains and flows generally southwest along the north and west sides of the main dune field, flows across the sand sheet, and terminates near the west border of the park in the sabkha. Big Spring Creek originates at Indian Spring, located on the sand sheet west of the main dune field. At the spring, "water discharges into a pond near the northeast shore and discharges from the pond on the southwest shore" (Rupert and Plummer, 2004). The flow discharges from the pond below ground, resurfaces approximately 100 yards downstream of the pond, then flows generally southwest across the sand sheet, and terminates near the west border of the park in the sabkha in a system of lakes that include Head Lake and San Luis Lake. Little Spring Creek originates as a seep/wetland in the sand sheet approximately three miles south of Indian Spring and west of the main dune field. The creek flows generally southwest across the sand sheet and terminates in the sabkha in a system of small lakes that include Twin Lakes, near the southwest border of the park. Medano Creek headwaters in the Sangre de Cristo Mountains. It flows generally south along the east side of the main dune field then southwest along the southeast side of the main dune field, terminating on the sand sheet south of the main dune field.

Average annual precipitation at Medano Pass, near the headwaters of Medano Creek in the Sangre de Cristo Mountians, is 28.9 inches (USDA, NRCS, 2006). Average annual precipitation at the GRSA Headquarters is 11.1 inches, and the average annual precipitation at Alamosa, CO, is 7.07 inches (USDOC, NOAA, 2006). During the year preceding the seepage investigation, October 1, 2003, through September 21, 2004, 12.69 inches of precipitation were recorded at the GRSA Headquarters. Monthly precipitation totals for July, August, and September 2004 were

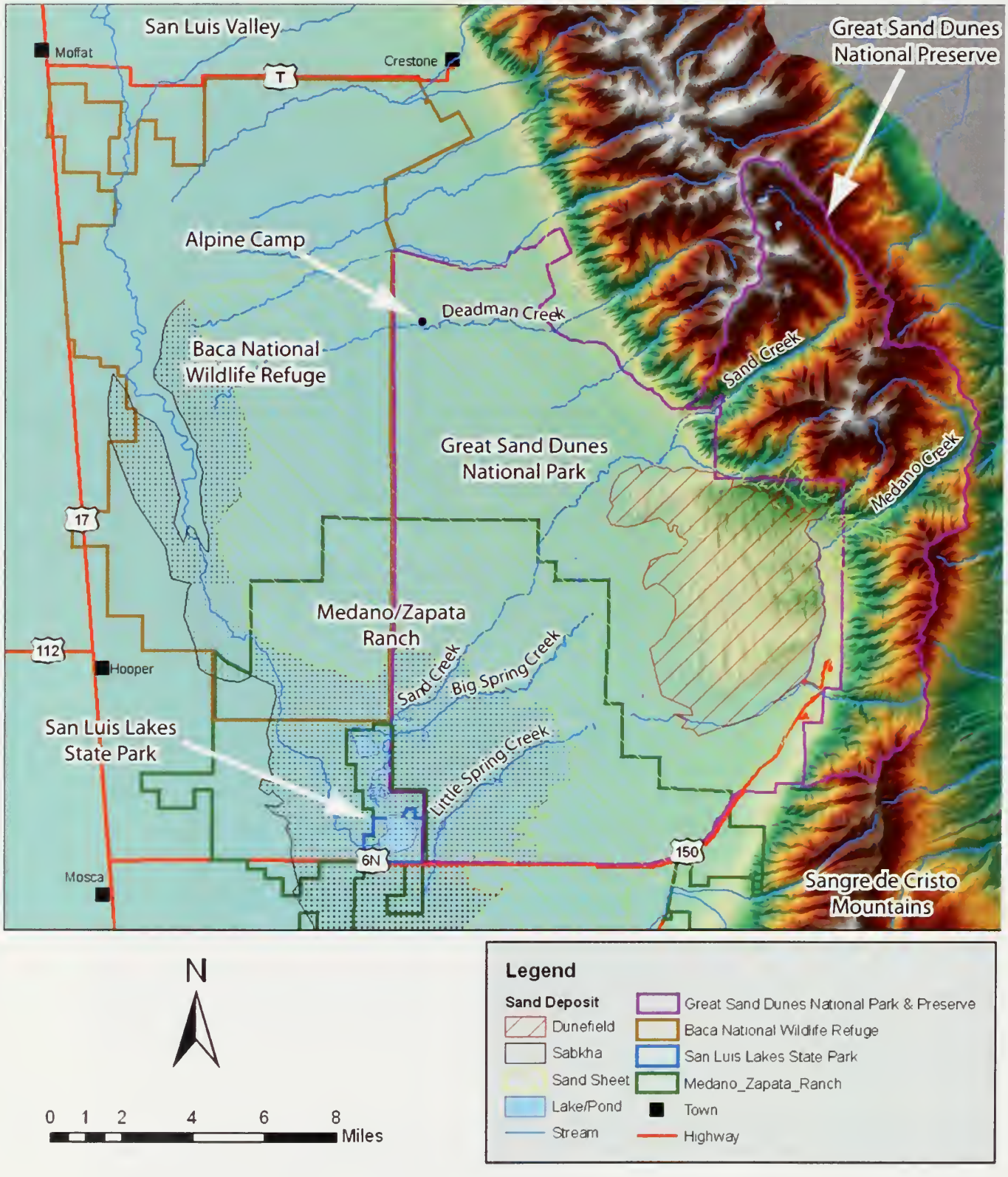


Figure 3. -- Great Sand Dunes National Park and Preserve and vicinity with prominent geologic, geomorphic, and hydrologic features (base map from Terrain Navigator by Map Tech).

2.57, .65, and 2.57 inches respectively. Average monthly precipitation for July, August, and September are 1.79, 2.00, and 1.22 inches respectively (USDOC, NOAA, 2006). On September 20, 2004, about 1.96 inches of precipitation was recorded at the GRSA Headquarters and on September 21 and 22, 2004, additional unmeasured precipitation occurred in the Sangre de Cristo Mountains. The discharges measured during this seepage investigation were influenced by the recent precipitation.

Discharge Measurement Cross Section Descriptions

During the September 22, 23, and 24, 2004, seepage investigation, discharge measurements were made at four locations on Deadman Creek (**DC**), four locations on Sand Creek (**SC**), three locations on Big Spring Creek (**BS**), and three locations on Little Spring Creek (**LS**). Cross sections were numbered from upstream to downstream as #1, #2, #3, and #4. On Sand Creek the terminus of flow observed during the seepage investigation on September 22, 2004, was designated as site SC#5. The locations of all discharge measurement cross sections are displayed in Figure 1 and listed in Table 3. Field notes, drawings, and photographs of the discharge measurement cross sections are in the Appendix.

Deadman Creek

DC #1 is located approximately 7.2 river-miles upstream of the Alpine Camp road crossing and about 1.3 river-miles upstream of DC#2. The cross section is near the downstream end of the first stand of aspen trees encountered while approaching the canyon mouth from the west on the jeep trail located on the south side of Deadman Creek. The channel bottom is cobble/gravel/boulder, and the stream bank vegetation includes shrubs, aspen, and spruce trees.

DC#2 is located at the Colorado Division of Water Resources (CDWR) flume located on Deadman Creek at the road crossing about 5.9 river-miles upstream of the Alpine Camp road crossing. The discharge measurements were taken in the upstream mouth of the flume at the staff gage. Discharge at this flume is displayed in "real-time" on the CDWR web site http://www.dwr.state.co.us for Station DEDCRECO.

DC#3 is located about 5.0 river-miles upstream of the Alpine Camp road crossing and one-quarter mile upstream of the river-ford on the road which starts on the south side of Deadman Creek at Alpine Camp and runs east along the south side of Deadman Creek. The ford is shown on the 1:24,000 topographic map but was not located on the ground at the time of the seepage investigation. DC#3 is about 0.9 miles downstream of DC#2. The cross section is located on a straight reach in a stand of juniper trees. The channel bottom is sand/gravel/cobble and the stream bank vegetation includes juniper and cottonwood.

DC#4 is located approximately one river-mile upstream of the Alpine Camp road crossing. Park the vehicle about .2 miles east of a large, lone dead cottonwood tree, standing on the north side of the road that starts at Alpine Camp and runs along the south side of Deadman Creek. Walk north to Deadman Creek. The channel bottom is coarse sand. The left bank is a vertical cut bank about 15-20 feet high and the right bank is mostly bare sand with some grasses and sedges.

Sand Creek

SC#1 is located approximately 1,200 river-feet upstream of the road crossing and 100 yards upstream of a gravel/cobble quarry located in the SE Section 30, T. 25 S., R. 73 W., 6th Principal Meridian (6th PM), near the mouth of Sand Creek Canyon. The channel bottom is cobble/gravel/boulder, and the stream bank vegetation is alder and grasses. The right bank is nearly vertical, and the left bank is a nearly level floodplain.

Table 3. -- Locations of discharge measurement cross sections for the September 22, 23, and 24, 2004, seepage investigation, Great Sand Dunes National Park and Preserve.

Station ID	NAD 27 Northing	NAD 27 Easting	NAD 83 Latitude N	NAD 83 Longitude W
DC#1	4194010	444987	37° 53' 38"	105° 37' 34"
DC#2	4193039	443217	37° 53' 6"	105° 38' 47"
DC#3	4193139	441805	37° 53' 9"	105° 39' 44"
DC#4	4193172	438061	37° 53' 9"	105° 42' 16"
SC#1	4188461	448719	37° 50' 38"	105° 35'
SC#2	4186858	447849	37° 49' 46"	105° 35' 35"
SC#3	4186194	445255	37° 49' 24"	105° 37' 21"
SC#4	4185592	444538	37° 49' 4"	105° 37' 51"
SC#5	4184843	444170	37° 48' 40"	105° 38' 5"
BS#1	4179785	444763	37° 45' 56"	105° 37' 40"
BS#2	4178391	443421	37° 45' 11"	105° 38' 34"
BS#3	4176443	441186	37° 44' 7"	105° 40' 5"
LS#1	4174362	444361	37° 43'	105° 37' 55"
LS#2	4174051	443588	37° 42' 50"	105° 38' 26"
LS#3	4173959	442740	37° 42' 47"	105° 39' 1"

SC#2 is located about 1.1 river-miles downstream of the road crossing located in the SE Section 30, T. 25 S., R. 73 W., 6th PM, and about 30 feet downstream of a flume located in NWSW Section 31, T. 25 S., R. 73 W., 6th PM. Discharge at this flume is displayed in "real-time" on the CDWR web site http://www.dwr.state.co.us for Station SANDUNCO. The channel bottom is gravel/cobble, and the stream bank vegetation includes grasses, alder, and cottonwood.

SC#3 is located approximately 3.5 river-miles downstream of the road crossing located in the SE Section 30, T. 25 S., R. 73 W., 6th PM, and about 2.4 river-miles downstream of cross section SC#2. The channel bottom is gravel/cobble, and the stream banks are sandy gravel.

SC#4 is located approximately 4.2 river-miles downstream of the road crossing located in the SE Section 30, T. 25 S., R. 73 W., 6th PM, and about 0.7 river-miles downstream of cross section SC#3. There is a single cottonwood tree on the left bank about 50 feet upstream of the cross section. The channel bottom is coarse sand and gravel, and the stream banks are sand and gravel.

SC#5 is located approximately 4.6 river-miles downstream of the road crossing located in the SE Section 30, T. 25 S., R. 73 W., 6th PM, and about 2,200 river-feet downstream of SC#4. Flow in Sand Creek terminated at this point when observed during the seepage investigation on September 22, 2004. The stream terminates in a wide, flat, coarse sand channel bottom that has no vegetation.

Big Spring Creek

BS#1 is located approximately 4.7 river-miles upstream of the road crossing located in the NW Section 9, T. 40 N., R. 12 E., New Mexico Principal Meridian (NMPM). The cross section is in an arroyo about 50 feet downstream of a seep that surfaces approximately one-quarter mile downstream of the Indian Spring pond. There is a steel fence post on the left bank at the cross section. The channel bottom is sand and is constricted by the growth of riparian vegetation that includes grasses, rushes, and watercress.

BS#2 is located approximately 3.1 river-miles upstream of the road crossing located in the NW Section 9, T. 40 N., R. 12 E., NMPM. The channel bottom is sand, and the channel is constricted by the growth of riparian vegetation, including grasses, sedges, rushes, and watercress. It is difficult to find a stream reach that is not overgrown with this vegetation. The measurement cross section was moved from a cross section previously established by GRSA, named Big Spring Gauge 4, for this reason.

BS#3 is located approximately 55 feet upstream of the road crossing located in the NW Section 9, T. 40 N., R. 12 E., NMPM, at a cross section previously established by GRSA named Big Spring Gauge 8 and marked with a steel fence post. The channel bottom is sand, and the flow is constricted by the growth of riparian vegetation, including grasses, sedges, rushes, and watercress. It is difficult to find a stream reach that is not overgrown with this vegetation.

Little Spring Creek

LS#1 is located in the SWNW Section 14, T. 40 N., R. 12 E., NMPM, approximately 100 yards upstream of a north/south fence line and gate. The cross section is about 1 river-mile upstream of cross section LS#3 and about one-quarter mile upstream of a water diversion consisting of one 24-inch culvert and two smaller culverts. The channel bottom is sand, and the stream channel is generally constricted with riparian vegetation, including grasses, sedges, rushes, and watercress. It is difficult to find a stream reach that is not overgrown with this vegetation.

LS#2 is located approximately 2,800 river-feet upstream of cross section LS#3 on a long, straight reach of channel. The channel bottom is sand, and the stream channel is generally constricted with riparian vegetation, including grasses, sedges, rushes, and watercress. It is difficult to find a stream reach that is not overgrown with this vegetation.

LS#3 is located at a two-foot flume located in the NWSW Section 15, T. 40 N., R. 12 E., NMPM, and is operated by the Colorado Division of Water Resources. A corral is located about 200 feet northeast of the flume. The cross section is located in the upstream mouth of the flume because no other suitable discharge measurement cross section could be located in the stream reach due to dense stream bank vegetation. The channel bottom is the flume.

Methods

Discharge measurement cross sections were established by Harte and Wondzell, NPS WRD, on Sand Creek on September 20, 2004, and on Deadman Creek on September 21, 2004. Cross sections were established on Big Spring Creek and Little Spring Creek on September 23, 2004, by the teams assigned to each cross section. Cross sections were located (1) at a point within the park as far upstream as practical on each stream, (2) at intermediate points downstream associated with transitions in geologic/geomorphic setting, (3) at points adjacent to established continuously-recording flumes, (4) at points having good access, (5) at points within a relatively straight stream reach, and (6) at points having enough flowing surface water to measure within accepted limits of accuracy. Cross sections were marked with flagged rebar driven into the ground on each stream bank. Cross section locations were documented using GPS (in UTM coordinates), and digital photographs were taken at each cross section on Sand Creek and Deadman Creek. Locations and photographs for cross sections on Big Spring Creek and Little Spring Creek were recorded following the September 22, 23, and 24, 2004, seepage investigation due to time constraints. Site descriptions were recorded in a field notebook for each cross section on Sand Creek and Deadman Creek.

U.S. Geological Survey (USGS) discharge measurement protocol was used during the seepage investigation. The primary reference used was Techniques for Water Resources Investigations of the United States Geological Survey, Chapter A8, Book 3, DISCHARGE MEASUREMENTS AT GAGING STATIONS, by Thomas J. Buchanan and William P. Somers, 1976. Additional references are listed under "Literature Cited" at the end of this report.

Discharge measurements were made with a Pygmy current meter, automatic digital counter, and standard wading rod marked in tenths of feet. A spin test with a minimum standard of 45 seconds was performed with each Pygmy current meter before and after each discharge measurement. Under this test format, a Pygmy current meter is presumed to be working properly if the bucket wheel, once set in motion, spins freely for a minimum of 45 seconds. Air and water temperatures were recorded before each discharge measurement. Stream stage was measured before and after each discharge measurement using a temporary staff gage installed in non-turbulent water at each cross section. Start and end times (24 hrs) were recorded for each discharge measurement.

Discharge was computed in the field using the velocity-area method. Discharge was recomputed in the office using the HMST v2.6 One-Point Velocity Discharge Measurement Checker software package (Loving, 2002). HMST v2.6 was used to compute the standard error, and a qualitative rating was assigned (poor, fair, good) for each discharge measurement.

The water depth at cross section Big Spring Creek #1 (**BS#1**) was too shallow to use a Pygmy current meter to measure velocity; therefore, discharge was measured using a portable 3-inch Parshall flume and standard Parshall flume discharge table. U.S. Bureau of Reclamation protocol was used while making discharge measurements with the Parshall flume (USDOI, BOR, 1975).

There were eight participants in the seepage investigation that were grouped into teams of two when possible. All participants were instructed on discharge measurement techniques and protocol prior to the seepage investigation. Each team made two scheduled discharge measurements at each of its assigned cross sections (Table 4). For each stream, discharge measurements were scheduled so that all teams could get to their assigned cross sections, set up their equipment, and begin the first and second discharge measurements at the scheduled times. Rebar cross section markers and staff gages were removed after completing the second discharge measurement at each cross section.

Table 4. -- Participants, assigned cross sections, and contact information for the September 22, 23, and 24, 2004, Great Sand Dunes National Park and Preserve seepage investigation.

Team	Agency	Cross Section[1]	Phone/email
Fred Bunch	NPS, GRSA, Mosca, CO	DC#1, SC#1, BS#3, LS#2	719-378-6361 fred_bunch@nps.gov
Mark Wondzell	NPS, WRD, Fort Collins, CO		970-225-3512 mark_wondzell@nps.gov
Andrew Valdez	NPS, GRSA, Mosca, CO	DC#3, SC#4	719-378-6362 andrew_valdez@nps.gov
Katie Hagaman	NPS, GRSA, Mosca, CO		719-378-6364 katie_hagaman@nps.gov
Bill Hansen	NPS, WRD, Fort Collins, CO	DC#2, SC#3, BS#2, LS#3	970-225-3532 bill_hansen@nps.gov
Julie Laufmann	USFS, Fort Collins, CO		970-225-3532 jlaufmann@fs.fed.us
Jim Harte	NPS, WRD, Fort Collins, CO	BS#1	970-225-3538 james_harte@nps.gov
Christie Heikes	Student, Adams State College, Alamosa, CO		719-587-7357 heikescl@adams.edu
Jim Harte	NPS, WRD, Fort Collins, CO	LS#1	970-225-3538 james_harte@nps.gov
Katie Hagaman	NPS, GRSA, Mosca, CO		719-378-6364 katie_hagaman@nps.gov
Jim Harte	NPS, WRD, Fort Collins, CO	DC#4, SC#2	970-225-3538 james_harte@nps.gov

[1] DC = Deadman Creek, SC = Sand Creek, BS = Big Spring Creek, LS = Little Spring Creek

Results and Discussion

Two discharge measurements were made at each of four cross sections on Deadman Creek, four cross sections on Sand Creek, three cross sections on Big Spring Creek, and three cross sections on Little Spring Creek. One additional discharge measurement was made on Deadman Creek at cross section DC#1 for a total of three measurements at that cross section. All discharge measurements were made reasonably close to the scheduled times. Summary results are listed in Table 1 and displayed on Figure 1.

Deadman Creek

Average discharge (cfs) between the most upstream cross section (DC#1) and the most downstream cross section (DC#4) fell steadily from 8.4 at DC#1, to 5.3 at DC#2, to 3.6 at DC#3, to 1.4 at DC#4, a loss over the measured reach of about 7.0 cfs, indicating a losing stream reach. No known surface water diversions occurred along the measured reach during the seepage investigation.

Cross section DC#1 is located near the upstream end of the alluvial fan, near the mouth of Deadman Canyon at the foot of the Sangre de Cristo Mountains. From DC#1 the creek flows for approximately 1.3 miles southwest across the alluvial fan to DC#2, located near the foot of the alluvial fan, losing about 3.1 cfs into the alluvial fan. The approximate loss rate between DC#1 and DC#2 was 2.4 cfs per mile. From DC#2 the creek flows for approximately 0.9 miles west across the sand sheet to DC#3, losing about 1.7 cfs into the sand sheet. The approximate loss rate between DC#2 and DC#3 was 1.9 cfs per mile. The discharge between DC#1 and DC#3 decreased by about 4.8 cfs and the approximate loss rate was 2.2 cfs per mile. From DC#3 the creek flows for approximately 4 miles west across the sand sheet to DC#4, losing about 2.2 cfs into the sand sheet. The approximate loss rate between DC#3 and DC#4 was 0.6 cfs per mile. Overall, the discharge between DC#1 and DC#4 decreased by about 7.0 cfs and the approximate loss rate was 1.1 cfs per mile (Table 5, Figures 4 and 5). Flow in Deadman Creek was completely subsurface at a point approximately 0.3 miles downstream of DC#4 on September 21, 2004; however, during the seepage investigation on September 22, 2004, the creek was observed flowing at a point more than one mile downstream of DC#4.

Emery et al. (1971) made discharge measurements on Deadman Creek on July 6, 1967. Discharge was about 7 cfs at the canyon mouth and 1 cfs at a point about 3.7 miles downstream of the canyon mouth. The approximate loss rate over the 3.7-mile reach was 1.6 cfs per mile. Emery's discharge loss rate falls between the September 22, 2004, loss rates of 2.2 cfs per mile over the reach extending from the canyon mouth to 2.2 miles downstream and 1.1 cfs per mile over the reach extending from the canyon mouth to 6.2 miles downstream.

Table 5. -- Change in discharge per stream mile for the September 22, 23, and 24, 2004, seepage investigation, Great Sand Dunes National Park and Preserve.

Station ID	Measured Discharge (cfs)	Change in Discharge Between Stations (cfs)	River Mile (miles)	Distance Between Stations (miles)	Rate of Change in Discharge per stream mile Between Stations (cfs/mile)	Setting
Deadman Creek						
DC#1	8.4	--	7.2	--	--	Alluvial Fan
DC#2	5.3	-3.1	5.9	1.3	-2.4	Alluvial Fan
DC#3	3.6	-1.7	5.0	0.9	-1.9	Sand Sheet
DC#4	1.4	-2.2	1.0	4.0	-0.6	Sand Sheet
Total Change	--	-7.0	--	6.2	-1.1	
Sand Creek						
SC#1	13	--	5.7	--	--	Alluvial Fan
SC#2	9.6	-3.4	4.3	1.4	-2.4	Alluvial Fan
SC#3	6.3	-3.3	1.9	2.4	-1.4	Dune : Sand Sheet
SC#4	5.5	-0.8	1.2	0.7	-1.1	Dune : Sand Sheet
SC#5	0.0	-5.5	0.8	0.4	-13	Dune : Sand Sheet
Total Change	--	-13	--	4.9	-2.6	
Big Spring Creek						
BS#1	0.2	--	4.7	--	--	Sand Sheet
BS#2	3.9	+3.7	3.1	1.6	+2.3	Sand Sheet
BS#3	5.4	+1.5	.01	3.1	+0.5	Sand Sheet
Total Change	--	+5.2	--	4.7	+1.1	
Little Spring Creek						
LS#1	1.1	--	3.9	--	--	Sand Sheet
LS#2	1.2	+0.1	3.3	0.6	+0.2	Sand Sheet
LS#3	1.2	0.0	2.5	0.8	0.0	Sand Sheet
Total Change	--	+0.1	--	1.4	+0.1	

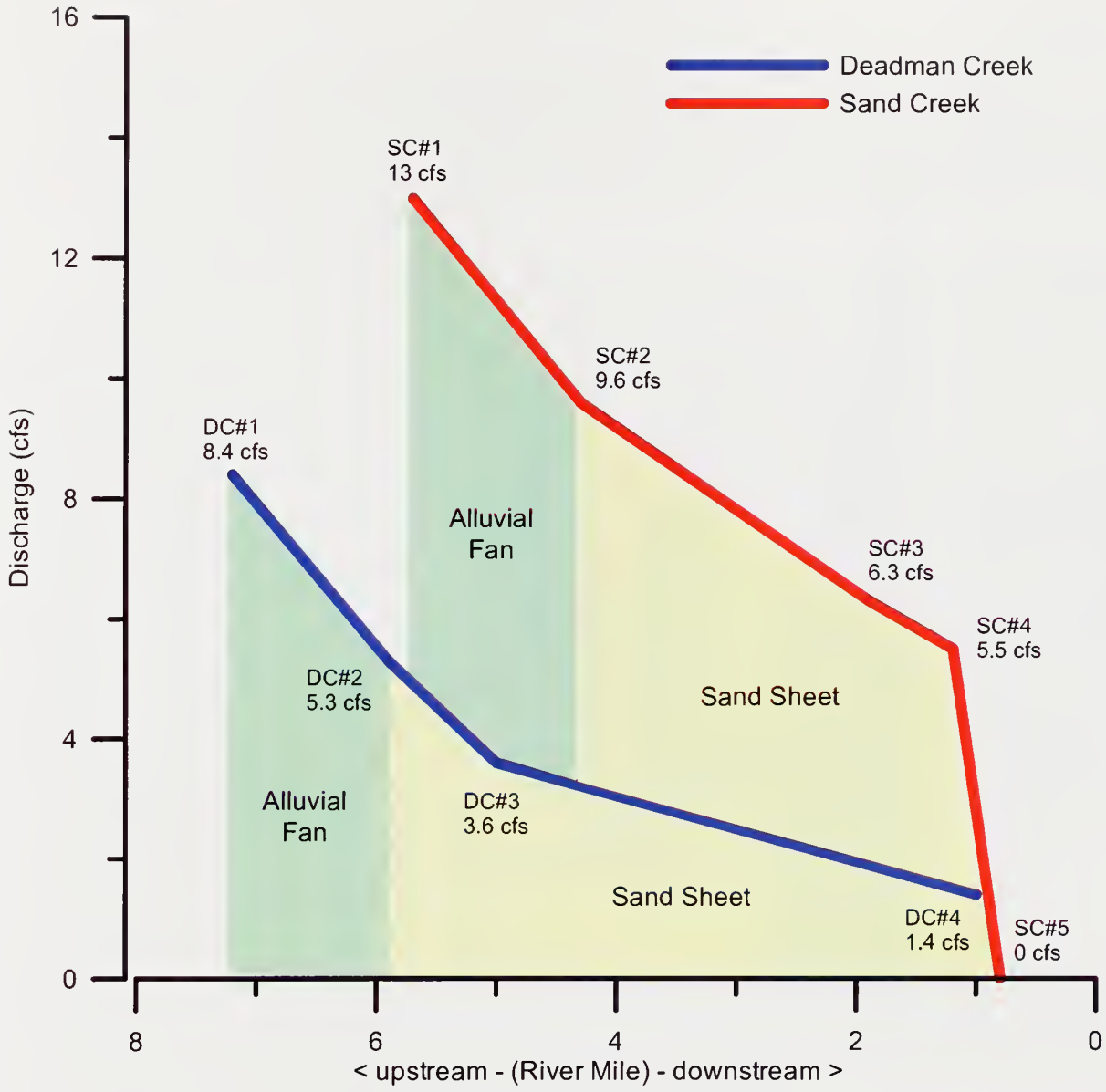


Figure 4. -- Discharge versus river mile for discharge measurements made September 22, 2004, on Deadman Creek and Sand Creek, Great Sand Dunes National Park and Preserve.

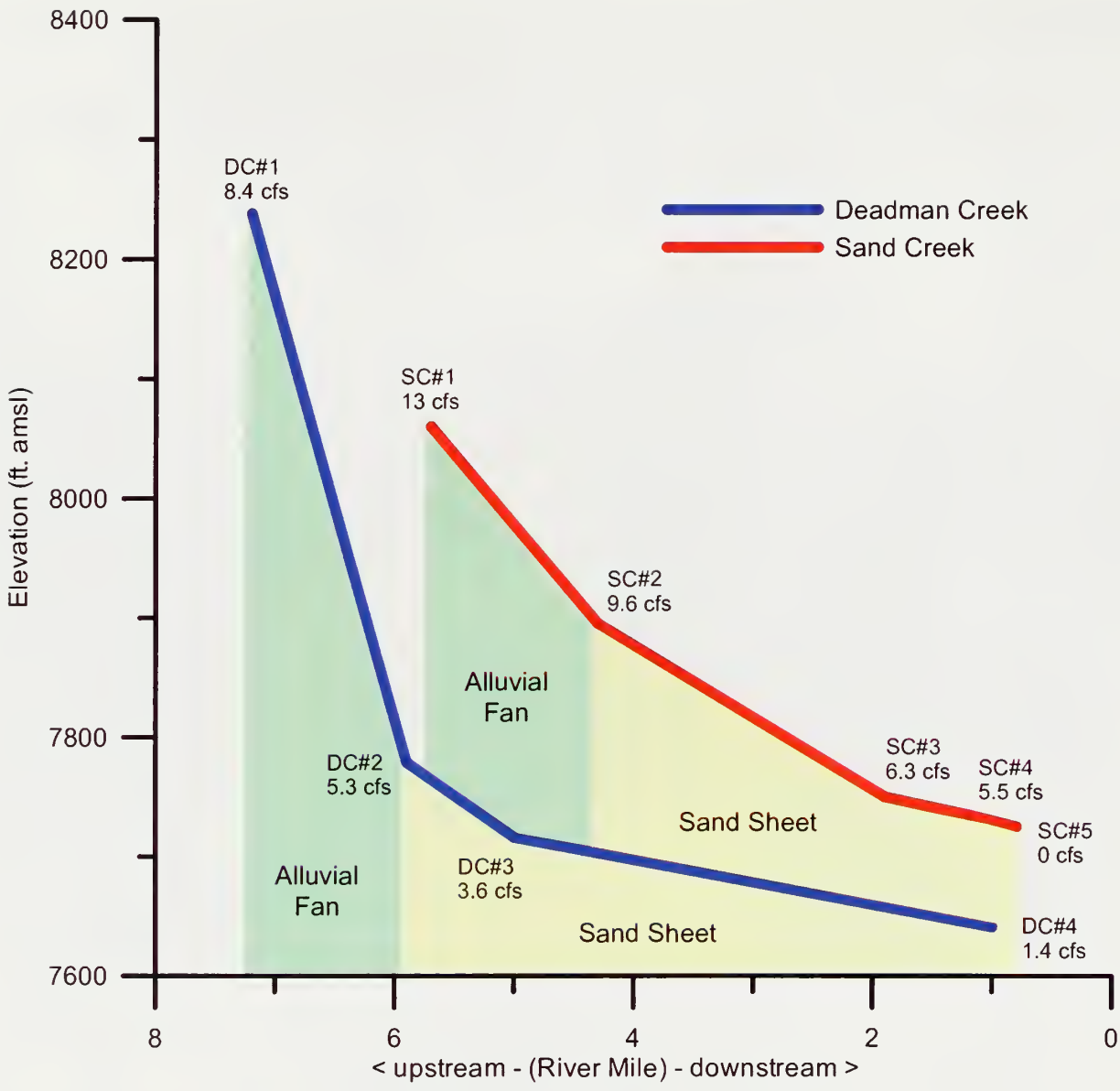


Figure 5. -- Elevation and discharge versus river mile for discharge measurements made September 22, 2004, on Deadman Creek and Sand Creek, Great Sand Dunes National Park and Preserve.

Sand Creek

Average discharge (cfs) between the most upstream cross section (SC#1) and the most downstream cross section (SC#5) fell from 13 at SC#1, to 9.6 at SC#2, to 6.3 at SC#3, to 5.5 at SC#4, to 0.0 at SC#5, a loss over the measured reach of about 13 cfs, indicating a losing stream reach. No known surface water diversions occurred along the measured reach during the seepage investigation.

Cross section SC#1 is located near the upstream end of the alluvial fan, near the mouth of Sand Creek Canyon, at the foot of the Sangre de Cristo Mountains. From SC#1 the creek flows for approximately 1.4 miles southwest across the alluvial fan to SC#2, located near the foot of the alluvial fan, losing about 3.4 cfs into the alluvial fan. The approximate loss rate between SC#1 and SC#2 was 2.4 cfs per mile. From SC#2 the creek flows for approximately 2.4 miles west/southwest across the sand sheet/main dune field interface to SC#3, located adjacent to the north side of the main dune field, losing about 3.3 cfs into the main dune field and sand sheet. The approximate loss rate between SC#2 and SC#3 was 1.4 cfs per mile. The discharge between SC#1 and SC#3 decreased by about 6.7 cfs and the approximate loss rate was 1.8 cfs per mile. From SC#3 the creek flows for about .7 miles southwest across the sand sheet/main dune field interface to SC#4, losing about .8 cfs into the main dune field and sand sheet. The approximate loss rate between SC#3 and SC#4 was 1.1 cfs per mile. The discharge between SC#1 and SC#4 decreased by about 7.5 cfs and the approximate loss rate was 1.7 cfs per mile. From SC#4 the creek flows for about 0.4 miles southwest across the sand sheet/main dune field interface to SC#5 (the point at which the flow went completely subsurface), losing about 5.5 cfs into the main dune field and sand sheet. The approximate loss rate between SC#4 and SC#5 was 13 cfs per mile. Overall, the discharge between SC#1 and SC#5 decreased by about 13 cfs and the approximate loss rate was 2.6 cfs per mile (Table 5, Figures 4 and 5).

Big Spring Creek

Average discharge (cfs) between the most upstream cross section (BS#1) and the most downstream cross section (BS#3) increased from 0.2 at BS#1, to 3.9 at BS#2, to 5.4 at BS#3, an increase of about 5.2 cfs, indicating a gaining stream reach. No known surface water diversions occurred along the measured reach during the seepage investigation.

Big Spring Creek originates at Indian Spring, located on the sand sheet near the west end of the main dune field. From BS#1 the stream flows for approximately 1.6 miles southwest across the sand sheet to BS#2, gaining about 3.7 cfs. The approximate rate of gain between BS#1 and BS#2 was 2.3 cfs per mile. From BS#2 the creek flows for approximately 3.1 miles southwest across the sand sheet to BS#3, gaining about 1.5 cfs. The approximate rate of gain between BS#2 and BS#3 was 0.5 cfs per mile. Overall, the discharge between BS#1 and BS#3 increased by about 5.2 cfs and the approximate rate of gain was 1.1 cfs per mile (Table 5, Figures 6 and 7). The increase in discharge along the measured stream reach suggests the shallow water table surface elevation is higher than the stream elevation in the measured stream reach and/or an upward gradient exists in the unconfined aquifer along the measured reach.

Little Spring Creek

Average discharge (cfs) between the most upstream cross section (LS#1) and the most downstream cross section (LS#3) stayed approximately constant, ranging from about 1.1 at LS#1, to 1.2 at LS#2, to 1.2 at LS#3, indicating neither a gaining nor a losing stream reach. No known surface water diversions occurred along the measured reach during the seepage investigation.

Little Spring Creek originates in a wetland/seep in the NW Section 14, T. 40 N., R. 12 E., NMPM. There are at least two identifiable sources, a seep at the head of a vegetated arroyo adjacent to the road and a wetland approximately 100 feet southeast of the road that may be connected to the same underground source. Cross section LS#1 is located in the SWNW Section 14, T. 40 N., R. 12 E., NMPM, on the sand sheet west of the main dune field, about 800 feet upstream of a concrete diversion consisting of one main culvert and two overflow culverts. From LS#1 the creek flows for approximately 0.6 miles southwest across the sand sheet to LS#2, gaining about 0.1 cfs. The approximate rate of gain between LS#1 and LS#2 was 0.2 cfs per mile. From LS#2 the creek flows for approximately 0.8 miles southwest across the sand sheet to LS#3 with no measured gain or loss of discharge. Considering the average discharge for each cross section, the discharge between LS#1 and LS#3 increased by about 0.1 cfs and the approximate rate of gain was 0.1 cfs per mile (Table 5, Figures 6 and 7). Considering all six discharge measurements made for the three cross sections, the discharge between cross sections LS#1 and LS #3 was approximately the same (Table 1). The approximately equal discharge along the measured stream reach from LS#1 to LS#3 suggests the shallow water table surface and the surface of the stream are near equilibrium and/or there is no gradient in the unconfined aquifer in the measured stream reach.

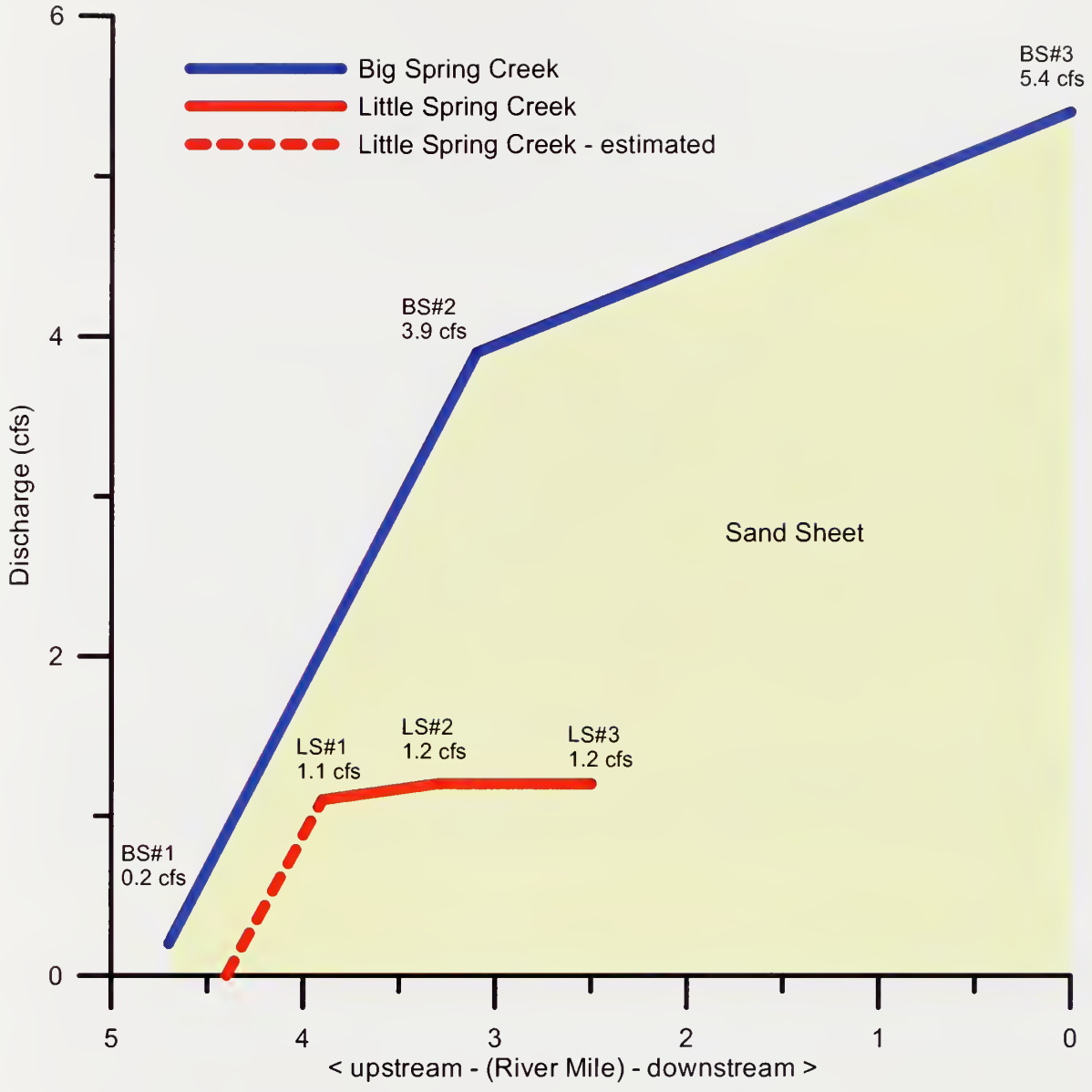


Figure 6. -- Discharge versus river mile for discharge measurements made September 23 and 24, 2004, on Big Spring Creek and Little Spring Creek, Great Sand Dunes National Park and Preserve.

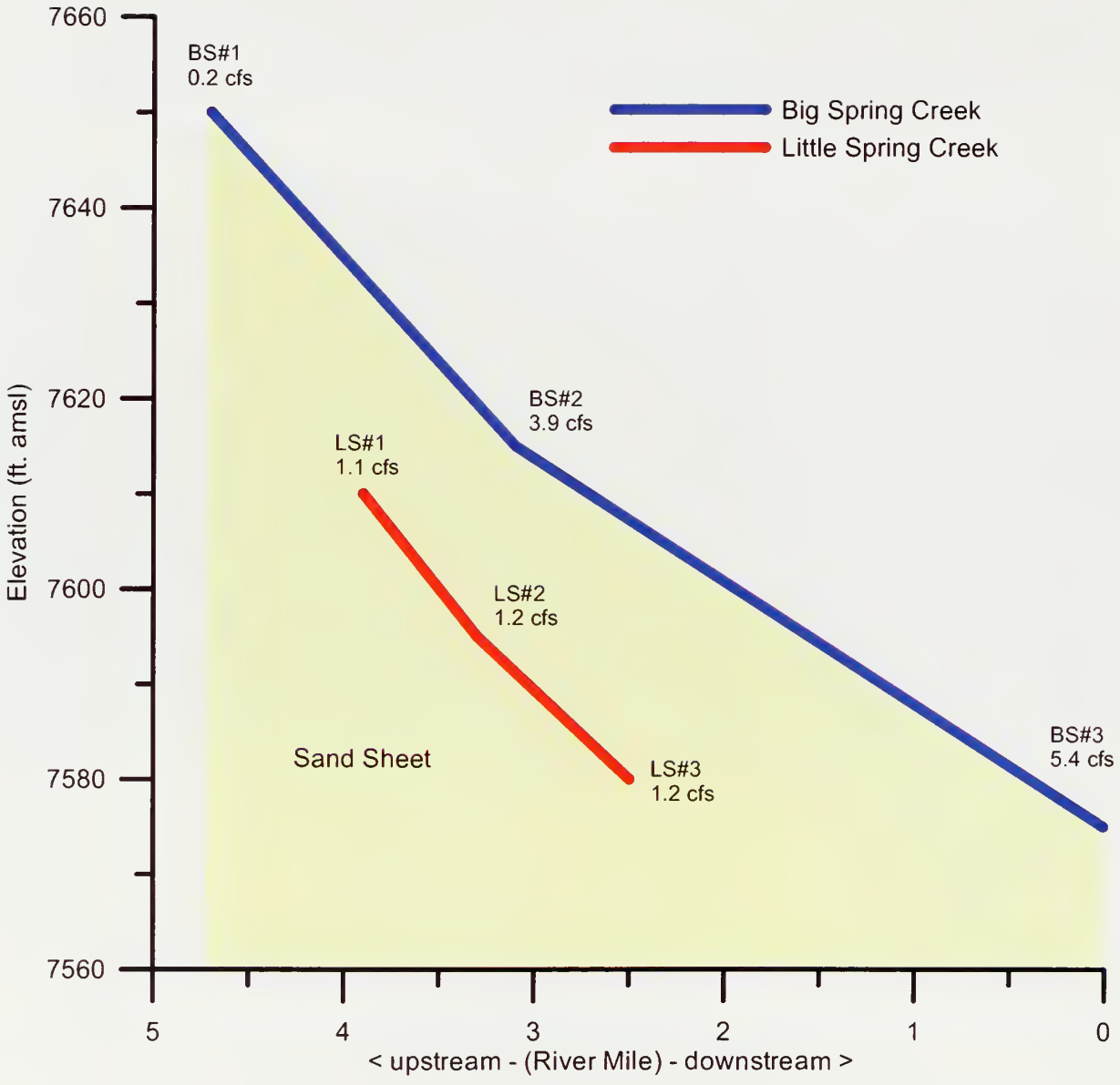


Figure 7. -- Elevation and discharge versus river mile for discharge measurements made September 23 and 24, 2004, on Big Spring Creek and Little Spring Creek, Great Sand Dunes National Park and Preserve.

Conclusions and Recommendations

The upstream to downstream decrease in discharge documented by the measurements made on September 22, 2004, in Deadman Creek and Sand Creek indicates the creeks were losing water to the alluvial fans, sand sheet, and main dune field on that day. In addition to the infiltration losses, some unknown amount of evapotranspiration was likely occurring at the time of the measurements. Streamflow that infiltrates into the alluvial fans, sand sheet, and main dune field may percolate to the unconfined and/or confined aquifers lying near the surface of, and at depth below, the valley floor.

Deadman Creek and Sand Creek generally occupy similar geomorphic and geologic settings. The creeks arise in the Sangre de Cristo Mountains, emerge from steep canyons, flow across alluvial fans and the sand sheet, and terminate in the sabkha near the center of the San Luis Valley. The creeks differ in that Sand Creek flows across the sand sheet/main dune field interface for part of its length and the Sand Creek channel width is much greater than the Deadman Creek channel width as it flows near the west side of the main dune field. The rate of loss of discharge in both creeks was greatest on the alluvial fans (2.4 cfs per mile). In Deadman Creek, the discharge decreased by 1.1 cfs per mile over the 6.2 mile reach from DC#1 to DC#4, while in Sand Creek, discharge decreased by 1.7 cfs per mile over the 4.5 mile reach from SC#1 to SC#4. In Sand Creek, the discharge decreased by 13 cfs per mile over the 0.4 mile reach between SC#4 and SC#5, a loss rate of more than five times that of any other measured reach.

The upstream to downstream increase in discharge documented by the measurements made on September 23, 2004, in Big Spring Creek indicates the creek was gaining water from the surrounding unconfined aquifer on that day. Discharge in Little Spring Creek remained approximately constant along the measured reach, indicating the stream was in equilibrium with the unconfined aquifer.

A second seepage investigation should be performed for Deadman, Sand, Big Spring, and Little Spring Creeks and compared with the results of the September 22, 23, and 24, 2004, seepage investigation. In addition to the cross sections measured during the September, 2004, investigation, one or more cross sections should be added upstream of cross sections DC#1 and SC#1. Discharge at the additional cross sections would be compared to discharges at cross sections DC#1 and SC#1 to estimate seepage losses at the Sangre de Cristo Mountain front where the Sangre de Cristo Fault separates the lower conductivity rocks of the Sangre de Cristo Mountains from the higher conductivity valley fill. If a suitable location can be found, one or more cross sections should be located and measured on Medano Creek upstream of the existing gaging station. Discharge from those cross sections would be compared to the discharge at the gaging station to estimate discharge losses at the mountain front.

Literature Cited

Buchanan, T. J., and W. P. Somers. 1976. Discharge Measurements at Gaging Stations *in* Techniques of Water-Resources Investigations of the United States Geological Survey, Book 3, Chapter A8. U.S. Geological Survey. Washington, D.C.

Emery, P. A., A. J. Boettcher, R. J. Snipes, and J. J. McIntyre, Jr. 1971. Hydrology of the San Luis Valley, south-central Colorado. Hydrologic Investigation Atlas 381. U.S. Geological Survey. Washington, D.C.

Loving, B. L. 2002. HMST version2.6 One-Point Velocity Discharge Measurement Checker: U.S. Geological Survey. Washington, D.C.

Rupert, M. G. and L. N. Plummer. 2004. Ground-Water Flow Direction, Water Quality, Recharge Sources, and Age, Great Sand Dunes National Monument, south-central Colorado, 2000-2001. Scientific Investigations Report 2004-5027. U.S. Geological Survey. Washington, D.C.

USDA, National Water and Climate Center. 2006. Colorado Monthly Precipitation Averages: 1971-2000 (inches). National Water and Climate Center. Portland, Oregon.

USDOC, National Oceanic and Atmospheric Administration. 2006. Period of Record Monthly Climate Summary. Western Regional Climate Center. Reno, Nevada.

USDOI, Bureau of Reclamation. 1975. Water Measurement Manual, Second Edition. U.S. Government Printing Office.

Appendix

Cross Section Descriptions, Cross Section Photographs, Discharge Measurement Notes Forms, and HMST v2.6 Printouts

9/21/04/1530 Deadman Cr. #1

DEADMAN CREEK #1 is located approximately ¼ mile downstream of the mouth of Deadman Canyon in the WEST or downstream end of the 1st stand of Aspen Trees encountered as you drive upstream on the Jeep Trail located on the south side of Deadman Cr (upstream of the Flume & Deadman #2)

Channel is cobble/gravel/boulder banks are Shrub, Aspen, Spruce

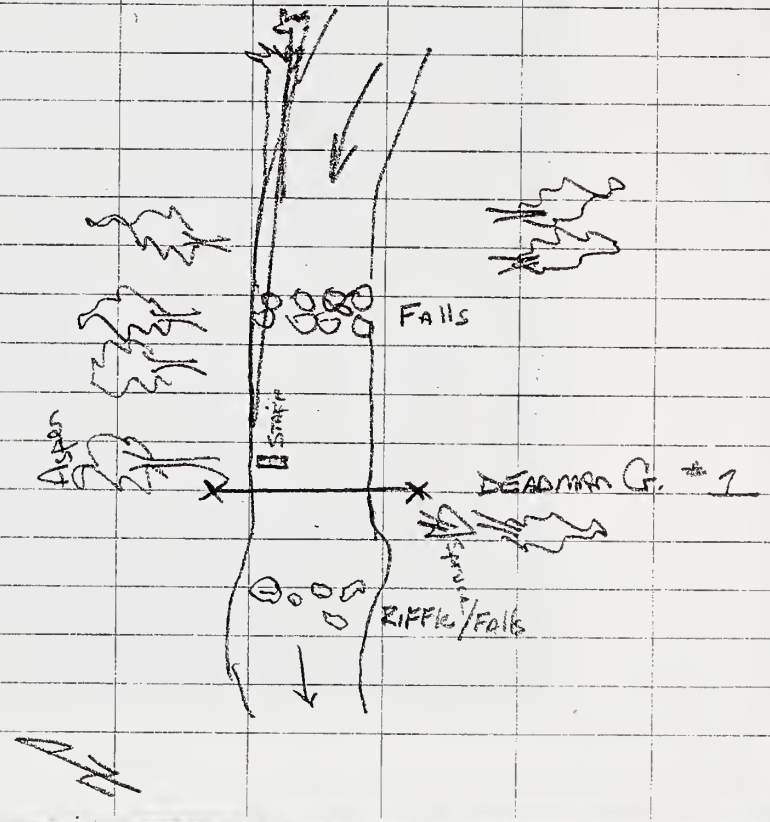
Channel gradient is steep (Type A) upstream and downstream of the Cross Section.

GPS: N 4194010
E 444987
NAD 27, Zone 13

(Photo numbers after erasing earlier photos)

Photos: 85 - Cross Section From Left bank
86 - " " " downstream
87 - " " " Right bank
88 - " " " upstream
89 - Staff Gage

Staff Gage: 0.58 Feet



Cross Section: Deadman Creek #1.09.21.04_429
Deadman Creek near the mouth of Deadman Canyon.
Cross section at orange tape viewed from left bank to right bank with staff gage·upstream of cross section on river right.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1530 hrs

Cross Section: Deadman Creek #1.09.21.04_430
Deadman Creek near the mouth of Deadman Canyon.
Cross section at orange tape viewed from downstream to upstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1530 hrs

Cross Section: Deadman Creek #1.09.21.04_431
Deadman Creek near the mouth of Deadman Canyon.
Cross section at orange tape viewed from right bank to left bank.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1530 hrs

Cross Section: Deadman Creek #1.09.21.04_432
Deadman Creek near the mouth of Deadman Canyon.
Cross section at orange tape viewed from upstream to downstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1530 hrs

Cross Section: Deadman Creek #1.09.21.04_434
Deadman Creek near the mouth of Deadman Canyon.
Staff gage located upstream of cross section on river right.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1530 hrs

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/22/04 Comp by FB Checked by _____

PARK GRSA STATION DEADMAN # 1

PERSONNEL: Meter Mark Wondzell Notes Fred Bunch

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 2:58 G.H. .56 Stop: 3:32 G.H. .56

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER Clear & Sunny

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1458	.56				
1532	.56				

FLOW: Width ~10' Area _____ Ave. Vel. _____ G.H. _____ Disch. 8.57

Method 0.6' Method coeff. ____ Hor. Angle coeff. ____ Susp. type _____ Susp. coeff. ____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 50.9° C 54° F Water 42.1° C ° F

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS _____

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
EW	1.0			.6							
	1.4	.4	0.30		5	42.1	.145			.12	.02
	1.8	.4	0.4		14	41.6	.354	(.354)		.16	.06
	2.2	.4	0.4		32	40.0	.800			.16	.13
	2.6	.4	0.5		47	40.3	1.151			.20	.23
	3.0	.4	0.6		59	40.2	1.441		.24	.24	.35
	3.4	.4	.75		53	40.3	1.294			.30	.39
	3.8	.4	0.70		44	40.7	1.069			.28	.30
	4.2	.4	0.80		43	40.4	1.053			.32	.34
	4.6	.4	0.85		62	40.5	1.501			.336	.50
	5.0	.4	1.0		73	40.3	1.771			.40	.71
	5.4	.4	1.05		81	40.3	1.962			.42	.82
	5.8	.4	1.0		71	40.0	1.736			.40	.69
	6.2	.4	0.95		56	40.0	1.376			.38	.52
⊙	6.6	.4	0.9		38	40.0	.944			.36	.34
	7.0	.4	1.0		39	40.5	.956			.40	.38
	7.4	.4	0.95		47	40.1	1.157			.38	.44
	7.8	.4	0.85		50	40.5	1.217			.34	.41
	8.2	.4	0.7		50	40.9	1.252			.28	.35
	8.6	.4	0.95		41	41.1	.989			.38	.38
	9.0	.4	0.7		43	41.3	1.031			.28	.29
	9.4	.4	0.7		52	40.5	1.264			.28	.35
	9.8	.4	0.9		29	41.8	.697			.36	.25
	10.2	.4	0.7		29	41.3	.705			.28	.20
	10.6	.4	0.3		39	40.3	.961			.12	.12
											8.57
											(8.57)

(11 MST .038)

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #1				
Station Number:	DC #1	WIDTH	9.600	# of Sections	25
Date:	9/22/2004	AREA	7.120	Sections > 5%	6
Measurement #:	1	VELOCITY	1.194	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.53%
Rating # (1 or 2)	2	TOTAL DISCHARGE	8.501		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.4	0.40	0.3	5	42.1	0.145	0.145	0.145	0.120	0.017
	1.8	0.40	0.4	14	41.6	0.354	0.354	0.354	0.160	0.057
	2.2	0.40	0.4	32	40	0.800	0.800	0.800	0.160	0.128
	2.6	0.40	0.5	47	40.3	1.151	1.151	1.151	0.200	0.230
	3	0.40	0.6	59	40.2	1.441	1.441	1.441	0.240	0.346
	3.4	0.40	0.75	53	40.3	1.294	1.294	1.294	0.300	0.388
	3.8	0.40	0.7	44	40.7	1.069	1.069	1.069	0.280	0.299
	4.2	0.40	0.8	43	40.4	1.053	1.053	1.053	0.320	0.337
	4.6	0.40	0.85	62	40.5	1.501	1.501	1.501	0.340	0.510
	5	0.40	1	73	40.3	1.771	1.771	1.771	0.400	0.708
	5.4	0.40	1.05	81	40.3	1.962	1.962	1.962	0.420	0.824
	5.8	0.40	1	71	40	1.736	1.736	1.736	0.400	0.694
	6.2	0.40	0.95	56	40	1.376	1.376	1.376	0.380	0.523
	6.6	0.40	0.9	38	40	0.944	0.944	0.944	0.360	0.340
	7	0.40	1	39	40.5	0.956	0.956	0.956	0.400	0.382
	7.4	0.40	0.95	47	40.1	1.157	1.157	1.157	0.380	0.440
	7.8	0.40	0.85	50	40.5	1.217	1.217	1.217	0.340	0.414
	8.2	0.40	0.7	50	40.9	1.205	1.205	1.205	0.280	0.337
	8.6	0.40	0.95	41	41.1	0.989	0.989	0.989	0.380	0.376
	9	0.40	0.7	43	41.3	1.031	1.031	1.031	0.280	0.289
	9.4	0.40	0.7	52	40.5	1.264	1.264	1.264	0.280	0.354
	9.8	0.40	0.9	29	41.8	0.698	0.698	0.698	0.360	0.251
	10.2	0.40	0.7	29	41.3	0.706	0.706	0.706	0.280	0.198
	10.6	0.20	0.3	39	40.3	0.961	0.961	0.961	0.060	0.058

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1B

DATE ~~9/24~~ 9/22/04 Comp by FB Checked by _____

PARK GRSA STATION DEADMANS #1

PERSONNEL: Meter MARK Wardzell Notes FRED Bunch

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 349 G.H. .56 Stop: 417 G.H. .56

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER Clear Sunny

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1549	.56				
1617	.56				

FLOW: Width 10.' Area _____ Ave. Vel. _____ G.H. _____ Disch. 8.46

Method 0.6' Method coeff. ____ Hor. Angle coeff. ____ Susp. type _____ Susp. coeff. ____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 46 C° F° Water 42 C° F°

PHOTOS TAKEN: Roll(s) # Frame(s) #

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS _____

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge	
LEW	1.0			.6								.80
	1.4	.4	0.3		5	45.9	.136			.12	.02	.85
	1.8	.4	0.35		8	41.7	.215			.14	.03	
	2.2	.4	0.4		33	40.9	.806			.16	.13	.90
	2.6	.4	0.5		49	40.7	1.187			.20	.24	
	3.0	.4	0.6		60	40.0	1.468			.24	.35	.92
	3.4	.4	0.75		51	40.0	1.256			.30	.38	.94
	3.8	.4	0.7		42	40.2	1.035			.28	.29	
	4.2	.4	0.85		40	40.6	.977			.34	.33	.96
	4.6	.4	0.85		62	40.3	1.509			.34	.51	.97
	5.0	.4	1.0		73	40.3	1.771			.4	.71	.98
	5.4	.4	1.05		83	40.1	2.019			.42	.85	.99
	5.8	.4	1.0		70	40.4	1.695			.4	.68	
	6.2	.4	0.95		50	40.0	1.232			.38	.47	
⊙	6.6	.4	0.9		40	40.5	.980			.36	.35	1.00
	7.0	.4	0.95		44	40.7	1.069			.38	.41	
	7.4	.4	0.95		46	40.6	1.119			.38	.43	
	7.8	.4	0.80		52	40.6	1.261			.32	.40	.99
	8.2	.4	0.7		48	40.3	1.175			.28	.33	
	8.6	.4	0.95		32	40.2	.796			.38	.30	.98
	9.0	.4	0.70		41	40.8	.996			.28	.28	.97
	9.4	.4	0.70		51	40.6	1.238			.28	.35	.96
	9.8	.4	0.9		36	40.5	.885			.36	.32	
	10.2	.4	0.7		27	40.7	.668			.28	.19	.94
	10.6	.4	0.3		32	40.7	.904			.12	.11	.92
											.054	.90
											8.46	
												.85
												.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

⊙ 1.00

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #1				
Station Number:	DC #1	WIDTH	9.600	# of Sections	25
Date:	9/22/2004	AREA	7.080	Sections > 5%	6
Measurement #:	1b	VELOCITY	1.184	Sections > 10%	1
Pygmy or AA (p/a)	p			*Standard Error	4.61%
Rating # (1 or 2)	2	TOTAL DISCHARGE	8.385		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.4	0.40	0.3	5	45.9	0.136	0.136	0.136	0.120	0.016
	1.8	0.40	0.35	8	41.7	0.215	0.215	0.215	0.140	0.030
	2.2	0.40	0.4	33	40.9	0.806	0.806	0.806	0.160	0.129
	2.6	0.40	0.5	49	40.7	1.187	1.187	1.187	0.200	0.237
	3	0.40	0.6	60	40	1.472	1.472	1.472	0.240	0.353
	3.4	0.40	0.75	51	40	1.256	1.256	1.256	0.300	0.377
	3.8	0.40	0.7	42	40.2	1.035	1.035	1.035	0.280	0.290
	4.2	0.40	0.85	40	40.6	0.977	0.977	0.977	0.340	0.332
	4.6	0.40	0.85	62	40.3	1.509	1.509	1.509	0.340	0.513
	5	0.40	1	73	40.3	1.771	1.771	1.771	0.400	0.708
	5.4	0.40	1.05	83	40.1	2.019	2.019	2.019	0.420	0.848
	5.8	0.40	1	70	40.4	1.695	1.695	1.695	0.400	0.678
	6.2	0.40	0.95	50	40	1.232	1.232	1.232	0.380	0.468
	6.6	0.40	0.9	40	40.5	0.980	0.980	0.980	0.360	0.353
	7	0.40	0.95	44	40.7	1.069	1.069	1.069	0.380	0.406
	7.4	0.40	0.95	46	40.6	1.119	1.119	1.119	0.380	0.425
	7.8	0.40	0.8	52	40.6	1.261	1.261	1.261	0.320	0.404
	8.2	0.40	0.7	48	40.3	1.175	1.175	1.175	0.280	0.329
	8.6	0.40	0.95	32	40.2	0.796	0.796	0.796	0.380	0.302
	9	0.40	0.7	41	40.8	0.996	0.996	0.996	0.280	0.279
	9.4	0.40	0.7	51	40.6	1.238	1.238	1.238	0.280	0.347
	9.8	0.40	0.9	36	40.5	0.885	0.885	0.885	0.360	0.319
	10.2	0.40	0.7	27	40.7	0.668	0.668	0.668	0.280	0.187
	10.6	0.20	0.3	37	40.7	0.904	0.904	0.904	0.060	0.054

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 2

DATE 9/22/04 Comp by FB Checked by _____

PARK GRSA STATION DEADMAN #1

PERSONNEL: Meter MARK WONDZELL Notes FRED BUNCH

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 4:30 G.H. .55 Stop: 5:01 G.H. .56

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER CLEAR & SUNNY

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1630	.55				
1701	.55				

FLOW: Width 10' Area _____ Ave. Vel. _____ G.H. _____ Disch. 8.34

Method 0.6' Method coeff. ____ Hor. Angle coeff. ____ Susp. type _____ Susp. coeff. ____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 46.8 C° F° Water 41.7 C° F°

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS NOTE: GAGE HT HAS BEEN CONSISTENT BETWEEN .55 AND .56.

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at—

Angle coef.	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	1.0			.6							
	1.4	.4	0.3		6	47.8	.152			.12	.02
	1.8	.4	0.4		10	40.6	.268			.16	.04
	2.2	.4	0.4		31	40.2	.772			.16	.12
	2.6	.4	0.5		47	40.0	1.16			.20	.23
	3.0	.4	0.6		61	40.1	1.492			.24	.36
	3.4	.4	0.8		45	40.3	1.104			.32	.35
	3.8	.4	0.7		42	40.0	1.04			.28	.29
	4.2	.4	0.85		42	40.9	1.017			.34	.34
	4.6	.4	0.80		61	40.4	1.481			.32	.47
	5.0	.4	0.95		75	40.1	1.827			.38	.69
	5.4	.4	1.05		81	40.2	1.966			.42	.82
	5.8	.4	1.0		68	40.3	1.652			.40	.66
	6.2	.4	0.95		51	40.5	1.241			.38	.47
⊙	6.6	.4	0.9		41	41.1	.989			.36	.36
	7.0	.4	1.0		39	40.1	.965			.40	.39
	7.4	.4	.95		44	40.5	1.075			.38	.41
	7.8	.4	.80		50	40.3	1.223			.32	.39
	8.2	.4	.70		50	40.7	1.211			.28	.34
	8.6	.4	.90		33	40.0	.824			.36	.30
	9.0	.4	.70		48	40.4	1.172			.28	.33
	9.4	.4	.70		53	40.6	1.285			.28	.36
	9.8	.4	.90		33	40.4	.816			.36	.29
	10.2	.4	.70		31	40.6	.764			.28	.21
	10.6	.4	.30		34	40.5	.837			.12	.10

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .83 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #1				
Station Number:	DC #1	**WIDTH**	9.600	**# of Sections**	25
Date:	9/22/2004	**AREA**	7.080	**Sections > 5%**	5
Measurement #:	2	**VELOCITY**	1.174	**Sections > 10%**	0
Pygmy or AA (p/a)	p			***Standard Error**	4.55%
Rating # (1 or 2)	2	**TOTAL DISCHARGE**	8.315		**GOOD**

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.4	0.40	0.3	6	47.8	0.152	0.152	0.152	0.120	0.018
	1.8	0.40	0.4	10	40.6	0.268	0.268	0.268	0.160	0.043
	2.2	0.40	0.4	31	40.2	0.772	0.772	0.772	0.160	0.123
	2.6	0.40	0.5	47	40	1.160	1.160	1.160	0.200	0.232
	3	0.40	0.6	61	40.1	1.492	1.492	1.492	0.240	0.358
	3.4	0.40	0.8	45	40.3	1.104	1.104	1.104	0.320	0.353
	3.8	0.40	0.7	42	40	1.040	1.040	1.040	0.280	0.291
	4.2	0.40	0.85	42	40.9	1.017	1.017	1.017	0.340	0.346
	4.6	0.40	0.8	61	40.4	1.481	1.481	1.481	0.320	0.474
	5	0.40	0.95	75	40.1	1.827	1.827	1.827	0.380	0.694
	5.4	0.40	1.05	81	40.2	1.966	1.966	1.966	0.420	0.826
	5.8	0.40	1	68	40.3	1.652	1.652	1.652	0.400	0.661
	6.2	0.40	0.95	51	40.5	1.241	1.241	1.241	0.380	0.471
	6.6	0.40	0.9	41	41.1	0.989	0.989	0.989	0.360	0.356
	7	0.40	1	39	40.1	0.965	0.965	0.965	0.400	0.386
	7.4	0.40	0.95	44	40.5	1.075	1.075	1.075	0.380	0.408
	7.8	0.40	0.8	50	40.3	1.223	1.223	1.223	0.320	0.391
	8.2	0.40	0.7	50	40.7	1.211	1.211	1.211	0.280	0.339
	8.6	0.40	0.9	33	40	0.824	0.824	0.824	0.360	0.296
	9	0.40	0.7	48	40.4	1.172	1.172	1.172	0.280	0.328
	9.4	0.40	0.7	53	40.6	1.285	1.285	1.285	0.280	0.360
	9.8	0.40	0.9	33	40.4	0.816	0.816	0.816	0.360	0.294
	10.2	0.40	0.7	31	40.6	0.765	0.765	0.765	0.280	0.214
	10.6	0.20	0.3	34	40.5	0.837	0.837	0.837	0.060	0.050

09/21/04 1400 Deadman Cr. #2

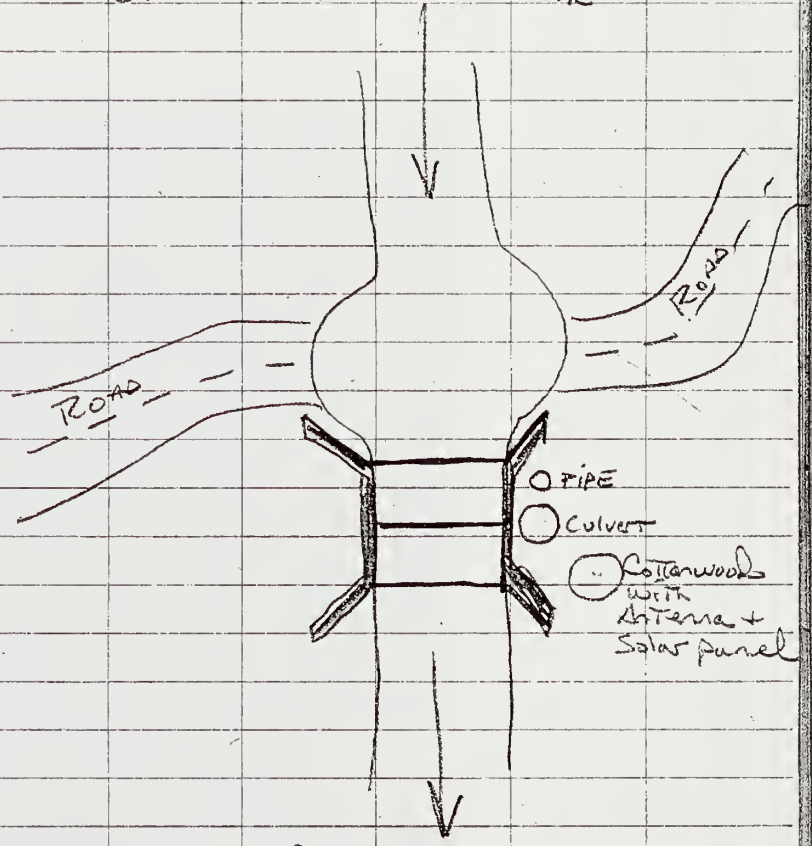
Deadman Cr. #2 CROSS SECTION is located AT A FLUME WHERE THE Road CROSSES Deadman Cr. about 1 mile downstream OF THE MOUTH OF Deadman Canyon. THIS FLUME is THE Real-Time measuring point FOR THE (CDWR) STATION Displayed on THEIR Website

GPS: N 4193039
E 443217
NAD 27, Zone 13

A Discharge mmt Taken with a pygmy meter on 9/22/04 was Taken inside THE upstream End OF THE Flume BECAUSE NO SUITABLE CROSS SECTIONS WERE Found upSTREAM OR DownSTREAM of THE Flume

PHOTOS: (Numbered AFTER ERASING SOME EARLIER photos)
79 - Flume FROM RIGHT BANK
80 - STAFF GAGE in Flume (.44 Feet)

81 - Flume From downstream
82 - Flume From downstream left Bank
83 - Flume From upstream
84 - Flume From Left Bank



Channel bottom is Cobble/gravel
banks are grass, Cottonwood, Juniper

Cross Section: Deadman Creek #2.09.21.04_423
Deadman Creek at the Colorado Division of Water Resources flume.
Flume viewed from right bank to left bank with staff gage visible on left bank upstream wall of the flume.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1400 hrs

Cross Section: Deadman Creek #2.09.21.04_424
Deadman Creek at the Colorado Division of Water Resources flume.
Staff gage bolted to the left bank upstream wall of the flume.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1400 hrs

Cross Section: Deadman Creek #2.09.21.04_425
Deadman Creek at the Colorado Division of Water Resources flume.
Flume viewed from downstream to upstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1400 hrs

Cross Section: Deadman Creek #2.09.21.04_426
Deadman Creek at the Colorado Division of Water Resources flume.
Flume viewed from downstream left bank to upstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1400 hrs

Cross Section: Deadman Creek #2.09.21.04_427
Deadman Creek at the Colorado Division of Water Resources flume.
Flume viewed from upstream to downstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1400 hrs

Cross Section: Deadman Creek #2.09.21.04_428
Deadman Creek at the Colorado Division of Water Resources flume.
Cross section at survey rod in upstream mouth of flume viewed from left bank.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1400 hrs

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. #1

DATE 9/22/04 Comp by LAUFMAN Checked by _____

PARK GRSA STATION DEADMAN FLUME #2

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 14:58 G.H. .42 Stop: 15:30 G.H. .42

METER TYPE Rigmy S/N 90068 SPIN Before Meas. 85s After 100s

WEATHER Part Cloudy current meter dig. 93249=SN

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1458	.42				
1530	.42				

FLOW: Width 8.2 Area ~~3.57~~ 3.66 Ave. Vel._____ G.H. 0.42 Disch. 5.42

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL FLUME

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 55 (C) (F°) Water 45.5 (C) (F°)

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	LEW 0.4	0	0.41	.6			0			0	0
	0.7	0.3	0.42		24	40.6	.598			.126	0.075
	1.0		0.42		31	40.9	.758			.126	0.0955
	1.3		0.42		49	40.3	1.198			.120	0.151
	1.6		0.42		57	40.7	1.392			.126	0.175
	1.9		0.42		56	40.3	1.365			.126	0.172
	2.2		0.41		57	46.5	1.619			.123	0.199
	2.5		0.43		68	40.0	1.663			.129	0.215
	2.8		0.42		62	40.5	1.501			.126	0.189
	3.1		0.42		68	40.4	1.647			.126	0.208
	3.4		0.42		71	40.5	1.714			.126	0.216
	3.7		0.42		80	40.3	1.937			.126	0.244
	4.0		0 42		61	40.3	1.484			.126	0.187
	4.3		0.43		64	40.5	1.548			.129	0.1997
⊙	4.6		0.42		72	40	1.759			.126	0.222
	4.9		0.43		79	40.3	1913			.129	0.247
	5.2		0.43		71	40.1	1.731			.129	0.223
	5.5		0.43		65	40.3	1.58			.129	0.204
	5.8		0.43		53	40.0	1.303			.129	0.168
	6.1		0.44		67	40.0	1.639			.132	0.216
	6.4		0.44		77	40.2	187			.132	0.247
	6.7		0.44		62	40.0	1.543			.132	0.204
	7.0		0.45		64	40.3	1.556			.135	0.210
	7.3		0.45		73	40.2	1.775			.135	0.240
	7.6		0.48		68	40.4	1.647			.144	0.237
	7.9		0.48		72	40.4	1.742			0.144	0.251
	8.2		0 48		68	40.3	1.651			.144	0.238
	8.5		0.47		54	40.7	1.305			.141	0 184
REW	8.6		0.47				0		.141	~~0.141~~	0
									$\frac{1}{2}$ =	3.~~52~~ 59	5.42

1.4145 × .85 = 1.23

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #2				
Station Number:	DC #2	WIDTH	8.200	# of Sections	29
Date:	9/22/2004	AREA	3.560	Sections > 5%	0
Measurement #:	1	VELOCITY	1.505	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.07%
Rating # (1 or 2)	2	TOTAL DISCHARGE	5.357		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0.4	0.15	0.41	0	0	0.000	0.000	0.000	0.062	0.000
	0.7	0.30	0.42	24	40.6	0.599	0.599	0.599	0.126	0.075
	1	0.30	0.42	31	40.9	0.759	0.759	0.759	0.126	0.096
	1.3	0.30	0.42	49	40.3	1.199	1.199	1.199	0.126	0.151
	1.6	0.30	0.42	57	40.2	1.393	1.393	1.393	0.126	0.176
	1.9	0.30	0.42	56	40.3	1.366	1.366	1.366	0.126	0.172
	2.2	0.30	0.41	67	40.5	1.620	1.620	1.620	0.123	0.199
	2.5	0.30	0.43	68	40	1.664	1.664	1.664	0.129	0.215
	2.8	0.30	0.42	62	40.5	1.501	1.501	1.501	0.126	0.189
	3.1	0.30	0.42	68	40.4	1.648	1.648	1.648	0.126	0.208
	3.4	0.30	0.42	71	40.5	1.715	1.715	1.715	0.126	0.216
	3.7	0.30	0.42	80	40.3	1.938	1.938	1.938	0.126	0.244
	4	0.30	0.42	61	40.3	1.485	1.485	1.485	0.126	0.187
	4.3	0.30	0.43	64	40.5	1.549	1.549	1.549	0.129	0.200
	4.6	0.30	0.42	72	40	1.760	1.760	1.760	0.126	0.222
	4.9	0.30	0.43	79	40.3	1.914	1.914	1.914	0.129	0.247
	5.2	0.30	0.43	71	40.1	1.732	1.732	1.732	0.129	0.223
	5.5	0.30	0.43	65	40.3	1.580	1.580	1.580	0.129	0.204
	5.8	0.30	0.43	53	40	1.304	1.304	1.304	0.129	0.168
	6.1	0.30	0.44	67	40	1.640	1.640	1.640	0.132	0.216
	6.4	0.30	0.44	77	40.2	1.871	1.871	1.871	0.132	0.247
	6.7	0.30	0.44	63	40	1.544	1.544	1.544	0.132	0.204
	7	0.30	0.45	64	40.3	1.556	1.556	1.556	0.135	0.210
	7.3	0.30	0.45	73	40.2	1.775	1.775	1.775	0.135	0.240
	7.6	0.30	0.48	68	40.4	1.648	1.648	1.648	0.144	0.237
	7.9	0.30	0.48	72	40.4	1.743	1.743	1.743	0.144	0.251
	8.2	0.30	0.48	68	40.3	1.652	1.652	1.652	0.144	0.238
	8.5	0.20	0.47	54	40.7	1.305	1.305	1.305	0.094	0.123
	8.6	0.05	0.47	0	0	0.000	0.000	0.000	0.023	0.000

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ _____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. #2

DATE 9/22/04 Comp by LAUFMANN Checked by _____

PARK GRSA STATION DEADMAN FLUME #2

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading,) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 16:27 G.H. .41 Stop: 17:00 G.H. .41

METER TYPE PYGMY S/N 90068 SPIN Before Meas. 100S After 94S

current meterdig SN = 93249

WEATHER PARTLY CLOUDY BREEZY

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1627	.41				
1700	.41				

FLOW: Width 8.2 Area 3.65 Ave. Vel._____ G.H. 0.41 Disch. 5.34

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL FLUME → NOTE: Removed rocks upstream to improve flow paths into flume prior to 2nd measurement - WRH

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 55.2 (F) Water 44.1 C (F)

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge	
EW	0.4	0	.41?								0	.80
	0.7	0.3	.43	.6	51	40.2	1.249			.129	.161	.85
	1.0		.43		58	40.6	1.403			.129	.181	
	1.3		.43		66	40.0	1.615			.129	.208	
	1.6		.43		58	40.1	1.420			.129	.183	.90
	1.9		.43		67	40.0	1.639			.129	.21	.92
	2.2		.42		72	40.1	1.755			.126	.221	.94
	2.5		.43		70	40.1	1.707			.129	.220	
	2.8		.42		58	40.2	1.416			.126	.178	.96
	3.1		.43		72	40.3	1.746			.129	.225	.97
	3.4		.43		68	40.0	1.663			.129	.215	.98
	3.7		.43		66	40.0	1.615			.129	.208	.99
	4.0		.43		67	40.3	1.627			.129	.210	
	4.3		.43		58	40.0	1.423			.129	.184	
⊙	4.6		.42		50	40.5	1.43			.126	.180	1.00
	4.9		.43		70	40.3	1.699			.129	.219	
	5.2		.42		62	40.2	1.512			.126	.191	
	5.5		.42		65	40.4	1.576			.126	.199	.99
	5.8		.42		63	40.5	1.524			.126	.192	.98
	6.1		.43		60	40.6	1.45			.129	.187	.97
	6.4		.43		66	40.1	1.611			.129	.208	.96
	6.7		.42		68	40.3	1.651			.126	.208	
	7.0		.44		55	40.7	1.328			.132	.175	.94
	7.3		.44		61	40.5	1.477			.132	.195	.92
	7.6		.46		61	40.2	1.488			.138	.205	.90
	7.9		.47		57	40.4	1.386			.141	.195	
	8.2		.47		61	40.5	1.477			.141	.208	
	8.5		.46		52	40.8	1.255			.138	.173	.85
ZEW	8.6		.45							.135	0	
									$\frac{1}{2}$	3.65	5.34	
												.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #2 - Inside Flume Mouth				
Station Number:	DC #2	WIDTH	8.200	# of Sections	29
Date:	9/22/2004	AREA	3.548	Sections > 5%	0
Measurement #:	2	VELOCITY	1.490	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.06%
Rating # (1 or 2)	2	TOTAL DISCHARGE	5.287		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0.4	0.15	0.41	0	0	0.000	0.000	0.000	0.062	0.000
	0.7	0.30	0.43	51	40.2	1.250	1.250	1.250	0.129	0.161
	1	0.30	0.43	58	40.6	1.403	1.403	1.403	0.129	0.181
	1.3	0.30	0.43	66	40	1.616	1.616	1.616	0.129	0.208
	1.6	0.30	0.43	58	40.1	1.420	1.420	1.420	0.129	0.183
	1.9	0.30	0.43	67	40	1.640	1.640	1.640	0.129	0.212
	2.2	0.30	0.42	72	40.1	1.756	1.756	1.756	0.126	0.221
	2.5	0.30	0.43	70	40.1	1.708	1.708	1.708	0.129	0.220
	2.8	0.30	0.42	58	40.2	1.417	1.417	1.417	0.126	0.179
	3.1	0.30	0.43	72	40.3	1.747	1.747	1.747	0.129	0.225
	3.4	0.30	0.43	68	40	1.664	1.664	1.664	0.129	0.215
	3.7	0.30	0.43	66	40	1.616	1.616	1.616	0.129	0.208
	4	0.30	0.43	67	40.3	1.628	1.628	1.628	0.129	0.210
	4.3	0.30	0.43	58	40	1.424	1.424	1.424	0.129	0.184
	4.6	0.30	0.42	59	40.5	1.430	1.430	1.430	0.126	0.180
	4.9	0.30	0.43	70	40.3	1.699	1.699	1.699	0.129	0.219
	5.2	0.30	0.42	62	40.2	1.512	1.512	1.512	0.126	0.191
	5.5	0.30	0.42	65	40.4	1.576	1.576	1.576	0.126	0.199
	5.8	0.30	0.42	63	40.5	1.525	1.525	1.525	0.126	0.192
	6.1	0.30	0.43	60	40.6	1.451	1.451	1.451	0.129	0.187
	6.4	0.30	0.43	66	40.1	1.612	1.612	1.612	0.129	0.208
	6.7	0.30	0.42	68	40.3	1.652	1.652	1.652	0.126	0.208
	7	0.30	0.44	55	40.7	1.329	1.329	1.329	0.132	0.175
	7.3	0.30	0.44	61	40.5	1.478	1.478	1.478	0.132	0.195
	7.6	0.30	0.46	61	40.2	1.489	1.489	1.489	0.138	0.205
	7.9	0.30	0.47	57	40.4	1.386	1.386	1.386	0.141	0.195
	8.2	0.30	0.47	61	40.5	1.478	1.478	1.478	0.141	0.208
	8.5	0.20	0.46	52	40.8	1.255	1.255	1.255	0.092	0.115
	8.6	0.05	0.45	0	0	0.000	0.000	0.000	0.022	0.000

09/21/04 1230 Deadman #3

Cross Section is located in a straight reach of Deadman Cr. with Juniper on the banks about ¼ mile upstream of the old Ford at the upstream end of the road running along the South side of Deadman Cr.

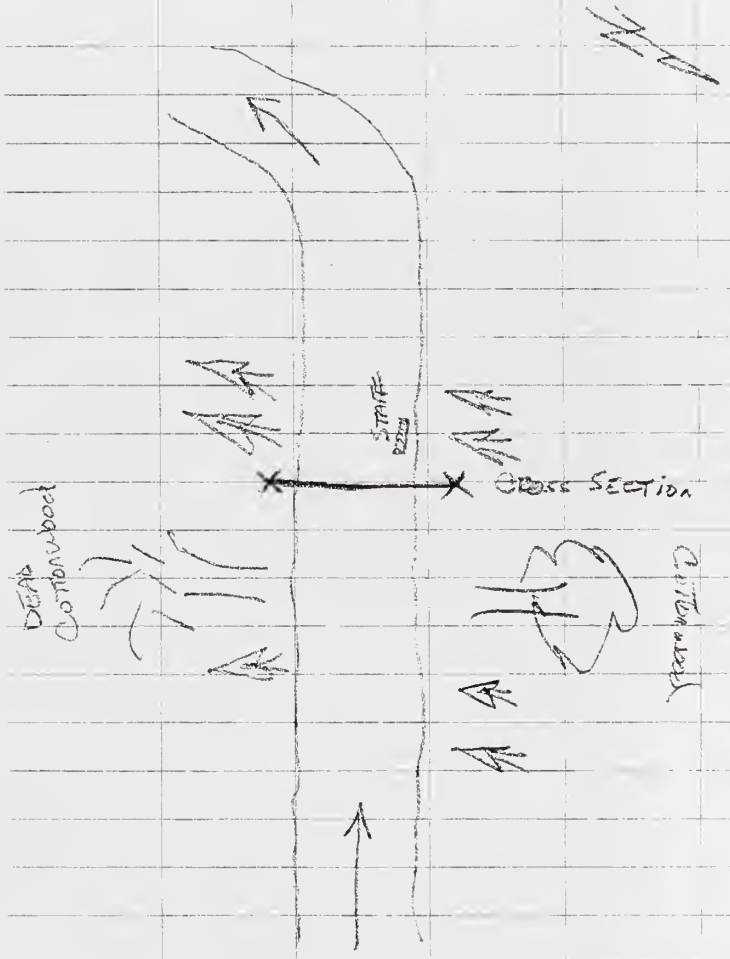
Channel bottom is 40% gravel / 5% cobble / 55% sand
banks are Juniper / Cottonwood

STAFF GAGE is on Right bank about 5 FEET downstream of Cross SECTION

STAFF Gage = .28 FEET = .28 FEET

GPS : N 4193139
E 441805
NAD 27, ZONE 13

Photos 95 - X-SEC From Right bank
96 - X-SEC From UPSTREAM
97 - X-SEC From left bank
98 - X-SEC From downstream
99 - STAFF GAGE
100 - X-SEC and STAFF from DOWNSTREAM RIGHT bank



Cross Section: Deadman Creek #3.09.21.04_417
Deadman Creek upstream of the Alpine Camp Road ford.
Cross section at orange tape viewed from right bank to left bank.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1230 hrs

Cross Section: Deadman Creek #3.09.21.04_418
Deadman Creek upstream of the Alpine Camp Road ford.
Cross section at orange tape viewed from upstream to downstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1230 hrs

Cross Section: Deadman Creek #3.09.21.04_419
Deadman Creek upstream of the Alpine Camp Road ford.
Cross section at orange tape viewed from left bank to right bank.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1230 hrs

Cross Section: Deadman Creek #3.09.21.04_420
Deadman Creek upstream of the Alpine Camp Road ford.
Cross section at orange tape viewed from downstream to upstream.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1230 hrs

Cross Section: Deadman Creek #3.09.21.04_421
Deadman Creek upstream of the Alpine Camp Road ford.
Staff gage located on river right downstream of cross section.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1230 hrs

Cross Section: Deadman Creek #3.09.21.04_422
Deadman Creek upstream of the Alpine Camp Road ford.
Cross section with staff gage located on river right downstream of cross section.

Deadman Creek, Saguache County, CO.
September 21, 2004 @ 1230 hrs

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/22/2004 Comp by _____ Checked by _____

PARK GRSA STATION Deadman Creek Station 3

PERSONNEL: Meter Andrew Valdez Notes Katie Hagaman

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., (Dnstr.), ! ft. (mi.) of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 15:00 G.H. 0.28 Stop: 15:26 G.H. 0.28

METER TYPE Pygmy S/N _____ SPIN Before Meas. 60.5 After 75.5

WEATHER Overcast, windy

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1500	.28				
1526	.28				

FLOW: Width_____ Area_____ Ave. Vel._____ G.H._____ Disch. 3.75

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 43 C° (F°) Water 49 C° (F°)

PHOTOS TAKEN: Roll(s) # Frame(s) #

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	0.25	0.5	0.25					0.095		x0.7 0.0875	0.0083
	0.75	0.5	0.40					0.634		0.200	0.1268
	1.25	0.5	0.50					1.092		0.250	0.2730
	1.75	0.5	0.60					0.665		0.300	0.1995
	2.25	0.5	0.55					0.809		0.275	0.2225
	2.75	0.5	0.50					0.661		0.250	0.1653
	3.25	0.5	0.55					0.524		0.275	0.1441
	3.75	0.5	0.60					0.530		0.300	0.1590
	4.25	0.5	0.58					0.487		0.290	0.1412
	4.75	0.5	0.58					0.424		0.290	0.1230
	5.25	0.5	0.60					0.381		0.300	0.1143
	5.75	0.5	0.60					0.653		0.300	0.1959
	6.25	0.5	0.65					0.548		0.325	0.1781
	6.75	0.5	0.50					0.902		0.250	0.2255
⊙	7.25	0.5	0.55					0.892		0.275	0.2453
	7.75	0.5	0.70					0.818		0.350	0.2863
	8.25	0.5	0.65					0.951		0.325	0.3091
	8.75	0.5	0.72					0.842		0.360	0.3031
	9.25	0.5	0.70					0.808		0.350	0.2828
	9.75	0.5	0.20					0.653		x0.7 0.070	0.0457
											3.75 cfs

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

AV

⊙ 1.00

.0 .10 .20 .30 .40 .50 .60 .70 .75

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #3 (after adding endpoints (verticals) at 0 feet and 10 feet)				
Station Number:	DC #3	WIDTH	10.000	# of Sections	22
Date:	9/22/2004	AREA	5.434	Sections > 5%	10
Measurement #:	1	VELOCITY	0.691	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	
Rating # (1 or 2)	2	TOTAL DISCHARGE	3.753		

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0	0.13	0			0.000	0.000	0.000	0.000	0.000
	0.25	0.38	0.25			0.095	0.095	0.095	0.094	0.009
	0.75	0.50	0.4			0.634	0.634	0.634	0.200	0.127
	1.25	0.50	0.5			1.092	1.092	1.092	0.250	0.273
	1.75	0.50	0.6			0.665	0.665	0.665	0.300	0.200
	2.25	0.50	0.55			0.809	0.809	0.809	0.275	0.222
	2.75	0.50	0.5			0.661	0.661	0.661	0.250	0.165
	3.25	0.50	0.55			0.524	0.524	0.524	0.275	0.144
	3.75	0.50	0.6			0.530	0.530	0.530	0.300	0.159
	4.25	0.50	0.58			0.487	0.487	0.487	0.290	0.141
	4.75	0.50	0.58			0.424	0.424	0.424	0.290	0.123
	5.25	0.50	0.6			0.381	0.381	0.381	0.300	0.114
	5.75	0.50	0.6			0.653	0.653	0.653	0.300	0.196
	6.25	0.50	0.65			0.548	0.548	0.548	0.325	0.178
	6.75	0.50	0.5			0.902	0.902	0.902	0.250	0.226
	7.25	0.50	0.55			0.892	0.892	0.892	0.275	0.245
	7.75	0.50	0.7			0.818	0.818	0.818	0.350	0.286
	8.25	0.50	0.65			0.951	0.951	0.951	0.325	0.309
	8.75	0.50	0.72			0.842	0.842	0.842	0.360	0.303
	9.25	0.50	0.7			0.808	0.808	0.808	0.350	0.283
	9.75	0.38	0.2			0.653	0.653	0.653	0.075	0.049
	10	0.13	0			0.000	0.000	0.000	0.000	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. 2

DATE 9/22/2004 Comp by _____ Checked by _____

PARK GRSA STATION Deadman Creek Station 3

PERSONNEL: Meter Andrew Valdez Notes Katie Hagaman

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr./(Dnstr.) 1 ft./(mi.) of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 16:30 G.H. 0.27 Stop: 16:54 G.H. 0.27

METER TYPE Pygmy S/N _____ SPIN Before Meas. 52s After 46s

WEATHER Partly cloudy

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1630	.27				
1654	.27				

FLOW: Width_____ Area_____ Ave. Vel._____ G.H._____ Disch. 3.49

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 53 C°(F°) Water 48 C°(F°)

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	0.25	0.5	0.20					0.319		×0.7 0.070	0.0223
	0.75	0.5	0.35					0.285		0.175	0.0499
	1.25	0.5	0.50					1.041		0.250	0.2602
	1.75	0.5	0.50					0.777		0.250	0.1943
	2.25	0.5	0.55					0.751		0.275	0.2065
	2.75	0.5	0.50					0.582		0.250	0.1455
	3.25	0.5	0.52					0.502		0.260	0.1305
	3.75	0.5	0.42					0.530		0.210	0.1113
	4.25	0.5	0.57					0.425		0.285	0.1211
	4.75	0.5	0.50					0.365		0.250	0.0913
	5.25	0.5	0.60					0.453		0.300	0.1359
	5.75	0.5	0.62					0.748		0.310	0.2319
	6.25	0.5	0.60					0.538		0.300	0.1614
	6.75	0.5	0.50					0.816		0.250	0.2040
⊙	7.25	0.5	0.60					0.876		0.300	0.2628
	7.75	0.5	0.65					0.772		0.325	0.2509
	8.25	0.5	0.65					0.957		0.325	0.3110
	8.75	0.5	0.70					0.814		0.350	0.2849
	9.25	0.5	0.60					0.809		0.300	0.2427
	9.75	0.5	0.30					0.659		×0.7 0.105	0.0692
											3.49 cfs AV

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #3 (after adding endpoints (verticals) at 0 feet and 10 feet)				
Station Number:	DC #3	**WIDTH**	10.000	**# of Sections**	22
Date:	9/22/2004	**AREA**	5.153	**Sections > 5%**	10
Measurement #:	2	**VELOCITY**	0.678	**Sections > 10%**	0
Pygmy or AA (p/a)	p			***Standard Error**	
Rating # (1 or 2)	2	**TOTAL DISCHARGE**	3.494		

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0	0.13	0			0.000	0.000	0.000	0.000	0.000
	0.25	0.38	0.2			0.319	0.319	0.319	0.075	0.024
	0.75	0.50	0.35			0.285	0.285	0.285	0.175	0.050
	1.25	0.50	0.5			1.041	1.041	1.041	0.250	0.260
	1.75	0.50	0.5			0.777	0.777	0.777	0.250	0.194
	2.25	0.50	0.55			0.751	0.751	0.751	0.275	0.207
	2.75	0.50	0.5			0.582	0.582	0.582	0.250	0.146
	3.25	0.50	0.52			0.502	0.502	0.502	0.260	0.131
	3.75	0.50	0.42			0.530	0.530	0.530	0.210	0.111
	4.25	0.50	0.57			0.425	0.425	0.425	0.285	0.121
	4.75	0.50	0.5			0.365	0.365	0.365	0.250	0.091
	5.25	0.50	0.6			0.453	0.453	0.453	0.300	0.136
	5.75	0.50	0.62			0.748	0.748	0.748	0.310	0.232
	6.25	0.50	0.6			0.538	0.538	0.538	0.300	0.161
	6.75	0.50	0.5			0.816	0.816	0.816	0.250	0.204
	7.25	0.50	0.6			0.876	0.876	0.876	0.300	0.263
	7.75	0.50	0.65			0.772	0.772	0.772	0.325	0.251
	8.25	0.50	0.65			0.957	0.957	0.957	0.325	0.311
	8.75	0.50	0.7			0.814	0.814	0.814	0.350	0.285
	9.25	0.50	0.6			0.809	0.809	0.809	0.300	0.243
	9.75	0.38	0.3			0.659	0.659	0.659	0.113	0.074
	10	0.13	0			0.000	0.000	0.000	0.000	0.000

09/21/04 1130 DEADman Cr. #4

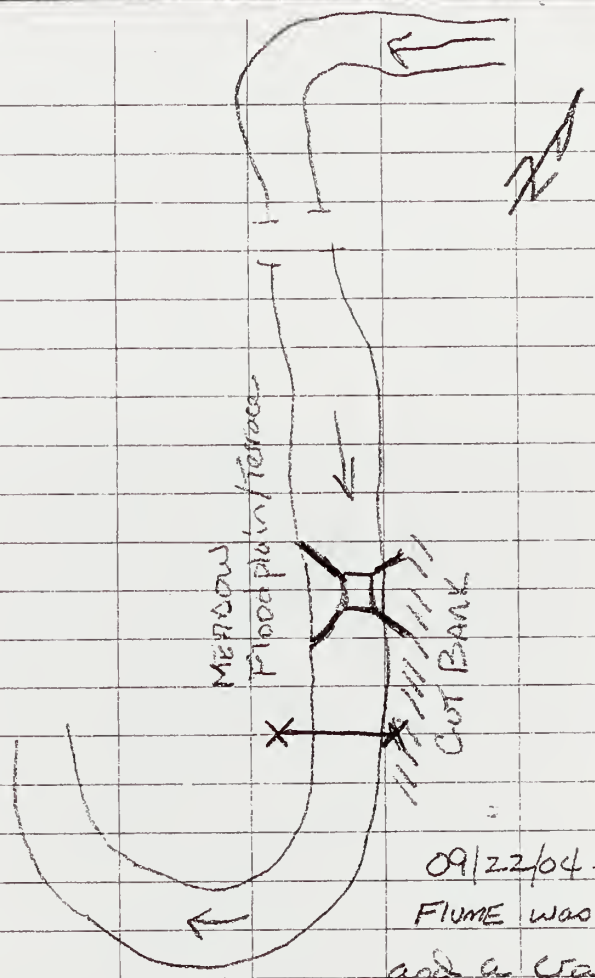
INSTALLED 6inch FLUME
STAFF GAGE: .43 FT.

FLUME is in UNSTABLE SAND channel
WITH platic VISQUEEN on THE
UPSTREAM END TO CONTROL EROSION

PHOTOS: 94- FLUME FROM LEFT BANK
93- FLUME FROM UPSTREAM
92- STAFF GAGE in FLUME
91- FLUME FROM RIGHT BANK
90- FLUME FROM DOWNSTREAM

FLUME is located APPROXIMATELY 1/2 TO 3/4
MILE UPSTREAM of Alpine Camp
Road Crossing

Channel bottom is course sand.



09/22/04 -
FLUME was removed
and a cross section
set up about 30 feet
downstream

Cross Section: Deadman Creek #4.09.21.04_435
Deadman Creek upstream of the Alpine Camp road crossing.
Cross section at white tape viewed from right bank to left bank with staff gage downstream of cross section on river left.

Deadman Creek, Saguache County, CO.
September 22, 2004 @ 1500 hrs

Cross Section: Deadman Creek #4.09.21.04_436
Deadman Creek upstream of the Alpine Camp road crossing.
Staff gage located downstream of the cross section on river left.

Deadman Creek, Saguache County, CO.
September 22, 2004 @ 1500 hrs

Cross Section: Deadman Creek #4.09.21.04_437
Deadman Creek upstream of the Alpine Camp road crossing.
Cross section at white tape viewed from downstream to upstream.

Deadman Creek, Saguache County, CO.
September 22, 2004 @ 1500 hrs

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9-22-04 Comp by _____ Checked by _____

PARK GRSA STATION DEADMAN CREEK #4

PERSONNEL: Meter HARTE Notes HARTE

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 1500 G.H. .25 Stop: 1535 G.H. .27

METER TYPE PYGMY S/N _____ SPIN Before Meas. 4.5+ After 4.5+

WEATHER Cloudy, Cool Rain in the Valley, Snow in Mountains

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1500	.25				
1535	.27				

FLOW: Width 6.9 ft Area_____ Ave. Vel._____ G.H._____ Disch. 1.48 cfs

Method .6 Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air_____C° F° Water_____C° F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

04-22-04 1500 hr [illegible] O.G. start = [illegible]
START TIME = 1500 hr end Time = 1535 O.G. end = .27

Air T°C = 11°C
H2O T°C = 16.5°C

River at—

Angle coefficient	Dist. from initial point FT	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY At point	VELOCITY Mean in vertical	Adjusted for hor. angle or	Area	Discharge
REW	1.0	.25	0								
1	1.25	.25	.18				0				0
2	1.50	.25	.27		30	40.7	.739			.0675	.05
3	1.75	.25	.30		47	40.5	1.146			.075	.086
4	2.00	.25	.29		47	40.0	1.16			.0725	.084
5	2.25	.25	.27		45	40.7	1.046			.0675	.071
6	2.50		.29		46	40.6	1.119			.0725	.081
7	2.75		.29		35	40.6	.859			.0725	.062
8	3.0		.28		48	40.3	1.175			.07	.082
9	3.25		.28		52	40.8	1.255			.07	.088
10	3.50		.25		47	40.4	1.148			.0625	.072
11	3.75		.28		52	40.0	1.280			.07	.09
12	4.0		.27		51	40.9	1.229			.0675	.083
13	4.25		.27		49	40.3	1.199			.0675	.081
14	4.50		.26		27	40.1	.678			.065	.044
15	4.75		.27		42	40.5	1.027			.0675	.069
16	5.00		.25		38	40.6	.930			.0625	.058
17	5.25		.30		30	41.1	.732			.075	.055
18	5.50		.28		41	40.3	1.009			.07	.071
19	5.75		.29		29	40.2	.724			.0725	.052
20	6.00		.29		35	40.2	.867			.0725	.063
21	6.25		.28		22	41.8	.527			.07	.038
22	6.5		.28		29	40.0	.727			.07	.051
23	6.75		.28		26	41.2	.637			.07	.045
LEW	7.00										
											1.45 cfs

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #4				
Station Number:	DC #4	WIDTH	6.000	# of Sections	25
Date:	9/22/2004	AREA	1.575	Sections > 5%	8
Measurement #:	1	VELOCITY	0.936	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.37%
Rating # (1 or 2)	2	TOTAL DISCHARGE	1.475		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.13	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.25	0.25	0.18	0	0	0.000	0.000	0.000	0.045	0.000
	1.5	0.25	0.27	30	40.7	0.739	0.739	0.739	0.068	0.050
	1.75	0.25	0.3	47	40.5	1.146	1.146	1.146	0.075	0.086
	2	0.25	0.29	47	40	1.160	1.160	1.160	0.073	0.084
	2.25	0.25	0.27	43	40.7	1.046	1.046	1.046	0.068	0.071
	2.5	0.25	0.29	46	40.6	1.119	1.119	1.119	0.073	0.081
	2.75	0.25	0.29	35	40.6	0.859	0.859	0.859	0.073	0.062
	3	0.25	0.28	48	40.3	1.175	1.175	1.175	0.070	0.082
	3.25	0.25	0.28	52	40.8	1.255	1.255	1.255	0.070	0.088
	3.5	0.25	0.25	47	40.4	1.148	1.148	1.148	0.063	0.072
	3.75	0.25	0.28	52	40	1.280	1.280	1.280	0.070	0.090
	4	0.25	0.27	51	40.9	1.229	1.229	1.229	0.068	0.083
	4.25	0.25	0.27	49	40.3	1.199	1.199	1.199	0.068	0.081
	4.5	0.25	0.26	27	40.1	0.678	0.678	0.678	0.065	0.044
	4.75	0.25	0.27	42	40.5	1.027	1.027	1.027	0.068	0.069
	5	0.25	0.25	38	40.6	0.930	0.930	0.930	0.063	0.058
	5.25	0.25	0.3	30	41.1	0.732	0.732	0.732	0.075	0.055
	5.5	0.25	0.28	41	40.3	1.008	1.008	1.008	0.070	0.071
	5.75	0.25	0.29	29	40.2	0.724	0.724	0.724	0.073	0.052
	6	0.25	0.29	35	40.2	0.867	0.867	0.867	0.073	0.063
	6.25	0.25	0.28	22	41.8	0.537	0.537	0.537	0.070	0.038
	6.5	0.25	0.28	29	40	0.727	0.727	0.727	0.070	0.051
	6.75	0.25	0.28	26	41.2	0.637	0.637	0.637	0.070	0.045
	7	0.13	0	0	0	0.000	0.000	0.000	0.000	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 7

DATE 9-22-04 Comp by _____ Checked by _____

PARK GRSA STATION DEADMAN CREEK #4

PERSONNEL: Meter HARTE Notes HARTE

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 1630 G.H. .27 Stop: 1700 G.H. .27

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45's After 45's

WEATHER Cool, Cloudy, breeze

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1630	.27				
1700	.27				

FLOW: Width 6 FT Area _____ Ave. Vel. _____ G.H. _____ Disch. 1.37

Method _____ Method coeff. _____ Hor. Angle coeff. _____ Susp. type _____ Susp. coeff. _____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air _____ C° F° Water _____ C° F°

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ _____ Type _____

OBSERVATIONS/COMMENTS _____

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

09-22-04 1630 START TIME = 1630 END TIME = 1700
START G.H. = 2.27 END G.H. = 2.27

START SPIN = 45° River at— END SPIN = 45°

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
		ft	ft						.....		
REW	1.0	.25	—	—	—	—	—	—	—	—	0
1	1.25		.20								0
2	1.50		.28		35	40.5	~~.861~~	~~.7~~		.07	.06
3	1.75		.29		46	40.7	1.117			.0725	.081
4	2.00		.30		44	40.7	1.069			.075	.08
5	2.25		.30		36	40.2	.889			.075	.067
6	2.50		.30		42	40.4	1.03			.075	.077
7	2.75		.28		44	40.4	1.087			.07	.075
8	3.00		.30		46	40.3	1.137			.075	.084
9	3.25		.30		37	40.7	.904			.075	.068
10	3.50		.30		44	40.5	1.072			.075	.081
11	3.75		.26		33	40.2	1.69			.065	.072
12	4.00		.26		42	40.5	1.027			.065	.067
13 ⊙	4.25		.26		45	40.4	1.10			.065	.072
14	4.50		.26		40	40.5	.977			.065	.064
15	4.75		.24		40	40.7	.977			.06	.059
16	5.00		.23		29	40.2	.724			.0575	.042
17	5.25		.23		29	40.6	.717			.0575	.041
18	5.50		.23		31	40.6	.776			.0575	.045
19	5.75		.22		34	40.1	.845			.055	.046
20	6.00		.24		30	41.2	.730			.06	.044
21	6.25		.28		24	41.3	.589			.07	.041
22	6.50		.28		31	41.1	.756			.07	.053
23	6.75		.29		29	41.4	.704			.07	.049
LEW	7.00										
											1.37 cfs

Air Temp = 11°C H2O Temp = 10°C

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Deadman Creek #4
Station Number:	DC #4
Date:	9/22/2004
Measurement #:	2
Pygmy or AA (p/a)	p
Rating # (1 or 2)	2

WIDTH	6.000	# of Sections	25
AREA	1.530	Sections > 5%	8
VELOCITY	0.898	Sections > 10%	0
		*Standard Error	4.37%
TOTAL DISCHARGE	1.374		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.13	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.25	0.25	0.2	0	0	0.000	0.000	0.000	0.050	0.000
	1.5	0.25	0.28	35	40.5	0.861	0.861	0.861	0.070	0.060
	1.75	0.25	0.29	46	40.7	1.117	1.117	1.117	0.073	0.081
	2	0.25	0.3	44	40.7	1.069	1.069	1.069	0.075	0.080
	2.25	0.25	0.3	36	40.3	0.889	0.889	0.889	0.075	0.067
	2.5	0.25	0.3	42	40.4	1.030	1.030	1.030	0.075	0.077
	2.75	0.25	0.28	44	40.4	1.077	1.077	1.077	0.070	0.075
	3	0.25	0.3	46	40.3	1.127	1.127	1.127	0.075	0.085
	3.25	0.25	0.3	37	40.7	0.904	0.904	0.904	0.075	0.068
	3.5	0.25	0.3	46	40.5	1.122	1.122	1.122	0.075	0.084
	3.75	0.25	0.26	45	40.1	1.109	1.109	1.109	0.065	0.072
	4	0.25	0.26	42	40.5	1.027	1.027	1.027	0.065	0.067
	4.25	0.25	0.26	45	40.4	1.101	1.101	1.101	0.065	0.072
	4.5	0.25	0.26	42	40.5	1.027	1.027	1.027	0.065	0.067
	4.75	0.25	0.24	40	40.7	0.975	0.975	0.975	0.060	0.059
	5	0.25	0.23	29	40.2	0.724	0.724	0.724	0.058	0.042
	5.25	0.25	0.23	29	40.6	0.717	0.717	0.717	0.058	0.041
	5.5	0.25	0.23	31	40	0.776	0.776	0.776	0.058	0.045
	5.75	0.25	0.22	34	40.1	0.846	0.846	0.846	0.055	0.047
	6	0.25	0.24	30	41.2	0.731	0.731	0.731	0.060	0.044
	6.25	0.25	0.28	24	41.3	0.589	0.589	0.589	0.070	0.041
	6.5	0.25	0.28	31	41.1	0.756	0.756	0.756	0.070	0.053
	6.75	0.25	0.28	29	41.4	0.704	0.704	0.704	0.070	0.049
	7	0.13	0	0	0	0.000	0.000	0.000	0.000	0.000

9/20/04 @ 1658 Sand Cr. #1

Cross Section is located approximately 100yds upstream of the Gravel pit at the mouth of Sand Cr. Canyon

GPS: N 4188461
E 448719
NAD 27, Zone 13

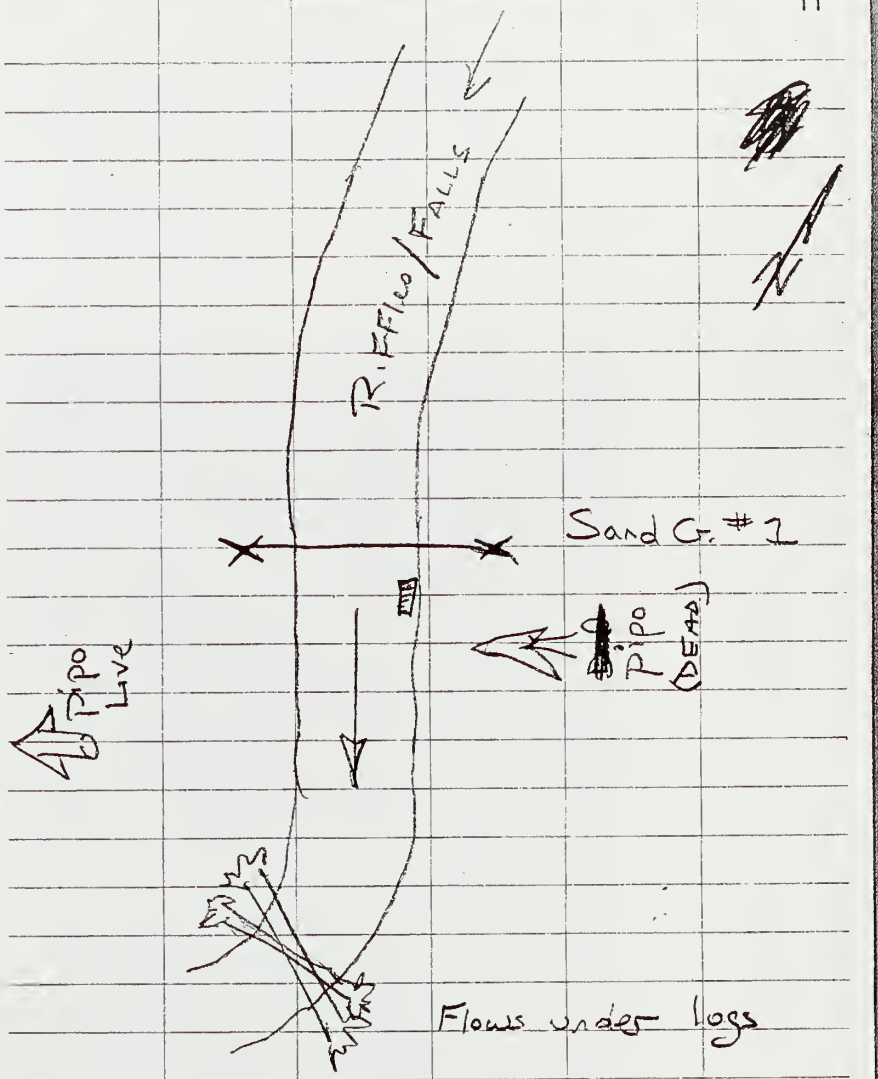
Staff Gage is located approximately 10 Feet downstream of the Cross Section on Left Bank

Staff Gage: 0.42 Ft.

Channel bottom is 5% Boulder / 75% Cobble / 20% gravel

Banks are vegetated with Alder, Right bank is steep; left bank is level Flood plain

Photos: 78 - x-sec From Right bank
77 - Staff Gage
76 - x-Sec looking ~~upstream~~ downstream
75 - x-Sec looking upstream
74 - x-Sec From left bank



Cross Section: Sand Creek #1.09.20.04_396
Sand Creek upstream of the gravel pit near the mouth of Sand Creek Canyon.
Cross section at orange tape viewed from left bank to right bank .

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1658 hrs

Cross Section: Sand Creek #1.09.20.04_397
Sand Creek upstream of the gravel pit near the mouth of Sand Creek Canyon.
Cross section at orange tape viewed from downstream to upstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1658 hrs

Cross Section: Sand Creek #1.09.20.04_398
Sand Creek upstream of the gravel pit near the mouth of Sand Creek Canyon.
Cross section at orange tape viewed from upstream to downstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1658 hrs

Cross Section: Sand Creek #1.09.20.04_399
Sand Creek upstream of the gravel pit near the mouth of Sand Creek Canyon.
Staff gage located on river left downstream of the cross section.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1658 hrs

Cross Section: Sand Creek #1.09.20.04_400
Sand Creek upstream of the gravel pit near the mouth of Sand Creek Canyon.
Cross section at orange tape viewed from right bank to left bank .

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1658 hrs

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. (1)

DATE 9/22/04 Comp by FB Checked by _____

PARK GRSA STATION SAND CREEK #1

PERSONNEL: Meter MARK WONDZELL Notes FLOOD CREW

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 9:57 G.H. 0.36 Stop: 10.43 G.H. 0.36

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER CLEAR & SUNNY

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0957	.36				
1043	.36				

FLOW: Width 14' Area_____ Ave. Vel._____ G.H._____ Disch. 12.12

Method 0.6 Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 39.4 F° Water 40.5 F°

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or ----------	Area	Discharge	
LEW	1.0		0	.6	0	6	0				0	.80
	1.5	.5	0.52		0	40.0	0			0.26	0	.85
	2.0	.5	0.50		6	45.5	0.158			0.25	.04	
	2.5	.5	0.75		27	41.3	0.659			0.375	.25	
	3.0	~~.75~~ .5	0.75		54	40.0	1.328			0.375	.50	.90
	3.5	.5	0.75		83	40.2	2.014			0.375	.76	.92
	4.0	.5	0.70		72	40.7	1.730			0.35	.61	.94
	4.5	.5	0.85		67	40.1	1.636			0.425	.70	
	5.0	.5	0.90		66	40.3	1.604			0.45	.72	.96
	5.5	.5	0.90		73	40.3	1.771			0.45	.80	.97
	6.0	.5	1.05		58	40.5	1.406			0.525	.74	.98
	6.5	.5	0.90		46	40.2	1.13			0.45	.51	.99
	7.0	.5	0.95		50	40.8	1.208			0.475	.57	
	7.5	.5	0.85		51	40.4	1.244			0.425	.53	
⊙	8.0	.5	1.0		37	40.1	0.917			0.5	.46	1.00
	8.5	.5	0.9		33	41.0	0.804			0.45	.36	
	9.0	.5	0.95		41	41.5	0.98			0.475	.47	
	9.5	.5	1.0		57	40.2	1.393			.50	.70	.99
	10.0	.5	1.0		64	40.2	1.56			.50	.79	.98
	10.5	.5	0.90		46	40.3	1.127			.45	.51	.97
	11.0	.5	1.0		46	40.6	1.119			.50	.56	.96
	11.5	.5	0.95		22	41.2	.544			0.475	.26	
	12.0	.5	1.15		31	40.5	.766			.575	.44	.94
	12.5	.5	0.95		25	40.9	.618			.475	.29	.92
	13.0	.5	0.60		24	41.1	.592			.30	.18	.90
	13.5	.5	0.80		37	40.2	.915			.40	.37	
	14.0	.5	0.80		0	40.0	0			.40	0	
	14.5	.5	0.30		0	40.0	0			.15	0	.85
											~~12.03~~	
											12.12	.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

⊙

.0 .10 .20 .30 .40 .50 .60 .70 .75

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #1				
Station Number:	SC #1	WIDTH	13.500	# of Sections	28
Date:	9/22/2004	AREA	11.260	Sections > 5%	8
Measurement #:	1	VELOCITY	1.072	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.33%
Rating # (1 or 2)	2	TOTAL DISCHARGE	12.075		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.25	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.5	0.50	0.52	0	40	0.000	0.000	0.000	0.260	0.000
	2	0.50	0.5	6	45.5	0.158	0.158	0.158	0.250	0.039
	2.5	0.50	0.75	27	41.3	0.659	0.659	0.659	0.375	0.247
	3	0.50	0.75	54	40	1.328	1.328	1.328	0.375	0.498
	3.5	0.50	0.75	83	40.2	2.014	2.014	2.014	0.375	0.755
	4	0.50	0.7	72	40.7	1.730	1.730	1.730	0.350	0.606
	4.5	0.50	0.85	67	40.1	1.636	1.636	1.636	0.425	0.695
	5	0.50	0.9	66	40.3	1.604	1.604	1.604	0.450	0.722
	5.5	0.50	0.9	73	40.3	1.771	1.771	1.771	0.450	0.797
	6	0.50	1.05	58	40.5	1.407	1.407	1.407	0.525	0.738
	6.5	0.50	0.9	46	40.2	1.130	1.130	1.130	0.450	0.509
	7	0.50	0.95	50	40.8	1.208	1.208	1.208	0.475	0.574
	7.5	0.50	0.85	51	40.4	1.244	1.244	1.244	0.425	0.529
	8	0.50	1	37	40.1	0.917	0.917	0.917	0.500	0.459
	8.5	0.50	0.9	33	41	0.804	0.804	0.804	0.450	0.362
	9	0.50	0.95	41	41.5	0.980	0.980	0.980	0.475	0.466
	9.5	0.50	1	57	40.2	1.393	1.393	1.393	0.500	0.696
	10	0.50	1	64	40.2	1.560	1.560	1.560	0.500	0.780
	10.5	0.50	0.9	46	40.3	1.127	1.127	1.127	0.450	0.507
	11	0.50	1	46	40.6	1.119	1.119	1.119	0.500	0.560
	11.5	0.50	0.95	22	41.2	0.544	0.544	0.544	0.475	0.258
	12	0.50	1.15	31	40.5	0.766	0.766	0.766	0.575	0.441
	12.5	0.50	0.95	25	40.9	0.618	0.618	0.618	0.475	0.294
	13	0.50	0.6	24	41.1	0.592	0.592	0.592	0.300	0.178
	13.5	0.50	0.8	37	40.2	0.915	0.915	0.915	0.400	0.366
	14	0.50	0.8	0	40	0.000	0.000	0.000	0.400	0.000
	14.5	0.25	0.3	0	40	0.000	0.000	0.000	0.075	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. (2)

DATE 9/22/04 Comp by FB Checked by _____

PARK GRSA STATION SAND CREEK #1

PERSONNEL: Meter MARK WONDZELL Notes FRED BUNCH

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 11:29 G.H. 0.36 Stop: 12:07 G.H. 0.36

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45 t After 45 t

WEATHER CLOUDY & SUNNY

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1129	.36				
1207	.36				

FLOW: Width 14' Area_____ Ave. Vel._____ G.H._____ Disch. 13.33

Method 0.6 Method coeff.____ Hor. Angle coeff.____ Susp. type_____ Susp. coeff.____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 57 C° F° Water 41.4 C° F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at—

Angle coef-ficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge	
EW	1.0			.6								.80
	1.5	.5	0.5		14	40.0	0.367			.25	.10	.85
	2.0	.5	0.5		39	40.4	0.958			.25	.24	
	2.5	.5	0.7		41	40.4	1.006			.35	.35	
	3.0	.5	0.75		69	40.5	1.667			.375	.63	.90
	3.5	.5	0.75		85	40.3	2.057			.375	.77	.92
	4.0	.5	0.65		70	40.0	1.712			.325	.56	.94
	4.5	.5	0.85		73	40.3	1.771			.425	.75	
	5.0	.5	0.90		66	40.1	1.612			.45	.73	.96
	5.5	.5	0.90		71	40.2	1.727			.45	.78	.97
	6.0	.5	1.05		58	40.2	1.417			.525	.74	.98
	6.5	.5	0.90		51	40.3	1.247			.45	.56	.99
	7.0	.5	0.95		47	40.6	1.143			.475	.54	
	7.5	.5	0.85		54	40.6	1.309			.425	.56	
⊙	8.0	.5	1.00		36	40.7	.881			.50	.44	1.00
	8.5	.5	0.90		37	41.0	.898			.45	.40	
	9.0	.5	0.95		41	40.0	1.016			.475	.48	
	9.5	.5	1.0		56	40.5	1.357			.50	.68	.99
	10.0	.5	1.0		58	40.2	1.417			.50	.71	.98
	10.5	.5	1.15		44	40.5	1.075			.575	.62	.97
	11.0	.5	1.00		42	40.6	1.025			.50	.51	.96
	11.5	.5	1.00		36	40.0	0.896			.50	.45	
	12.0	.5	1.05		33	40.8	0.808			.525	.42	.94
	12.5	.5	0.95		24	40.6	0.598			.475	.28	.92
	13.0	.5	0.60		29	40.1	.726			.30	.22	.90
	13.5	.5	0.85		37	40.7	.904			.425	.38	
	14.0	.5	0.70		32	40.3	.794			.35	.28	
	14.5	.5	0.30		40	40	.992			.15	.15	.85
											13.33	
												.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

⊙ 1.00

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #1				
Station Number:	SC #1	WIDTH	13.500	# of Sections	28
Date:	9/22/2004	AREA	11.275	Sections > 5%	7
Measurement #:	2	VELOCITY	1.175	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.19%
Rating # (1 or 2)	2	TOTAL DISCHARGE	13.251		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.25	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.5	0.50	0.5	14	40	0.367	0.367	0.367	0.250	0.092
	2	0.50	0.5	39	40.4	0.958	0.958	0.958	0.250	0.240
	2.5	0.50	0.7	41	40.4	1.006	1.006	1.006	0.350	0.352
	3	0.50	0.75	69	40.5	1.667	1.667	1.667	0.375	0.625
	3.5	0.50	0.75	85	40.3	2.057	2.057	2.057	0.375	0.771
	4	0.50	0.65	70	40	1.712	1.712	1.712	0.325	0.556
	4.5	0.50	0.85	73	40.3	1.771	1.771	1.771	0.425	0.753
	5	0.50	0.9	66	40.1	1.612	1.612	1.612	0.450	0.725
	5.5	0.50	0.9	71	40.2	1.727	1.727	1.727	0.450	0.777
	6	0.50	1.05	58	40.2	1.417	1.417	1.417	0.525	0.744
	6.5	0.50	0.9	51	40.3	1.247	1.247	1.247	0.450	0.561
	7	0.50	0.95	47	40.6	1.143	1.143	1.143	0.475	0.543
	7.5	0.50	0.85	54	40.6	1.309	1.309	1.309	0.425	0.556
	8	0.50	1	36	40.7	0.881	0.881	0.881	0.500	0.440
	8.5	0.50	0.9	37	41	0.898	0.898	0.898	0.450	0.404
	9	0.50	0.95	41	40	1.016	1.016	1.016	0.475	0.482
	9.5	0.50	1	56	40.5	1.359	1.359	1.359	0.500	0.680
	10	0.50	1	58	40.2	1.417	1.417	1.417	0.500	0.708
	10.5	0.50	1.15	44	40.5	1.075	1.075	1.075	0.575	0.618
	11	0.50	1	42	40.6	1.025	1.025	1.025	0.500	0.512
	11.5	0.50	1	36	40	0.896	0.896	0.896	0.500	0.448
	12	0.50	1.05	33	40.8	0.808	0.808	0.808	0.525	0.424
	12.5	0.50	0.95	24	40.6	0.599	0.599	0.599	0.475	0.284
	13	0.50	0.6	29	40.1	0.726	0.726	0.726	0.300	0.218
	13.5	0.50	0.85	37	40.7	0.904	0.904	0.904	0.425	0.384
	14	0.50	0.7	32	40.3	0.794	0.794	0.794	0.350	0.278
	14.5	0.25	0.3	40	40	0.992	0.992	0.992	0.075	0.074

9/20/04 1530 Sand Cr. #2

Cross Section is located approximately 30 FEET downstream of a Flume with CDWR Real-Time gage

STAFF Gage located on River Right Approximately 10 FEET downstream of The Cross Section

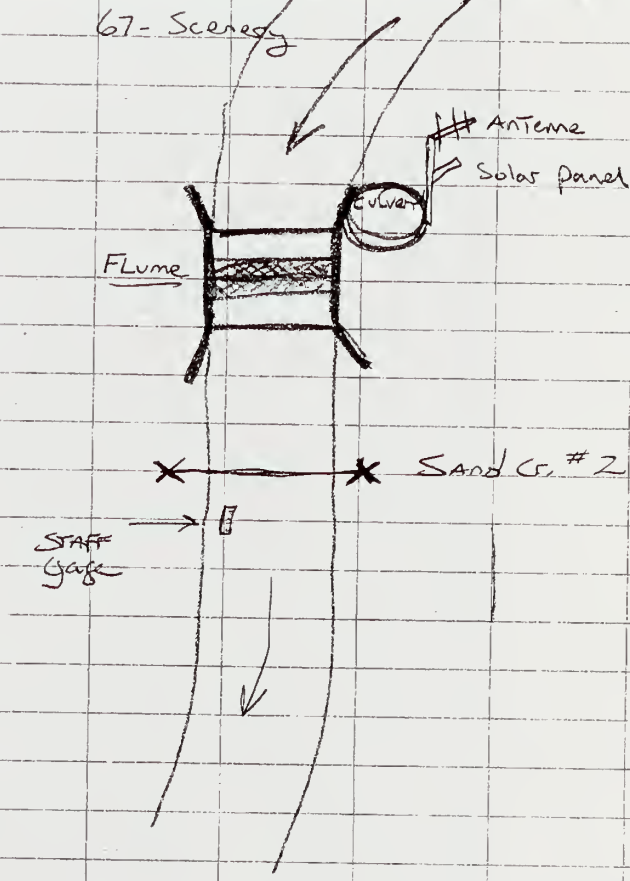
STAFF GAGE: .6 Ft

GPS: N 4196858
E 447849
NAD 27, Zone 13

Channel Bottom is Gravel/Cobble
Banks are grass and alder and Cottonwood

THE Real-Time surface water gage posted on Colorado Division of Water Resources (CDWR) WEB SITE is located at THE Flume
THE Flume is not operating properly due To Aggradation of Cobble/sized Sediment at upstream mouth of Flume

Photos: 73 - STAFF Plate
& 72 - STAFF Plate
71 - View downstream
70 - View upstream
69 - Cross Section From Right bank
68 - Cross Section From Left bank
67 - Scenery



Cross Section: Sand Creek #2.09.20.04_390
Sand Creek downstream of Colorado Division of Water Resources flume.
Cross section at orange tape viewed from left bank to right bank with staff gage downstream of cross section.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1530 hrs

Cross Section: Sand Creek #2.09.20.04_391
Sand Creek downstream of Colorado Division of Water Resources flume.
Cross section at orange tape viewed from right bank to left bank.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1530 hrs

Cross Section: Sand Creek #2.09.20.04_392
Sand Creek downstream of Colorado Division of Water Resources flume.
Cross section at orange tape viewed from downstream to upstream with flume in background.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1530 hrs

Cross Section: Sand Creek #2.09.20.04_393
Sand Creek downstream of Colorado Division of Water Resources flume.
Cross section at orange tape viewed from upstream to downstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1530 hrs

Cross Section: Sand Creek #2.09.20.04_395
Sand Creek downstream of Colorado Division of Water Resources flume.
Staff gage located downstream of cross section on river right.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1530 hrs

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/22/04 Comp by _____ Checked by _____

PARK GRCA STATION SAND CREEK #2

PERSONNEL: Meter Pygmy - Hastie Notes HASTIE

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 1000 G.H. .53 Stop: 1100 G.H. .53

METER TYPE Pygmy S/N N/A SPIN Before Meas. 45 sec After 45 sec.

WEATHER Clear, Sunny

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1000	.53				
1100	.53				

FLOW: Width _____ Area _____ Ave. Vel. _____ G.H. _____ Disch. 9.65

Method _____ Method coeff. _____ Hor. Angle coeff. _____ Susp. type _____ Susp. coeff. _____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air _____ C° F° Water _____ C° F°

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS _____

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

9/22/04 Air T°C = 6.25°C H_2O T°C = 6°C START G.G. = .53 END G.G. = .53

START TIME = 1000 River at— SPin = 45° START

STOP TIME = 11:00

	Angle coefficient	Dist. from initial point	Width Ft	Depth Ft	Observation depth	Revolutions	Time in seconds	VELOCITY: At point FPS	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
REW		2.3	~~.40~~	~~1.03~~		~~28~~	~~40.3~~	~~.698~~				0
1		2.7	.40	1.03		28	40.3	.698			.412	.2876
2		3.1	.40	1.01		30	40.8	.737			.404	.2977
3		3.5	.40	.90		28	40.4	.697			.36	.2509
4		3.9	.40	.83		30	40.7	.739			.332	.2453
5		4.3	.40	.70		32	40.2	.796			.28	.223
6		4.7	.40	.70		35	40.7	.857			.28	.240
7		5.1	.40	.66		36	40.9	.876			.264	.231
8		5.5	.40	.62		38	40.6	.930			.248	.231
9		5.8	.30	.69		38	40.9	.923			.207	.191
10		6.1	.30	.71		37	40.7	.904			.213	.192
11		6.4	.30	.71		37	40.5	.909			.213	.194
12		6.7	.30	.72		39	41.1	.943			.216	.204
13 ⊙		7.0	.30	.73		43	40.1	1.061			.219	.232
14		7.3	.30	.71		42	40.4	1.03			.213	.219
15		7.6	.30	.72		42	40.3	1.032			.216	.223
16		7.9	.30	.72		47	40.7	1.14			.216	.246
17		8.2	.30	.80		48	40.1	1.181			.24	.283
18		8.5	.30	.73		48	40.8	1.161			.219	.254
19		8.8	.30	.70		49	40.7	1.182			.21	.249
20		9.1	.30	.82		46	40.3	1.127			.246	.277
21		9.4	.30	.91		43	40.1	1.061			.273	.29
22		9.7	.30	.88		48	40.4	1.172			.264	.31
23		10.0	.30	.86		50	40.7	1.211			.258	.312
24		10.3	.30	.87		52	40.7	1.258			.261	.328
25		10.6	.30	.83		51	40.6	1.256			.249	.313
26		10.9	.30	1.0		45	40.7	1.093			.30	.328
27		11.2	.30	1.02		49	40.7	1.187			.306	.363
28		11.5	.30	1.0		48	40.0	1.184			.3	.355
29		11.8	.30	.95		50	40.3	1.223			.285	.349
30		12.1	.30	1.0		51	40.5	1.241			.30	.372
31		12.4	.30	1.3		48	40.4	1.172			.39	.457
32		12.7	.30	.89		47	40.1	1.157			.267	.309
33		13.0	.30	.81		42	40.4	1.037	↙		.243	.252
34		13.3	.30	.61		46	41.0	1.109	↙		.183	.203
35		13.6	.30	.67		48	40.6	1.167	↙		.201	.235
36		13.9	.30	.29		35	40.2	.867	↙		.087	.075
37		14.2	.30	.18		23	40.4	.578			.054	.031
LEW		14.4										0
												9.653

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #2				
Station Number:	SC #2	WIDTH	12.100	# of Sections	39
Date:	9/22/2004	AREA	9.389	Sections > 5%	0
Measurement #:	1	VELOCITY	1.023	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	3.84%
Rating # (1 or 2)	2	TOTAL DISCHARGE	9.604		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	2.3	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	2.7	0.40	1.03	28	40.3	0.698	0.698	0.698	0.412	0.288
	3.1	0.40	1.01	30	40.8	0.737	0.737	0.737	0.404	0.298
	3.5	0.40	0.9	28	40.4	0.697	0.697	0.697	0.360	0.251
	3.9	0.40	0.83	30	40.7	0.739	0.739	0.739	0.332	0.245
	4.3	0.40	0.7	32	40.2	0.796	0.796	0.796	0.280	0.223
	4.7	0.40	0.7	35	40.7	0.857	0.857	0.857	0.280	0.240
	5.1	0.40	0.66	36	40.9	0.877	0.877	0.877	0.264	0.231
	5.5	0.35	0.62	38	40.6	0.930	0.930	0.930	0.217	0.202
	5.8	0.30	0.69	38	40.9	0.924	0.924	0.924	0.207	0.191
	6.1	0.30	0.71	37	40.7	0.904	0.904	0.904	0.213	0.193
	6.4	0.30	0.71	37	40.5	0.909	0.909	0.909	0.213	0.194
	6.7	0.30	0.72	39	41.1	0.943	0.943	0.943	0.216	0.204
	7	0.30	0.73	43	40.1	1.061	1.061	1.061	0.219	0.232
	7.3	0.30	0.71	42	40.4	1.030	1.030	1.030	0.213	0.219
	7.6	0.30	0.72	42	40.3	1.032	1.032	1.032	0.216	0.223
	7.9	0.30	0.72	47	40.7	1.140	1.140	1.140	0.216	0.246
	8.2	0.30	0.8	48	40.1	1.181	1.181	1.181	0.240	0.283
	8.5	0.30	0.73	48	40.8	1.161	1.161	1.161	0.219	0.254
	8.8	0.30	0.7	49	40.9	1.182	1.182	1.182	0.210	0.248
	9.1	0.30	0.82	46	40.3	1.127	1.127	1.127	0.246	0.277
	9.4	0.30	0.91	43	40.1	1.061	1.061	1.061	0.273	0.290
	9.7	0.30	0.88	48	40.4	1.172	1.172	1.172	0.264	0.309
	10	0.30	0.86	50	40.7	1.211	1.211	1.211	0.258	0.312
	10.3	0.30	0.87	52	40.7	1.258	1.258	1.258	0.261	0.328
	10.6	0.30	0.83	51	40	1.256	1.256	1.256	0.249	0.313
	10.9	0.30	1	45	40.7	1.093	1.093	1.093	0.300	0.328
	11.2	0.30	1.02	49	40.7	1.187	1.187	1.187	0.306	0.363
	11.5	0.30	1	48	40	1.184	1.184	1.184	0.300	0.355
	11.8	0.30	0.95	50	40.3	1.223	1.223	1.223	0.285	0.348
	12.1	0.30	1	51	40.5	1.241	1.241	1.241	0.300	0.372
	12.4	0.30	1.3	48	40.4	1.172	1.172	1.172	0.390	0.457
	12.7	0.30	0.89	47	40.1	1.157	1.157	1.157	0.267	0.309
0.98	13	0.30	0.81	42	40.1	1.037	1.037	1.016	0.243	0.247
0.98	13.3	0.30	0.61	46	41	1.109	1.109	1.087	0.183	0.199
0.98	13.6	0.30	0.67	48	40.6	1.167	1.167	1.143	0.201	0.230
0.98	13.9	0.30	0.29	35	40.2	0.867	0.867	0.850	0.087	0.074
	14.2	0.25	0.18	23	40.4	0.578	0.578	0.578	0.045	0.026
	14.4	0.10	0	0	0	0.000	0.000	0.000	0.000	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. E 2

DATE 9-22-04 Comp by _____ Checked by _____

PARK GRSA STATION SAND CREEK E 2

PERSONNEL: Meter HARTE Notes HARTE

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 1130 G.H. .53 Stop: 1226 G.H. .53

METER TYPE Pygmy S/N N/A SPIN Before Meas. 45s After 45s

WEATHER Clear, Sunny

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1130	.53				
1226	.53				

FLOW: Width_____ Area_____ Ave. Vel._____ G.H._____ Disch. 9.54

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air_____ C° F° Water_____ C° F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

09/22/14 START TIME = 1130 END TIME = 1226
START 0.6 = .53 END 0.6 = .53
START spin = 45+sec River at— END spin = 45+sec

AIR T°C = 8°C
H2O T°C = 7°C

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
REW	2.3	.40	~~1.03~~		~~30~~	~~40.8~~	~~.739~~				
	2.7		1.03		30	40.8	.737			.412	.304
	~~2.8~~ 2.1		1.03		29	41.0	.710			.412	.292
	~~3.2~~ 3.5		.93		25	40.5	.624			.372	.232
	3.9		.85		32	40.1	.798			.34	.271
	4.3		.70		32	40.7	.786			.28	.220
	4.7		.70		32	40.4	.792			.28	.222
	5.1		.67		33	40.8	.808			.268	.216
	5.5		.64		36	41.2	.870			.256	.223
	5.8	.30	.69		33	40.7	.810			.207	.168
	6.1		.72		36	40.1	.893			.216	.193
	6.4		.70		36	40.2	.891			.210	.187
	6.7		.72		35	40.1	.869			.216	.188
	7.0		.73		38	40.1	.941			.219	.206
⊙	7.3		.71		45	41.3	1.078			.213	.23
	7.6		.75		45	40.7	1.046			.225	.235
	7.9		.75		43	40.0	1.064			.225	.239
	8.2		.80		47	40.2	1.154			.24	.277
	8.5		.76		48	40.4	1.172			.228	.267
	8.8		.73		53	40.3	1.294			.219	.283
	9.1		.83		46	40.1	1.133			.249	.282
	9.4		.89		47	40.2	1.154			.267	.308
	9.7		.89		48	40.5	1.169			.267	.3121
	10.0		.85		53	40.2	1.287			.255	.331
	10.3		.87		53	40.5	1.288			.261	.336
	10.6		.82		53	40.1	1.30			.246	.32
	10.9		1.0		46	40.0	1.136			.3	.341
	11.2		1.01		45	40.2	1.106			.303	.335
	11.5		1.0		45	40.2	1.106			.3	.332
	11.8		~~1.04~~ 1.0		48	40.3	1.175			.3	.352
	12.1		.99		53	40.3	1.294			.297	.384
	12.4		1.03		48	40.4	1.172			.306	.359
	12.7		.80		45	40.2	1.106			.267	.295
	13.0		.80		41	40.4	1.006			.237	.238
	13.3		.80		48	40.5	1.169			.186	.217
	13.6		.80		47	40.7	1.14			.201	.229
	13.9		.30		36	40.5	.885			.093	.082
	14.2		.30		24	41.2	.591			.054	.032
LEW	14.4										

9.54

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #2				
Station Number:	SC #2	WIDTH	12.100	# of Sections	39
Date:	9/22/2004	AREA	9.386	Sections > 5%	0
Measurement #:	2	VELOCITY	1.011	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	3.84%
Rating # (1 or 2)	2	TOTAL DISCHARGE	9.494		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	2.3	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	2.7	0.40	1.03	30	40.8	0.737	0.737	0.737	0.412	0.304
	3.1	0.40	1.03	29	41	0.711	0.711	0.711	0.412	0.293
	3.5	0.40	0.93	25	40.5	0.624	0.624	0.624	0.372	0.232
	3.9	0.40	0.85	32	40.1	0.798	0.798	0.798	0.340	0.271
	4.3	0.40	0.7	32	40.7	0.786	0.786	0.786	0.280	0.220
	4.7	0.40	0.7	32	40.4	0.792	0.792	0.792	0.280	0.222
	5.1	0.40	0.67	33	40.8	0.808	0.808	0.808	0.268	0.217
	5.5	0.35	0.64	36	41.2	0.870	0.870	0.870	0.224	0.195
	5.8	0.30	0.69	33	40.7	0.810	0.810	0.810	0.207	0.168
	6.1	0.30	0.72	36	40.1	0.893	0.893	0.893	0.216	0.193
	6.4	0.30	0.7	36	40.2	0.891	0.891	0.891	0.210	0.187
	6.7	0.30	0.72	35	40.1	0.869	0.869	0.869	0.216	0.188
	7	0.30	0.73	38	40.1	0.941	0.941	0.941	0.219	0.206
	7.3	0.30	0.71	45	41.3	1.078	1.078	1.078	0.213	0.230
	7.6	0.30	0.75	43	40.7	1.046	1.046	1.046	0.225	0.235
	7.9	0.30	0.75	43	40	1.064	1.064	1.064	0.225	0.239
	8.2	0.30	0.8	47	40.2	1.154	1.154	1.154	0.240	0.277
	8.5	0.30	0.76	48	40.4	1.172	1.172	1.172	0.228	0.267
	8.8	0.30	0.73	53	40.3	1.294	1.294	1.294	0.219	0.283
	9.1	0.30	0.83	46	40.1	1.133	1.133	1.133	0.249	0.282
	9.4	0.30	0.89	47	40.2	1.154	1.154	1.154	0.267	0.308
	9.7	0.30	0.89	48	40.5	1.169	1.169	1.169	0.267	0.312
	10	0.30	0.85	53	40.2	1.297	1.297	1.297	0.255	0.331
	10.3	0.30	0.87	53	40.5	1.288	1.288	1.288	0.261	0.336
	10.6	0.30	0.82	53	40.1	1.301	1.301	1.301	0.246	0.320
	10.9	0.30	1	46	40	1.136	1.136	1.136	0.300	0.341
	11.2	0.30	1.01	45	40.2	1.106	1.106	1.106	0.303	0.335
	11.5	0.30	1	45	40.2	1.106	1.106	1.106	0.300	0.332
	11.8	0.30	1	48	40.3	1.175	1.175	1.175	0.300	0.353
	12.1	0.30	0.99	53	40.3	1.294	1.294	1.294	0.297	0.384
	12.4	0.30	1.02	48	40.4	1.172	1.172	1.172	0.306	0.359
	12.7	0.30	0.89	45	40.2	1.106	1.106	1.106	0.267	0.295
0.98	13	0.30	0.79	41	40.4	1.006	1.006	0.986	0.237	0.234
0.98	13.3	0.30	0.62	48	40.5	1.169	1.169	1.146	0.186	0.213
0.98	13.6	0.30	0.67	47	40.7	1.140	1.140	1.117	0.201	0.225
0.98	13.9	0.30	0.31	36	40.5	0.885	0.885	0.867	0.093	0.081
	14.2	0.25	0.18	24	41.2	0.591	0.591	0.591	0.045	0.027
	14.4	0.10	0	0	0	0.000	0.000	0.000	0.000	0.000

9/20/04 Hartz, Valdez, Woodzell

SITE # 3 – Sand Ck Station #3

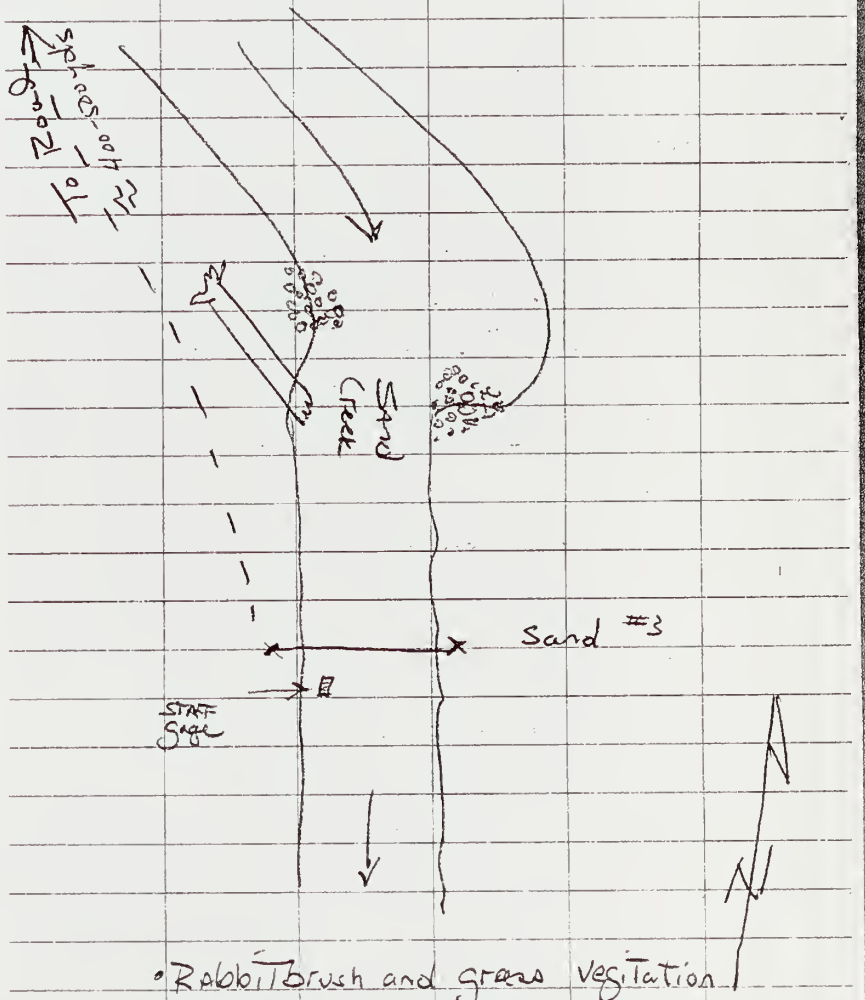
N = 4186194
E = 445255
NAD 27, ZONE 13

SITE DESCRIPTION: Unsurveyed
PARKING on Terrace above Right Bank
(1ST Appearance of Creek while driving upstream)
Refer TO "Sand C." map For Cross Section location
• STAFF GAGE downstream of X-sec. on Right Bank

Photo #	Description
58	XS - looking E from (R) bank
59	XS - looking W from (L) bank
60	XS - looking Upstream
61	XS - looking downstream

CROSS SECTION DESCRIPTION:
Gravel/Cobble channel bottom
Sandy/gravel banks

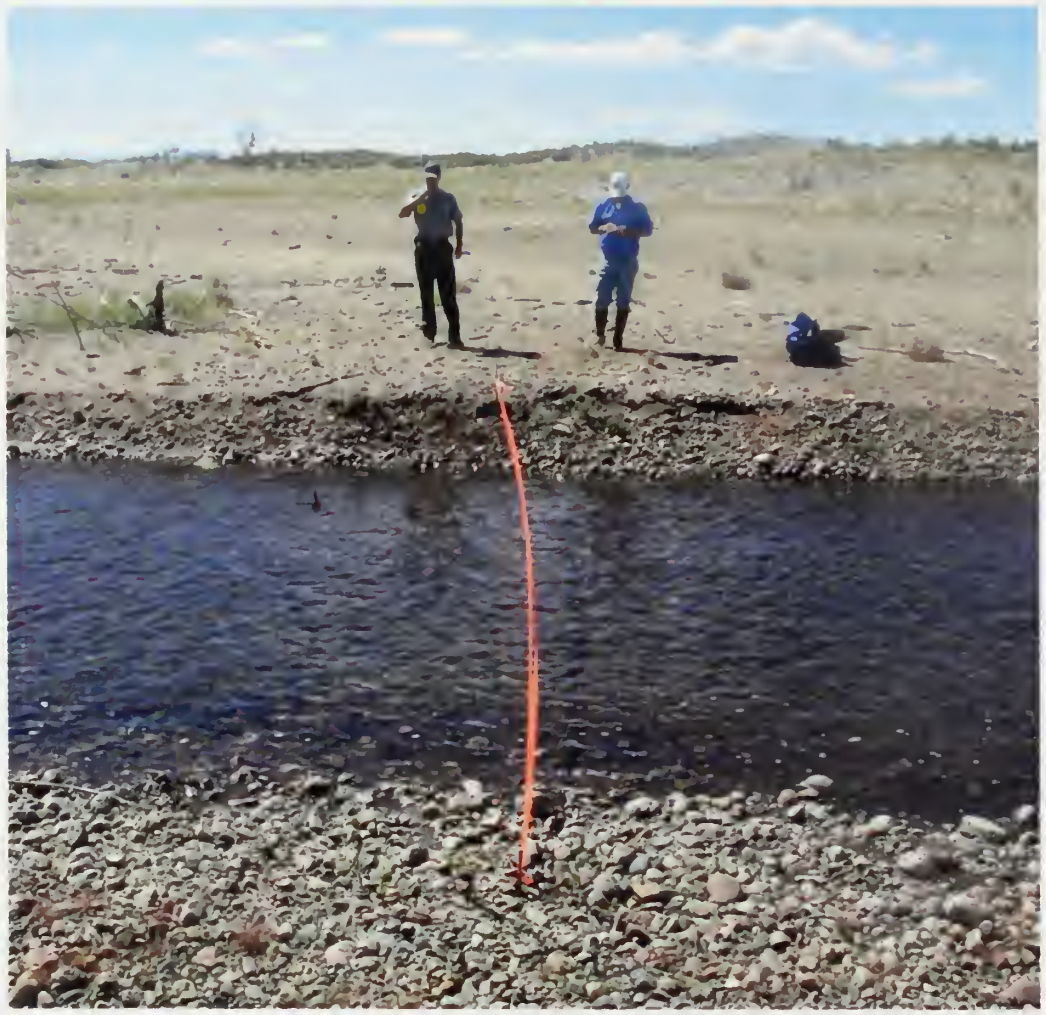
1410 – STAFF GAGE ≈ .82 FT.



• Rabbitbrush and grass vegitation

Cross Section: Sand Creek #3.09.20.04_380
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from right bank to left bank with staff gage downstream of cross section.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1410 hrs

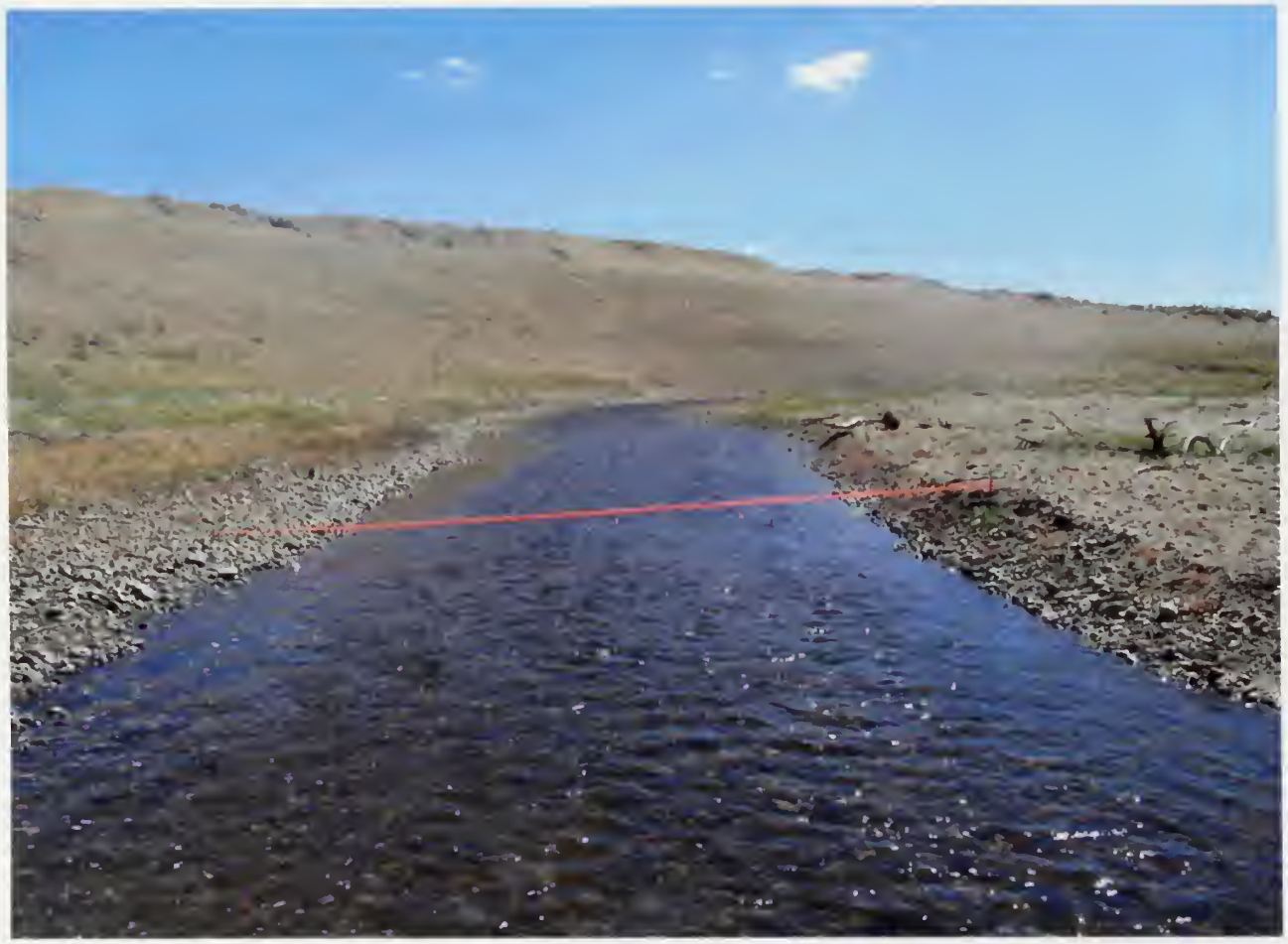


Cross Section: Sand Creek #3.09.20.04_381
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from left bank to right bank.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1410 hrs

Cross Section: Sand Creek #3.09.20.04_382
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from downstream to upstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1410 hrs



Cross Section: Sand Creek #3.09.20.04_383
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from upstream to downstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1410 hrs

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. #1

DATE 9-22-04 Comp by LAUFMANN Checked by _____

PARK GRSA STATION SAND CREEK #3

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 10:00 (SM) G.H. 7.30 (→ .73 SM) Stop: 10:43 G.H. 7.30 (→ .73 SM)

METER TYPE PYGMY S/N 90068 SPIN Before Meas. 94 SEC After 96 SEC

└ Current Meter Digitizer → S/N 93249

WEATHER SUNNY CLEAR - BREEZY

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
10:00	.73				
10:43	.73				

FLOW: Width 17.0 Area 7.34 Ave. Vel._____ G.H. 7.30 Disch. 6.30

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL RIFFLE

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 46.9 C° F° Water 44.2 C° (F°)

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	LEW 3.2	0		.6			0			0	0
	3.7	.5	0.14				0			0.07	0
	4.2		0.15		11	41.0	.289 ~~0~~			0.075	0.022
	4.7		0.26		20	40.7	.502			0.13	0.065
	5.2		0.28		23	40.2	.580			0.14	0.0812
	5.7		0.34		25	41.9	.604			0.17	0.103
	6.2		0.37		29	40.7	.715			0.19	0.132
	6.7		0.44		27	40.8	.666			0.22	0.147
	7.2		0.52		36	40.4	.886			0.26	0.230
	7.7		0.51		32	40.5	.789			0.26	0.201
	8.2		0.51		39	40.7	.951			0.26	0.243
	8.7		0.52		42	41.0	1.014			0.26	0.264
	9.2		0.55		40	40.9	0.970			0.28	0.267
	9.7		0.53		44	41.0	1.061			0.27	0.281
0	10.2		0.50		38	40.2	0.938			0.25	0.235
	10.7		0.60		41	40	1.015			0.30	0.305
	11.2		0.63		40	40.3	.984			0.32	0.310
	11.7		0.49		46	40.6	1.119			0.25	0.274
	12.2		0.50		46	40.5	1.121			0.25	0.280
	12.7		0.49		39	40.6	.953			0.25	0.237
	13.2		0.43		35	40.8	.854			0.22	0.184
	13.7		0.55		36	40.6	.882			0.28	0.243
	14.2		0.50		47	40.5	1.151			0.25	0.288
	14.7		0.52		40	40.9	.970			0.26	0.252
	15.2		0.56		49	40.6	1.190			0.28	0.333
	15.7		0.58		34	40.3	.841			0.29	0.244
	16.2		0.58		45	40.5	1.098			0.29	0.318
	16.7		0.55		28	40.2	.699			0.28	0.192
	17.2		0.52		33	40.1	.821			0.26	0.213
	17.7		0.51		33	41.3	.798			0.26	0.203
	18.2		0.33		27	41.3	.658			0.17	0.109
	19.2		0.20	.6						0.10	0
	19.7		0.11							0.06	0
REW	20.2		0							0	0
	~~20.7~~										
										Σ =	7.39	6.30

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #3				
Station Number:	SC #3	WIDTH	17.000	# of Sections	35
Date:	9/22/2004	AREA	7.260	Sections > 5%	2
Measurement #:	1	VELOCITY	0.868	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.04%
Rating # (1 or 2)	2	TOTAL DISCHARGE	6.304		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	3.2	0.25	0	0	0	0.000	0.000	0.000	0.000	0.000
	3.7	0.50	0.14	0	0	0.000	0.000	0.000	0.070	0.000
	4.2	0.50	0.15	11	41	0.289	0.289	0.289	0.075	0.022
	4.7	0.50	0.26	20	40.7	0.503	0.503	0.503	0.130	0.065
	5.2	0.50	0.28	23	40.2	0.581	0.581	0.581	0.140	0.081
	5.7	0.50	0.34	25	41.9	0.604	0.604	0.604	0.170	0.103
	6.2	0.50	0.37	29	40.7	0.716	0.716	0.716	0.185	0.132
	6.7	0.50	0.44	27	40.8	0.667	0.667	0.667	0.220	0.147
	7.2	0.50	0.52	36	40.4	0.887	0.887	0.887	0.260	0.231
	7.7	0.50	0.51	32	40.5	0.790	0.790	0.790	0.255	0.201
	8.2	0.50	0.51	39	40.7	0.951	0.951	0.951	0.255	0.243
	8.7	0.50	0.52	42	41	1.015	1.015	1.015	0.260	0.264
	9.2	0.50	0.55	40	40.9	0.970	0.970	0.970	0.275	0.267
	9.7	0.50	0.53	44	41	1.062	1.062	1.062	0.265	0.281
	10.2	0.50	0.5	38	40.2	0.939	0.939	0.939	0.250	0.235
	10.7	0.50	0.6	41	40	1.016	1.016	1.016	0.300	0.305
	11.2	0.50	0.63	40	40.3	0.984	0.984	0.984	0.315	0.310
	11.7	0.50	0.49	46	40.6	1.119	1.119	1.119	0.245	0.274
	12.2	0.50	0.5	46	40.5	1.122	1.122	1.122	0.250	0.281
	12.7	0.50	0.49	39	40.6	0.954	0.954	0.954	0.245	0.234
	13.2	0.50	0.43	35	40.8	0.855	0.855	0.855	0.215	0.184
	13.7	0.50	0.55	36	40.6	0.883	0.883	0.883	0.275	0.243
	14.2	0.50	0.5	47	40.5	1.146	1.146	1.146	0.250	0.286
	14.7	0.50	0.52	40	40.9	0.970	0.970	0.970	0.260	0.252
	15.2	0.50	0.56	49	40.6	1.190	1.190	1.190	0.280	0.333
	15.7	0.50	0.58	34	40.3	0.841	0.841	0.841	0.290	0.244
	16.2	0.50	0.58	45	40.5	1.098	1.098	1.098	0.290	0.319
	16.7	0.50	0.55	28	40.2	0.700	0.700	0.700	0.275	0.193
	17.2	0.50	0.52	33	40.1	0.822	0.822	0.822	0.260	0.214
	17.7	0.50	0.51	33	41.3	0.799	0.799	0.799	0.255	0.204
	18.2	0.50	0.33	27	41.3	0.659	0.659	0.659	0.165	0.109
	18.7	0.50	0.25	15	40	0.391	0.391	0.391	0.125	0.049
	19.2	0.50	0.2	0	0	0.000	0.000	0.000	0.100	0.000
	19.7	0.50	0.11	0	0	0.000	0.000	0.000	0.055	0.000
	20.2	0.25	0	0	0	0.000	0.000	0.000	0.000	0.000

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. #2

DATE 9/22/04 Comp by LAUFMANN Checked by _____

PARK GRSA STATION SAND CREEK #3

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 11.34 G.H. 7.3 → .73 Stop: 12:16 G.H. 7.3 → .73

METER TYPE Ryamy S/N 90068 SPIN Before Meas. 96S After 90 SEC

↳ Current Meter Digitizer → S/N 93249

WEATHER SUNNY CLEAR

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1134	.73				
1216	.73				

FLOW: Width 17.0 Area 7.38 Ave. Vel._____ G.H. 7.30 Disch. 6.37

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL RIFFLE

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

60.1

River at—

Angle coef.	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	(LEW) 3.2	0		.6			0			0	0
	3.7	.5	0.15		—	—	0			.075	0
	4.2		0.15		11	41.2	.287			.08	0.022
	4.7		0.26		20	40.4	.506			0.14	0.068
	5.2		0.27		26	41	.64			0.14	0.086
	5.7		0.35		22	40.1	.557			0.18	0.097
	6.2		0.38		27	41	.663			0.19	0.126
	6.7		0.46		21	41.3	.658			0.23	0.151 (.119)
	7.2		0.53		34	40.1	.845			0.27	0.224
	7.7		0.51		31	40.5	.766			0.26	0.195
	8.2		0.53		37	40.1	.917			0.27	0.243
	8.7		0.49		42	40.4	1.029			0.25	0.252
	9.2		0.55		36	41.2	.870			0.28	0.239
	9.7		0.51		42	40.5	1.026			0.26	0.262
⊙	10.2		0.49		38	40.7	.938			0.25	0.230
	10.7		0.61		40	40.1	1.012			0.31	0.309
	11.2		0.63		42	40.7	1.022			0.32	0.322
	11.7		0.5		44	40.6	1.071			0.25	0.268
	12.2		0.49		49	40.7	1.187			0.25	0.29
	12.7		0.5		39	40.2	.962			0.25	0.241
	13.2		0.45		41	40.6	1.000			0.23	0.225
	13.7		0.54		37	40.6	.906			0.27	0.245
	14.2		0.59		42	40.1	1.036			0.30	0.306
	14.7		0.55		36	40.6	.882			0.28	0.243
	15.2		0.56		46	40.4	1.124			0.28	0.315
	15.7		0.58		35	40.7	.856			0.29	0.248
	16.2		0.57		43	40.1	1.06			0.29	0.302
	16.7		0.53		35	40.2	.867			0.27	0.230
	17.2		0.49		37	40.9	.901			~~0.25~~	0.221
	17.7		0.45		30	40.9	.735			0.23	0.165 (.077)
	18.2		0.27		23	40.7	.573			0.14	0.095
	18.7		0.25		15	40.8	.384			0.125	0.048
	19.2	0.5	0.2	.6					0		0.10	0
	19.7	0.5	0.13	.6					0		0.07	0
REW	20.2											
									4	=	7.38	6.37

4.135 + 2.078 = 6.213

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #3				
Station Number:	SC #3	WIDTH	17.000	# of Sections	35
Date:	9/22/2004	AREA	7.260	Sections > 5%	2
Measurement #:	2	VELOCITY	0.856	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.05%
Rating # (1 or 2)	2	TOTAL DISCHARGE	6.213		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	3.2	0.25	0	0	0	0.000	0.000	0.000	0.000	0.000
	3.7	0.50	0.15	0	0	0.000	0.000	0.000	0.075	0.000
	4.2	0.50	0.15	11	41.2	0.288	0.288	0.288	0.075	0.022
	4.7	0.50	0.26	20	40.4	0.507	0.507	0.507	0.130	0.066
	5.2	0.50	0.27	26	41	0.640	0.640	0.640	0.135	0.086
	5.7	0.50	0.35	22	40.1	0.558	0.558	0.558	0.175	0.098
	6.2	0.50	0.38	27	41	0.664	0.664	0.664	0.190	0.126
	6.7	0.50	0.46	21	41.3	0.520	0.520	0.520	0.230	0.119
	7.2	0.50	0.53	34	40.1	0.846	0.846	0.846	0.265	0.224
	7.7	0.50	0.51	31	40.5	0.766	0.766	0.766	0.255	0.195
	8.2	0.50	0.53	37	40.1	0.917	0.917	0.917	0.265	0.243
	8.7	0.50	0.49	42	40.4	1.030	1.030	1.030	0.245	0.252
	9.2	0.50	0.55	36	41.2	0.870	0.870	0.870	0.275	0.239
	9.7	0.50	0.51	42	40.5	1.027	1.027	1.027	0.255	0.262
	10.2	0.50	0.49	38	40.2	0.939	0.939	0.939	0.245	0.230
	10.7	0.50	0.61	40	40.1	0.989	0.989	0.989	0.305	0.302
	11.2	0.50	0.63	42	40.7	1.022	1.022	1.022	0.315	0.322
	11.7	0.50	0.5	44	40.6	1.072	1.072	1.072	0.250	0.268
	12.2	0.50	0.49	49	40.7	1.187	1.187	1.187	0.245	0.291
	12.7	0.50	0.5	39	40.2	0.963	0.963	0.963	0.250	0.241
	13.2	0.50	0.45	41	40.6	1.001	1.001	1.001	0.225	0.225
	13.7	0.50	0.54	37	40.6	0.906	0.906	0.906	0.270	0.245
	14.2	0.50	0.59	42	40.1	1.037	1.037	1.037	0.295	0.306
	14.7	0.50	0.55	36	40.6	0.883	0.883	0.883	0.275	0.243
	15.2	0.50	0.56	46	40.4	1.125	1.125	1.125	0.280	0.315
	15.7	0.50	0.58	35	40.7	0.857	0.857	0.857	0.290	0.249
	16.2	0.50	0.57	43	40.1	1.061	1.061	1.061	0.285	0.302
	16.7	0.50	0.53	35	40.2	0.867	0.867	0.867	0.265	0.230
	17.2	0.50	0.49	37	40.8	0.902	0.902	0.902	0.245	0.221
	17.7	0.50	0.45	30	40.9	0.736	0.736	0.736	0.225	0.166
	18.2	0.50	0.27	23	40.7	0.574	0.574	0.574	0.135	0.077
	18.7	0.50	0.25	15	40.8	0.384	0.384	0.384	0.125	0.048
	19.2	0.50	0.2	0	0	0.000	0.000	0.000	0.100	0.000
	19.7	0.50	0.13	0	0	0.000	0.000	0.000	0.065	0.000
	20.2	0.25	0	0	0	0.000	0.000	0.000	0.000	0.000

9/20/04 1440 – Sand Cr. #4

STAFF GAGE = .81 Ft

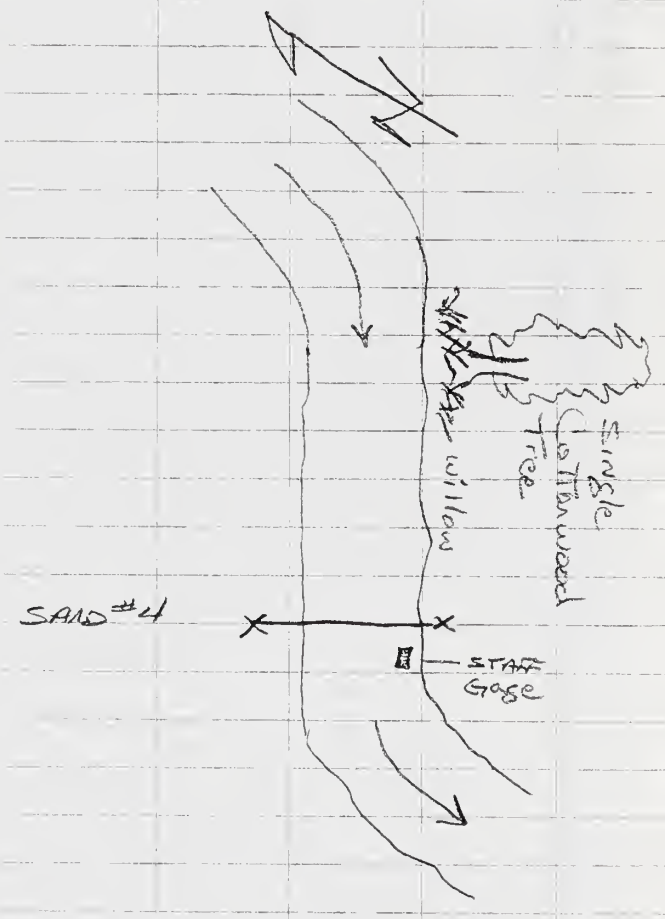
GPS: N 4185592
E 444538
NAD 27, Zone 13

PHOTO DESCRIPTIONS:
#62, 63, 64, 65, 66
62 - Left Bank Across Cross Section
63 - Right Bank " " "
64 - Upstream To Downstream
65 - Downstream looking upstream
66 - STAFF Plate From left Bank
• STAFF Gage on Left Bank downstream of Cross Section

Cross Section DESCRIPTIONS:
• Course Sand Channel
• Sand and gravel banks

Rabbitbrush and grass vegitation.

SEE "Sand Cr. Map" FOR site location



Cross Section: Sand Creek #4.09.20.04_384
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from left bank to right bank.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1440 hrs

Cross Section: Sand Creek #4.09.20.04_385
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from right bank to left bank.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1440 hrs

Cross Section: Sand Creek #4.09.20.04_386
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from upstream to downstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1440 hrs

Cross Section: Sand Creek #4.09.20.04_387
Sand Creek northwest of Main Dune Field.
Cross section at orange tape viewed from downstream to upstream.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1440 hrs

Cross Section: Sand Creek #4.09.20.04_388
Sand Creek northwest of Main Dune Field.
Cross section at orange tape with staff gage located on river left downstream of cross section.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1440 hrs

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/22/2004 Comp by _____ Checked by _____

PARK GRSA STATION Sand Creek Station 4

PERSONNEL: Meter Andrew Valdez Notes Katie Hagaman

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 10:00 G.H. 0.80 Stop: 10:24 G.H. 0.79

METER TYPE Pygmy S/N _____ SPIN Before Meas. 80s After 72s

WEATHER Clear

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1000	.80				
1024	.79				

FLOW: Width _____ Area _____ Ave. Vel. _____ G.H. _____ Disch. 5.44 cfs

Method _____ Method coeff. _____ Hor. Angle coeff. _____ Susp. type _____ Susp. coeff. _____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air _____ C° F° Water _____ C° F°

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS

Mapped creek terminus downstream of Sand Creek Station 4. GPS File: Sand ck ter 040922

Water level in Sand Creek Pisometer near terminus is 6.00 feet at 10:52AM

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	0.4	0.8	0.22					0.522		x0.7 0.1232	0.0643
	1.2	0.8	0.32					0.809		0.256	0.2071
	2.0	0.8	0.32					0.764		0.256	0.1956
	2.8	0.8	0.31					0.719		0.248	0.1783
	3.6	0.8	0.28					0.653		0.224	0.1463
	4.4	0.8	0.20					0.528		0.160	0.0845
	5.2	0.8	0.27					0.553		0.216	0.1194
	6.0	0.8	0.30					0.744		0.240	0.1786
	6.8	0.8	0.38					0.724		0.304	0.2200
	7.6	0.8	0.36					0.727		0.288	0.2093
	8.4	0.8	0.30					0.727		0.240	0.1745
	9.2	0.8	0.41					0.971		0.328	0.3185
	10.0	0.8	0.40					1.151		0.320	0.3683
	10.8	0.8	0.50					0.876		0.400	0.3504
⊙	11.6	0.8	0.50					0.922		0.400	0.3688
	12.4	0.8	0.55					0.971		0.440	0.4272
	13.2	0.8	0.60					1.065		0.480	0.5112
	14.0	0.8	0.60					1.057		0.480	0.5074
	14.8	0.8	0.60					1.306		0.480	0.6269
	15.6	0.8	0.50					0.655		x0.7 0.280	0.1834
											5.44 cfs

? REW 0 7 Av

LREW ~~26~~ 6

1/2

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #4 (computed after adding verticals (endpoints) at 0 feet and 16 feet)				
Station Number:	SC #4	WIDTH	16.000	# of Sections	22
Date:	9/22/2004	AREA	6.192	Sections > 5%	8
Measurement #:	1	VELOCITY	0.881	Sections > 10%	1
Pygmy or AA (p/a)	p			*Standard Error	
Rating # (1 or 2)	2	TOTAL DISCHARGE	5.458		

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0	0.20	0			0.000	0.000	0.000	0.000	0.000
	0.4	0.60	0.22			0.522	0.522	0.522	0.132	0.069
	1.2	0.80	0.32			0.809	0.809	0.809	0.256	0.207
	2	0.80	0.32			0.764	0.764	0.764	0.256	0.196
	2.8	0.80	0.31			0.719	0.719	0.719	0.248	0.178
	3.6	0.80	0.28			0.653	0.653	0.653	0.224	0.146
	4.4	0.80	0.2			0.528	0.528	0.528	0.160	0.084
	5.2	0.80	0.27			0.553	0.553	0.553	0.216	0.119
	6	0.80	0.3			0.744	0.744	0.744	0.240	0.179
	6.8	0.80	0.38			0.724	0.724	0.724	0.304	0.220
	7.6	0.80	0.36			0.727	0.727	0.727	0.288	0.209
	8.4	0.80	0.3			0.727	0.727	0.727	0.240	0.174
	9.2	0.80	0.41			0.971	0.971	0.971	0.328	0.318
	10	0.80	0.4			1.151	1.151	1.151	0.320	0.368
	10.8	0.80	0.5			0.876	0.876	0.876	0.400	0.350
	11.6	0.80	0.5			0.922	0.922	0.922	0.400	0.369
	12.4	0.80	0.55			0.971	0.971	0.971	0.440	0.427
	13.2	0.80	0.6			1.065	1.065	1.065	0.480	0.511
	14	0.80	0.6			1.057	1.057	1.057	0.480	0.507
	14.8	0.80	0.6			1.306	1.306	1.306	0.480	0.627
	15.6	0.60	0.5			0.655	0.655	0.655	0.300	0.197
	16	0.20	0			0.000	0.000	0.000	0.000	0.000

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 2

DATE 7/22/2004 Comp by _____ Checked by _____

PARK GRSA STATION Sand Creek Station 4

PERSONNEL: Meter Andrew Valdez Notes Katie Hagaman

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 11:30 G.H. 0.79 Stop: 11:53 G.H. 0.79

METER TYPE Rigmy S/N _____ SPIN Before Meas. 72s After too windy

WEATHER Mostly sunny

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1130	.79				
1153	.79				

FLOW: Width_____ Area_____ Ave. Vel._____ G.H._____ Disch. 5.49

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air_____C° F° Water_____C° F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	0.4	0.8	0.24					0.629		x0.7 0.1344	0.0845
	1.2	0.8	0.30					0.772		0.240	0.1853
	2.0	0.8	0.30					0.663		0.240	0.1591
	2.8	0.8	0.32					0.708		0.256	0.1812
	3.6	0.8	0.28					0.720		0.224	0.1613
	4.4	0.8	0.20					0.572		0.160	0.0915
	5.2	0.8	0.26					0.265		0.208	0.0551
	6.0	0.8	0.30					0.573		0.240	0.1375
	6.8	0.8	0.40					0.688		0.320	0.2202
	7.6	0.8	0.40					0.830		0.320	0.2656
	8.4	0.8	0.35					0.820		0.280	0.2296
	9.2	0.8	0.40					0.940		0.320	0.3008
	10.0	0.8	0.46					0.838		0.368	0.3084
	10.8	0.8	0.40					0.852		0.320	0.2726
⊙	11.6	0.8	0.50					1.084		0.400	0.4336
	12.4	0.8	0.55					1.270		0.440	0.5588
	13.2	0.8	0.60					1.065		0.480	0.5112
	14.0	0.8	0.65					1.002		0.520	0.5210
	14.8	0.8	0.62					1.343		0.496	0.6661
	15.6	0.8	0.45					0.584		x0.7 0.252	0.1472
											5.49 cfs ✓AV

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

⊙ 1.00

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Sand Creek #4 (computed after adding verticals (endpoints) at 0 feet and 16 feet)				
Station Number:	SC #4	WIDTH	16.000	# of Sections	22
Date:	9/22/2004	AREA	6.246	Sections > 5%	7
Measurement #:	2	VELOCITY	0.882	Sections > 10%	2
Pygmy or AA (p/a)	p			*Standard Error	
Rating # (1 or 2)	2	TOTAL DISCHARGE	5.507		

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0	0.20	0			0.000	0.000	0.000	0.000	0.000
	0.4	0.60	0.24			0.629	0.629	0.629	0.144	0.091
	1.2	0.80	0.3			0.772	0.772	0.772	0.240	0.185
	2	0.80	0.3			0.663	0.663	0.663	0.240	0.159
	2.8	0.80	0.32			0.708	0.708	0.708	0.256	0.181
	3.6	0.80	0.28			0.720	0.720	0.720	0.224	0.161
	4.4	0.80	0.2			0.572	0.572	0.572	0.160	0.092
	5.2	0.80	0.26			0.265	0.265	0.265	0.208	0.055
	6	0.80	0.3			0.573	0.573	0.573	0.240	0.138
	6.8	0.80	0.4			0.688	0.688	0.688	0.320	0.220
	7.6	0.80	0.4			0.830	0.830	0.830	0.320	0.266
	8.4	0.80	0.35			0.820	0.820	0.820	0.280	0.230
	9.2	0.80	0.4			0.940	0.940	0.940	0.320	0.301
	10	0.80	0.46			0.838	0.838	0.838	0.368	0.308
	10.8	0.80	0.4			0.852	0.852	0.852	0.320	0.273
	11.6	0.80	0.5			1.084	1.084	1.084	0.400	0.434
	12.4	0.80	0.55			1.270	1.270	1.270	0.440	0.559
	13.2	0.80	0.6			1.065	1.065	1.065	0.480	0.511
	14	0.80	0.65			1.002	1.002	1.002	0.520	0.521
	14.8	0.80	0.62			1.343	1.343	1.343	0.496	0.666
	15.6	0.60	0.45			0.584	0.584	0.584	0.270	0.158
	16	0.20	0			0.000	0.000	0.000	0.000	0.000

Cross Section: Sand Creek #5.09.20.04_379
Sand Creek northwest of the Main Dune Field.
Terminus of flow viewed from downstream to upstream toward the Sangre de Cristo Mountains.

Sand Creek, Saguache County, CO.
September 20, 2004 @ 1210 hrs

Big Spring Creek

9-23-04 1510

BS #1:

Set up a 3 inch Parshall Flume at Big Spring Discharge measuring point #1.

At 1510 hrs The STAFF GAGE in THE FLUME Read .36 Ft.

Discharge = .2042 cfs (3" Parshall Flume Table)

Photos: 91-95

Channel is sand and constricted by water-vegetation (Water Cress?, Rushes, grasses.)

SITE: Big Spring Creek 09.23.04_448

Big Spring Creek west of the Main Dune Field at Indian Spring.
Stream source is Indian Spring. Water collects in the pond, with no surface outlet, and apparently infiltrates the ground and resurfaces in a seep at the head of an arroyo approximately 100 yards downstream of the pond.

Big Spring Creek, Saguache County, CO.
September 23, 2004, @ 1410 hrs

Cross Section: Big Spring Creek #1.09.23.04_449

Big Spring Creek downstream of the Main Dune Field below Indian Spring pond.
Portable three-inch Parshall flume installed to measure discharge near seep approximately 100 yards downstream of the Indian Spring pond viewed from left bank to right bank.

Big Spring Creek, Saguache County, CO.
September 23, 2004 @ 1510 hrs

Cross Section: Big Spring Creek #1.09.23.04_450
Big Spring Creek downstream of the Main Dune Field below Indian Spring pond.
Portable three-inch Parshall flume installed to measure discharge near seep approximately 100 yards downstream of the Indian Spring pond viewed from upstream to downstream.

Big Spring Creek, Saguache County, CO.
September 23, 2004 @ 1510 hrs

Cross Section: Big Spring Creek #1.09.23.04_451
Big Spring Creek downstream of the Main Dune Field below Indian Spring pond.
Portable three-inch Parshall flume installed to measure discharge near seep approximately 100 yards downstream of the Indian Spring pond viewed from downstream to upstream.

Big Spring Creek, Saguache County, CO.
September 23, 2004 @ 1510 hrs

Cross Section: Big Spring Creek #1.09.23.04_452

Big Spring Creek downstream of the Main Dune Field below Indian Spring pond.
Portable three-inch Parshall flume installed to measure discharge near seep approximately 100 yards downstream of the Indian Spring pond showing flume exit with backwater.

Big Spring Creek, Saguache County, CO.
September 23, 2004 @ 1510 hrs

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time______ Samples: Yes/No Time______

Method: EDI______ EWI______ Other______

SEDIMENT Yes/No Time______ Method: EDI______ EWI______ Other______

BIOLOGICAL Yes/No Time______ Type______

OBSERVATIONS/COMMENTS______

Discharge was measured with a 3-inch Parshall Flume. Channel bottom is sand. Stream banks encroaching on channel with riparian vegetation.

Discharge for stage of .36 ft found in ISCO open channel flow measurement handbook

LEVEL NOTES

EQUIPMENT TYPE______ S/N______

PERSONNEL: Instrument/Notes______ Rod______

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No.______

Comp by______ Checked by______

DATE [illegible]

PARK [illegible] STATION [illegible] Creek

PERSONNEL: Meter [illegible] Notes [illegible]

MEASUREMENT TYPE (circle one) Wading, Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage [illegible]

Measurement Time/G.H.: Local Standard (24hr) Start [illegible] G.H. [illegible] Stop [illegible] G.H. [illegible]

METER TYPE [illegible] S/N______ SPIN Before Meas.______ After______

WEATHER [illegible]

HIGH WATER MARK______ Gage Height of Zero Flow______ft.

CREST STAGE CHECKED: Yes/No______ READING______ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
[illegible]	[illegible]				
[illegible]	[illegible]				

FLOW: Width______ Area______ Ave. Vel.______ G.H. [illegible] Disch. [illegible]

Method______ Method coeff.______ Hor. Angle coeff.______ Susp. type______ Susp. coeff.______

Meter______ft. above bottom of weight No. Secs.______ G.H. changes______ft. in______hrs.

FLOW MEASURED with a 3-inch Parshall Flume

Cross Section______

CONTROL______

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range______

S/N______ P/N______

Conversion slope______ Conversion offset______ Ex. Volt.______ Output Range______

NITROGEN TANK PRESSURE______ FEED______ BBL RATE______per. min.

INTAKE/ORIFICE CLEANED______ TEMPERATURE: Air______C° F° Water______C° F°

PHOTOS TAKEN: Roll(s) #______ Frame(s) #______

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 2

DATE 9-23-04 Comp by _____ Checked by _____

PARK GRSA STATION Big Spring Creek # 2

PERSONNEL: Meter Ware Notes Heiser

MEASUREMENT TYPE (circle one) Wading, Cable, Bridge, Boat, Ice, Upstr., Dnstr., ____ft., mi. of gage Flume

Measurement Time/G.H.: Local Standard (24hr) Start: 1000 G.H. .36 Stop: 1100 G.H. .36

METER TYPE Price Pygmy S/N _____ SPIN Before Meas. _____ After _____

WEATHER Clear, Sunny, 70's

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1000	.36				
1100	.36				

FLOW: Width _____ Area _____ Ave. Vel. _____ G.H. .36 Disch. .2042 cfs

Method _____ Method coeff. _____ Hor. Angle coeff. _____ Susp. type _____ Susp. coeff. _____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW MEASURED W/ 3 inch Parshall Flume

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air _____ C° F° Water _____ C° F°

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS

Discharge measured with a 3-inch parshall flume. Channel bottom is sand. Stream banks are encroaching on channel with riparian vegetation.

Discharge of .2042 cfs at stage of .36 ft was near the low end of the flow measurement capability.

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

Cross Section: Big Spring Creek #2.12.07.04_528
Big Spring Creek west of Main Dune Field.
Cross section viewed from right bank to left bank.

Big Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Big Spring Creek #2.12.07.04_529
Big Spring Creek west of Main Dune Field.
Cross section viewed from downstream to upstream.

Big Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Big Spring Creek #2.12.07.04_530
Big Spring Creek west of Main Dune Field.
Cross section viewed from upstream to downstream.

Big Spring Creek, Alamosa County, CO.
December 07, 2004

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. #1

DATE 9/23/04 Comp by LAUFMANN Checked by _____

PARK GRSA STATION BIG SPRINGS - MID - (#2)

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading,) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 15:00 G.H. .50 Stop: 15:39 G.H. .50

METER TYPE PYGMY S/N P#90068 SPIN Before Meas. 113s After 97s

WEATHER SUNNY - CLEAR

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1500	.50				
1539	.50				

FLOW: Width 10.8 Area 3.76 Ave. Vel._____ G.H. .50 Disch. 3.93

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ ft. above bottom of weight No. Secs._____ G.H. changes _____ ft. in _____ hrs.

FLOW_____

Cross Section_____

CONTROL SANDBED CHANNEL / SANDBED DUNES MOVING

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 67.1 C (F) Water 64.0 C (F)

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
	X	X	X	.6	X	X	X			X	X
LEW	4.0	.3	.320	|			0			.096	
	4.3	.3	.320	|	25	41.4	.61			.096	.059
	4.6	.3	.26	↓	16	41.9	.397			.078	.031
	4.9	.3	.25		25	40	.631			.075	.047
	5.2	.1	.24		19	40.4	.482			.072	.035
	5.5	|	.24		21	40.8	.525			.072	.038
	5.8	|	.24		30	40.0	.751			.072	.054
	6.1	|	.31		33	40.1	.821			.093	.076
	6.4	|	.24		18	40.1	.462			.072	.033
	6.7	|	.25		44	40.1	1.067			.075	.080
	7.0	|	.27		43	40.1	1.045			.08	.085
	7.3	|	.26		38	40.6	.929			.078	.073
	7.6	|	.30		39	40.1	.951			.09	.086
○	7.9	|	.30		49	40.2	1.201			.09	.103
	8.2	|	.32		54	40.6	1.308			.096	.126
	8.5	|	.35		63	40.5	1.524			.105	.160
	8.8		.30		55	40.1	1.348			.09	.121
	9.1		.37		63	40.6	1.521			.111	.169
	9.4		.37		57	40.2	1.392			.111	.155
	9.7		.37		66	40.4	1.599			.111	.178
	10.0		.35		59	40.7	1.423			.105	.149
	10.3		.36		65	40.4	1.576			.108	.170
	10.6		.37		65	40.2	1.583			.111	.176
	10.9		.32		55	40.0	1.351			.096	.130
	11.2		.33		48	40.1	1.18			.099	.117
	11.5		.34		61	40.0	1.495			.102	.153
	11.8		.36		48	40.6	1.166			.108	.126
	12.1		.37		48	40.6	1.166			.111	.129
	12.4		.42		70	40.6	1.686			.126	.212
	12.7		.43		57	40.0	1.399			.129	.108
	13.0		.31		48	40.3	1.174			.093	.109
	13.3	.3	.41	.6	47	40.3	1.151			.123	.142
	13.6	|	.44	|	40	41.0	0.967			.132	.128
	13.9	|	.44	|	33	40.3	0.817			.132	.108
	14.2	|	.45	|	38	40.4	0.934			.135	.126
	14.5	|	.50		31	41.3	0.751			.150	.113
	14.7	.2	.48		12	43.6	.295			~~.096~~ ###	.028
REW	14.8	.1	.45				0			.045	0
									Σ =	3.76	3.93

Area .70 | Discharge .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

Horiz .094

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Big Spring Creek #2				
Station Number:	BS #2	WIDTH	10.800	# of Sections	38
Date:	9/22/2004	AREA	3.646	Sections > 5%	1
Measurement #:	1	VELOCITY	1.093	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	3.90%
Rating # (1 or 2)	2	TOTAL DISCHARGE	3.986		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	4	0.15	0.32	0	0	0.000	0.000	0.000	0.048	0.000
	4.3	0.30	0.32	25	41.4	0.611	0.611	0.611	0.096	0.059
	4.6	0.30	0.26	16	41.9	0.398	0.398	0.398	0.078	0.031
	4.9	0.30	0.25	25	40	0.631	0.631	0.631	0.075	0.047
	5.2	0.30	0.24	19	40.4	0.483	0.483	0.483	0.072	0.035
	5.5	0.30	0.24	21	40.8	0.526	0.526	0.526	0.072	0.038
	5.8	0.30	0.24	30	40	0.752	0.752	0.752	0.072	0.054
	6.1	0.30	0.31	33	40.1	0.822	0.822	0.822	0.093	0.076
	6.4	0.30	0.24	18	40.1	0.462	0.462	0.462	0.072	0.033
	6.7	0.30	0.25	44	40.1	1.085	1.085	1.085	0.075	0.081
	7	0.30	0.27	43	40.7	1.046	1.046	1.046	0.081	0.085
	7.3	0.30	0.26	38	40.6	0.930	0.930	0.930	0.078	0.073
	7.6	0.30	0.3	39	40.7	0.951	0.951	0.951	0.090	0.086
	7.9	0.30	0.3	49	40.2	1.202	1.202	1.202	0.090	0.108
	8.2	0.30	0.32	54	40.6	1.309	1.309	1.309	0.096	0.126
	8.5	0.30	0.35	63	40.5	1.525	1.525	1.525	0.105	0.160
	8.8	0.30	0.3	55	40.1	1.348	1.348	1.348	0.090	0.121
	9.1	0.30	0.37	63	40.6	1.521	1.521	1.521	0.111	0.169
	9.4	0.30	0.37	57	40.2	1.393	1.393	1.393	0.111	0.155
	9.7	0.30	0.37	66	40.4	1.600	1.600	1.600	0.111	0.178
	10	0.30	0.35	59	40.7	1.423	1.423	1.423	0.105	0.149
	10.3	0.30	0.36	65	40.4	1.576	1.576	1.576	0.108	0.170
	10.6	0.30	0.37	65	40.2	1.584	1.584	1.584	0.111	0.176
	10.9	0.30	0.32	55	40	1.352	1.352	1.352	0.096	0.130
	11.2	0.30	0.33	48	40.1	1.181	1.181	1.181	0.099	0.117
	11.5	0.30	0.34	61	40	1.496	1.496	1.496	0.102	0.153
	11.8	0.30	0.36	48	40.6	1.167	1.167	1.167	0.108	0.126
	12.1	0.30	0.37	48	40.6	1.167	1.167	1.167	0.111	0.129
	12.4	0.30	0.42	70	40.6	1.687	1.687	1.687	0.126	0.213
	12.7	0.30	0.43	57	40	1.400	1.400	1.400	0.129	0.181
	13	0.30	0.31	48	40.3	1.175	1.175	1.175	0.093	0.109
	13.3	0.30	0.41	47	40.3	1.151	1.151	1.151	0.123	0.142
	13.6	0.30	0.44	40	41	0.968	0.968	0.968	0.132	0.128
	13.9	0.30	0.44	33	40.3	0.818	0.818	0.818	0.132	0.108
	14.2	0.30	0.45	38	40.4	0.935	0.935	0.935	0.135	0.126
	14.5	0.25	0.5	31	41.3	0.752	0.752	0.752	0.125	0.094
	14.7	0.15	0.48	12	43.6	0.296	0.296	0.296	0.072	0.021
	14.8	0.05	0.45	0	0	0.000	0.000	0.000	0.023	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. #2

DATE 9/23/04 Comp by LAUFMANN Checked by _____

PARK GRSA STATION BIG SPRINGS-MID (#2)

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 16:06 G.H. .5 Stop: 16:53 G.H. .5

METER TYPE Pygmy S/N SN: P90068 SPIN Before Meas. 97s After 114

WEATHER CLEAR

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1606	.50				
1653	.50				

FLOW: Width 10.8 Area 3.89 Ave. Vel. _____ G.H. 0.50 Disch. 3.78

Method _____ Method coeff. ____ Hor. Angle coeff. ____ Susp. type _____ Susp. coeff. ____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL SANDBED CHANNEL / SAND BED DUNE MOVING

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 67 C (F) Water 65.8 C F

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS _____

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
LEW	4.0	0.3	.33	6			0			.099	0
	4.3	0.3	.33		19	41.0	.476			.099	.047
	4.6		.27		16	42.7	.390			.081	.032
	4.9		.25		20	42.1	.487			.075	.037
	5.2		.26		19	40.4	.482			.078	.038
	5.5		.24		16	40.1	.414			.072	.030
	5.8		.25		24	41.3	.589			.075	.044
	6.1		.26		21	41	.535			.078	.042
	6.4		.25		23	40.1	.581			.075	.044
	6.7		.30		40	40	.991			.09	.089
	7.0		.29		38	40.1	.941			.087	.082
	7.3		.28		40	40.6	.977			.084	.082
	7.6		.34		46	40.8	1.113			.102	.114
	7.9		.33		44	40.3	1.079			.099	.107
⊙	8.2		.35		49	40.0	1.207			.105	.127
	8.5		.35		56	40.2	1.368			.105	.144
	8.8		.23		42	40.2	1.034			.069	0.071
	9.1		.33		63	40.3	1.532			.099	.152
	9.4		.35		67	40.6	1.615			.105	.169
	9.7		.37		70	40.3	1.599			.111	.178
	10.0		.40		52	40.4	1.267			.120	.152
	10.3		.34		65	40	1.591			.102	.162
	10.6		.36		56	40.7	1.352			.108	.146
	10.9		.36		58	40.1	1.420			.108	.153
	11.2		.35		65	40.3	1.580			.105	.166
	11.5		.33		61	40.3	1.484			.099	.147
	11.8		.35		45	40.1	1.108			.105	.116
	12.1		.37		52	40.3	1.270			.111	.141
	12.4		.34		37	40.3	.912			.102	.093
	12.7		.38		43	40.1	1.060			.114	.121
	13.0		.38		39	40.8	.949			.114	.108
	13.3		.38		47	40.7	1.140			.114	.130
	13.6	.3	.38	.6	39	40.2	.962			.114	.110
	13.9		.42		37	40.2	.914			.126	.115
	14.2		.44		45	40.6	1.095			.132	.145
	14.5		.50		30	40.3	.745			.15	.111
	14.7		.49		9	40.9	.223			.147	.033
REW	14.8		.44				0			.132	0
										Σ = 3.89	3.78

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Big Spring Creek #2				
Station Number:	BS #2	WIDTH	10.800	# of Sections	38
Date:	9/22/2004	AREA	3.633	Sections > 5%	1
Measurement #:	2	VELOCITY	1.033	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	3.96%
Rating # (1 or 2)	2	TOTAL DISCHARGE	3.753		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	4	0.15	0.33	0	0	0.000	0.000	0.000	0.050	0.000
	4.3	0.30	0.33	19	41	0.476	0.476	0.476	0.099	0.047
	4.6	0.30	0.27	16	42.7	0.391	0.391	0.391	0.081	0.032
	4.9	0.30	0.25	20	42.1	0.487	0.487	0.487	0.075	0.037
	5.2	0.30	0.26	19	40.4	0.483	0.483	0.483	0.078	0.038
	5.5	0.30	0.24	16	40.1	0.414	0.414	0.414	0.072	0.030
	5.8	0.30	0.25	24	41.3	0.589	0.589	0.589	0.075	0.044
	6.1	0.30	0.26	21	41	0.523	0.523	0.523	0.078	0.041
	6.4	0.30	0.25	23	40.1	0.582	0.582	0.582	0.075	0.044
	6.7	0.30	0.3	40	40	0.992	0.992	0.992	0.090	0.089
	7	0.30	0.29	38	40.1	0.941	0.941	0.941	0.087	0.082
	7.3	0.30	0.28	40	40.6	0.977	0.977	0.977	0.084	0.082
	7.6	0.30	0.34	46	40.8	1.114	1.114	1.114	0.102	0.114
	7.9	0.30	0.33	44	40.3	1.080	1.080	1.080	0.099	0.107
	8.2	0.30	0.35	49	40	1.208	1.208	1.208	0.105	0.127
	8.5	0.30	0.35	56	40.2	1.369	1.369	1.369	0.105	0.144
	8.8	0.30	0.23	42	40.2	1.035	1.035	1.035	0.069	0.071
	9.1	0.30	0.33	63	40.3	1.533	1.533	1.533	0.099	0.152
	9.4	0.30	0.35	67	40.6	1.616	1.616	1.616	0.105	0.170
	9.7	0.30	0.37	70	40.3	1.699	1.699	1.699	0.111	0.189
	10	0.30	0.4	52	40.4	1.267	1.267	1.267	0.120	0.152
	10.3	0.30	0.34	65	40	1.592	1.592	1.592	0.102	0.162
	10.6	0.30	0.36	56	40.7	1.353	1.353	1.353	0.108	0.146
	10.9	0.30	0.36	58	40.1	1.420	1.420	1.420	0.108	0.153
	11.2	0.30	0.35	65	40.3	1.580	1.580	1.580	0.105	0.166
	11.5	0.30	0.33	61	40.3	1.485	1.485	1.485	0.099	0.147
	11.8	0.30	0.35	45	40.1	1.109	1.109	1.109	0.105	0.116
	12.1	0.30	0.37	52	40.3	1.270	1.270	1.270	0.111	0.141
	12.4	0.30	0.34	37	40.3	0.913	0.913	0.913	0.102	0.093
	12.7	0.30	0.38	43	40.1	1.061	1.061	1.061	0.114	0.121
	13	0.30	0.38	39	40.8	0.949	0.949	0.949	0.114	0.108
	13.3	0.30	0.38	47	40.7	1.140	1.140	1.140	0.114	0.130
	13.6	0.30	0.38	39	40.2	0.963	0.963	0.963	0.114	0.110
	13.9	0.30	0.42	37	40.2	0.915	0.915	0.915	0.126	0.115
	14.2	0.30	0.44	45	40.6	1.096	1.096	1.096	0.132	0.145
	14.5	0.25	0.5	30	40.3	0.746	0.746	0.746	0.125	0.093
	14.7	0.15	0.49	9	44.9	0.224	0.224	0.224	0.074	0.016
	14.8	0.05	0.44	0	0	0.000	0.000	0.000	0.022	0.000

Cross Section: Big Spring Creek #3.12.07.04_531
Big Spring Creek west of Main Dune Field at GRSA Cross Section #7.
Cross section viewed from right bank to left bank.

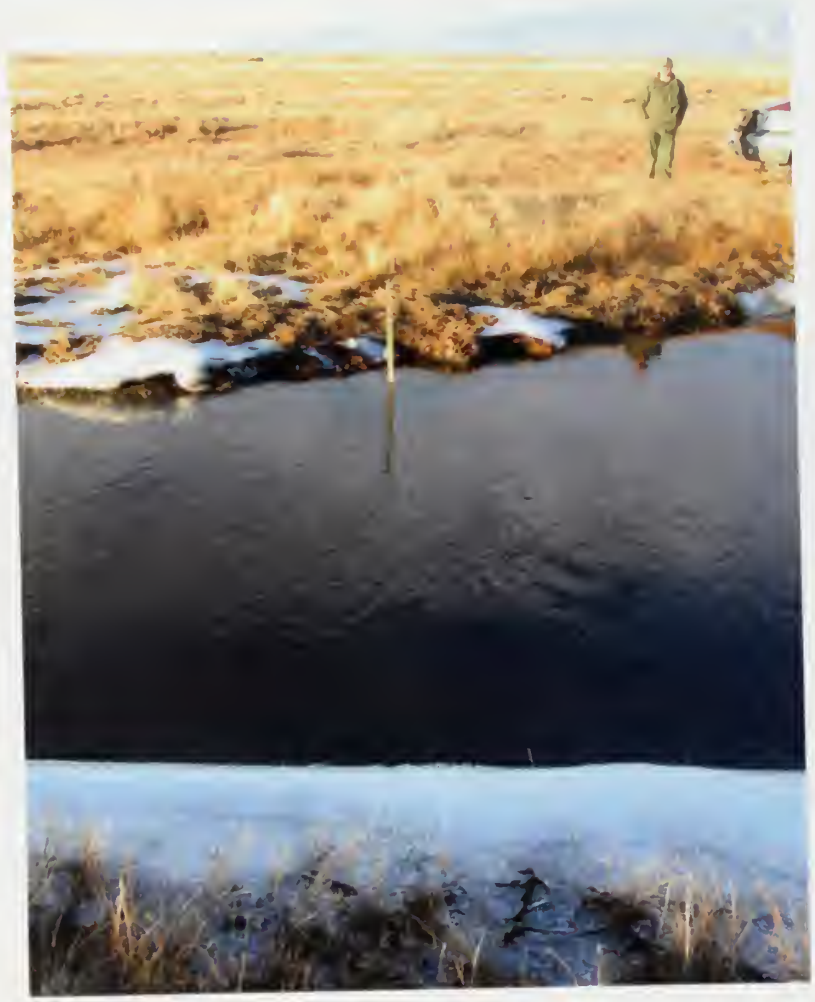
Big Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Big Spring Creek #3.12.07.04_532
Big Spring Creek west of Main Dune Field at GRSA Cross Section #7.
Cross section viewed from upstream to downstream.

Big Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Big Spring Creek #3.12.07.04_533
Big Spring Creek west of Main Dune Field at GRSA Cross Section #7.
Cross section viewed from downstream to upstream.

Big Spring Creek, Alamosa County, CO.
December 07, 2004



Cross Section: Big Spring Creek #3.12.07.04_534
Big Spring Creek west of Main Dune Field at GRSA Cross Section #7.
Cross section viewed from left bank to right bank.

Big Spring Creek, Alamosa County, CO.
December 07, 2004

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/23/04 Comp by FB Checked by _____

PARK GRSA STATION Big Spring #7 (#3)

PERSONNEL: Meter Mark Wondzell Notes Fred Bunch

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 2:58 G.H. 0.43 Stop: 3:37 G.H. 0.43

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER Clear & Sunny

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1458	.43				
1537	.43				

FLOW: Width 13.2' Area _____ Ave. Vel. _____ G.H. _____ Disch. 5.41

Method 2.6 Method coeff. ____ Hor. Angle coeff. ____ Susp. type _____ Susp. coeff. ____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 62.8 C° F° Water 66.4 C° F°

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS _____

Staff Gage Reading @ FLUME = 0.75 @ 3:45 pm

Big Spring Creek Flume

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

River at—

Angle coef.	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
LEW	1.0			.6							
	1.4	.4	0.4		8	43.5	.208			.16	.03
	1.8	.4	0.45		10	41.5	.263			.18	.05
	2.2	.4	0.45		25	40.2	.628			.18	.11
	2.6	.4	0.45		36	40.6	.883			.18	.16
	3.0	.4	0.60		36	40.2	.891			.24	.21
	3.4	.4	0.5		38	40.7	.928			.20	.19
	3.8	.4	0.45		36	40.2	.891			.18	.16
	4.2	.4	0.4		42	40.7	1.022			.16	.16
	4.6	.4	0.4		46	40.7	1.117			.16	.18
	5.0	.4	0.4		48	40.0	1.184			.16	.19
	5.4	.4	0.35		51	40.2	1.25			.14	.18
	5.8	.4	0.30		48	40.2	1.178			.12	.14
	6.2	.4	0.30		54	40.5	1.312			.12	.16
⊙	6.6	.4	0.30		54	40.2	1.321			.12	.16
	7.0	.4	0.30		61	40.3	1.485			.12	.18
	7.4	.4	0.30		57	40.4	1.386			.12	.17
	7.8	.4	0.30		53	40.2	1.297			.12	.16
	8.2	.4	0.30		50	40.2	1.226			.12	.15
	8.6	.4	0.30		50	40.5	1.217			.12	.15
	9.0	.4	0.30		48	40.1	1.181			.12	.14
	9.4	.4	0.30		40	40.4	.982			.12	.12
	9.8	.4	0.30		44	40.1	1.085			.12	.13
	10.2	.4	0.35		48	40.2	1.178			.14	~~.14~~ .16
	10.6	.4	0.45		41	40.6	1.001			.18	.18
	11.0	.4	0.45		43	40.7	1.046			.18	.19
	11.4	.4	0.55		38	40.5	.932			.22	~~.11~~ .21
	11.8	.4	0.60		40	40.5	.98			.24	.24
	12.2	.4	0.60		37	41.0	.898			.24	.22
	12.6	.4	0.70		45	40.3	1.104			.28	~~.13~~ .31
	13.0	.4	0.75		45	41.0	1.085			.30	.33
	13.4	.4	0.7		29	41.3	.705			.28	~~.08~~ .20
	13.8	.4	0.7		11	42.8	.278			.28	.08

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Big Spring Creek #3				
Station Number:	BS #3	WIDTH	12.800	# of Sections	33
Date:	9/23/2004	AREA	5.460	Sections > 5%	2
Measurement #:	1	VELOCITY	0.974	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.16%
Rating # (1 or 2)	2	TOTAL DISCHARGE	5.320		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.4	0.40	0.4	8	43.5	0.208	0.208	0.208	0.160	0.033
	1.8	0.40	0.45	10	41.5	0.263	0.263	0.263	0.180	0.047
	2.2	0.40	0.45	25	40.2	0.628	0.628	0.628	0.180	0.113
	2.6	0.40	0.45	36	40.6	0.883	0.883	0.883	0.180	0.159
	3	0.40	0.6	36	40.2	0.891	0.891	0.891	0.240	0.214
	3.4	0.40	0.5	38	40.7	0.928	0.928	0.928	0.200	0.186
	3.8	0.40	0.45	36	40.2	0.891	0.891	0.891	0.180	0.160
	4.2	0.40	0.4	42	40.7	1.022	1.022	1.022	0.160	0.164
	4.6	0.40	0.4	46	40.7	1.117	1.117	1.117	0.160	0.179
	5	0.40	0.4	48	40	1.184	1.184	1.184	0.160	0.189
	5.4	0.40	0.35	51	40.2	1.250	1.250	1.250	0.140	0.175
	5.8	0.40	0.3	48	40.2	1.178	1.178	1.178	0.120	0.141
	6.2	0.40	0.3	54	40.5	1.312	1.312	1.312	0.120	0.157
	6.6	0.40	0.3	54	40.2	1.321	1.321	1.321	0.120	0.159
	7	0.40	0.3	61	40.3	1.485	1.485	1.485	0.120	0.178
	7.4	0.40	0.3	57	40.4	1.386	1.386	1.386	0.120	0.166
	7.8	0.40	0.3	53	40.2	1.297	1.297	1.297	0.120	0.156
	8.2	0.40	0.3	50	40.2	1.226	1.226	1.226	0.120	0.147
	8.6	0.40	0.3	50	40.5	1.217	1.217	1.217	0.120	0.146
	9	0.40	0.3	48	40.1	1.181	1.181	1.181	0.120	0.142
	9.4	0.40	0.3	40	40.4	0.982	0.982	0.982	0.120	0.118
	9.8	0.40	0.3	44	40.1	1.085	1.085	1.085	0.120	0.130
	10.2	0.40	0.35	48	40.2	1.178	1.178	1.178	0.140	0.165
	10.6	0.40	0.45	41	40.6	1.001	1.001	1.001	0.180	0.180
	11	0.40	0.45	43	40.7	1.046	1.046	1.046	0.180	0.188
	11.4	0.40	0.55	38	40.5	0.932	0.932	0.932	0.220	0.205
	11.8	0.40	0.6	40	40.5	0.980	0.980	0.980	0.240	0.235
	12.2	0.40	0.6	37	41	0.898	0.898	0.898	0.240	0.215
	12.6	0.40	0.7	45	40.3	1.104	1.104	1.104	0.280	0.309
	13	0.40	0.75	45	41	1.085	1.085	1.085	0.300	0.326
	13.4	0.40	0.7	29	41.3	0.706	0.706	0.706	0.280	0.198
	13.8	0.20	0.7	11	42.8	0.278	0.278	0.278	0.140	0.039

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

FLUME @ 4^49 0.75

Big Spring Creek Flume

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. (2)

DATE 9/23/04 Comp by _____ Checked by _____

PARK GRSA STATION Big Springs #7 (#3)

PERSONNEL: Meter M. Wendzell Notes F. Bunch

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 3:59 G.H. 0.43 Stop: 4:37 G.H. 0.43

METER TYPE Pygmy S/N _____ SPIN Before Meas. 454 After _____

WEATHER Clear/Sunny - light breeze

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
1559	.43				
1637	.43				

FLOW: Width 13.2 Area_____ Ave. Vel._____ G.H._____ Disch. 5.6

Method 0.6 Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

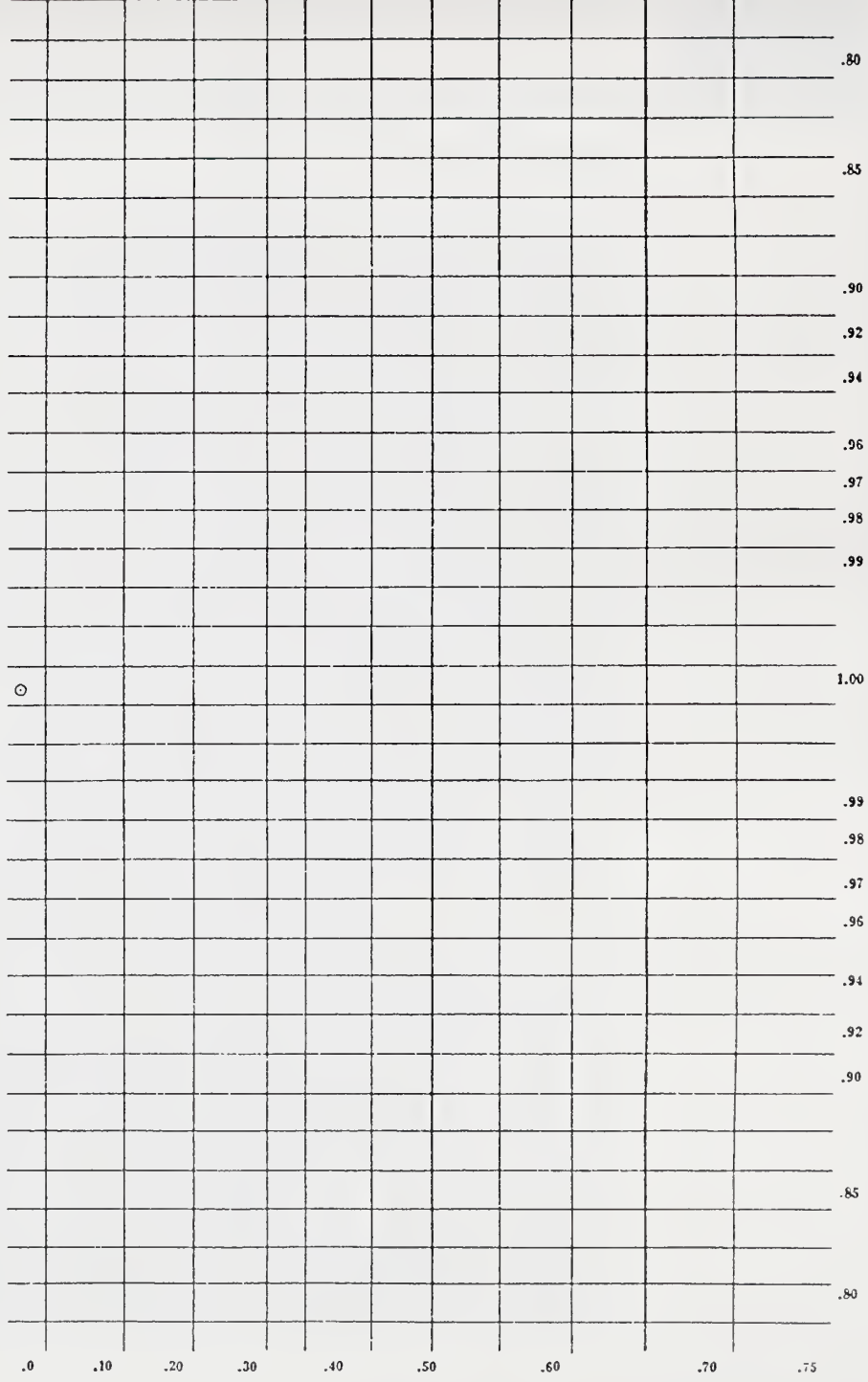
INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 68.9 C (F) Water 65.5 C F

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge	
LEW	1.0			.6								.80
	1.4	.4	0.4		6	43.7	.163			0.16	0.03	.85
	1.8	.4	0.45		13	42.3	.326			0.18	0.11	
	2.2	.4	0.45		26	42.1	.624			0.18	0.11	.90
	2.6	.4	0.5		35	40.1	.869			0.20	0.17	
	3.0	.4	0.6		35	40.9	.853			0.24	0.20	.92
	3.4	.4	0.5		35	40.3	.865			0.20	0.17	.94
	3.8	.4	0.45		43	40.5	1.051			0.18	0.19	
	4.2	.4	0.4		42	40.6	1.025			0.16	0.16	.96
	4.6	.4	0.4		49	40.3	1.199			0.16	0.19	.97
	5.0	.4	0.35		54	40.3	1.318			0.14	0.18	.98
	5.4	.4	0.30		55	40.2	1.345			0.12	0.16	.99
	5.8	.4	0.30		41	40.6	1.001			0.12	0.12	
	6.2	.4	0.35		54	40.0	1.328			0.14	0.19	
⊙	6.6	.4	0.3		55	40.1	1.348			0.12	0.16	1.00
	7.0	.4	0.3		55	40.3	1.342			0.12	0.16	
	7.4	.4	0.3		60	40.5	1.454			0.12	0.17	
	7.8	.4	0.3		52	40.4	1.267			0.12	0.15	.99
	8.2	.4	0.3		58	40.6	1.403			0.12	0.17	.98
	8.6	.4	0.3		54	40.5	1.312			0.12	0.16	.97
	9.0	.4	0.3		57	40.5	1.383			0.12	0.17	.96
	9.4	.4	0.3		52	40.2	1.273			0.12	0.15	
	9.8	.4	0.3		51	40.6	1.238			0.12	0.15	.94
	10.2	.4	0.35		38	40.0	.994			0.14	0.14	.92
	10.6	.4	0.45		46	40.4	1.125			0.18	0.20	.90
	11.0	.4	0.50		50	40.7	1.211			0.20	0.24	
	11.4	.4	0.55		43	40.8	1.043			0.22	0.23	
	11.8	.4	0.6		35	40.5	.861			0.24	0.21	.85
	12.2	.4	0.65		44	40.1	1.085			0.26	0.28	
	12.6	.4	0.7		46	40.5	1.122			0.28	0.31	
	13.0	.4	0.75		43	40.4	1.053			0.30	0.32	.80
	13.4	.4	0.65		29	40.1	.726			0.26	0.19	
	13.8	.4	0.70		16	40.9	.407			0.28	0.11	

.0 .10 .20 .30 .40 .50 .60 .70 .75



HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Big Spring Creek #3
Station Number:	BS #3
Date:	9/23/2004
Measurement #:	2
Pygmy or AA (p/a)	p
Rating # (1 or 2)	2

WIDTH	12.800	# of Sections	33
AREA	5.480	Sections > 5%	3
VELOCITY	1.014	Sections > 10%	0
		*Standard Error	4.14%
TOTAL DISCHARGE	5.559		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.20	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.4	0.40	0.4	6	43.7	0.163	0.163	0.163	0.160	0.026
	1.8	0.40	0.45	13	42.3	0.326	0.326	0.326	0.180	0.059
	2.2	0.40	0.45	26	42.1	0.624	0.624	0.624	0.180	0.112
	2.6	0.40	0.5	35	40.1	0.869	0.869	0.869	0.200	0.174
	3	0.40	0.6	35	40.9	0.853	0.853	0.853	0.240	0.205
	3.4	0.40	0.5	35	40.3	0.865	0.865	0.865	0.200	0.173
	3.8	0.40	0.45	43	40.5	1.051	1.051	1.051	0.180	0.189
	4.2	0.40	0.4	42	40.6	1.025	1.025	1.025	0.160	0.164
	4.6	0.40	0.4	49	40.3	1.199	1.199	1.199	0.160	0.192
	5	0.40	0.35	54	40.3	1.318	1.318	1.318	0.140	0.185
	5.4	0.40	0.3	55	40.2	1.345	1.345	1.345	0.120	0.161
	5.8	0.40	0.3	41	40.6	1.001	1.001	1.001	0.120	0.120
	6.2	0.40	0.35	54	40	1.328	1.328	1.328	0.140	0.186
	6.6	0.40	0.3	55	40.1	1.348	1.348	1.348	0.120	0.162
	7	0.40	0.3	55	40.3	1.342	1.342	1.342	0.120	0.161
	7.4	0.40	0.3	60	40.5	1.454	1.454	1.454	0.120	0.174
	7.8	0.40	0.3	52	40.4	1.267	1.267	1.267	0.120	0.152
	8.2	0.40	0.3	58	40.6	1.403	1.403	1.403	0.120	0.168
	8.6	0.40	0.3	54	40.5	1.312	1.312	1.312	0.120	0.157
	9	0.40	0.3	57	40.5	1.383	1.383	1.383	0.120	0.166
	9.4	0.40	0.3	52	40.2	1.274	1.274	1.274	0.120	0.153
	9.8	0.40	0.3	51	40.6	1.238	1.238	1.238	0.120	0.149
	10.2	0.40	0.35	38	40	0.944	0.944	0.944	0.140	0.132
	10.6	0.40	0.45	46	40.4	1.125	1.125	1.125	0.180	0.202
	11	0.40	0.5	50	40.7	1.211	1.211	1.211	0.200	0.242
	11.4	0.40	0.55	43	40.8	1.043	1.043	1.043	0.220	0.230
	11.8	0.40	0.6	35	40.5	0.861	0.861	0.861	0.240	0.207
	12.2	0.40	0.65	44	40.1	1.085	1.085	1.085	0.260	0.282
	12.6	0.40	0.7	46	40.5	1.122	1.122	1.122	0.280	0.314
	13	0.40	0.75	43	40.4	1.053	1.053	1.053	0.300	0.316
	13.4	0.40	0.65	29	40.1	0.726	0.726	0.726	0.260	0.189
	13.8	0.20	0.7	16	40.9	0.407	0.407	0.407	0.140	0.057

9/23/04 0910

① THE HEAD OF LITTLE Spring Creek (NORTH SOURCE) IS located NEAR THE WEST EDGE OF A dune Field AT:

GPS: N 417693.18 m
E 444716.8 m
NAD 27, Zone 13

THE NORTH Spring Source is A ~~SEEP~~ (Boggy, NOT Flowing) in a channelized ditch choked with rushes, sedges, cattail and fringed with Greasewood.

PHOTO: #98

09/23/04

0930 (est.)

② THE FIRST location where significant concentrated flow is observed (on north Trib.) of Little Spring Creek is about ½ mile downstream of its source and about 100 yds upstream of a confluence with a flowing tributary on River left. (From South Spring Source) Inflow from the side of the Channel/Gully is visible

Photo #88

GPS: N 37° 43.084 NAD 27, Zone 13
W 105° 37.831

0940 (est.)

③ Confluence of Little Spring Cr. and a Tributary joining on River left. (South Spring Source)

GPS: N 4174391.5 m
E 444408.14
NAD 27, Zone 13

Photo: #89, #90

09/24/04 0915 Little Spring Culvert Diversion

Water Depth in Culvert (0.48?)

- Upstream Depth-in-pipe = 0.47 feet
- downstream Depth-in-pipe = 0.30 feet
- n = ? pipe: .025 approach:
- Culvert is iron and in good condition
- 2 foot diameter culvert

Level survey of Culvert bottom elevation:

- upstream = 10.74 feet
- downstream = 11.65 feet

- culvert length = 29.15 feet

Computations:

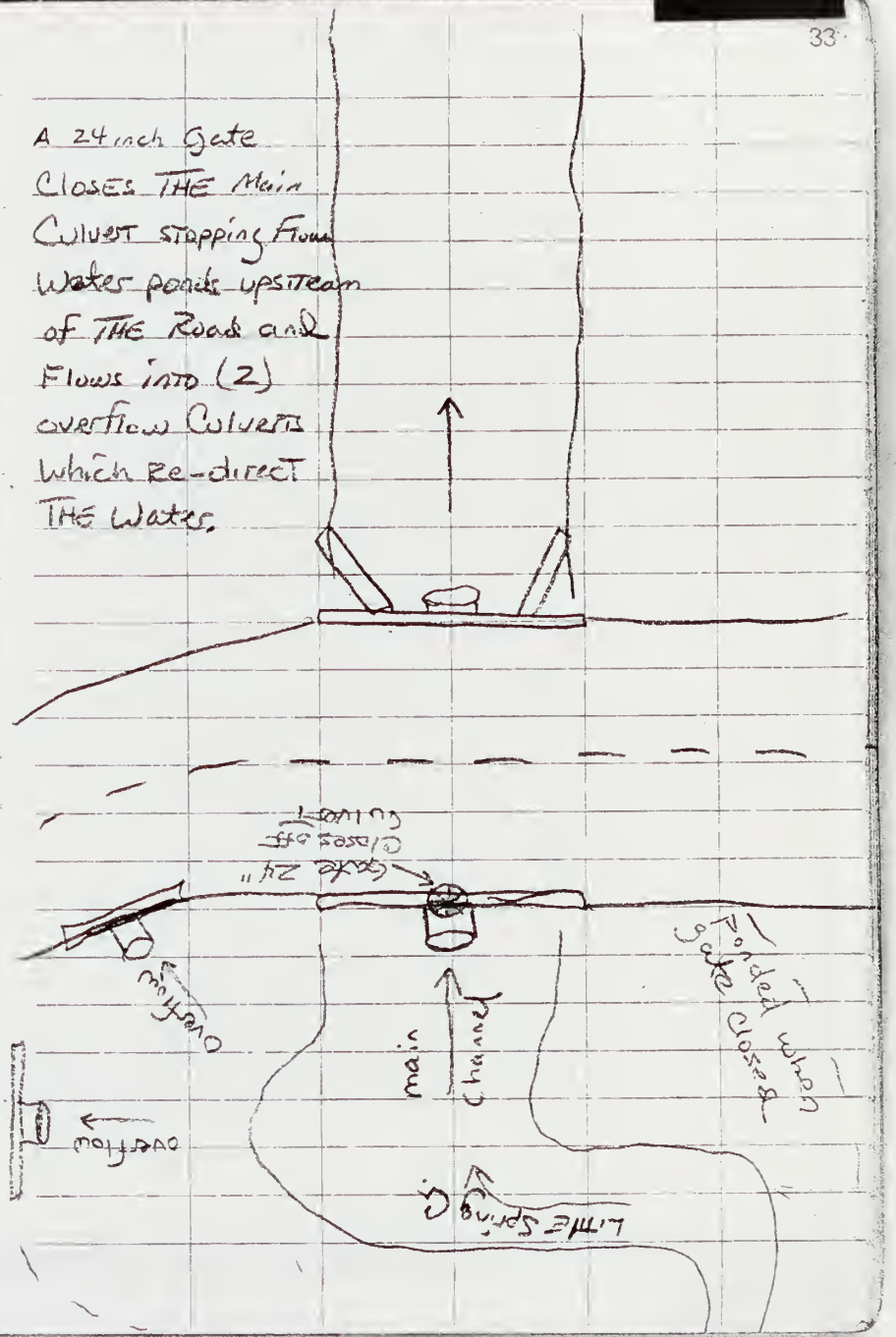
① Slope: (11.65 Ft - 10.74 Ft) / 29.15 Ft =

.91 Ft / 29.15 Ft = .0312

- Culvert looks like Corrugated Cast iron? used "n" for 2 Ft Corrugated metal pipe = .025
- Approach is smooth sand/silt

n =

A 24 inch Gate Closes the Main Culvert stopping Flow. Water ponds upstream of the Road and Flows into (2) overflow Culverts which re-direct the Waters.



SITE: Little Spring Creek 09.23.04_443
Little Spring Creek west of the Main Dune Field.
The north spring source, a seep at the head of an arroyo, viewed looking upstream.

Little Spring Creek, Alamosa County, CO.
September 23, 2004, @ 0910 hrs

SITE: Little Spring Creek 09.23.04_444
Little Spring Creek west of the Main Dune Field.
First point of concentrated flowing water located about one-half mile downstream of the north spring source viewed from downstream to upstream.

Little Spring Creek, Alamosa County, CO.
September 23, 2004, @ 0930 hrs

SITE: Little Spring Creek 09.23.04_445
Little Spring Creek west of the Main Dune Field.
First point of concentrated flowing water located about one-half mile downstream of the north spring source viewed from upstream to downstream.

Little Spring Creek, Alamosa County, CO.
September 23, 2004, @ 0930 hrs

SITE: Little Spring Creek 09.23.04_446
Little Spring Creek downstream of the Main Dune Field.
Confluence of tributaries from north and south source areas of Little Spring Creek about one-half mile downstream of the source areas, viewed from upstream on the north tributary to downstream.

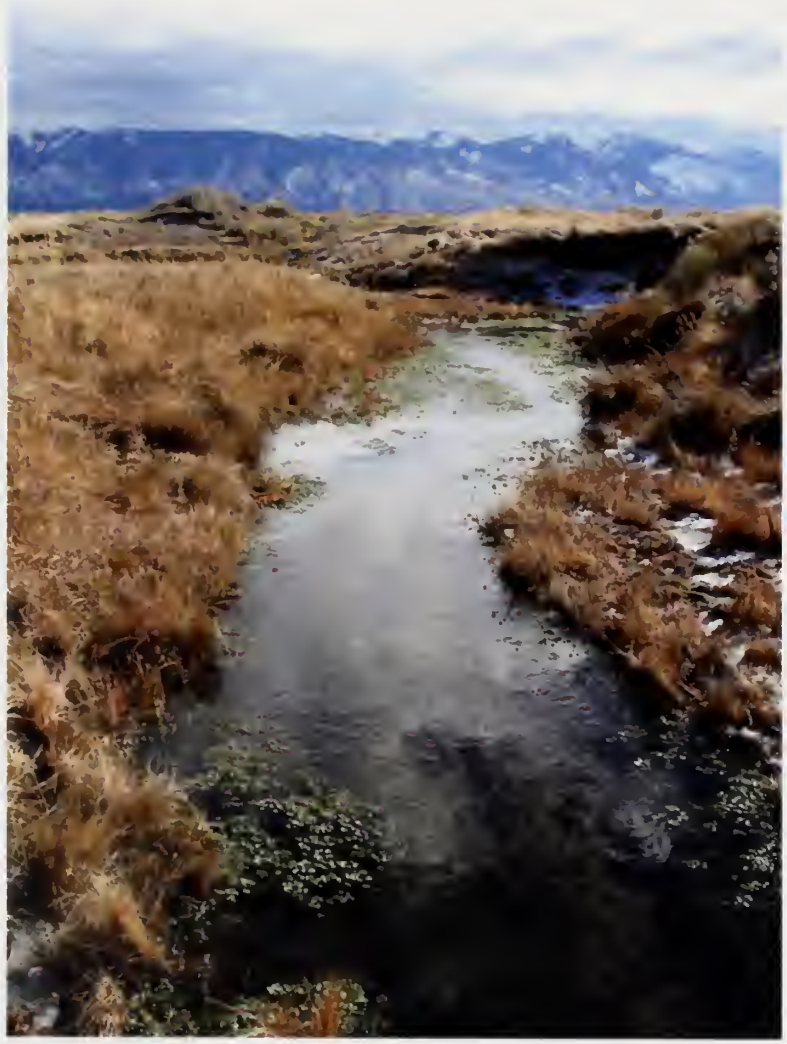
Little Spring Creek, Alamosa County, CO.
September 23, 2004, @ 0940 hrs

SITE: Little Spring Creek 09.23.04_447
Little Spring Creek downstream of the Main Dune Field.
Confluence of tributaries from north and south source areas of Little Spring Creek about one-half mile downstream of the source areas, viewed from downstream of the confluence to upstream.

Little Spring Creek, Alamosa County, CO.
September 23, 2004, @ 0940 hrs

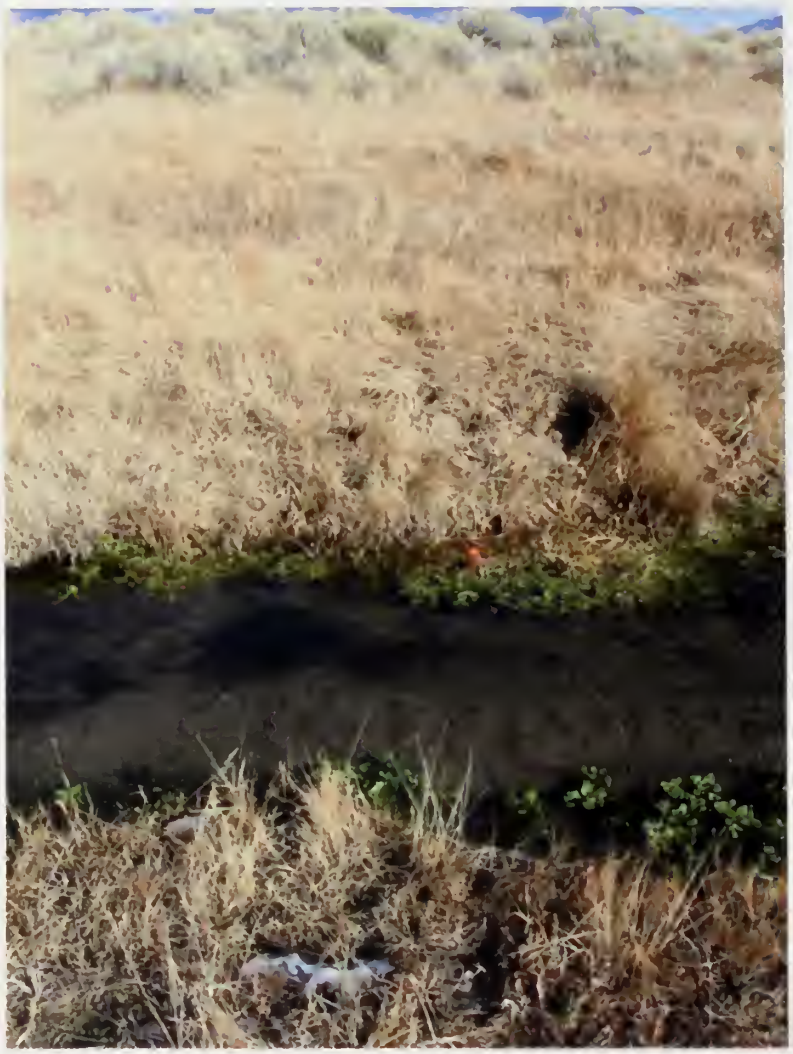
Cross Section: Little Spring Creek #1.12.07.04_550
Little Spring Creek west of the Main Dune Field.
Cross section viewed from right bank to left bank.

Little Spring Creek, Alamosa County, CO.
December 07, 2004



Cross Section: Little Spring Creek #1.12.07.04_551
Little Spring Creek west of the Main Dune Field.
Cross section viewed from downstream to upstream.

Little Spring Creek, Alamosa County, CO.
December 07, 2004



Cross Section: Little Spring Creek #1.12.07.04_552
Little Spring Creek west of the Main Dune Field.
Cross section viewed from left bank to right bank.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Little Spring Creek #1.12.07.04_553
Little Spring Creek west of the Main Dune Field.
Cross section viewed from upstream to downstream.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT. Yes/No Time_____ Method. EDI_____ EWI_____ Other_____

BIOLOGICAL. Yes/No Time_____ _____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/24/2004 Comp by _____ Checked by _____

PARK GRSA STATION Little Spring Station 1 (upstream of culv

PERSONNEL: Meter Jim Harte Notes Katie Hagaman

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: [illegible] G.H. 0.73 Stop: 09:10 G.H. 0.73

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER clear

HIGH WATER MARK _____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0945	.73				
0910	.73				

FLOW: Width_____ Area_____ Ave. Vel._____ G.H._____ Disch. 1.12

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 7 (C) F° Water 8.5 (C) F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coef. ficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
REW	0.3										0
	0.5	0.2	0.41		0			0			0
	0.7	0.2	0.46		3	40.5		0.102		0.092	0.0094
	0.9	0.2	0.50		10	45.3		0.243		0.100	0.0243
	1.1	0.2	0.50		12	41.0		0.312		0.100	0.0312
	1.3	0.2	0.53		15	40.0		0.391		0.106	0.0414
	1.5	0.2	0.60		18	41.0		0.453		0.120	0.0544
	1.7	0.2	0.61		21	40.6		0.528		0.122	0.0644
	1.9	0.2	0.63		25	40.8		0.620		0.126	0.0781
	2.1	0.2	0.63		28	40.4		0.697		0.126	0.0878
	2.3	0.2	0.63		31	41.2		0.754		0.126	0.0950
	2.5	0.2	0.63		33	40.8		0.808		0.126	0.1018
	2.7	0.2	0.61		34	40.6		0.835		0.122	0.1019
	2.9	0.2	0.58		31	40.8		0.761		0.116	0.0883
⊙	3.1	0.2	0.53		30	40.8		0.737		0.106	0.0781
	3.3	0.2	0.53		25	41.1		0.615		0.106	0.0652
	3.5	0.2	0.53		24	40.6		0.599		0.106	0.0635
	3.7	0.2	0.48		18	40.2		0.461		0.096	0.0443
	3.9	0.2	0.50		14	41.3		0.357		0.100	0.0357
	4.1	0.2	0.52		14	42.2		0.350		0.104	0.0364
	4.3	0.2	0.42		10	41.3		0.264		0.084	0.0222
LEW	4.5										0
											1.12 cfs

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

.0 .10 .20 .30 .40 .50 .60 .70 .75

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Little Spring Creek #1				
Station Number:	LS #1	WIDTH	4.200	# of Sections	22
Date:	9/23/2004	AREA	2.166	Sections > 5%	10
Measurement #:	1	VELOCITY	0.519	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	5.48%
Rating # (1 or 2)	2	TOTAL DISCHARGE	1.123		FAIR

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0.3	0.10	0	0	0	0.000	0.000	0.000	0.000	0.000
	0.5	0.20	0.41	0	0	0.000	0.000	0.000	0.082	0.000
	0.7	0.20	0.46	3	40.5	0.102	0.102	0.102	0.092	0.009
	0.9	0.20	0.5	10	45.3	0.243	0.243	0.243	0.100	0.024
	1.1	0.20	0.5	12	41	0.312	0.312	0.312	0.100	0.031
	1.3	0.20	0.53	15	40	0.391	0.391	0.391	0.106	0.041
	1.5	0.20	0.6	18	41	0.453	0.453	0.453	0.120	0.054
	1.7	0.20	0.61	21	40.6	0.528	0.528	0.528	0.122	0.064
	1.9	0.20	0.63	25	40.8	0.620	0.620	0.620	0.126	0.078
	2.1	0.20	0.63	28	40.4	0.697	0.697	0.697	0.126	0.088
	2.3	0.20	0.63	31	41.2	0.754	0.754	0.754	0.126	0.095
	2.5	0.20	0.63	33	40.8	0.808	0.808	0.808	0.126	0.102
	2.7	0.20	0.61	34	40.6	0.835	0.835	0.835	0.122	0.102
	2.9	0.20	0.58	31	40.8	0.761	0.761	0.761	0.116	0.088
	3.1	0.20	0.53	30	40.8	0.737	0.737	0.737	0.106	0.078
	3.3	0.20	0.53	25	41.1	0.615	0.615	0.615	0.106	0.065
	3.5	0.20	0.53	24	40.6	0.599	0.599	0.599	0.106	0.063
	3.7	0.20	0.48	18	40.2	0.461	0.461	0.461	0.096	0.044
	3.9	0.20	0.5	14	41.3	0.357	0.357	0.357	0.100	0.036
	4.1	0.20	0.52	14	42.2	0.350	0.350	0.350	0.104	0.036
	4.3	0.20	0.42	10	41.3	0.264	0.264	0.264	0.084	0.022
	4.5	0.10	0	0	0	0.000	0.000	0.000	0.000	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

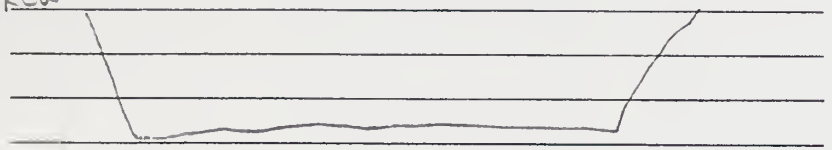
Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

REW



LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. 2

DATE 9/24/2004 Comp by _____ Checked by _____

PARK GRSA STATION Little Spring Station 1 (upstream of culvert)

PERSONNEL: Meter Jim Harte Notes Katie Hagaman

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 09:45 G.H. 0.73 Stop: 10:08 G.H. 0.73

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45+ After 45+

WEATHER clear

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0945	.73				
1008	.73				

FLOW: Width _____ Area _____ Ave. Vel. _____ G.H. _____ Disch. 1.16

Method _____ Method coeff. _____ Hor. Angle coeff. _____ Susp. type _____ Susp. coeff. _____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL _____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt. _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 8.5 (C) F° Water 10.0 (C) F°

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

Cross Section: Little Spring Creek #2.12.07.04_554
Little Spring Creek west of the Main Dune Field.
Cross section viewed from downstream to upstream.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Little Spring Creek #2.12.07.04_555
Little Spring Creek west of the Main Dune Field.
Cross section viewed from upstream to downstream.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/4/04 Comp by _____ Checked by _____

PARK RMS STATION Little Spring #2

PERSONNEL: Meter MARK Wondzell Notes FRED Bunch

MEASUREMENT TYPE (circle one) Wading, Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 8 44 G.H. 0.40 Stop: 9 27 G.H. 0.40

METER TYPE Pygmy S/N _____ SPIN Before Meas. 45 T After 45 T

WEATHER Overcast & Sunny

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0844	.40				
0927	.40				

FLOW: Width 5.0' Area_____ Ave. Vel._____ G.H._____ Disch. 1.218

Method 0.6 Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Sees._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 13 C° F° Water 4 C° F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
LEW	1.0			.6							
	1.2	.2	0.42		0	40	0			0.084	0
	1.4	.2	0.48		0	40	0			0.084	0
	1.6	.2	0.61		1	71.5	.045			0,122	0.005
	1.8	.2	0.64		0	40	0			0,128	0
	2.0	.2	0.64		7	46.4	.175			0,128	.022
	2.2	.2	0.65		10	41.5	.263			0.13	0.034
	2.4	.2	0.68		10	41.9	.260			0,136	0.035
	2.6	.2	0.7		13	41.0	.336			0,14	0.047
	2.8	.2	0.74		14	41.7	.354			0,148	0,052
	3.0	.2	0.76		17	42.0	.420			0,152	0.064
	3.2	.2	0,79		18	41.8	.446			0.158	0.070
	3.4	.2	0,76		22	40.6	.552			0,152	0.084
	3.6	.2	0.80		23	41.1	.569			0,16	0,091
⊙	3.8	.2	0.82		26	40.6	.646			0,164	0,106
	4.0	.2	0.83		27	40.8	.667			0,166	0,111
	4.2	.2	0.85		23	41.5	.563			0,17	0.096
	4.4	.2	0.85		26	40.7	.645			0,17	0.110
	4.6	.2	0.88		25	41.1	.615			0,176	0.108
	4.8	.2	0.83		18	41.8	.445			0,166	0.074
	5.0	.2	0.89		14	41.3	.357			0.158	0.056
	5.2	.2	0.79 0.74		6	46.5	.155			0,148	0.023
	5.4	.2	0.71		5	60.6	.110			0,142	0.016
	5.6	.2	0.69		2	70.3	.058			0,138	0.008
	5.8	.2	0.64		2	80.5	.052			0,128	0.006
	6.0	.2	0,55		0	40	0			0.11	0
	6.2	.2	0.55		0	40	0			0.11	0
	6.4	.2	0.48		0	40	0			0.096	0

1.218

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Little Spring Creek #2				
Station Number:	LS #2	WIDTH	5.400	# of Sections	28
Date:	9/23/2004	AREA	3.728	Sections > 5%	10
Measurement #:	1	VELOCITY	0.327	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	10.58%
Rating # (1 or 2)	2	TOTAL DISCHARGE	1.220		POOR

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.10	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.2	0.20	0.42	0	40	0.000	0.000	0.000	0.084	0.000
	1.4	0.20	0.48	0	40	0.000	0.000	0.000	0.096	0.000
	1.6	0.20	0.61	1	71.5	0.045	0.045	0.045	0.122	0.005
	1.8	0.20	0.64	0	40	0.000	0.000	0.000	0.128	0.000
	2	0.20	0.64	7	46.4	0.176	0.176	0.176	0.128	0.023
	2.2	0.20	0.65	10	41.5	0.263	0.263	0.263	0.130	0.034
	2.4	0.20	0.68	10	41.9	0.260	0.260	0.260	0.136	0.035
	2.6	0.20	0.7	13	41	0.336	0.336	0.336	0.140	0.047
	2.8	0.20	0.74	14	41.7	0.354	0.354	0.354	0.148	0.052
	3	0.20	0.76	17	42	0.420	0.420	0.420	0.152	0.064
	3.2	0.20	0.79	18	41.8	0.445	0.445	0.445	0.158	0.070
	3.4	0.20	0.76	22	40.6	0.552	0.552	0.552	0.152	0.084
	3.6	0.20	0.8	23	41.1	0.569	0.569	0.569	0.160	0.091
	3.8	0.20	0.82	26	40.6	0.646	0.646	0.646	0.164	0.106
	4	0.20	0.83	27	40.8	0.667	0.667	0.667	0.166	0.111
	4.2	0.20	0.85	23	41.5	0.563	0.563	0.563	0.170	0.096
	4.4	0.20	0.85	26	40.7	0.645	0.645	0.645	0.170	0.110
	4.6	0.20	0.88	25	41.1	0.615	0.615	0.615	0.176	0.108
	4.8	0.20	0.83	18	41.8	0.445	0.445	0.445	0.166	0.074
	5	0.20	0.79	14	41.3	0.357	0.357	0.357	0.158	0.056
	5.2	0.20	0.74	6	46.5	0.155	0.155	0.155	0.148	0.023
	5.4	0.20	0.71	5	60.6	0.110	0.110	0.110	0.142	0.016
	5.6	0.20	0.69	2	72.3	0.058	0.058	0.058	0.138	0.008
	5.8	0.20	0.64	2	90.5	0.052	0.052	0.052	0.128	0.007
	6	0.20	0.55	0	40	0.000	0.000	0.000	0.110	0.000
	6.2	0.20	0.55	0	40	0.000	0.000	0.000	0.110	0.000
	6.4	0.10	0.48	0	40	0.000	0.000	0.000	0.048	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. 2

DATE 9/24/04 Comp by _____ Checked by _____

PARK GRSA STATION LITTLE SPRING CREEK #2

PERSONNEL: Meter MARK WONDZELL Notes FIELD BUNCH

MEASUREMENT TYPE (circle one) (Wading); Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 9:46 G.H. 0.41 Stop: 10:28 G.H. 0.405

METER TYPE PYGMY S/N _____ SPIN Before Meas. 454 After 454

WEATHER CLEAR & SUNNY

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0946	.41				
1028	.41				

FLOW: Width 5.6' Area_____ Ave. Vel._____ G.H._____ Disch. 1.16

Method 0.6' Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW_____

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 50.7 C° F° Water 49.1 C° F°

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
LEW	1.0			.6							
	1.2	.2	0.43		0	40	0			0.086	0
	1.4	.2	0.51		0	40	0			0.102	0
	1.6	.2	0.63		1	42.4	.054			0.126	0.001
	1.8	.2	0.64		3	43.3	.098			0.128	0.012
	2.0	.2	0.65		5	44.4	.139			0.13	0.018
	2.2	.2	0.68		7	45.1	.180			0.14	0.025
	2.4	.2	0.71		8	42.7	.211			0.14	0.029
	2.6	.2	0.73		10	42.8	256			0.15	0.038
	2.8	.2	0.75		12	41.0	.312			0.15	0.047
	3.0	.2	0.78		16	40.6	.410			0.16	0.066
	3.2	.2	0.8		18	42.8	.435			0.16	0.069
	3.4	.2	0.8		19	41.2	.474			0.16	0.076
	3.6	.2	0.8		24	42.3	.576			0.16	0.092
⊙	3.8	.2	0.82		23	41.3	.566			0.164	0.093
	4.0	.2	0.84		24	40.1	.606			0.168	0.102
	4.2	.2	0.85		24	40.1	.606			0.17	0.103
	4.4	.2	0.86		23	40.5	.577			0.172	0.099
	4.6	.2	0.88		29	40.5	.719			0.176	0.126
	4.8	.2	0.84		17	41.4	.426			0.168	0.072
	5.0	.2	0.80		9	43.4	.230			0.16	0.037
	5.2	.2	0.76	1	7	45.6	.179			0.15	0.027
	5.4	.2	0.68	1	3	46.8	.093			0.14	0.013
	5.6	.2	0.70	1	1	59.1	.047			0.14	0.007
	5.8	.2	0.60		3	78.2	.068			0.12	0.008
	6.0	.2	0.58		0	40	0			0.12	0
	6.2	.2	0.5		0	40	0			0.10	0
	6.4	.2	0.35		0	40	0			0.07	0

116

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Little Spring Creek #2				
Station Number:	LS #2	WIDTH	5.400	# of Sections	28
Date:	9/23/2004	AREA	3.759	Sections > 5%	10
Measurement #:	2	VELOCITY	0.310	Sections > 10%	1
Pygmy or AA (p/a)	p			*Standard Error	11.09%
Rating # (1 or 2)	2	TOTAL DISCHARGE	1.164		POOR

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	1	0.10	0	0	0	0.000	0.000	0.000	0.000	0.000
	1.2	0.20	0.43	0	40	0.000	0.000	0.000	0.086	0.000
	1.4	0.20	0.51	0	40	0.000	0.000	0.000	0.102	0.000
	1.6	0.20	0.63	1	42.4	0.054	0.054	0.054	0.126	0.007
	1.8	0.20	0.64	3	43.3	0.098	0.098	0.098	0.128	0.013
	2	0.20	0.65	5	44.4	0.139	0.139	0.139	0.130	0.018
	2.2	0.20	0.68	7	45.1	0.180	0.180	0.180	0.136	0.025
	2.4	0.20	0.71	8	42.7	0.211	0.211	0.211	0.142	0.030
	2.6	0.20	0.73	10	42.8	0.256	0.256	0.256	0.146	0.037
	2.8	0.20	0.75	12	41	0.312	0.312	0.312	0.150	0.047
	3	0.20	0.78	16	40.6	0.410	0.410	0.410	0.156	0.064
	3.2	0.20	0.8	18	42.8	0.435	0.435	0.435	0.160	0.070
	3.4	0.20	0.8	19	41.2	0.474	0.474	0.474	0.160	0.076
	3.6	0.20	0.8	24	42.3	0.576	0.576	0.576	0.160	0.092
	3.8	0.20	0.82	23	41.3	0.566	0.566	0.566	0.164	0.093
	4	0.20	0.84	24	40.1	0.606	0.606	0.606	0.168	0.102
	4.2	0.20	0.85	24	40.1	0.606	0.606	0.606	0.170	0.103
	4.4	0.20	0.86	23	40.5	0.577	0.577	0.577	0.172	0.099
	4.6	0.20	0.88	29	40.5	0.719	0.719	0.719	0.176	0.127
	4.8	0.20	0.84	17	41.4	0.426	0.426	0.426	0.168	0.071
	5	0.20	0.8	9	43.4	0.230	0.230	0.230	0.160	0.037
	5.2	0.20	0.76	7	45.6	0.179	0.179	0.179	0.152	0.027
	5.4	0.20	0.68	3	46.8	0.093	0.093	0.093	0.136	0.013
	5.6	0.20	0.7	1	59.1	0.047	0.047	0.047	0.140	0.007
	5.8	0.20	0.6	3	78.2	0.068	0.068	0.068	0.120	0.008
	6	0.20	0.58	0	40	0.000	0.000	0.000	0.116	0.000
	6.2	0.20	0.5	0	40	0.000	0.000	0.000	0.100	0.000
	6.4	0.10	0.35	0	40	0.000	0.000	0.000	0.035	0.000

1330 (est.)

⑤ Flume at corrals on Little Spring Creek
Flume is run by State of Colo.
Cleaned Flume and pipe to stilling well
STAFF GAGE READ .34 FT. AFTER cleaning
(.35 Ft. before cleaning)

GPS N 4173958.62 m
E 442738.77
NAD 27, Zone 13

Flume is about 200 Ft. South of the
Corrals on a main Road.

(Little Spring Cr. #3)

Cross Section: Little Spring Creek #3.09.23.04_108
Little Spring Creek downstream of the Main Dune Field.
Flume located about 200 feet south of corrals about two miles east of the Medano Ranch headquarters viewed from downstream to upstream.

Little Spring Creek, Alamosa County, CO.
September 23, 2004 @ 1300 hrs

Cross Section: Little Spring Creek #3.09.23.04_109
Little Spring Creek downstream of the Main Dune Field.
Flume located about 200 feet south of corrals about two miles east of the Medano Ranch headquarters viewed from upstream to downstream.

Little Spring Creek, Alamosa County, CO.
September 23, 2004 @ 1300 hrs

Cross Section: Little Spring Creek #3.12.07.04_558
Little Spring Creek west of the Main Dune Field.
Cross section located in flume entrance viewed from downstream to upstream.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Little Spring Creek #3.12.07.04_559
Little Spring Creek west of the Main Dune Field.
Cross section located in the flume entrance viewed from right bank to left bank.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Little Spring Creek #3.12.07.04_560
Little Spring Creek west of the Main Dune Field.
Cross section located in the flume entrance viewed from upstream to downstream.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Little Spring Creek #3.12.07.04_561
Little Spring Creek west of the Main Dune Field.
Cross section located in the flume entrance viewed from left bank to right bank.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

Cross Section: Little Spring Creek #3.12.07.04_562
Little Spring Creek west of the Main Dune Field.
Staff gage located in flume entrance viewed from left bank to right bank.

Little Spring Creek, Alamosa County, CO.
December 07, 2004

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

DISCHARGE MEASUREMENT NOTES

Meas. No. 1

DATE 9/24/04 Comp by LAUFMAN Checked by _____

~ ~1050' upstream o 4-way flu

PARK GRSA STATION LITTLE SPRINGS CREEK FLUME (#3)

PERSONNEL: Meter HANSEN Notes LAUFMAN

MEASUREMENT TYPE (circle one) (Wading) Cable, Bridge, Boat, Ice; Upstr., Dnstr., ___ ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 08:43 am G.H. .33 Stop: 09:15 G.H. .33

METER TYPE Rigmy S/N P900628 SPIN Before Meas. 134s After 92s

WEATHER clear

HIGH WATER MARK _____ Gage Height of .Zero .Flow. _____ ft.

CREST STAGE CHECKED: Yes/No _____ READING _____ ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0943	.33				
0945	.33				

FLOW: Width _____ Area 1.113 Ave. Vel. _____ G.H. _____ Disch. 1.205

Method _____ Method coeff. ____ Hor. Angle coeff. ____ Susp. type _____ Susp. coeff. ____

Meter _____ ft. above bottom of weight No. Secs. _____ G.H. changes _____ ft. in _____ hrs.

FLOW _____

Cross Section _____

CONTROL FLUME – REW → STAFF PLATE ON RIGHT SIDE OF FLUME

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range _____

S/N _____ P/N _____

Conversion slope _____ Conversion offset _____ Ex. Volt _____ Output Range _____

NITROGEN TANK PRESSURE _____ FEED _____ BBL RATE _____ per. min.

INTAKE/ORIFICE CLEANED _____ TEMPERATURE: Air 48 C (F) Water 42.3 (C) F

PHOTOS TAKEN: Roll(s) # _____ Frame(s) # _____

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time _____ Samples: Yes/No Time _____

Method: EDI _____ EWI _____ Other _____

SEDIMENT: Yes/No Time _____ Method: EDI _____ EWI _____ Other _____

BIOLOGICAL: Yes/No Time _____ Type _____

OBSERVATIONS/COMMENTS _____

LEVEL NOTES

EQUIPMENT TYPE _____ S/N _____

PERSONNEL: Instrument/Notes _____ Rod _____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

River at—

	Angle coefficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
LEW		0.3	0.2	.27	.6	—	—	0			.054	—
		0.5		.27		47	40.5	1.145			.054	.062
		0.7		.26		49	40.0	1.207			.052	.063
		0.9		.27		53	40.5	1.287			.054	.070
		1.1		.27		48	40.2	1.1177			.054	.060
		1.3		.28		49	40.6	1.190			.056	.067
		1.5		.27		48	40.8	1.160			.054	.063
		1.7		.27		45	40.9	1.087			.054	.059
		1.9		.28		60	40.5	1.453			.056	.081
		2.1		.28		57	40.2	1.392			.056	.078
		2.3		.28		57	40.5	1.382			.056	.077
		2.5		.28		48	40.7	1.163			.056	.065
		2.7		.28		49	40.1	1.204			.056	.067
		2.9		.30		44	40.0	1.087			.060	.065
⊙		3.1		.31		51	40.5	124			.062	.077
		3.3		.31		55	40.5	1.335			.062	.083
		3.5		.31		50	40.2	1.225			.062	.076
		3.7		.31		36	41.0	0.875			.062	.054
		3.9		.31		24	40.1	0.605			.062	.038
REW		4.0	.1	.31				0			.031	0
										Σ_i =	1.113	1.205

.0 .10 .20 .30 .40 .50 .60 .70 .75

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Little Spring Creek #3, Inside Flume Mouth				
Station Number:	LS #3	WIDTH	3.700	# of Sections	20
Date:	9/24/2004	AREA	1.055	Sections > 5%	15
Measurement #:	1	VELOCITY	1.136	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.69%
Rating # (1 or 2)	2	TOTAL DISCHARGE	1.199		GOOD

Print Header | Print Full Sheet | Clear Sheet | Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0.3	0.10	0.27	0	0	0.000	0.000	0.000	0.027	0.000
	0.5	0.20	0.27	47	40.5	1.146	1.146	1.146	0.054	0.062
	0.7	0.20	0.26	49	40	1.208	1.208	1.208	0.052	0.063
	0.9	0.20	0.27	53	40.5	1.288	1.288	1.288	0.054	0.070
	1.1	0.20	0.27	48	40.2	1.178	1.178	1.178	0.054	0.064
	1.3	0.20	0.28	49	40.6	1.190	1.190	1.190	0.056	0.067
	1.5	0.20	0.27	48	40.8	1.161	1.161	1.161	0.054	0.063
	1.7	0.20	0.27	45	40.9	1.088	1.088	1.088	0.054	0.059
	1.9	0.20	0.28	60	40.5	1.454	1.454	1.454	0.056	0.081
	2.1	0.20	0.28	57	40.2	1.393	1.393	1.393	0.056	0.078
	2.3	0.20	0.28	57	40.5	1.383	1.383	1.383	0.056	0.077
	2.5	0.20	0.28	48	40.7	1.164	1.164	1.164	0.056	0.065
	2.7	0.20	0.28	49	40.1	1.205	1.205	1.205	0.056	0.067
	2.9	0.20	0.3	44	40	1.088	1.088	1.088	0.060	0.065
	3.1	0.20	0.31	51	40.5	1.241	1.241	1.241	0.062	0.077
	3.3	0.20	0.31	55	40.5	1.335	1.335	1.335	0.062	0.083
	3.5	0.20	0.31	50	40.2	1.226	1.226	1.226	0.062	0.076
	3.7	0.20	0.31	36	41	0.874	0.874	0.874	0.062	0.054
	3.9	0.15	0.31	24	40.1	0.606	0.606	0.606	0.047	0.028
	4	0.05	0.31	0	0	0.000	0.000	0.000	0.016	0.000

(Sept,1999)

UNITED STATES
DOI-NPS-WRD
WATER RIGHTS BRANCH

OTHER MEASUREMENTS

WATER QUALITY: Yes/No Time_____ Samples: Yes/No Time_____

Method: EDI_____ EWI_____ Other_____

SEDIMENT: Yes/No Time_____ Method: EDI_____ EWI_____ Other_____

BIOLOGICAL: Yes/No Time_____ Type_____

OBSERVATIONS/COMMENTS_____

LEVEL NOTES

EQUIPMENT TYPE_____ S/N_____

PERSONNEL: Instrument/Notes_____ Rod_____

STATION	B.S.	H.I.	F.S.	ELEV.	COMMENTS

DISCHARGE MEASUREMENT NOTES

Meas. No. #2

DATE 9/24/04 Comp by LAUFMANN Checked by _____

PARK GRSA STATION LITTLE SPRINGS FLUME (#3)

PERSONNEL: Meter HANSEN Notes LAUFMANN

MEASUREMENT TYPE (circle one) (Wading), Cable, Bridge, Boat, Ice; Upstr., Dnstr., ____ft., mi. of gage

Measurement Time/G.H.: Local Standard (24hr) Start: 09:44 G.H. .33 Stop: 10:08 G.H. .33

METER TYPE Rigmy S/N P90068 SPIN Before Meas. 92S After 86S

WEATHER CLEAR

HIGH WATER MARK_____ Gage Height of .Zero .Flow._____ft.

CREST STAGE CHECKED: Yes/No _____ READING_____ft.

GAGE READINGS

Time	Staff Plate	Sensor	Time	Staff Plate	Sensor
0944	.33				
1008	.33				

FLOW: Width_____ Area 1.124 Ave. Vel._____ G.H._____ Disch. 1.265

Method_____ Method coeff._____ Hor. Angle coeff._____ Susp. type_____ Susp. coeff._____

Meter_____ft. above bottom of weight No. Secs._____ G.H. changes _____ft. in _____hrs.

FLOW FLUME STAFF PLATE ON RIGHT SIDE OF FLUME

Cross Section_____

CONTROL_____

CHANGED Sensor/Datalogger parameters (circle if yes)? If yes fill in applicable spaces below:

Make/Model/PSI Range_____

S/N_____ P/N_____

Conversion slope_____ Conversion offset_____ Ex. Volt._____ Output Range_____

NITROGEN TANK PRESSURE_____ FEED_____ BBL RATE_____ per. min.

INTAKE/ORIFICE CLEANED_____ TEMPERATURE: Air 63.5 C (F) Water 45.9 C (F)

PHOTOS TAKEN: Roll(s) #_____ Frame(s) #_____

River at—

Angle coef-ficient	Dist. from initial point	Width	Depth	Observation depth	Revolutions	Time in seconds	VELOCITY: At point	VELOCITY: Mean in vertical	Adjusted for hor. angle or	Area	Discharge
LEW	.3	×.2	.24	.6	—	—	0			.048	0
	.5		.25		46	40.3	1.127			.050	.056
	.7		.26		52	40.7	1.258			.052	.065
	.9		.26		55	40.6	1.332			.052	.069
	1.1		.27		48	40.2	1.177			.054	.064
	1.3		.28		43	40.2	1.058			.056	.059
	1.5		.28		59	40.6	1.426			.056	.080
	1.7		.28		58	40.5	1.406			.056	.079
	1.9		.29		55	40.7	1.328			.058	.077
	2.1		.29		57	40.1	1.396			.058	.081
	2.3		.29		57	40.6	1.379			.058	.080
	2.5		.30		55	40.4	1.338			.060	.080
	2.7		.30		54	40.2	1.321			.060	.079
	2.9		.30		52	40.4	1.267			.060	.076
⊙	3.1		.30		51	40.7	1.234			.060	.074
	3.3		.31		52	40.0	1.279			.062	.079
	3.5		.32		41	40.6	1.142			.064	.073
	3.7		.32		36	40.3	0.888			.064	.057
	3.9		.32		23	40.2	0.58			.064	.037
REW	4.0	.1	.32				0			.032	0
									Σ =	1.124	1.265

HMST v2.6 One-Point Velocity Discharge Measurement Checker

By Brian Loving, Hydrologist, US Geological Survey

Station Name:	Little Spring Creek #3, Inside Flume Mouth				
Station Number:	LS #3	WIDTH	3.700	# of Sections	20
Date:	9/24/2004	AREA	1.068	Sections > 5%	14
Measurement #:	2	VELOCITY	1.178	Sections > 10%	0
Pygmy or AA (p/a)	p			*Standard Error	4.68%
Rating # (1 or 2)	2	TOTAL DISCHARGE	1.258		GOOD

Print Header

Print Full Sheet

Clear Sheet

Stable (even, firm, sn

Correction Coefficient	Distance	Width	Depth	Revolutions	Seconds	Velocity At Point	Mean Velocity	Adjusted Velocity	Area	Discharge
	0.3	0.10	0.24	0	0	0.000	0.000	0.000	0.024	0.000
	0.5	0.20	0.25	46	40.3	1.127	1.127	1.127	0.050	0.056
	0.7	0.20	0.26	52	40.7	1.258	1.258	1.258	0.052	0.065
	0.9	0.20	0.26	55	40.6	1.332	1.332	1.332	0.052	0.069
	1.1	0.20	0.27	48	40.2	1.178	1.178	1.178	0.054	0.064
	1.3	0.20	0.28	43	40.2	1.058	1.058	1.058	0.056	0.059
	1.5	0.20	0.28	59	40.6	1.427	1.427	1.427	0.056	0.080
	1.7	0.20	0.28	58	40.5	1.407	1.407	1.407	0.056	0.079
	1.9	0.20	0.29	55	40.7	1.329	1.329	1.329	0.058	0.077
	2.1	0.20	0.29	57	40.1	1.396	1.396	1.396	0.058	0.081
	2.3	0.20	0.29	57	40.6	1.380	1.380	1.380	0.058	0.080
	2.5	0.20	0.3	55	40.4	1.339	1.339	1.339	0.060	0.080
	2.7	0.20	0.3	54	40.2	1.321	1.321	1.321	0.060	0.079
	2.9	0.20	0.3	52	40.4	1.267	1.267	1.267	0.060	0.076
	3.1	0.20	0.3	51	40.7	1.235	1.235	1.235	0.060	0.074
	3.3	0.20	0.31	52	40	1.280	1.280	1.280	0.062	0.079
	3.5	0.20	0.32	47	40.6	1.143	1.143	1.143	0.064	0.073
	3.7	0.20	0.32	36	40.3	0.889	0.889	0.889	0.064	0.057
	3.9	0.15	0.32	23	40.2	0.581	0.581	0.581	0.048	0.028
	4	0.05	0.32	0	0	0.000	0.000	0.000	0.016	0.000

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS D-93, December 2007

National Park Service
U.S. Department of the Interior

Natural Resource Program Center

Natural Resource Program Center
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov