Flow-net Relationships in the Forebay of John Day Dam, 1982

by
Albert E. Giorgi

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COASTAL ZONE AND ESTUARINE STUDIES

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ABSTRACT

During the spring of 1982, the National Marine Fisheries Service initiated a multiyear research program to define the effects of river conditions and dam operations on the current system (flow-net) in the forebay of John Day Dam on the Columbia River and to relate smolt passage behavior to the physical characteristics of the flow-net. Twelve digital, magnetic recording current meters were deployed in a grid within the restricted zone adjacent to the dam on 13 May 1982. Current velocity and direction were monitored until 3 November 1982. During this initial year, research efforts focused on gathering the first general data on flows within the forebay of John Day Dam and developing the computer software necessary to ultimately construct the flow-net model.

GOALS AND OBJECTIVES

Even though collection and transportation facilities are operating at key dams in the Snake-Columbia River System, significant numbers of juvenile salmonids continue to migrate downstream of their own volition (Sims et al. 1982). Improved fingerling bypass systems are being developed to ensure the safe passage of these migrants as they encounter the numerous dams on their seaward journey (McConnell and Muir 1982; Swan et al. 1982 and 1983).

Special flows, spills, and operating techniques at the dams are also being used to enhance smolt survival. These techniques are executed on the premise that the current system (flow-net) in each forebay responds to dam operations and that smolts in turn respond to the flow-net, as suggested by previous juvenile radio tracking studies conducted by the National Marine Fisheries Service (NMFS) in John Day forebay (Sims et al. 1981; Faurot et al. 1982).

The ultimate objective of the research program reported upon herein is to define the flow-net in the forebay of John Day Dam over a range of flow conditions and dam operations, and relate it to smolt passage behavior. Such information is fundamental in assessing the effectiveness of providing special flows and dam operations, and may also be useful in the design of fingerling bypass systems. To advance toward the ultimate objective, it is necessary to begin systematically gathering data and developing the computer software required to process and analyze the data. During 1982, we concentrated on these initial facets of the program.

METHODS AND MATERIALS

From 13 May to 3 November 1982, 12 self-contained, magnetic recording current meters (Interocean Systems, Inc., model 135 m [1/]) were deployed in the forebay of John Day Dam. The meters were secured to a self-adjusting buoy system which maintained them at a constant depth, 3 m below the surface of the reservoir. Eleven of the meters were positioned in two parallel lines which spanned the length of the powerhouse and spillway approximately 115 and 365 m from the face of the dam (Figure 1). The 12th meter was stationed approximately 600 m from the dam and 100 m from the Oregon shore. Each hour both current velocity and direction were monitored for intervals ranging from 8 to 56 minutes. Cassette tapes and battery packs were replaced monthly to ensure that the meters continued to operate throughout the field season. Mechanical and electronic problems in these instruments did occur, thus the regular monthly inspections proved to be quite necessary.

Within the meter, data were recorded digitally on the magnetic tape cassettes in an 8-bit binary code. Current velocity was measured with a neutrally buoyant Savonius rotor mounted on carbide pivots running in jewel bearings. The operational range of velocities is rated as 5 to 300 $cm \cdot sec^{-1} \pm 1\%$ of full scale reading. Direction was measured by a fluxgate magnetic compass over the full range of $0\text{-}359° \pm 3°$ magnetic.

Cassettes with encoded data were read into the Burroughs 7800 mainframe computer at the Northwest and Alaska Fisheries Center (NWAFC) via the digital cassette reader provided with the meters. The tape reader has minimal translating capabilities and merely transfers the coded data into

[1/]Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

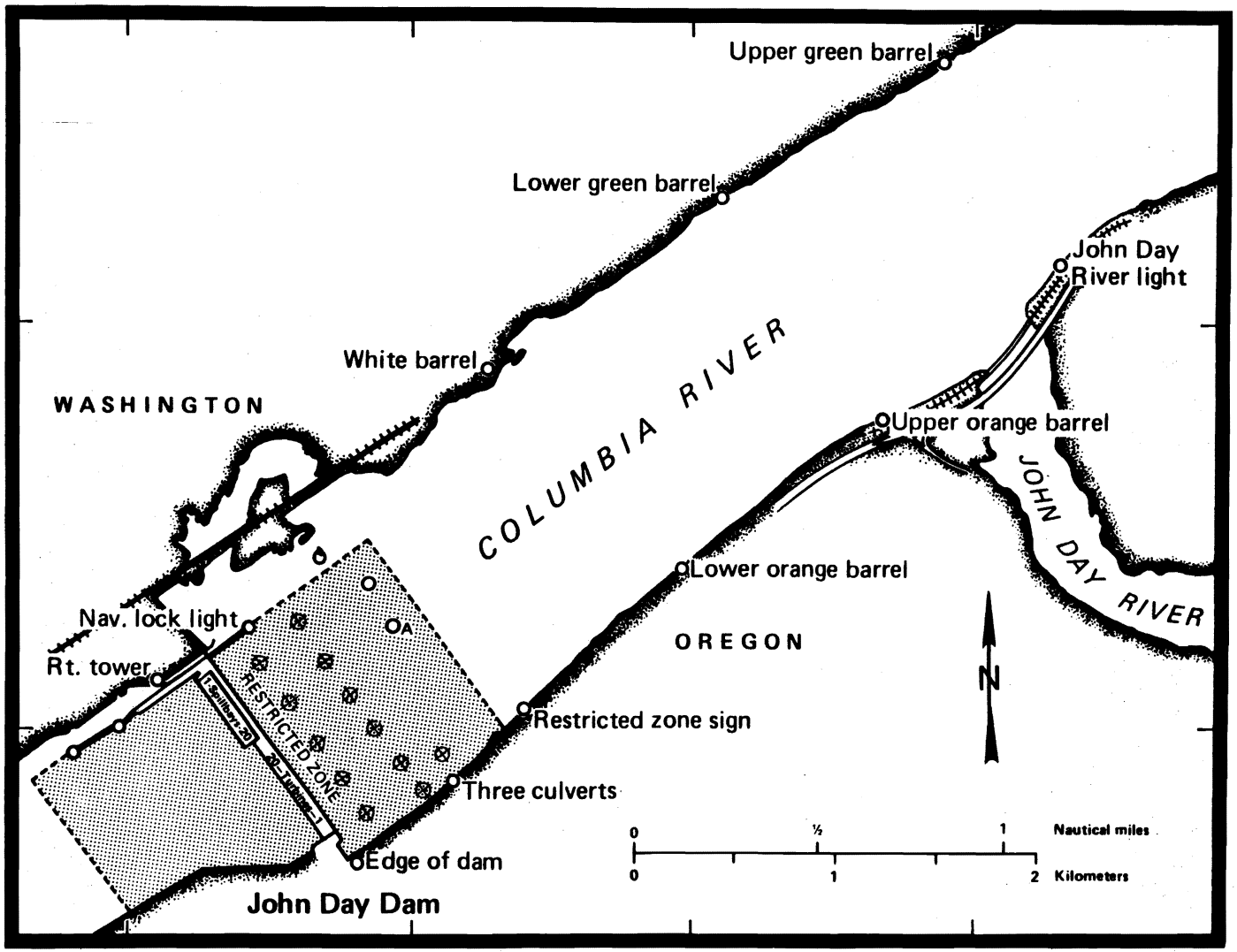

Figure 1.--Location of current meters (⊕) during the 1982 field season.

the mainframe. No software was provided by Interoceans Systems, Inc., thus the extensive and sophisticated programs necessary to process and analyze the data had to be developed by NMFS programmers in conjunction with the Biometrics Unit at the NWAFC.

The major components constituting the development of the flow-net model are outlined in Figure 2. Once the raw data was stored in the Burroughs 7800, the data must be checked for errors and edited before it is fit to be processed in the analysis program package. The data editing programs are still being developed; portions of the analysis program however, are operational at this time. Once we are satisfied with the performance of these programs, the current meter data will be meshed with the Columbia River Operational Hydronet and Management System (CROHMS) and dam operations data which are provided by the control room at John Day Dam, to produce the flow-net model. Some discrepancies between the CROHMS file maintained at the U.S. Army Corps of Engineers office in Portland, Oregon, and the control room data have been observed. Clearly, these conflicting data will affect the resolution of our model, and every attempt is being made to reconcile them. During 1982, in addition to gathering our initial set of data most of our efforts were directed at identifying and troubleshooting idiosyncrasies peculiar to this brand of current meter and developing the computer programs necessary to analyze the data.

RESULTS AND DISCUSSION

Inspection of data confirms that the current meters are effective in detecting changes in forebay currents (Figure 3). On 29 May 1982, with a river flow of 340 kcfs, current velocities increased from 20 to 35

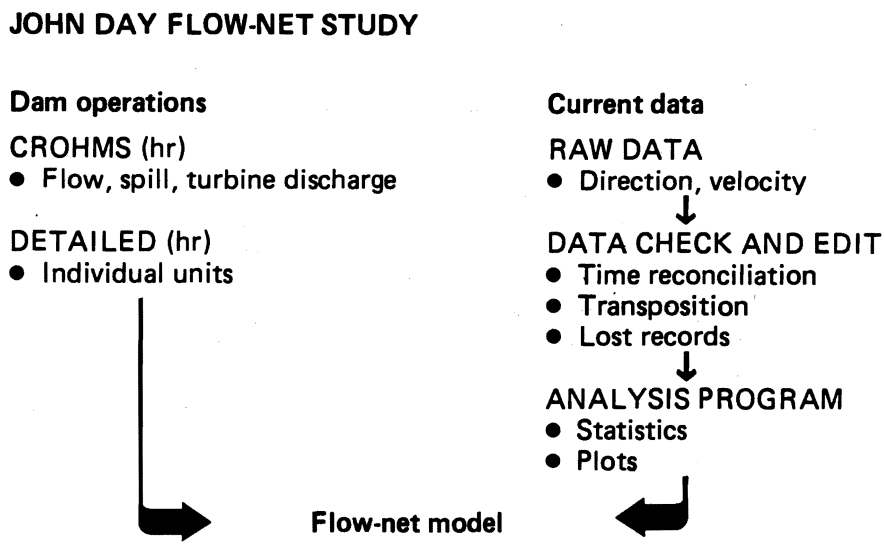

Figure 2.--Flowchart summarizing the major components in the John Day Dam Flow-net Study.

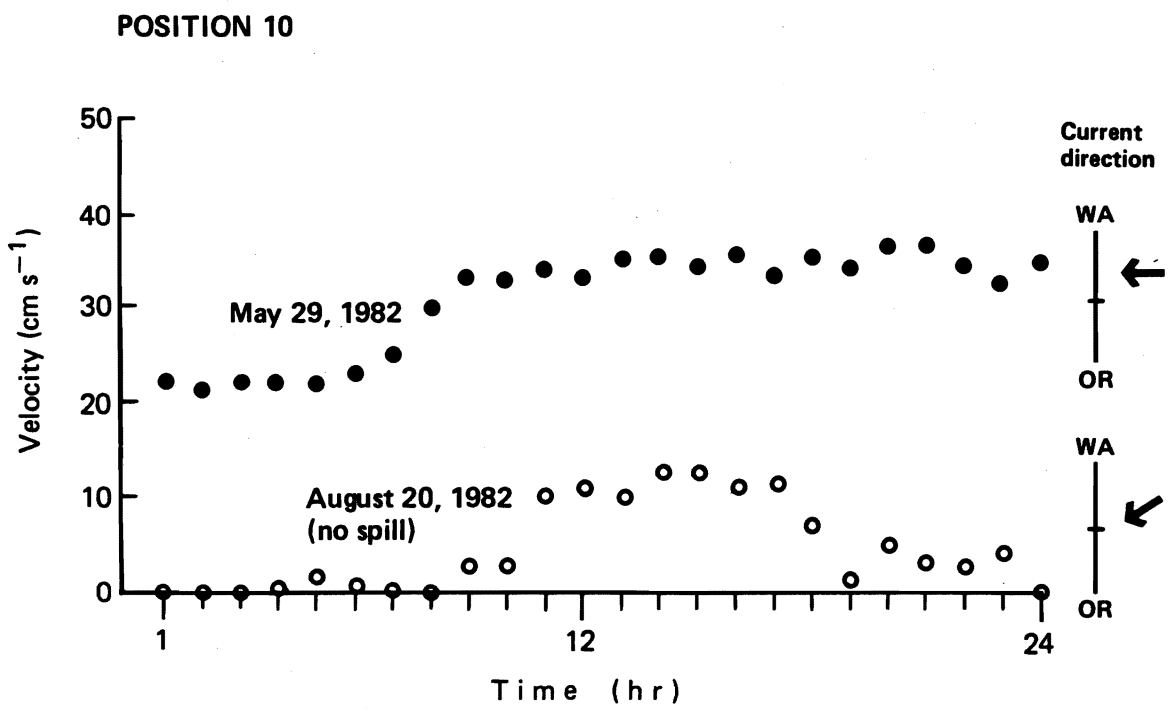

Figure 3.--Mean hourly current velocity at position 10 (center of spillway, 365 m from dam) on two different dates. For each day, the net current direction with respect to the dam (vertical line) is depicted to the right of the graph.

$cm \cdot sec^{-1}$ at position 10 (center of spillway, 365 m from the dam) as spill levels increased from 150 to 180 kcfs at 0700 h. Three months later, on 20 August, no spill was occurring and river flow had dropped to 205 kcfs. These conditions resulted in an overall decrease in current velocity from the 29 May levels and a concomitant shift in current direction away from the spillway towards the powerhouse. The increase in current velocity from 0 to approximately 12 $cm \cdot sec^{-1}$ on 20 August appears to be a consequence of increased power generation which typically occurs during the morning and continues through the evening hours.

Appendix A is an example of the intermediate, diagnostic data file, which details by hour, for a single location, the river conditions (total flow and turbine and spill discharge in kcfs and percent turbine and spill discharge) as well as the current velocity ($cm \cdot sec^{-1}$) and direction (°mag.). Inspection of these files allows us to assess current patterns at particular locations and detect any malfunctioning meters. Furthermore, and more importantly, these files form the foundation for constructing the flow-net model.

One of the major problems encountered during the first year's work was inherent to the manufacturers circuitry in the current meters. An independent data-time stamp was not provided with the serial current data, complicating and confounding necessary time reconciliation. To solve this problem, the NMFS' electronics shop developed a date-time stamp circuit to incorporate into the meter data. At the time of this report, the circuitry has been installed and successfully tested in 10 of the meters.

SUMMARY

1. Current patterns were monitiored within the restricted zone in John Day forebay from 13 May to 3 November 1982.

2. Current meter circuitry was redesigned by the NMFS electronics shop to provide date and time information with the serial data.

3. Portions of the computer software necessary to construct the flow-net model were developed.

4. During the 1982 field season we focused our attention on defining the flow-net near the dam. In 1983, we will attempt to determine how far upstream we can detect current fluctuations associated with dam operations and estimate the time lag involved between operation adjustments and current responses. We anticipate that by the end of 1983 a complete computer programming package will be available for analyzing the John Day Dam flow-net. Additionally, we will track radio tagged juvenile chinook salmon in the forebay and evaluate their migratory behavior with respect to the prevailing current conditions.

SUMMARY OF EXPENDITURES DURING 1982

Category:	Amount ($ x 10^3):
Salaries	22.3
Transport	0.3
Travel	0.6
Contract Services	3.3
Supplies and Materials	4.2
Equipment	90.6 a/
Support (NOAA, DOC, S.L.U.C.)	10.1
	131.4

a/ Twelve current meters purchased from Interocean Systems, Inc.

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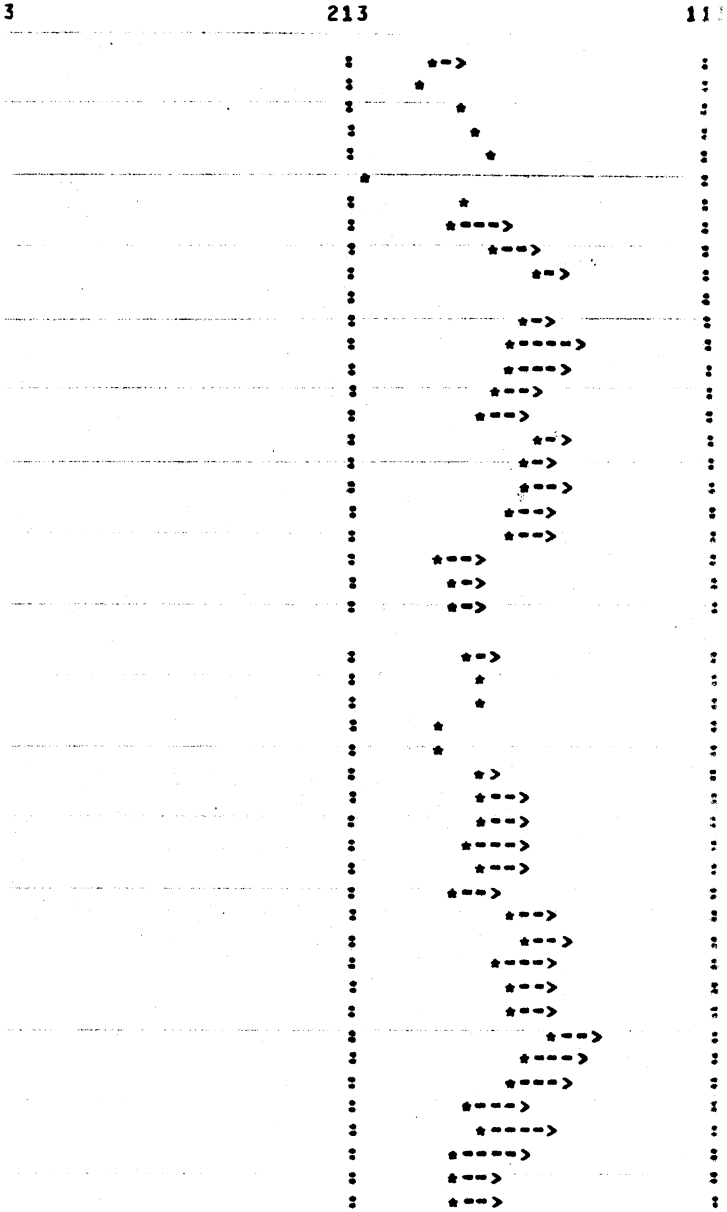
APPENDIX A

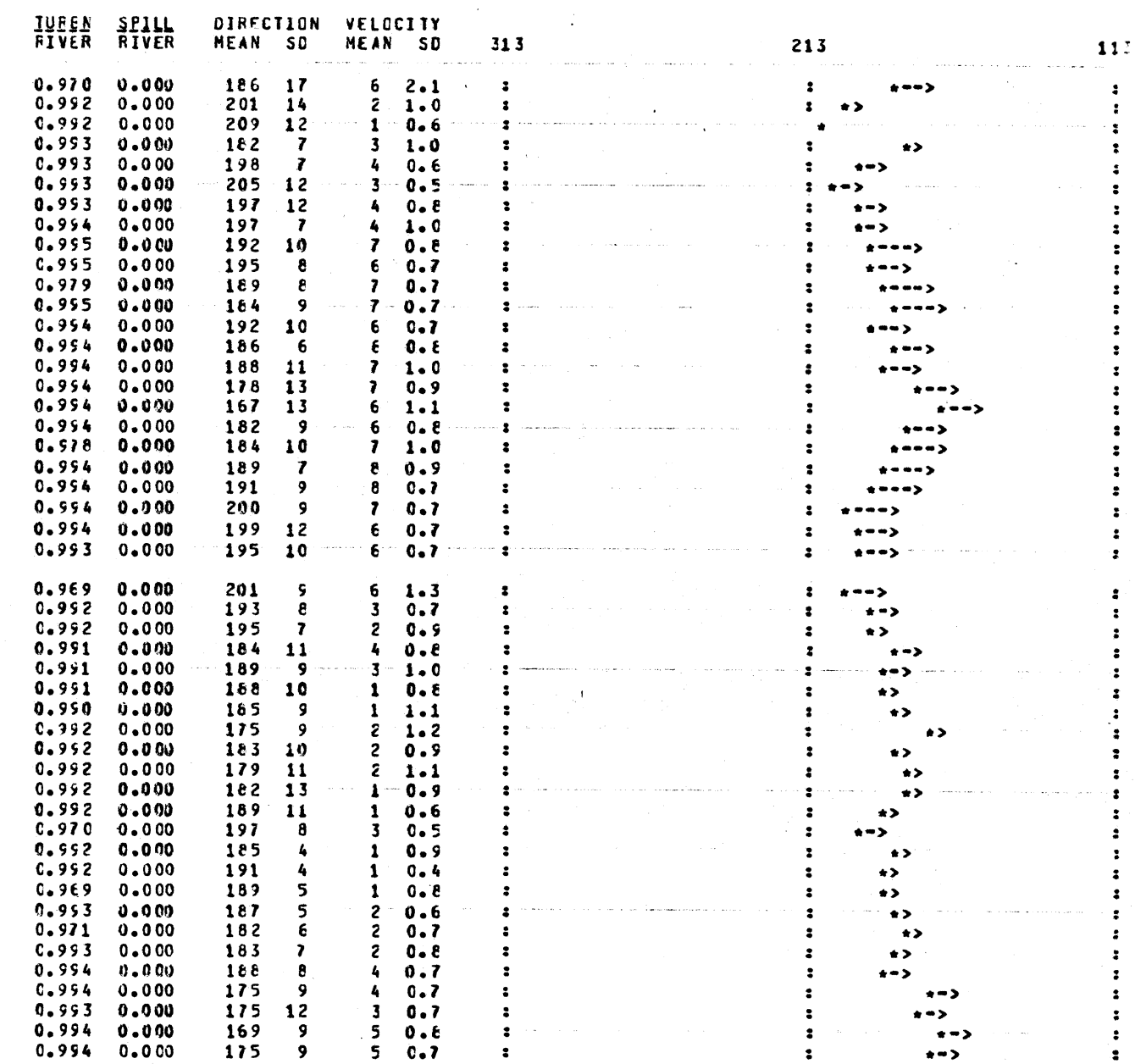
Hourly river flows and current data for Meter 476 at Station Three, 29 September - 3 November 1982. The schematic display on the right side of each page depicts the current patterns for that hour. The lateral position of the asterisk relative to the heading at the top of the page (313, 213, 113°mag.) indicates the mean current direction for that hour. The center value (213°mag.) is normal to the face of the dam. The dashed arrow emanating from the asterisk represents the mean velocity at that meter (each printed character beyond the asterisk is equivalent to 2 $cm \cdot sec^{-1}$).

DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD	313	213
82 SEP 28	0- 1	91.4	89.0	0.0	0.974	0.000						
	1- 2	89.3	88.7	0.0	0.993	0.000						
	2- 3	90.2	89.6	0.0	0.993	0.000						
	3- 4	87.9	87.3	0.0	0.993	0.000						
	4- 5	91.6	91.0	0.0	0.993	0.000						
	5- 6	94.6	94.0	0.0	0.994	0.000						
	6- 7	110.3	107.9	0.0	0.978	0.000						
	7- 8	111.0	110.4	0.0	0.995	0.000						
	8- 9	116.3	115.7	0.0	0.995	0.000						
	9-10	128.1	127.5	0.0	0.995	0.000						
	10-11	129.5	127.1	0.0	0.981	0.000						
	11-12	129.4	128.8	0.0	0.995	0.000						
	12-13	121.2	120.6	0.0	0.995	0.000						
	13-14	122.9	122.3	0.0	0.995	0.000						
	14-15	121.8	121.2	0.0	0.995	0.000						
	15-16	140.3	137.9	0.0	0.983	0.000						
	16-17	139.2	138.6	0.0	0.996	0.000						
	17-18	132.3	131.7	0.0	0.995	0.000						
	18-19	130.8	130.2	0.0	0.995	0.000						
	19-20	132.1	131.5	0.0	0.995	0.000						
	20-21	123.4	122.8	0.0	0.995	0.000						
	21-22	115.3	114.7	0.0	0.995	0.000						
	22-23	104.4	103.8	0.0	0.994	0.000						
	23-24	100.0	97.6	0.0	0.976	0.000						
82 SEP 29	0- 1	82.5	81.9	0.0	0.993	0.000						
	1- 2	77.9	77.3	0.0	0.992	0.000						
	2- 3	88.8	88.2	0.0	0.993	0.000						
	3- 4	83.4	82.8	0.0	0.993	0.000						
	4- 5	83.1	82.5	0.0	0.993	0.000						
	5- 6	88.8	88.2	0.0	0.993	0.000						
	6- 7	100.0	99.4	0.0	0.994	0.000						
	7- 8	133.2	132.6	0.0	0.995	0.000						
	8- 9	122.7	122.1	0.0	0.995	0.000						
	9-10	128.8	128.2	0.0	0.995	0.000						
	10-11	127.3	126.7	0.0	0.995	0.000						
	11-12	121.9	121.3	0.0	0.995	0.000						
	12-13	126.0	123.6	0.0	0.981	0.000						
	13-14	123.1	122.5	0.0	0.995	0.000						
	14-15	113.5	112.9	0.0	0.995	0.000	269	**	0	0.0	: *	:
	15-16	112.4	111.8	0.0	0.995	0.000	162	7	5	1.2	:	: *->
	16-17	113.2	112.7	0.0	0.996	0.000	158	7	4	0.7	:	: *->
	17-18	121.9	121.4	0.0	0.996	0.000	157	6	7	0.8	:	: *--->
	18-19	132.5	131.9	0.0	0.995	0.000	159	8	7	0.8	:	: *--->
	19-20	137.3	136.7	0.0	0.996	0.000	167	8	10	1.2	:	: *---->
	20-21	137.2	134.8	0.0	0.983	0.000	188	8	9	1.0	:	: *--->
	21-22	127.3	124.9	0.0	0.981	0.000	188	6	9	0.5	:	: *--->
	22-23	122.7	122.1	0.0	0.995	0.000	188	6	8	0.5	:	: *--->
	23-24	110.9	110.3	0.0	0.995	0.000	182	5	6	0.5	:	: *-->

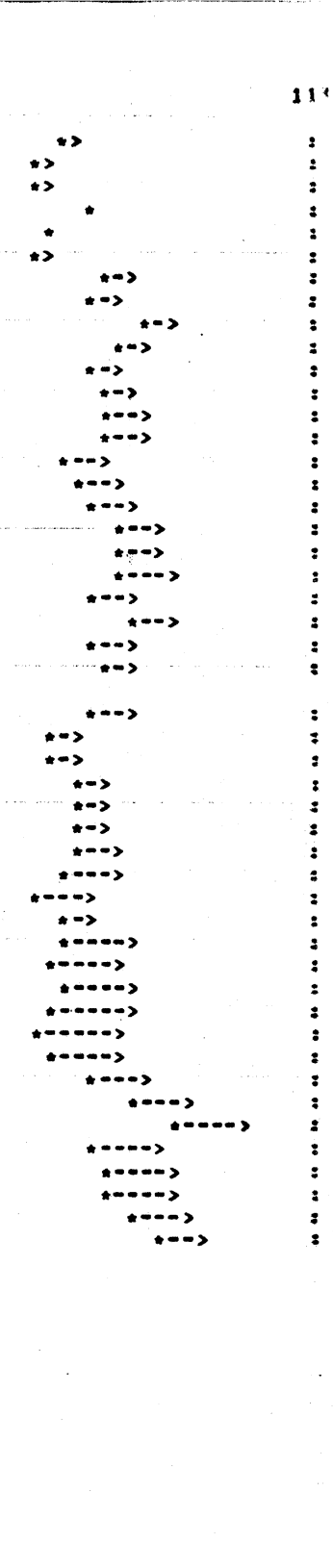
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 SEP 30	0- 1	87.8	85.4	0.0	0.973	0.000	189	6	3	0.3
	1- 2	57.0	56.4	0.0	0.989	0.000	194	6	0	0.0
	2- 3	52.0	51.4	0.0	0.988	0.000	181	10	0	0.0
	3- 4	51.9	51.3	0.0	0.988	0.000	175	14	0	0.0
	4- 5	51.8	51.2	0.0	0.988	0.000	171	11	0	0.0
	5- 6	53.7	51.3	0.0	0.955	0.000	207	15	0	0.0
	6- 7	81.5	79.1	0.0	0.971	0.000	183	12	0	0.8
	7- 8	143.1	142.5	0.0	0.996	0.000	183	7	7	0.7
	8- 9	135.3	134.7	0.0	0.996	0.000	172	7	6	0.6
	9-10	127.1	126.5	0.0	0.995	0.000	162	12	5	1.3
	10-11	119.1	118.5	0.0	0.995	0.000	SPIN TEST GROUP			
	11-12	128.6	128.0	0.0	0.995	0.000	164	9	5	0.9
	12-13	166.2	163.8	0.0	0.986	0.000	170	8	11	0.8
	13-14	139.0	138.4	0.0	0.996	0.000	170	6	8	0.7
	14-15	128.3	127.7	0.0	0.995	0.000	173	5	6	0.3
	15-16	117.1	114.7	0.0	0.980	0.000	179	5	6	0.4
	16-17	114.1	113.5	0.0	0.995	0.000	162	7	4	1.0
	17-18	114.4	113.8	0.0	0.995	0.000	163	5	5	0.6
	18-19	116.6	116.0	0.0	0.995	0.000	165	6	6	0.5
	19-20	123.4	122.8	0.0	0.995	0.000	168	7	7	0.7
	20-21	118.3	117.7	0.0	0.995	0.000	170	7	6	0.8
	21-22	114.7	114.1	0.0	0.995	0.000	190	5	5	0.7
	22-23	100.6	100.0	0.0	0.994	0.000	187	8	5	1.2
	23-24	98.7	98.1	0.0	0.994	0.000	184	5	4	0.7
82 OCT 1	0- 1	84.2	81.8	0.0	0.971	0.000	180	4	4	0.6
	1- 2	66.7	64.3	0.0	0.964	0.000	177	7	0	0.2
	2- 3	63.7	63.1	0.0	0.991	0.000	179	8	0	0.0
	3- 4	63.6	63.0	0.0	0.991	0.000	191	15	0	0.4
	4- 5	65.4	64.8	0.0	0.991	0.000	187	13	0	0.3
	5- 6	89.6	89.0	0.0	0.993	0.000	178	8	2	0.9
	6- 7	113.4	112.8	0.0	0.995	0.000	179	9	6	1.1
	7- 8	126.2	125.6	0.0	0.995	0.000	178	5	6	0.6
	8- 9	124.4	123.8	0.0	0.995	0.000	181	6	8	0.7
	9-10	120.8	120.2	0.0	0.995	0.000	178	9	6	0.8
	10-11	120.8	120.2	0.0	0.995	0.000	186	4	7	0.7
	11-12	123.3	122.7	0.0	0.995	0.000	170	11	7	1.0
	12-13	126.7	126.1	0.0	0.995	0.000	165	10	6	0.9
	13-14	126.0	125.4	0.0	0.995	0.000	173	11	8	0.8
	14-15	129.3	126.9	0.0	0.981	0.000	171	13	7	1.2
	15-16	124.1	123.5	0.0	0.995	0.000	171	11	7	1.1
	16-17	125.3	124.7	0.0	0.995	0.000	155	12	6	1.0
	17-18	131.7	131.1	0.0	0.995	0.000	164	10	8	0.9
	18-19	136.1	133.7	0.0	0.982	0.000	168	12	8	1.3
	19-20	137.5	136.9	0.0	0.996	0.000	181	9	9	1.5
	20-21	136.6	134.2	0.0	0.982	0.000	179	12	9	0.9
	21-22	113.0	112.4	0.0	0.995	0.000	185	7	9	0.9
	22-23	106.1	105.5	0.0	0.994	0.000	186	9	7	1.1
	23-24	85.1	84.5	0.0	0.993	0.000	184	9	5	0.7



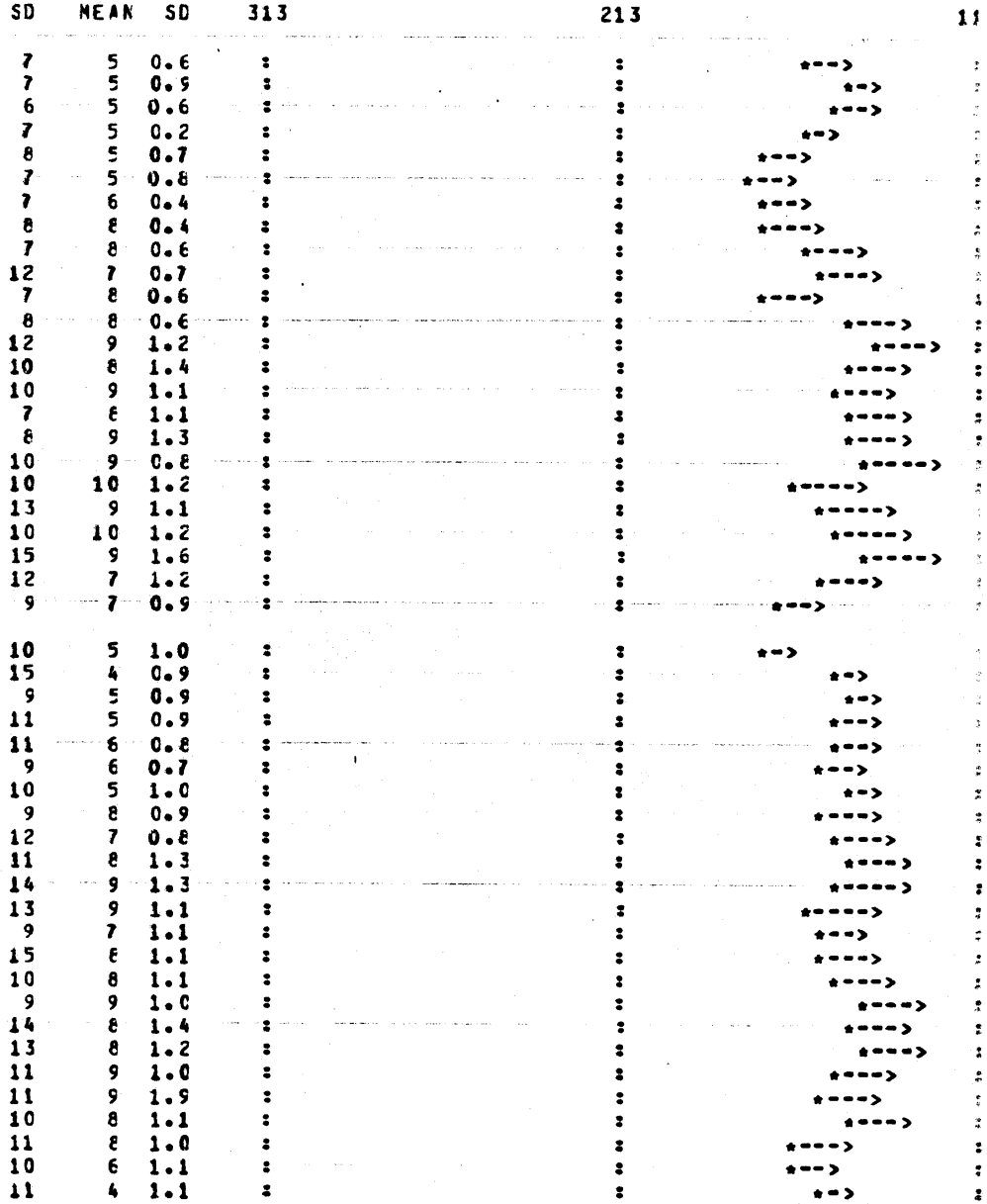
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 2	0- 1	80.1	77.7	0.0	0.970	0.000	186	17	6	2.1
	1- 2	76.6	76.0	0.0	0.992	0.000	201	14	2	1.0
	2- 3	77.1	76.5	0.0	0.992	0.000	209	12	1	0.6
	3- 4	81.8	81.2	0.0	0.993	0.000	182	7	3	1.0
	4- 5	83.3	82.7	0.0	0.993	0.000	198	7	4	0.6
	5- 6	85.7	85.1	0.0	0.993	0.000	205	12	3	0.5
	6- 7	82.9	82.3	0.0	0.993	0.000	197	12	4	0.8
	7- 8	96.3	95.7	0.0	0.994	0.000	197	7	4	1.0
	8- 9	113.2	112.6	0.0	0.995	0.000	192	10	7	0.8
	9-10	111.2	110.6	0.0	0.995	0.000	195	8	6	0.7
	10-11	112.4	110.0	0.0	0.979	0.000	189	8	7	0.7
	11-12	109.5	108.9	0.0	0.995	0.000	184	9	7	0.7
	12-13	100.9	100.3	0.0	0.994	0.000	192	10	6	0.7
	13-14	99.0	98.4	0.0	0.994	0.000	186	6	6	0.8
	14-15	98.3	97.7	0.0	0.994	0.000	188	11	7	1.0
	15-16	97.3	96.7	0.0	0.994	0.000	178	13	7	0.9
	16-17	95.3	94.7	0.0	0.994	0.000	167	13	6	1.1
	17-18	95.7	95.1	0.0	0.994	0.000	182	9	6	0.8
	18-19	106.8	104.4	0.0	0.978	0.000	184	10	7	1.0
	19-20	108.6	108.0	0.0	0.994	0.000	189	7	8	0.9
	20-21	105.3	104.7	0.0	0.994	0.000	191	9	8	0.7
	21-22	99.3	98.7	0.0	0.994	0.000	200	9	7	0.7
	22-23	98.2	97.6	0.0	0.994	0.000	199	12	6	0.7
	23-24	87.9	87.3	0.0	0.993	0.000	195	10	6	0.7
82 OCT 3	0- 1	76.3	73.9	0.0	0.969	0.000	201	9	6	1.3
	1- 2	74.0	73.4	0.0	0.992	0.000	193	8	3	0.7
	2- 3	70.6	70.0	0.0	0.992	0.000	195	7	2	0.9
	3- 4	70.2	69.6	0.0	0.991	0.000	184	11	4	0.8
	4- 5	64.4	63.8	0.0	0.991	0.000	189	9	3	1.0
	5- 6	63.5	62.9	0.0	0.991	0.000	188	10	1	0.8
	6- 7	62.9	62.3	0.0	0.990	0.000	185	9	1	1.1
	7- 8	74.1	73.5	0.0	0.992	0.000	175	9	2	1.2
	8- 9	75.0	74.4	0.0	0.992	0.000	183	10	2	0.9
	9-10	75.1	74.5	0.0	0.992	0.000	179	11	2	1.1
	10-11	76.4	75.8	0.0	0.992	0.000	182	13	1	0.9
	11-12	76.6	76.0	0.0	0.992	0.000	189	11	1	0.6
	12-13	80.7	78.3	0.0	0.970	0.000	197	8	3	0.5
	13-14	78.8	78.2	0.0	0.992	0.000	185	4	1	0.9
	14-15	76.3	75.7	0.0	0.992	0.000	191	4	1	0.4
	15-16	77.5	75.1	0.0	0.969	0.000	189	5	1	0.8
	16-17	80.0	79.4	0.0	0.993	0.000	187	5	2	0.6
	17-18	82.4	80.0	0.0	0.971	0.000	182	6	2	0.7
	18-19	87.6	87.0	0.0	0.993	0.000	183	7	2	0.8
	19-20	93.8	93.2	0.0	0.994	0.000	188	8	4	0.7
	20-21	92.8	92.2	0.0	0.994	0.000	175	9	4	0.7
	21-22	88.0	87.4	0.0	0.993	0.000	175	12	3	0.7
	22-23	97.1	96.5	0.0	0.994	0.000	169	9	5	0.8
	23-24	101.2	100.6	0.0	0.994	0.000	175	9	5	0.7



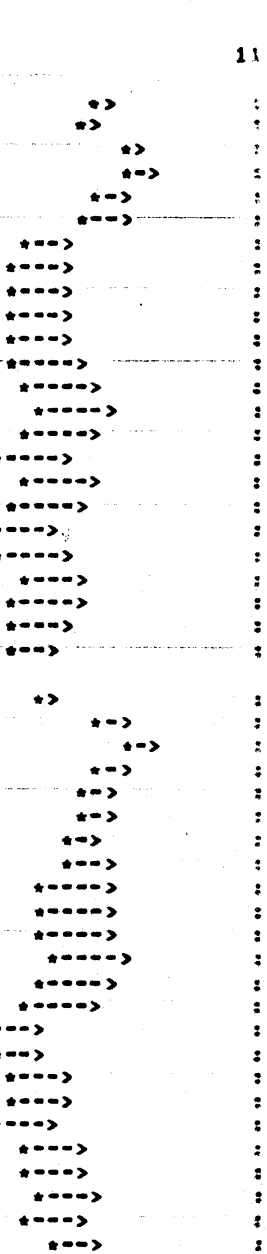
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 4	0- 1	81.1	78.7	0.0	0.970	0.000	185	11	3	1.0
	1- 2	77.3	76.7	0.0	0.992	0.000	194	9	2	0.9
	2- 3	69.6	69.0	0.0	0.991	0.000	191	11	1	1.0
	3- 4	70.9	70.3	0.0	0.992	0.000	177	8	0	0.2
	4- 5	72.6	72.0	0.0	0.992	0.000	189	7	1	0.7
	5- 6	83.2	80.8	0.0	0.971	0.000	192	11	2	0.9
	6- 7	102.7	102.1	0.0	0.994	0.000	174	7	3	1.1
	7- 8	108.3	107.7	0.0	0.994	0.000	177	10	4	1.0
	8- 9	107.0	106.4	0.0	0.994	0.000	160	7	4	0.6
	9-10	103.0	102.4	0.0	0.994	0.000	169	8	5	0.6
	10-11	96.5	95.9	0.0	0.994	0.000	177	6	4	0.6
	11-12	99.6	99.0	0.0	0.994	0.000	173	9	4	0.8
	12-13	100.2	99.6	0.0	0.994	0.000	175	9	5	0.6
	13-14	100.8	100.2	0.0	0.994	0.000	172	6	6	0.5
	14-15	98.2	97.6	0.0	0.994	0.000	184	7	5	0.7
	15-16	97.1	96.5	0.0	0.994	0.000	180	8	5	0.6
	16-17	105.6	105.0	0.0	0.994	0.000	175	9	6	0.7
	17-18	107.6	107.0	0.0	0.994	0.000	171	11	6	0.8
	18-19	113.9	113.3	0.0	0.995	0.000	171	12	5	0.8
	19-20	126.6	126.0	0.0	0.995	0.000	170	7	7	0.7
	20-21	99.8	97.4	0.0	0.976	0.000	176	13	6	1.0
	21-22	99.0	98.4	0.0	0.994	0.000	167	12	6	0.5
	22-23	101.2	98.8	0.0	0.976	0.000	177	7	5	0.6
	23-24	99.8	99.2	0.0	0.994	0.000	174	7	5	0.8
82 OCT 5	0- 1	99.0	98.4	0.0	0.994	0.000	177	6	6	0.8
	1- 2	98.3	97.7	0.0	0.994	0.000	188	7	5	0.6
	2- 3	94.1	93.5	0.0	0.994	0.000	188	7	4	0.8
	3- 4	95.9	95.3	0.0	0.994	0.000	180	5	4	1.2
	4- 5	94.1	93.5	0.0	0.994	0.000	179	4	4	0.6
	5- 6	96.2	93.8	0.0	0.975	0.000	183	4	5	1.0
	6- 7	119.7	119.1	0.0	0.995	0.000	183	8	7	1.1
	7- 8	126.2	125.6	0.0	0.995	0.000	186	6	8	0.8
	8- 9	117.8	117.2	0.0	0.995	0.000	191	8	7	0.6
	9-10	94.1	93.5	0.0	0.994	0.000	187	4	4	0.6
	10-11	111.0	110.4	0.0	0.995	0.000	184	8	10	1.0
	11-12	109.7	109.1	0.0	0.995	0.000	188	9	10	0.9
	12-13	103.1	100.7	0.0	0.977	0.000	184	9	10	1.3
	13-14	103.3	100.9	0.0	0.977	0.000	191	12	11	1.2
	14-15	99.4	98.8	0.0	0.994	0.000	191	9	13	1.6
	15-16	97.7	97.1	0.0	0.994	0.000	187	9	10	2.1
	16-17	96.2	95.6	0.0	0.994	0.000	176	18	9	1.6
	17-18	102.1	101.5	0.0	0.994	0.000	166	18	7	1.3
	18-19	114.2	113.6	0.0	0.995	0.000	153	11	10	0.7
	19-20	130.3	129.7	0.0	0.995	0.000	177	10	11	1.0
	20-21	128.7	128.1	0.0	0.995	0.000	175	6	11	0.8
	21-22	125.2	124.6	0.0	0.995	0.000	171	9	10	0.6
	22-23	112.6	112.0	0.0	0.995	0.000	164	11	8	1.3
	23-24	105.3	104.7	0.0	0.994	0.000	159	9	7	0.6



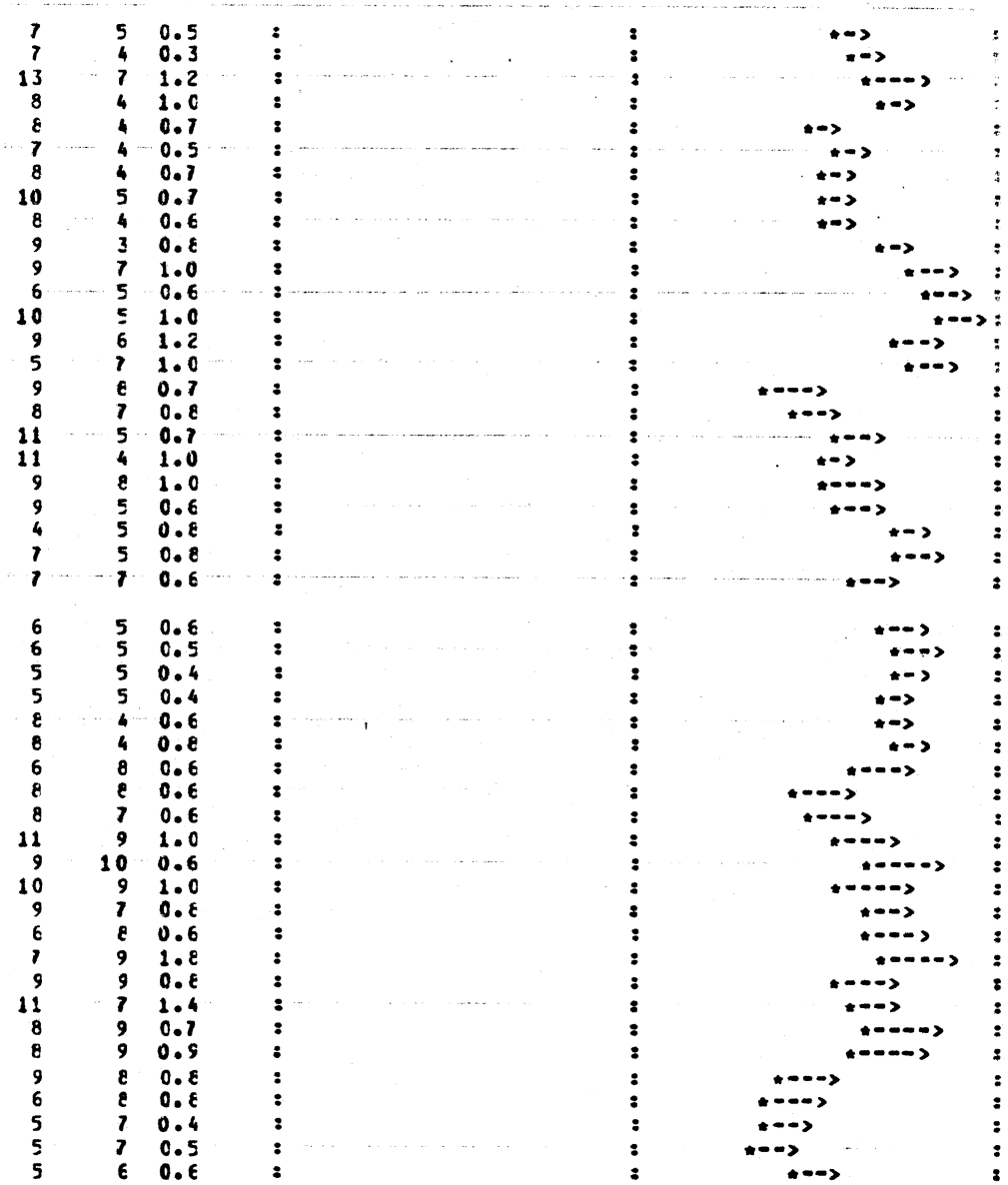
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 6	0- 1	97.2	96.6	0.0	0.994	0.000	160	7	5	0.6
	1- 2	95.4	94.8	0.0	0.994	0.000	150	7	5	0.9
	2- 3	94.4	93.8	0.0	0.994	0.000	153	6	5	0.6
	3- 4	96.3	93.9	0.0	0.975	0.000	159	7	5	0.2
	4- 5	95.2	94.6	0.0	0.994	0.000	172	8	5	0.7
	5- 6	96.0	95.4	0.0	0.994	0.000	177	7	5	0.8
	6- 7	103.0	100.6	0.0	0.977	0.000	173	7	6	0.4
	7- 8	125.1	124.5	0.0	0.995	0.000	174	8	8	0.4
	8- 9	125.1	124.5	0.0	0.995	0.000	161	7	8	0.6
	9-10	125.1	124.5	0.0	0.995	0.000	159	12	7	0.7
	10-11	125.6	125.0	0.0	0.995	0.000	172	7	8	0.6
	11-12	124.6	124.0	0.0	0.995	0.000	147	8	8	0.6
	12-13	126.4	124.0	0.0	0.981	0.000	140	12	9	1.2
	13-14	124.8	124.2	0.0	0.995	0.000	149	10	8	1.4
	14-15	126.1	125.5	0.0	0.995	0.000	152	10	9	1.1
	15-16	126.6	124.2	0.0	0.981	0.000	149	7	8	1.1
	16-17	130.4	129.8	0.0	0.995	0.000	147	8	9	1.3
	17-18	133.4	132.8	0.0	0.996	0.000	146	10	9	0.8
	18-19	146.4	144.0	0.0	0.984	0.000	164	10	10	1.2
	19-20	146.0	145.4	0.0	0.996	0.000	158	13	9	1.1
	20-21	148.1	145.7	0.0	0.984	0.000	155	10	10	1.2
	21-22	129.2	128.6	0.0	0.995	0.000	145	15	9	1.6
	22-23	116.3	114.9	0.0	0.988	0.000	159	12	7	1.2
	23-24	108.7	108.1	0.0	0.994	0.000	169	9	7	0.9
82 OCT 7	0- 1	103.4	102.8	0.0	0.994	0.000	172	10	5	1.0
	1- 2	100.5	99.9	0.0	0.994	0.000	154	15	4	0.9
	2- 3	99.7	99.1	0.0	0.994	0.000	150	9	5	0.9
	3- 4	99.4	98.8	0.0	0.994	0.000	151	11	5	0.9
	4- 5	98.3	97.7	0.0	0.994	0.000	152	11	6	0.8
	5- 6	98.7	98.1	0.0	0.994	0.000	157	9	6	0.7
	6- 7	104.6	104.0	0.0	0.994	0.000	149	10	5	1.0
	7- 8	125.3	124.7	0.0	0.995	0.000	155	9	8	0.9
	8- 9	128.8	128.2	0.0	0.995	0.000	154	12	7	0.8
	9-10	134.4	133.8	0.0	0.996	0.000	148	11	8	1.3
	10-11	134.3	133.7	0.0	0.996	0.000	155	14	9	1.3
	11-12	134.4	133.8	0.0	0.996	0.000	159	13	9	1.1
	12-13	134.4	133.8	0.0	0.996	0.000	156	9	7	1.1
	13-14	134.4	133.8	0.0	0.996	0.000	157	15	8	1.1
	14-15	134.4	133.8	0.0	0.996	0.000	154	10	8	1.1
	15-16	132.5	131.9	0.0	0.995	0.000	147	9	9	1.0
	16-17	126.0	125.4	0.0	0.995	0.000	149	14	8	1.4
	17-18	130.0	129.4	0.0	0.995	0.000	146	13	8	1.2
	18-19	137.6	137.0	0.0	0.996	0.000	154	11	9	1.0
	19-20	141.2	140.6	0.0	0.996	0.000	155	11	9	1.9
	20-21	141.2	138.8	0.0	0.983	0.000	151	10	8	1.1
	21-22	129.2	128.6	0.0	0.995	0.000	166	11	8	1.0
	22-23	109.3	108.7	0.0	0.995	0.000	166	10	6	1.1
	23-24	95.7	93.3	0.0	0.975	0.000	155	11	4	1.1



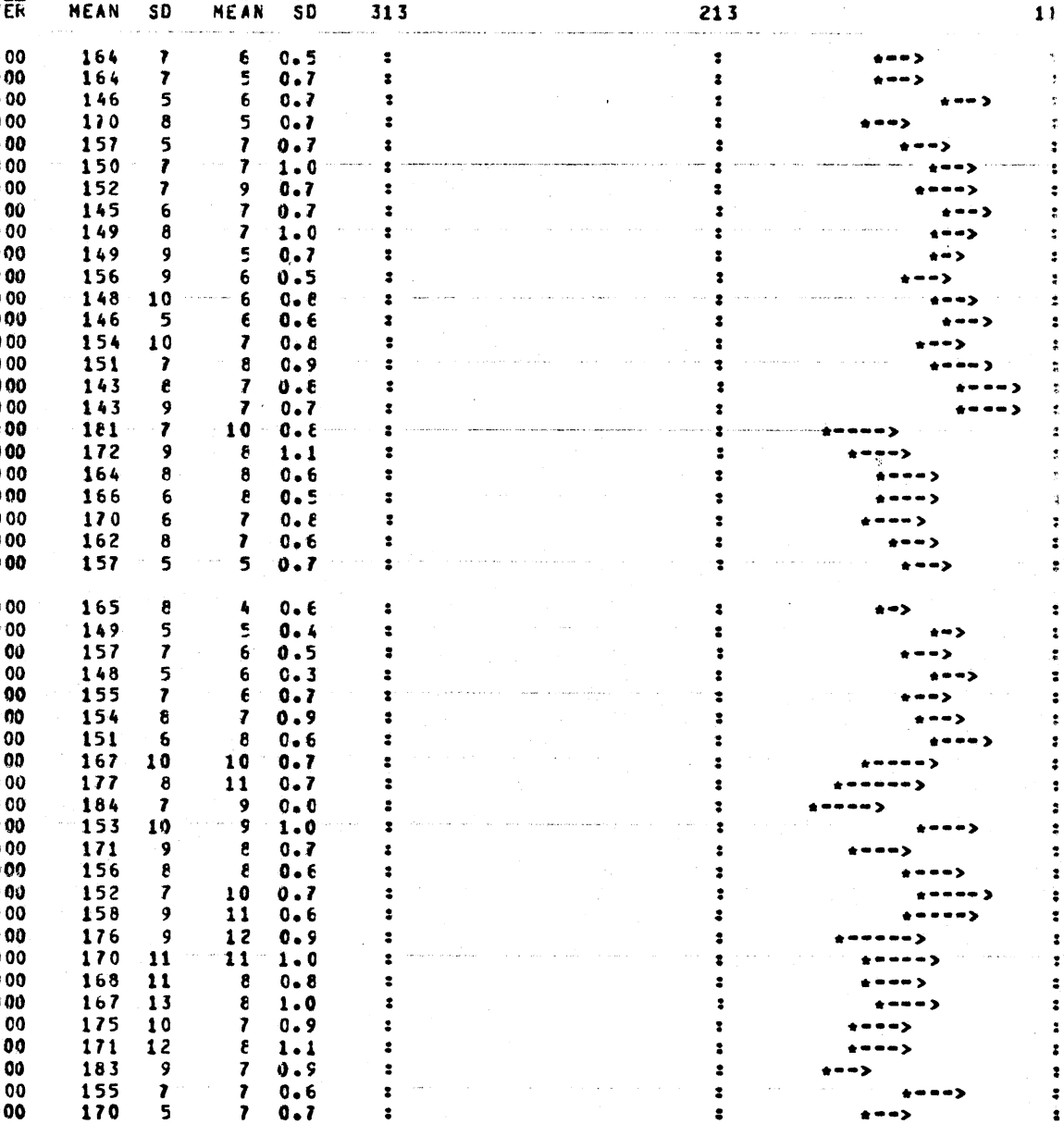
DATE YR MON CY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 8	0- 1	93.5	92.9	0.0	0.994	0.000	156	13	1	0.9
	1- 2	93.1	92.5	0.0	0.994	0.000	160	13	3	1.0
	2- 3	91.5	90.9	0.0	0.993	0.000	149	7	3	1.0
	3- 4	90.9	90.3	0.0	0.993	0.000	149	9	4	1.0
	4- 5	91.3	90.7	0.0	0.993	0.000	155	8	3	0.3
	5- 6	106.9	106.3	0.0	0.994	0.000	163	9	6	0.3
	6- 7	112.6	110.2	0.0	0.979	0.000	177	6	6	0.5
	7- 8	122.4	121.8	0.0	0.995	0.000	179	5	7	0.5
	8- 9	125.2	124.6	0.0	0.995	0.000	179	6	8	0.6
	9-10	128.7	128.1	0.0	0.995	0.000	180	5	8	0.4
	10-11	133.6	133.0	0.0	0.996	0.000	179	5	9	0.6
	11-12	134.3	133.7	0.0	0.996	0.000	179	5	9	0.5
	12-13	136.1	133.7	0.0	0.982	0.000	178	5	9	0.4
	13-14	135.4	133.0	0.0	0.982	0.000	174	5	9	1.7
	14-15	133.6	133.0	0.0	0.996	0.000	179	6	9	0.2
	15-16	133.6	133.0	0.0	0.996	0.000	184	3	9	0.0
	16-17	140.8	140.2	0.0	0.996	0.000	176	7	9	0.3
	17-18	140.7	140.1	0.0	0.996	0.000	181	6	10	0.6
	18-19	143.0	142.4	0.0	0.996	0.000	189	6	10	0.4
	19-20	144.8	142.4	0.0	0.983	0.000	184	7	10	0.5
	20-21	137.8	137.2	0.0	0.996	0.000	178	6	9	1.7
	21-22	136.7	136.1	0.0	0.996	0.000	181	5	10	1.7
	22-23	126.4	125.8	0.0	0.995	0.000	183	7	8	0.6
	23-24	99.9	99.3	0.0	0.994	0.000	180	5	6	0.4
82 OCT 9	0- 1	76.9	76.3	0.0	0.992	0.000	174	6	2	0.6
	1- 2	86.9	84.5	0.0	0.972	0.000	158	8	3	0.5
	2- 3	82.7	82.1	0.0	0.993	0.000	150	9	4	0.7
	3- 4	82.9	82.3	0.0	0.993	0.000	157	7	3	0.5
	4- 5	82.1	81.5	0.0	0.993	0.000	160	7	3	0.7
	5- 6	83.0	82.4	0.0	0.993	0.000	162	7	4	0.4
	6- 7	93.1	92.5	0.0	0.994	0.000	167	7	5	0.6
	7- 8	109.0	108.4	0.0	0.994	0.000	164	7	6	0.6
	8- 9	130.0	129.4	0.0	0.995	0.000	173	9	10	1.1
	9-10	142.0	141.4	0.0	0.996	0.000	172	9	10	0.8
	10-11	142.0	141.4	0.0	0.996	0.000	175	8	9	0.9
	11-12	139.3	136.9	0.0	0.983	0.000	170	9	9	0.8
	12-13	128.0	125.6	0.0	0.981	0.000	172	8	10	1.0
	13-14	117.7	117.1	0.0	0.995	0.000	179	9	10	1.0
	14-15	110.7	110.1	0.0	0.995	0.000	189	6	8	0.6
	15-16	106.7	106.1	0.0	0.994	0.000	186	8	7	0.9
	16-17	105.1	104.5	0.0	0.994	0.000	180	9	8	1.2
	17-18	110.0	109.4	0.0	0.995	0.000	183	12	8	0.7
	18-19	122.4	121.8	0.0	0.995	0.000	185	10	9	0.7
	19-20	124.7	124.1	0.0	0.995	0.000	177	6	9	0.8
	20-21	110.5	109.9	0.0	0.995	0.000	177	7	8	0.9
	21-22	110.2	109.6	0.0	0.995	0.000	174	7	8	2.1
	22-23	111.8	111.2	0.0	0.995	0.000	175	6	7	0.8
	23-24	100.9	100.3	0.0	0.994	0.000	169	7	6	0.4



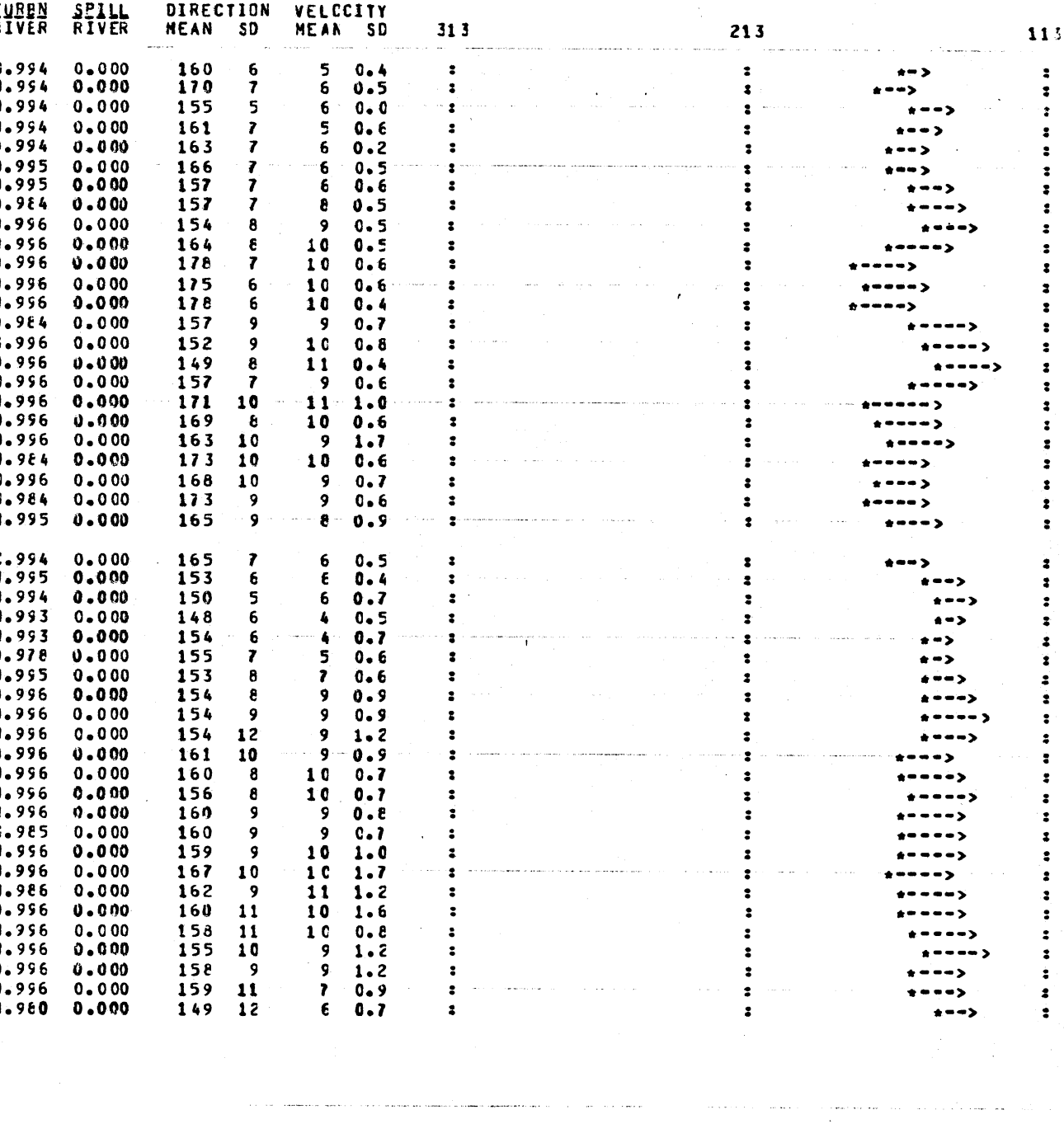
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 10	0- 1	89.1	88.5	0.0	0.993	0.000	157	7	5	0.5
	1- 2	77.5	76.9	0.0	0.992	0.000	155	7	4	0.3
	2- 3	77.8	75.4	0.0	0.969	0.000	147	13	7	1.2
	3- 4	77.4	76.8	0.0	0.992	0.000	144	8	4	1.0
	4- 5	80.8	80.2	0.0	0.993	0.000	166	8	4	0.7
	5- 6	85.6	85.0	0.0	0.993	0.000	156	7	4	0.5
	6- 7	90.9	90.3	0.0	0.993	0.000	163	8	4	0.7
	7- 8	99.8	99.2	0.0	0.994	0.000	160	10	5	0.7
	8- 9	94.8	92.4	0.0	0.975	0.000	161	8	4	0.6
	9-10	94.3	93.7	0.0	0.994	0.000	143	9	3	0.8
	10-11	100.0	97.6	0.0	0.976	0.000	137	9	7	1.0
	11-12	93.3	92.7	0.0	0.994	0.000	132	6	5	0.6
	12-13	95.7	93.3	0.0	0.975	0.000	129	10	5	1.0
	13-14	94.1	93.5	0.0	0.994	0.000	140	9	6	1.2
	14-15	91.0	90.4	0.0	0.993	0.000	137	5	7	1.0
	15-16	91.6	89.2	0.0	0.974	0.000	177	9	8	0.7
	16-17	92.1	91.5	0.0	0.993	0.000	171	8	7	0.8
	17-18	88.7	88.1	0.0	0.993	0.000	158	11	5	0.7
	18-19	95.4	94.8	0.0	0.994	0.000	161	11	4	1.0
	19-20	117.8	117.2	0.0	0.995	0.000	161	9	8	1.0
	20-21	100.6	98.2	0.0	0.976	0.000	157	9	5	0.6
	21-22	87.1	86.5	0.0	0.993	0.000	142	4	5	0.8
	22-23	91.5	89.1	0.0	0.974	0.000	142	7	5	0.8
	23-24	108.5	107.9	0.0	0.994	0.000	154	7	7	0.6
82 OCT 11	0- 1	81.6	81.0	0.0	0.993	0.000	146	6	5	0.6
	1- 2	84.9	84.3	0.0	0.993	0.000	139	6	5	0.5
	2- 3	85.4	82.9	0.0	0.971	0.000	139	5	5	0.4
	3- 4	83.1	82.5	0.0	0.993	0.000	143	5	5	0.4
	4- 5	85.7	85.2	0.0	0.994	0.000	143	8	4	0.6
	5- 6	88.8	88.2	0.0	0.993	0.000	141	8	4	0.8
	6- 7	121.1	120.5	0.0	0.995	0.000	154	6	8	0.6
	7- 8	126.9	126.3	0.0	0.995	0.000	168	8	8	0.6
	8- 9	126.3	125.7	0.0	0.995	0.000	164	8	7	0.6
	9-10	138.4	137.8	0.0	0.996	0.000	156	11	9	1.0
	10-11	156.9	156.3	0.0	0.996	0.000	150	9	10	0.6
	11-12	156.9	156.3	0.0	0.996	0.000	156	10	9	1.0
	12-13	135.2	134.6	0.0	0.996	0.000	149	9	7	0.8
	13-14	131.5	130.8	0.0	0.995	0.000	148	6	8	0.6
	14-15	142.0	141.4	0.0	0.996	0.000	144	7	9	1.8
	15-16	142.5	141.9	0.0	0.996	0.000	155	9	9	0.8
	16-17	126.4	124.0	0.0	0.981	0.000	152	11	7	1.4
	17-18	133.6	133.0	0.0	0.996	0.000	148	8	9	0.7
	18-19	131.3	130.7	0.0	0.995	0.000	153	8	9	0.9
	19-20	138.7	138.1	0.0	0.996	0.000	171	9	8	0.8
	20-21	134.3	133.7	0.0	0.996	0.000	176	6	8	0.8
	21-22	122.2	121.6	0.0	0.995	0.000	178	5	7	0.4
	22-23	118.4	116.0	0.0	0.980	0.000	180	5	7	0.5
	23-24	110.5	109.9	0.0	0.995	0.000	169	5	6	0.6



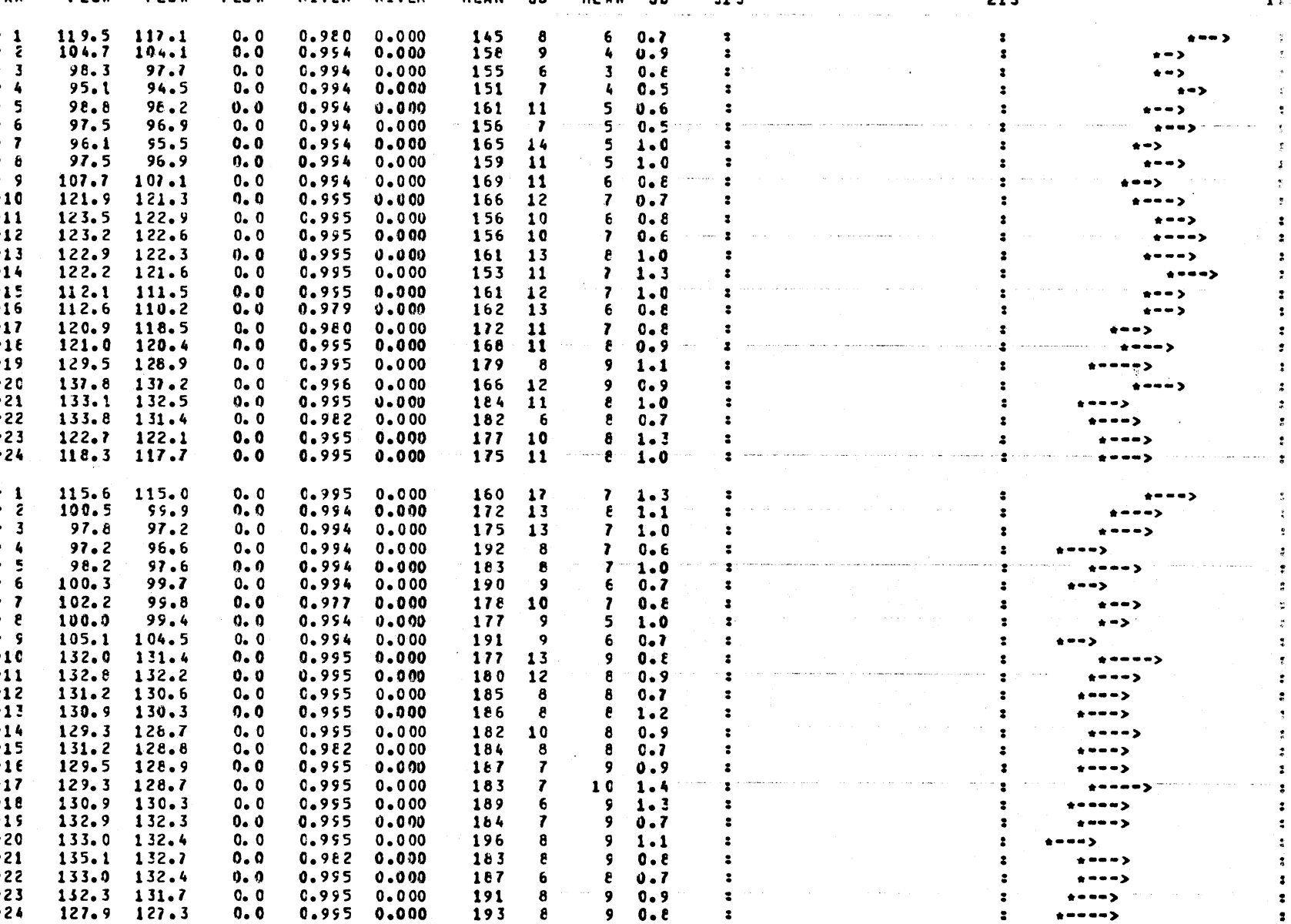
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 12	0- 1	108.7	106.3	0.0	0.978	0.000	164	7	6	0.5
	1- 2	106.1	105.5	0.0	0.994	0.000	164	7	5	0.7
	2- 3	110.6	108.2	0.0	0.978	0.000	146	5	6	0.7
	3- 4	109.4	108.8	0.0	0.995	0.000	170	8	5	0.7
	4- 5	110.6	110.0	0.0	0.995	0.000	157	5	7	0.7
	5- 6	104.8	102.4	0.0	0.977	0.000	150	7	7	1.0
	6- 7	123.2	122.6	0.0	0.995	0.000	152	7	9	0.7
	7- 8	121.2	120.6	0.0	0.995	0.000	145	6	7	0.7
	8- 9	123.0	120.6	0.0	0.980	0.000	149	8	7	1.0
	9-10	112.6	112.0	0.0	0.995	0.000	149	9	5	0.7
	10-11	116.8	116.2	0.0	0.995	0.000	156	9	6	0.5
	11-12	133.3	132.7	0.0	0.995	0.000	148	10	6	0.8
	12-13	133.3	132.7	0.0	0.995	0.000	146	5	6	0.6
	13-14	126.4	125.8	0.0	0.995	0.000	154	10	7	0.8
	14-15	126.4	125.8	0.0	0.995	0.000	151	7	8	0.9
	15-16	121.4	119.0	0.0	0.980	0.000	143	8	7	0.8
	16-17	119.8	119.2	0.0	0.995	0.000	143	9	7	0.7
	17-18	132.6	132.0	0.0	0.995	0.000	181	7	10	0.8
	18-19	129.2	128.6	0.0	0.995	0.000	172	9	8	1.1
	19-20	131.0	128.6	0.0	0.982	0.000	164	8	8	0.6
	20-21	127.3	126.7	0.0	0.995	0.000	166	6	8	0.5
	21-22	119.1	118.5	0.0	0.995	0.000	170	6	7	0.8
	22-23	117.8	117.2	0.0	0.995	0.000	162	8	7	0.6
	23-24	96.8	96.2	0.0	0.994	0.000	157	5	5	0.7
82 OCT 13	0- 1	102.1	101.5	0.0	0.994	0.000	165	8	4	0.6
	1- 2	100.8	100.2	0.0	0.994	0.000	149	5	5	0.4
	2- 3	101.3	100.7	0.0	0.994	0.000	157	7	6	0.5
	3- 4	104.6	104.0	0.0	0.994	0.000	148	5	6	0.3
	4- 5	112.2	109.8	0.0	0.979	0.000	155	7	6	0.7
	5- 6	122.6	122.0	0.0	0.995	0.000	154	8	7	0.9
	6- 7	135.5	134.9	0.0	0.996	0.000	151	6	8	0.6
	7- 8	143.3	142.7	0.0	0.996	0.000	167	10	10	0.7
	8- 9	158.6	156.2	0.0	0.985	0.000	177	8	11	0.7
	9-10	141.2	138.8	0.0	0.983	0.000	184	7	9	0.0
	10-11	145.8	145.2	0.0	0.996	0.000	153	10	9	1.0
	11-12	144.8	144.2	0.0	0.996	0.000	171	9	8	0.7
	12-13	145.0	144.4	0.0	0.996	0.000	156	8	8	0.6
	13-14	144.8	144.4	0.0	0.997	0.000	152	7	10	0.7
	14-15	144.7	144.1	0.0	0.996	0.000	158	9	11	0.6
	15-16	140.4	139.8	0.0	0.996	0.000	176	9	12	0.9
	16-17	130.2	129.6	0.0	0.995	0.000	170	11	11	1.0
	17-18	115.3	114.7	0.0	0.995	0.000	168	11	8	0.8
	18-19	116.8	114.4	0.0	0.979	0.000	167	13	8	1.0
	19-20	117.3	114.9	0.0	0.980	0.000	175	10	7	0.9
	20-21	117.4	115.0	0.0	0.980	0.000	171	12	8	1.1
	21-22	115.5	114.9	0.0	0.995	0.000	183	9	7	0.9
	22-23	114.1	113.5	0.0	0.995	0.000	155	7	7	0.6
	23-24	94.6	92.2	0.0	0.975	0.000	170	5	7	0.7



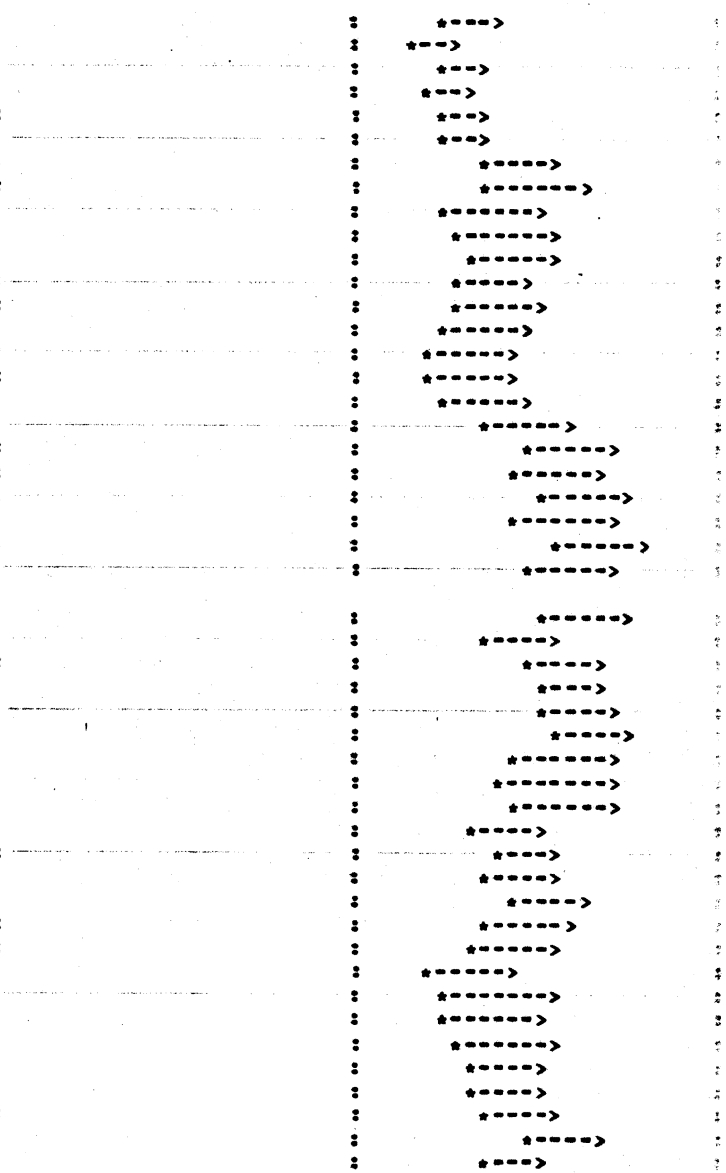
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 14	0- 1	95.7	95.1	0.0	0.994	0.000	160	6	5	0.4
	1- 2	99.7	99.1	0.0	0.994	0.000	170	7	6	0.5
	2- 3	101.1	100.5	0.0	0.994	0.000	155	5	6	0.0
	3- 4	102.6	102.0	0.0	0.994	0.000	161	7	5	0.6
	4- 5	101.1	100.5	0.0	0.994	0.000	163	7	6	0.2
	5- 6	109.8	109.2	0.0	0.995	0.000	166	7	6	0.5
	6- 7	125.4	124.8	0.0	0.995	0.000	157	7	6	0.6
	7- 8	147.6	145.2	0.0	0.984	0.000	157	7	8	0.5
	8- 9	147.8	147.2	0.0	0.996	0.000	154	8	9	0.5
	9-10	144.8	144.2	0.0	0.996	0.000	164	8	10	0.5
	10-11	150.8	150.2	0.0	0.996	0.000	178	7	10	0.6
	11-12	150.8	150.2	0.0	0.996	0.000	175	6	10	0.6
	12-13	150.8	150.2	0.0	0.996	0.000	178	6	10	0.4
	13-14	148.7	146.3	0.0	0.984	0.000	157	9	9	0.7
	14-15	145.6	145.0	0.0	0.996	0.000	152	9	10	0.8
	15-16	147.0	146.4	0.0	0.996	0.000	149	8	11	0.4
	16-17	146.2	145.6	0.0	0.996	0.000	157	7	9	0.6
	17-18	146.2	145.6	0.0	0.996	0.000	171	10	11	1.0
	18-19	147.9	147.3	0.0	0.996	0.000	169	8	10	0.6
	19-20	148.0	147.4	0.0	0.996	0.000	163	10	9	1.7
	20-21	150.3	147.9	0.0	0.984	0.000	173	10	10	0.6
	21-22	144.8	144.2	0.0	0.996	0.000	168	10	9	0.7
	22-23	147.6	145.2	0.0	0.984	0.000	173	9	9	0.6
	23-24	116.6	116.0	0.0	0.995	0.000	165	9	8	0.9
82 OCT 15	0- 1	102.0	101.4	0.0	0.994	0.000	165	7	6	0.5
	1- 2	112.3	111.7	0.0	0.995	0.000	153	6	6	0.4
	2- 3	108.1	107.5	0.0	0.994	0.000	150	5	6	0.7
	3- 4	89.5	88.9	0.0	0.993	0.000	148	6	4	0.5
	4- 5	91.1	90.5	0.0	0.993	0.000	154	6	4	0.7
	5- 6	108.3	105.9	0.0	0.978	0.000	155	7	5	0.6
	6- 7	131.0	130.4	0.0	0.995	0.000	153	8	7	0.6
	7- 8	141.6	141.0	0.0	0.996	0.000	154	8	9	0.9
	8- 9	141.6	141.0	0.0	0.996	0.000	154	9	9	0.9
	9-10	143.5	142.9	0.0	0.996	0.000	154	12	9	1.2
	10-11	140.7	140.1	0.0	0.996	0.000	161	10	9	0.9
	11-12	140.7	140.1	0.0	0.996	0.000	160	8	10	0.7
	12-13	145.5	144.9	0.0	0.996	0.000	156	8	10	0.7
	13-14	156.1	155.5	0.0	0.996	0.000	160	9	9	0.8
	14-15	160.2	157.8	0.0	0.985	0.000	160	9	9	0.7
	15-16	154.0	153.4	0.0	0.996	0.000	159	9	10	1.0
	16-17	153.3	152.7	0.0	0.996	0.000	167	10	10	1.7
	17-18	167.2	164.8	0.0	0.986	0.000	162	9	11	1.2
	18-19	167.2	166.6	0.0	0.996	0.000	160	11	10	1.6
	19-20	166.6	166.0	0.0	0.996	0.000	158	11	10	0.8
	20-21	155.0	154.4	0.0	0.996	0.000	155	10	9	1.2
	21-22	148.4	147.8	0.0	0.996	0.000	158	9	9	1.2
	22-23	136.3	135.7	0.0	0.996	0.000	159	11	7	0.9
	23-24	118.4	116.0	0.0	0.980	0.000	149	12	6	0.7



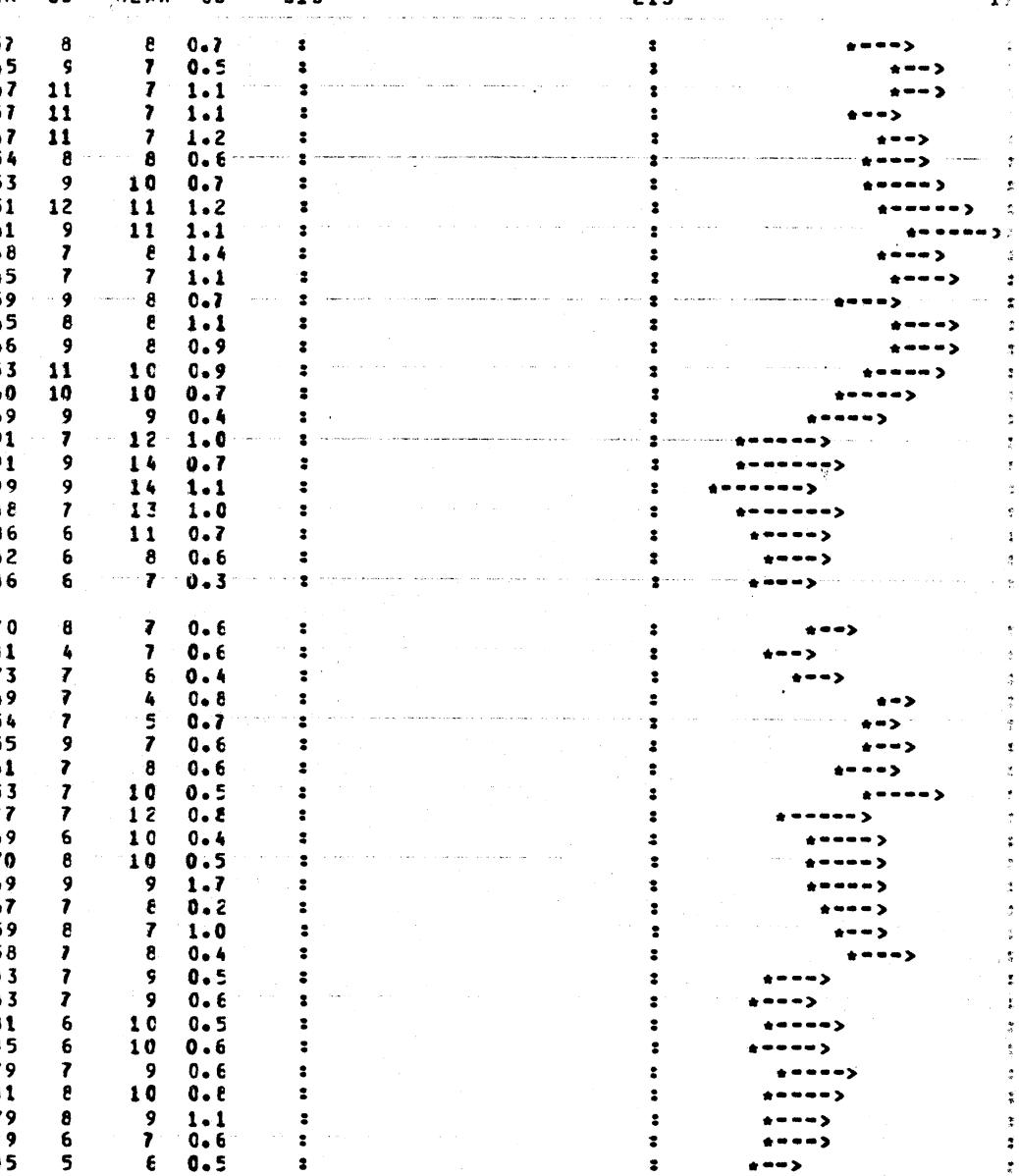
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 16	0- 1	119.5	117.1	0.0	0.980	0.000	145	8	6	0.7
	1- 2	104.7	104.1	0.0	0.994	0.000	158	9	4	0.9
	2- 3	98.3	97.7	0.0	0.994	0.000	155	6	3	0.8
	3- 4	95.1	94.5	0.0	0.994	0.000	151	7	4	0.5
	4- 5	98.8	98.2	0.0	0.994	0.000	161	11	5	0.6
	5- 6	97.5	96.9	0.0	0.994	0.000	156	7	5	0.5
	6- 7	96.1	95.5	0.0	0.994	0.000	165	14	5	1.0
	7- 8	97.5	96.9	0.0	0.994	0.000	159	11	5	1.0
	8- 9	107.7	107.1	0.0	0.994	0.000	169	11	6	0.8
	9-10	121.9	121.3	0.0	0.995	0.000	166	12	7	0.7
	10-11	123.5	122.9	0.0	0.995	0.000	156	10	6	0.8
	11-12	123.2	122.6	0.0	0.995	0.000	156	10	7	0.6
	12-13	122.9	122.3	0.0	0.995	0.000	161	13	8	1.0
	13-14	122.2	121.6	0.0	0.995	0.000	153	11	7	1.3
	14-15	112.1	111.5	0.0	0.995	0.000	161	12	7	1.0
	15-16	112.6	110.2	0.0	0.979	0.000	162	13	6	0.8
	16-17	120.9	118.5	0.0	0.980	0.000	172	11	7	0.8
	17-18	121.0	120.4	0.0	0.995	0.000	168	11	8	0.9
	18-19	129.5	128.9	0.0	0.995	0.000	179	8	9	1.1
	19-20	137.8	137.2	0.0	0.996	0.000	166	12	9	0.9
	20-21	133.1	132.5	0.0	0.995	0.000	184	11	8	1.0
	21-22	133.8	131.4	0.0	0.982	0.000	182	6	8	0.7
	22-23	122.7	122.1	0.0	0.995	0.000	177	10	8	1.3
	23-24	118.3	117.7	0.0	0.995	0.000	175	11	8	1.0
82 OCT 17	0- 1	115.6	115.0	0.0	0.995	0.000	160	17	7	1.3
	1- 2	100.5	99.9	0.0	0.994	0.000	172	13	8	1.1
	2- 3	97.8	97.2	0.0	0.994	0.000	175	13	7	1.0
	3- 4	97.2	96.6	0.0	0.994	0.000	192	8	7	0.6
	4- 5	98.2	97.6	0.0	0.994	0.000	183	8	7	1.0
	5- 6	100.3	99.7	0.0	0.994	0.000	190	9	6	0.7
	6- 7	102.2	99.8	0.0	0.977	0.000	178	10	7	0.8
	7- 8	100.0	99.4	0.0	0.994	0.000	177	9	5	1.0
	8- 9	105.1	104.5	0.0	0.994	0.000	191	9	6	0.7
	9-10	132.0	131.4	0.0	0.995	0.000	177	13	9	0.8
	10-11	132.8	132.2	0.0	0.995	0.000	180	12	8	0.9
	11-12	131.2	130.6	0.0	0.995	0.000	185	8	8	0.7
	12-13	130.9	130.3	0.0	0.995	0.000	186	8	8	1.2
	13-14	129.3	128.7	0.0	0.995	0.000	182	10	8	0.9
	14-15	131.2	128.8	0.0	0.982	0.000	184	8	8	0.7
	15-16	129.5	128.9	0.0	0.995	0.000	187	7	9	0.9
	16-17	129.3	128.7	0.0	0.995	0.000	183	7	10	1.4
	17-18	130.9	130.3	0.0	0.995	0.000	189	6	9	1.3
	18-19	132.9	132.3	0.0	0.995	0.000	184	7	9	0.7
	19-20	133.0	132.4	0.0	0.995	0.000	196	8	9	1.1
	20-21	135.1	132.7	0.0	0.982	0.000	183	8	9	0.8
	21-22	133.0	132.4	0.0	0.995	0.000	187	6	8	0.7
	22-23	132.3	131.7	0.0	0.995	0.000	191	8	9	0.9
	23-24	127.9	127.3	0.0	0.995	0.000	193	8	9	0.8



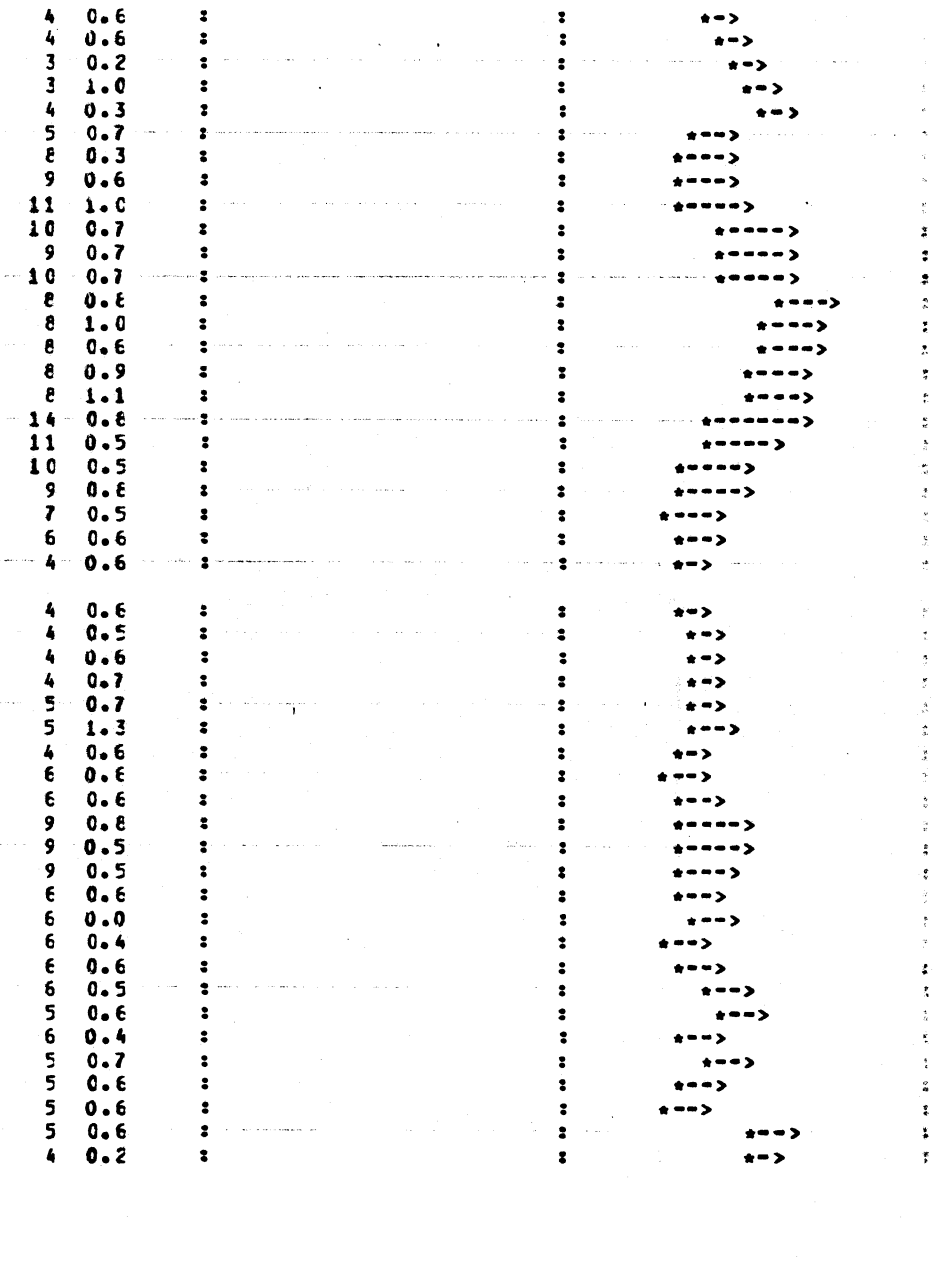
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 18	0- 1	113.9	113.3	0.0	0.995	0.000	189	7	8	0.5
	1- 2	90.9	88.5	0.0	0.974	0.000	198	10	6	0.5
	2- 3	90.0	89.4	0.0	0.993	0.000	189	6	6	0.6
	3- 4	93.5	92.9	0.0	0.994	0.000	193	6	5	0.6
	4- 5	98.8	98.2	0.0	0.994	0.000	189	8	5	0.6
	5- 6	118.7	118.1	0.0	0.995	0.000	187	4	7	0.7
	6- 7	161.4	159.0	0.0	0.985	0.000	177	7	10	0.7
	7- 8	188.8	188.2	0.0	0.997	0.000	179	8	13	1.2
	8- 9	177.9	177.3	0.0	0.997	0.000	191	10	14	1.0
	9-10	166.7	166.1	0.0	0.996	0.000	185	9	13	0.7
	10-11	165.0	164.4	0.0	0.996	0.000	181	7	12	0.5
	11-12	148.5	147.9	0.0	0.996	0.000	187	5	10	0.4
	12-13	148.4	146.0	0.0	0.984	0.000	184	8	12	0.8
	13-14	147.7	147.1	0.0	0.996	0.000	190	7	11	0.6
	14-15	148.7	148.1	0.0	0.996	0.000	192	10	11	0.8
	15-16	148.2	147.6	0.0	0.996	0.000	192	11	12	1.0
	16-17	148.1	147.5	0.0	0.996	0.000	188	8	12	1.1
	17-18	149.3	148.7	0.0	0.996	0.000	177	9	12	1.0
	18-19	155.3	154.7	0.0	0.996	0.000	165	8	11	1.5
	19-20	155.8	155.2	0.0	0.996	0.000	170	9	12	0.8
	20-21	154.7	154.1	0.0	0.996	0.000	161	11	12	1.2
	21-22	154.6	154.0	0.0	0.996	0.000	169	9	13	1.2
	22-23	153.8	153.2	0.0	0.996	0.000	158	12	13	1.3
	23-24	152.4	151.8	0.0	0.996	0.000	166	9	12	1.3
82 OCT 19	0- 1	153.9	151.5	0.0	0.984	0.000	161	10	12	1.0
	1- 2	138.0	137.4	0.0	0.996	0.000	177	8	11	1.0
	2- 3	134.7	134.1	0.0	0.996	0.000	164	9	10	0.9
	3- 4	137.9	137.3	0.0	0.996	0.000	162	10	9	0.7
	4- 5	149.2	148.6	0.0	0.996	0.000	160	10	9	0.4
	5- 6	157.7	157.1	0.0	0.996	0.000	158	6	9	1.7
	6- 7	187.3	186.6	0.0	0.996	0.000	169	7	13	1.1
	7- 8	209.5	208.9	0.0	0.997	0.000	173	10	16	0.9
	8- 9	194.7	194.1	0.0	0.997	0.000	168	10	14	0.5
	9-10	162.4	161.8	0.0	0.996	0.000	180	7	11	0.8
	10-11	154.3	151.9	0.0	0.984	0.000	174	5	8	0.4
	11-12	145.6	145.0	0.0	0.996	0.000	175	5	11	0.3
	12-13	147.2	146.6	0.0	0.996	0.000	169	8	10	0.4
	13-14	139.3	138.7	0.0	0.996	0.000	179	9	11	1.1
	14-15	137.4	136.8	0.0	0.996	0.000	182	6	11	1.0
	15-16	140.4	139.8	0.0	0.996	0.000	193	9	12	0.7
	16-17	168.0	167.4	0.0	0.996	0.000	188	11	15	1.2
	17-18	170.7	170.1	0.0	0.996	0.000	187	9	14	1.4
	18-19	171.3	170.7	0.0	0.996	0.000	185	10	13	0.8
	19-20	168.8	168.2	0.0	0.996	0.000	179	5	11	1.3
	20-21	168.6	168.0	0.0	0.996	0.000	180	7	10	0.9
	21-22	167.9	167.3	0.0	0.996	0.000	177	7	11	0.7
	22-23	153.5	152.9	0.0	0.996	0.000	165	8	9	0.5
	23-24	147.7	147.1	0.0	0.996	0.000	178	7	8	0.4



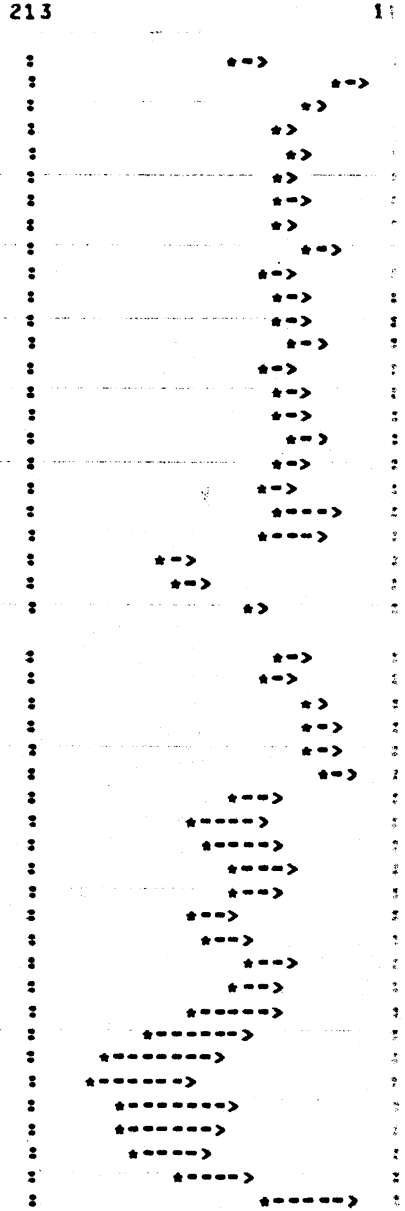
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 20	0- 1	139.9	139.3	0.0	0.996	0.000	157	8	8	0.7
	1- 2	128.3	127.7	0.0	0.995	0.000	145	9	7	0.5
	2- 3	126.5	125.9	0.0	0.995	0.000	147	11	7	1.1
	3- 4	129.5	128.9	0.0	0.995	0.000	157	11	7	1.1
	4- 5	124.6	124.0	0.0	0.995	0.000	147	11	7	1.2
	5- 6	139.1	138.5	0.0	0.996	0.000	154	8	8	0.6
	6- 7	156.8	156.2	0.0	0.996	0.000	153	9	10	0.7
	7- 8	167.3	166.7	0.0	0.996	0.000	151	12	11	1.2
	8- 9	169.7	169.1	0.0	0.996	0.000	141	9	11	1.1
	9-10	146.6	146.0	0.0	0.996	0.000	148	7	8	1.4
	10-11	140.4	139.8	0.0	0.996	0.000	145	7	7	1.1
	11-12	133.9	133.3	0.0	0.996	0.000	159	9	8	0.7
	12-13	137.7	135.3	0.0	0.983	0.000	145	8	8	1.1
	13-14	145.4	143.0	0.0	0.983	0.000	146	9	8	0.9
	14-15	139.4	138.8	0.0	0.996	0.000	153	11	10	0.9
	15-16	146.4	144.0	0.0	0.984	0.000	160	10	10	0.7
	16-17	149.2	148.6	0.0	0.996	0.000	169	9	9	0.4
	17-18	163.7	163.1	0.0	0.996	0.000	191	7	12	1.0
	18-19	178.5	177.9	0.0	0.997	0.000	191	9	14	0.7
	19-20	178.2	175.8	0.0	0.987	0.000	199	9	14	1.1
	20-21	183.5	182.9	0.0	0.997	0.000	188	7	13	1.0
	21-22	168.7	168.1	0.0	0.996	0.000	186	6	11	0.7
	22-23	142.4	141.8	0.0	0.996	0.000	182	6	8	0.6
	23-24	128.9	128.3	0.0	0.995	0.000	186	6	7	0.3
82 OCT 21	0- 1	124.0	123.4	0.0	0.995	0.000	170	8	7	0.6
	1- 2	117.0	116.4	0.0	0.995	0.000	181	4	7	0.6
	2- 3	111.7	111.1	0.0	0.995	0.000	173	7	6	0.4
	3- 4	109.0	108.4	0.0	0.994	0.000	149	7	4	0.8
	4- 5	112.3	111.7	0.0	0.995	0.000	154	7	5	0.7
	5- 6	129.1	128.5	0.0	0.995	0.000	155	9	7	0.6
	6- 7	147.6	147.0	0.0	0.996	0.000	161	7	8	0.6
	7- 8	172.4	170.0	0.0	0.986	0.000	153	7	10	0.5
	8- 9	178.1	177.5	0.0	0.997	0.000	177	7	12	0.8
	9-10	166.7	166.1	0.0	0.996	0.000	169	6	10	0.4
	10-11	153.9	153.3	0.0	0.996	0.000	170	8	10	0.5
	11-12	153.7	153.1	0.0	0.996	0.000	169	9	9	1.7
	12-13	146.6	146.0	0.0	0.996	0.000	167	7	8	0.2
	13-14	146.1	145.7	0.0	0.984	0.000	159	8	7	1.0
	14-15	141.1	140.5	0.0	0.996	0.000	158	7	8	0.4
	15-16	140.2	139.6	0.0	0.996	0.000	183	7	9	0.5
	16-17	143.5	142.9	0.0	0.996	0.000	183	7	9	0.6
	17-18	148.5	147.9	0.0	0.996	0.000	181	6	10	0.5
	18-19	152.3	151.7	0.0	0.996	0.000	185	6	10	0.6
	19-20	152.2	151.6	0.0	0.996	0.000	179	7	9	0.6
	20-21	152.0	149.6	0.0	0.984	0.000	181	8	10	0.8
	21-22	147.8	147.2	0.0	0.996	0.000	179	8	9	1.1
	22-23	144.5	143.9	0.0	0.996	0.000	179	6	7	0.6
	23-24	118.7	118.1	0.0	0.995	0.000	185	5	6	0.5



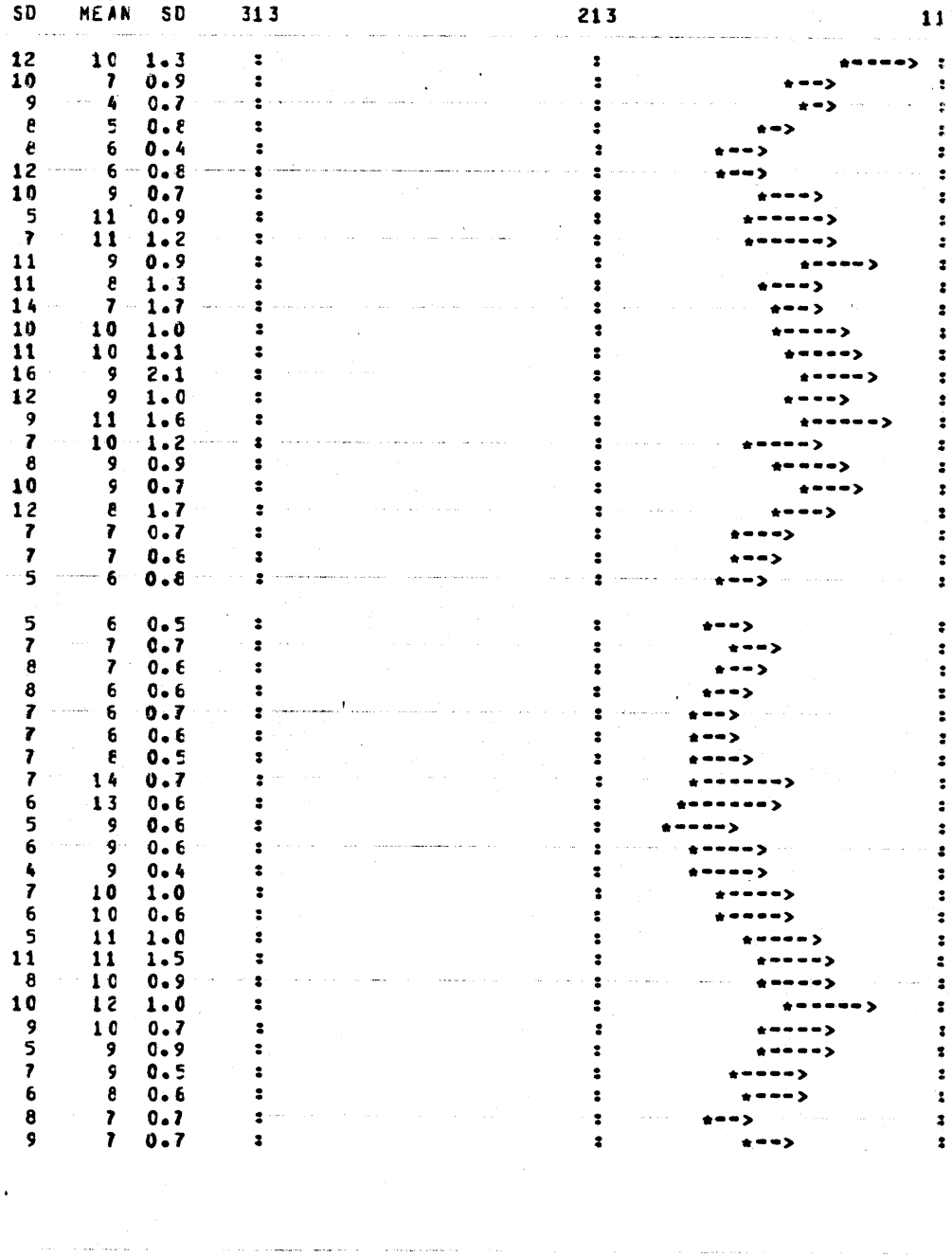
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 22	0- 1	94.5	93.9	0.0	0.994	0.000	173	8	4	0.6
	1- 2	92.3	91.7	0.0	0.993	0.000	169	7	4	0.6
	2- 3	84.8	84.2	0.0	0.993	0.000	163	8	3	0.2
	3- 4	89.9	89.3	0.0	0.993	0.000	161	7	3	1.0
	4- 5	92.3	91.7	0.0	0.993	0.000	159	5	4	0.3
	5- 6	105.3	104.7	0.0	0.994	0.000	176	6	5	0.7
	6- 7	141.7	141.1	0.0	0.996	0.000	160	5	8	0.3
	7- 8	152.8	152.2	0.0	0.996	0.000	182	6	9	0.6
	8- 9	158.3	157.7	0.0	0.996	0.000	183	6	11	1.0
	9-10	159.8	157.4	0.0	0.985	0.000	168	7	10	0.7
	10-11	149.4	148.8	0.0	0.996	0.000	167	8	9	0.7
	11-12	153.1	152.5	0.0	0.996	0.000	170	8	10	0.7
	12-13	141.2	140.6	0.0	0.996	0.000	154	10	8	0.8
	13-14	132.5	131.9	0.0	0.995	0.000	158	8	8	1.0
	14-15	127.4	126.8	0.0	0.995	0.000	158	11	8	0.6
	15-16	134.2	133.7	0.0	0.996	0.000	160	10	8	0.9
	16-17	131.2	130.6	0.0	0.995	0.000	162	9	8	1.1
	17-18	190.0	189.4	0.0	0.997	0.000	172	8	14	0.8
	18-19	153.9	153.3	0.0	0.996	0.000	174	7	11	0.5
	19-20	143.3	140.9	0.0	0.983	0.000	180	5	10	0.5
	20-21	123.5	122.9	0.0	0.995	0.000	182	7	9	0.8
	21-22	118.0	117.4	0.0	0.995	0.000	186	5	7	0.5
	22-23	106.1	105.5	0.0	0.994	0.000	181	6	6	0.6
	23-24	83.8	83.2	0.0	0.993	0.000	182	4	4	0.6
82 OCT 23	0- 1	88.2	87.6	0.0	0.993	0.000	182	6	4	0.6
	1- 2	90.5	89.9	0.0	0.993	0.000	178	6	4	0.5
	2- 3	90.1	89.5	0.0	0.993	0.000	177	6	4	0.6
	3- 4	90.2	89.6	0.0	0.993	0.000	175	5	4	0.7
	4- 5	90.3	89.7	0.0	0.993	0.000	178	7	5	0.7
	5- 6	90.7	90.1	0.0	0.993	0.000	176	9	5	1.3
	6- 7	93.6	91.2	0.0	0.974	0.000	180	7	4	0.6
	7- 8	112.5	111.9	0.0	0.995	0.000	185	6	6	0.6
	8- 9	119.8	119.2	0.0	0.995	0.000	180	6	6	0.6
	9-10	135.3	134.7	0.0	0.996	0.000	181	6	9	0.8
	10-11	138.3	137.7	0.0	0.996	0.000	180	6	9	0.5
	11-12	130.6	130.0	0.0	0.995	0.000	179	5	9	0.5
	12-13	110.5	109.9	0.0	0.995	0.000	181	5	6	0.6
	13-14	99.3	96.9	0.0	0.976	0.000	178	4	6	0.0
	14-15	97.6	97.0	0.0	0.994	0.000	186	5	6	0.4
	15-16	93.1	92.5	0.0	0.994	0.000	181	6	6	0.6
	16-17	99.0	98.4	0.0	0.994	0.000	175	6	6	0.5
	17-18	103.1	102.7	0.0	0.996	0.000	169	7	5	0.6
	18-19	109.2	108.6	0.0	0.995	0.000	180	5	6	0.4
	19-20	105.9	105.3	0.0	0.994	0.000	172	10	5	0.7
	20-21	100.9	100.3	0.0	0.994	0.000	182	4	5	0.6
	21-22	97.1	96.5	0.0	0.994	0.000	185	5	5	0.6
	22-23	97.8	97.2	0.0	0.994	0.000	160	7	5	0.6
	23-24	90.0	89.4	0.0	0.993	0.000	160	6	4	0.2



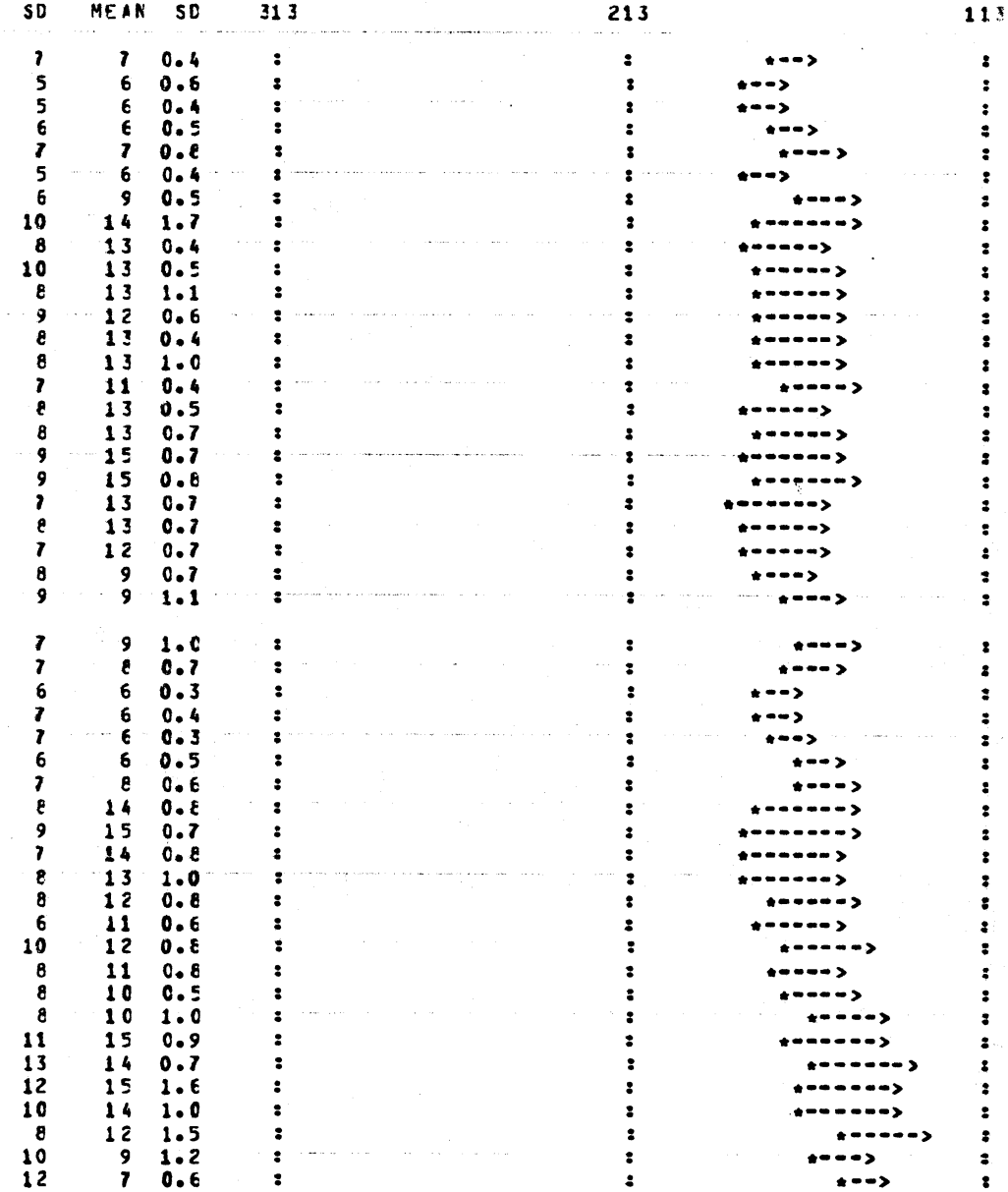
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL /FLOW	TURBN RIVER	SPILL RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 24	0- 1	94.8	92.4	0.0	0.975	0.000	155	7	5	0.0
	1- 2	83.1	82.5	0.0	0.993	0.000	130	7	3	0.5
	2- 3	81.6	81.0	0.0	0.993	0.000	138	9	3	0.7
	3- 4	83.1	80.7	0.0	0.971	0.000	144	8	3	0.6
	4- 5	81.6	81.0	0.0	0.993	0.000	139	4	2	0.6
	5- 6	82.7	82.1	0.0	0.993	0.000	145	6	2	0.5
	6- 7	86.2	83.8	0.0	0.972	0.000	143	5	4	0.9
	7- 8	83.6	83.0	0.0	0.993	0.000	144	8	3	1.0
	8- 9	86.4	85.8	0.0	0.993	0.000	139	4	4	0.3
	9-10	103.7	103.1	0.0	0.994	0.000	149	6	5	0.6
	10-11	104.4	102.0	0.0	0.977	0.000	146	8	4	0.5
	11-12	101.8	101.2	0.0	0.994	0.000	147	7	4	0.6
	12-13	99.2	98.6	0.0	0.994	0.000	142	8	4	0.7
	13-14	97.5	96.9	0.0	0.994	0.000	149	10	4	0.7
	14-15	96.1	95.5	0.0	0.994	0.000	145	7	4	0.4
	15-16	93.8	91.4	0.0	0.974	0.000	145	6	4	0.6
	16-17	89.4	88.9	0.0	0.994	0.000	142	6	3	1.0
	17-18	92.9	92.3	0.0	0.994	0.000	147	7	4	0.7
	18-19	104.9	104.3	0.0	0.994	0.000	148	5	5	0.3
	19-20	105.2	104.6	0.0	0.994	0.000	147	8	8	1.1
	20-21	103.7	103.1	0.0	0.994	0.000	149	7	7	0.9
	21-22	103.8	103.2	0.0	0.994	0.000	176	10	5	1.1
	22-23	105.9	103.5	0.0	0.977	0.000	174	6	5	0.4
	23-24	93.6	93.0	0.0	0.994	0.000	152	5	2	0.6
82 OCT 25	0- 1	85.0	82.6	0.0	0.972	0.000	143	10	3	1.0
	1- 2	83.0	82.4	0.0	0.993	0.000	150	6	3	0.5
	2- 3	84.1	83.5	0.0	0.993	0.000	135	8	3	0.8
	3- 4	85.5	84.9	0.0	0.993	0.000	138	7	4	0.5
	4- 5	91.8	89.4	0.0	0.974	0.000	138	7	4	1.0
	5- 6	90.9	90.3	0.0	0.993	0.000	135	9	3	0.7
	6- 7	118.4	117.8	0.0	0.995	0.000	155	9	7	0.6
	7- 8	140.0	139.4	0.0	0.996	0.000	170	10	10	0.8
	8- 9	143.1	142.5	0.0	0.996	0.000	164	8	10	0.9
	9-10	119.8	119.2	0.0	0.995	0.000	157	9	8	1.2
	10-11	118.0	117.4	0.0	0.995	0.000	158	10	7	0.8
	11-12	118.2	115.8	0.0	0.980	0.000	169	11	7	0.9
	12-13	118.2	117.6	0.0	0.995	0.000	164	9	6	0.6
	13-14	102.9	102.3	0.0	0.994	0.000	154	6	5	0.7
	14-15	101.6	100.9	0.0	0.993	0.000	155	9	6	0.7
	15-16						169	12	12	1.4
	16-17	118.6	118.0	0.0	0.995	0.000	182	12	13	1.0
	17-18	122.3	121.7	0.0	0.995	0.000	194	11	15	1.0
	18-19	132.8	132.2	0.0	0.995	0.000	196	11	15	1.0
	19-20	134.8	134.2	0.0	0.996	0.000	187	8	15	1.3
	20-21	132.8	132.2	0.0	0.995	0.000	188	10	15	1.2
	21-22	131.7	131.1	0.0	0.995	0.000	187	6	11	0.5
	22-23	107.8	107.2	0.0	0.994	0.000	173	10	9	1.0
	23-24	101.3	100.7	0.0	0.994	0.000	148	12	11	1.2



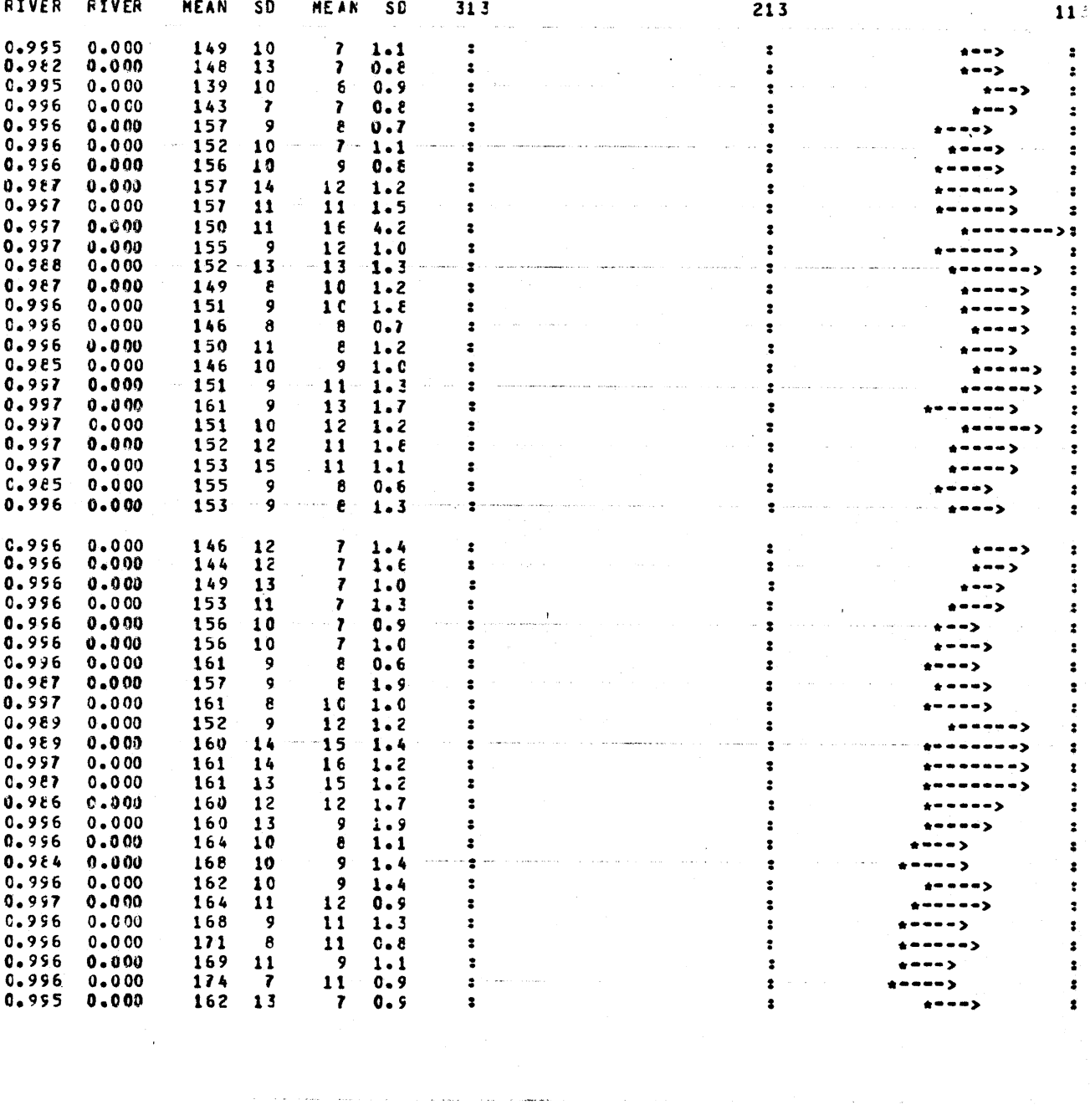
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 26	0- 1	100.7	100.1	0.0	0.994	0.000	143	12	10	1.3
	1- 2	99.6	99.0	0.0	0.994	0.000	155	10	7	0.9
	2- 3	91.2	90.6	0.0	0.993	0.000	151	9	4	0.7
	3- 4	89.4	88.8	0.0	0.993	0.000	164	8	5	0.8
	4- 5	89.0	88.4	0.0	0.993	0.000	178	8	6	0.4
	5- 6	105.4	104.8	0.0	0.994	0.000	176	12	6	0.8
	6- 7						164	10	9	0.7
	7- 8	184.4	182.0	0.0	0.987	0.000	170	5	11	0.9
	8- 9	186.0	183.6	0.0	0.987	0.000	167	7	11	1.2
	9-10	156.1	155.5	0.0	0.996	0.000	154	11	9	0.9
	10-11	148.7	148.1	0.0	0.996	0.000	167	11	8	1.3
	11-12	135.7	135.1	0.0	0.996	0.000	159	14	7	1.7
	12-13	155.8	155.2	0.0	0.996	0.000	161	10	10	1.0
	13-14	159.7	159.1	0.0	0.996	0.000	157	11	10	1.1
	14-15	147.9	147.3	0.0	0.996	0.000	151	16	9	2.1
	15-16	137.6	137.0	0.0	0.996	0.000	159	12	9	1.0
	16-17	160.9	160.3	0.0	0.996	0.000	154	9	11	1.6
	17-18	150.9	150.3	0.0	0.996	0.000	169	7	10	1.2
	18-19	149.9	149.3	0.0	0.996	0.000	159	8	9	0.9
	19-20	146.2	145.6	0.0	0.996	0.000	152	10	9	0.7
	20-21	136.3	133.9	0.0	0.982	0.000	161	12	8	1.7
	21-22	128.7	128.1	0.0	0.995	0.000	172	7	7	0.7
	22-23	124.0	123.4	0.0	0.995	0.000	173	7	7	0.6
	23-24	105.7	105.1	0.0	0.994	0.000	175	5	6	0.8
82 OCT 27	0- 1	105.2	104.6	0.0	0.994	0.000	179	5	6	0.5
	1- 2	104.4	102.0	0.0	0.977	0.000	175	7	7	0.7
	2- 3	102.0	101.4	0.0	0.994	0.000	179	8	7	0.6
	3- 4	102.3	101.7	0.0	0.994	0.000	179	8	6	0.6
	4- 5	102.7	102.1	0.0	0.994	0.000	187	7	6	0.7
	5- 6	103.9	103.3	0.0	0.994	0.000	184	7	6	0.6
	6- 7	133.4	132.8	0.0	0.996	0.000	186	7	8	0.5
	7- 8	190.7	190.1	0.0	0.997	0.000	185	7	14	0.7
	8- 9	186.2	185.6	0.0	0.997	0.000	187	6	13	0.6
	9-10	156.9	154.5	0.0	0.985	0.000	191	5	9	0.6
	10-11	149.5	148.9	0.0	0.996	0.000	185	6	9	0.6
	11-12	156.4	155.8	0.0	0.996	0.000	184	4	9	0.4
	12-13	160.8	160.2	0.0	0.996	0.000	176	7	10	1.0
	13-14	161.9	159.5	0.0	0.985	0.000	177	6	10	0.6
	14-15	159.1	156.7	0.0	0.985	0.000	171	5	11	1.0
	15-16	154.0	153.4	0.0	0.996	0.000	165	11	11	1.5
	16-17	157.7	155.3	0.0	0.985	0.000	164	8	10	0.9
	17-18	160.3	158.9	0.0	0.991	0.000	158	10	12	1.0
	18-19	155.6	155.0	0.0	0.996	0.000	166	9	10	0.7
	19-20	156.0	153.6	0.0	0.985	0.000	163	5	9	0.9
	20-21	152.7	150.3	0.0	0.984	0.000	173	7	9	0.5
	21-22	143.4	142.8	0.0	0.996	0.000	170	6	8	0.6
	22-23	128.9	128.3	0.0	0.995	0.000	180	8	7	0.7
	23-24	125.7	123.3	0.0	0.981	0.000	171	9	7	0.7



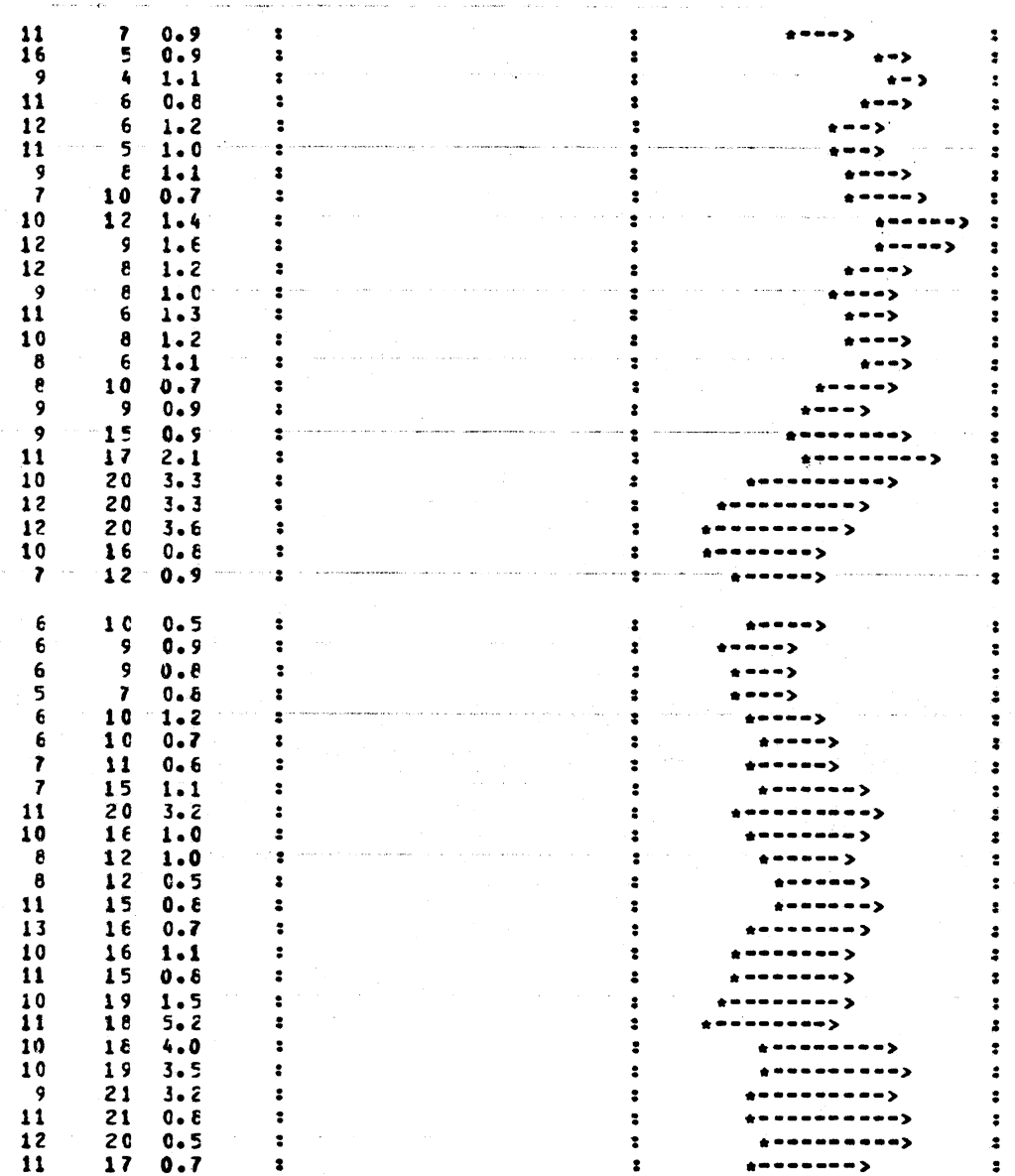
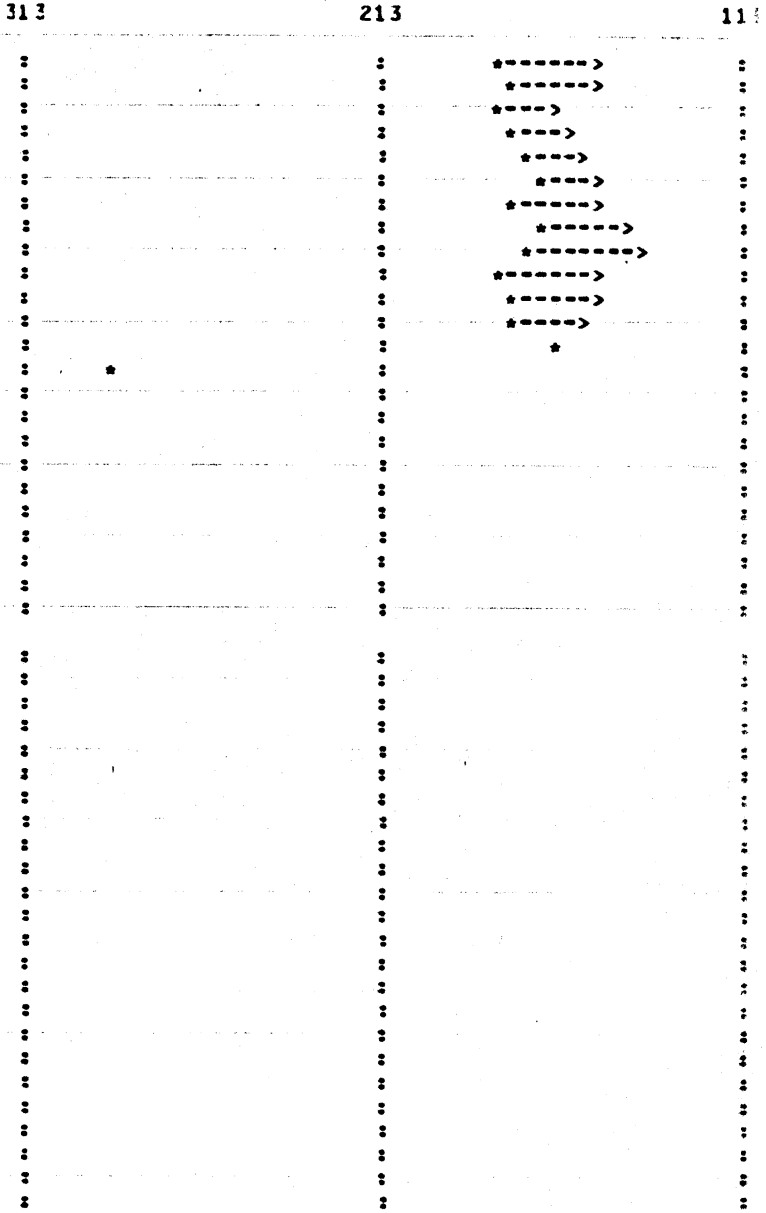
DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL /FLOW	TURBN RIVER	SPILL RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 28	0- 1	121.0	120.4	0.0	0.995	0.000	173	7	7	0.4
	1- 2	117.6	117.0	0.0	0.995	0.000	179	5	6	0.6
	2- 3	116.9	116.3	0.0	0.995	0.000	181	5	6	0.4
	3- 4	116.6	116.0	0.0	0.995	0.000	172	6	6	0.5
	4- 5	119.8	117.4	0.0	0.980	0.000	171	7	7	0.8
	5- 6	120.2	119.6	0.0	0.995	0.000	180	5	6	0.4
	6- 7	152.3	149.9	0.0	0.984	0.000	166	6	9	0.5
	7- 8	188.2	187.6	0.0	0.997	0.000	178	10	14	1.7
	8- 9	182.2	181.6	0.0	0.997	0.000	180	8	13	0.4
	9-10	173.6	173.0	0.0	0.997	0.000	177	10	13	0.5
	10-11	168.1	167.5	0.0	0.996	0.000	178	8	13	1.1
	11-12	167.4	166.8	0.0	0.996	0.000	176	9	12	0.6
	12-13	168.8	168.2	0.0	0.996	0.000	178	8	13	0.4
	13-14	171.6	169.2	0.0	0.986	0.000	176	8	13	1.0
	14-15	165.6	165.0	0.0	0.996	0.000	168	7	11	0.4
	15-16	171.7	171.1	0.0	0.997	0.000	182	8	13	0.5
	16-17	174.7	174.1	0.0	0.997	0.000	178	8	13	0.7
	17-18	178.8	178.2	0.0	0.997	0.000	182	9	15	0.7
	18-19	180.4	179.8	0.0	0.997	0.000	178	9	15	0.8
	19-20	179.9	179.3	0.0	0.997	0.000	184	7	13	0.7
	20-21	169.8	169.2	0.0	0.996	0.000	182	8	13	0.7
	21-22	158.8	158.2	0.0	0.996	0.000	180	7	12	0.7
	22-23	148.9	148.3	0.0	0.996	0.000	177	8	9	0.7
	23-24	126.5	125.9	0.0	0.995	0.000	170	9	9	1.1
82 OCT 29	0- 1	112.4	111.8	0.0	0.995	0.000	167	7	9	1.0
	1- 2	110.6	110.0	0.0	0.995	0.000	170	7	8	0.7
	2- 3	112.2	109.8	0.0	0.979	0.000	177	6	6	0.3
	3- 4	110.3	109.7	0.0	0.995	0.000	177	7	6	0.4
	4- 5	112.2	111.6	0.0	0.995	0.000	174	7	6	0.3
	5- 6	112.6	112.0	0.0	0.995	0.000	167	6	6	0.5
	6- 7	146.0	145.4	0.0	0.996	0.000	165	7	8	0.6
	7- 8	188.2	187.6	0.0	0.997	0.000	176	8	14	0.8
	8- 9	194.0	193.4	0.0	0.997	0.000	180	9	15	0.7
	9-10	180.3	179.7	0.0	0.997	0.000	180	7	14	0.8
	10-11	169.8	169.2	0.0	0.996	0.000	181	8	13	1.0
	11-12	173.7	173.1	0.0	0.997	0.000	175	8	12	0.8
	12-13	164.7	164.1	0.0	0.996	0.000	177	6	11	0.6
	13-14	171.1	170.5	0.0	0.996	0.000	167	10	12	0.8
	14-15	167.4	166.8	0.0	0.996	0.000	172	8	11	0.8
	15-16	167.1	166.5	0.0	0.996	0.000	171	8	10	0.5
	16-17	177.5	176.9	0.0	0.997	0.000	163	8	10	1.0
	17-18	198.9	198.3	0.0	0.997	0.000	169	11	15	0.9
	18-19	214.5	213.9	0.0	0.997	0.000	159	13	14	0.7
	19-20	216.4	215.8	0.0	0.997	0.000	163	12	15	1.6
	20-21	207.6	205.2	0.0	0.988	0.000	165	10	14	1.0
	21-22	197.3	196.7	0.0	0.997	0.000	153	8	12	1.5
	22-23	163.3	162.7	0.0	0.996	0.000	162	10	9	1.2
	23-24	139.9	139.3	0.0	0.996	0.000	153	12	7	0.6



DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 OCT 30	0- 1	131.7	131.1	0.0	0.995	0.000	149	10	7	1.1
	1- 2	135.4	133.0	0.0	0.982	0.000	148	13	7	0.8
	2- 3	132.8	132.2	0.0	0.995	0.000	139	10	6	0.9
	3- 4	134.4	133.8	0.0	0.996	0.000	143	7	7	0.8
	4- 5	140.1	139.5	0.0	0.996	0.000	157	9	8	0.7
	5- 6	146.3	145.7	0.0	0.996	0.000	152	10	7	1.1
	6- 7	166.8	166.2	0.0	0.996	0.000	156	10	9	0.8
	7- 8	181.2	178.8	0.0	0.987	0.000	157	14	12	1.2
	8- 9	185.2	184.6	0.0	0.997	0.000	157	11	11	1.5
	9-10	199.3	198.7	0.0	0.997	0.000	150	11	16	4.2
	10-11	201.5	200.9	0.0	0.997	0.000	155	9	12	1.0
	11-12	195.5	193.1	0.0	0.988	0.000	152	13	13	1.3
	12-13	182.9	180.5	0.0	0.987	0.000	149	8	10	1.2
	13-14	170.8	170.2	0.0	0.996	0.000	151	9	10	1.8
	14-15	151.3	150.7	0.0	0.996	0.000	146	8	8	0.7
	15-16	146.5	145.9	0.0	0.996	0.000	150	11	8	1.2
	16-17	156.2	153.8	0.0	0.985	0.000	146	10	9	1.0
	17-18	174.1	173.5	0.0	0.997	0.000	151	9	11	1.3
	18-19	188.3	187.7	0.0	0.997	0.000	161	9	13	1.7
	19-20	188.5	187.9	0.0	0.997	0.000	151	10	12	1.2
	20-21	186.4	185.8	0.0	0.997	0.000	152	12	11	1.8
	21-22	172.2	171.6	0.0	0.997	0.000	153	15	11	1.1
	22-23	158.8	156.4	0.0	0.985	0.000	155	9	8	0.6
	23-24	148.5	147.9	0.0	0.996	0.000	153	9	8	1.3
82 OCT 31	0- 1	141.0	140.4	0.0	0.996	0.000	146	12	7	1.4
	1- 2	140.3	139.7	0.0	0.996	0.000	144	12	7	1.6
	2- 3	139.7	139.1	0.0	0.996	0.000	149	13	7	1.0
	3- 4	139.5	138.9	0.0	0.996	0.000	153	11	7	1.3
	4- 5	143.5	142.9	0.0	0.996	0.000	156	10	7	0.9
	5- 6	148.5	147.9	0.0	0.996	0.000	156	10	7	1.0
	6- 7	151.7	151.1	0.0	0.996	0.000	161	9	8	0.6
	7- 8	179.2	176.8	0.0	0.987	0.000	157	9	8	1.9
	8- 9	188.1	187.5	0.0	0.997	0.000	161	8	10	1.0
	9-10	216.8	214.4	0.0	0.989	0.000	152	9	12	1.2
	10-11	217.5	215.1	0.0	0.989	0.000	160	14	15	1.4
	11-12	203.5	202.9	0.0	0.997	0.000	161	14	16	1.2
	12-13	190.9	188.5	0.0	0.987	0.000	161	13	15	1.2
	13-14	166.8	164.4	0.0	0.986	0.000	160	12	12	1.7
	14-15	145.2	144.6	0.0	0.996	0.000	160	13	9	1.9
	15-16	143.2	142.6	0.0	0.996	0.000	164	10	8	1.1
	16-17	154.3	151.9	0.0	0.984	0.000	168	10	9	1.4
	17-18	169.3	168.7	0.0	0.996	0.000	162	10	9	1.4
	18-19	176.3	175.7	0.0	0.997	0.000	164	11	12	0.9
	19-20	165.5	164.9	0.0	0.996	0.000	168	9	11	1.3
	20-21	161.6	161.0	0.0	0.996	0.000	171	8	11	0.8
	21-22	157.8	157.2	0.0	0.996	0.000	169	11	9	1.1
	22-23	141.5	140.9	0.0	0.996	0.000	174	7	11	0.9
	23-24	128.7	128.1	0.0	0.995	0.000	162	13	7	0.9



DATE YR	MON	DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82	NOV	1	0- 1	111.6	111.0	0.0	0.995	0.000	167	11	7	0.9
			1- 2	105.9	103.5	0.0	0.977	0.000	143	16	5	0.9
			2- 3	106.3	105.7	0.0	0.994	0.000	142	9	4	1.1
			3- 4	106.9	106.3	0.0	0.994	0.000	151	11	6	0.8
			4- 5	113.5	112.9	0.0	0.995	0.000	157	12	6	1.2
			5- 6	136.1	135.5	0.0	0.996	0.000	155	11	5	1.0
			6- 7	164.1	163.5	0.0	0.996	0.000	152	9	8	1.1
			7- 8	183.4	182.8	0.0	0.997	0.000	154	7	10	0.7
			8- 9	159.7	159.1	0.0	0.996	0.000	147	10	12	1.4
			9-10	151.6	151.0	0.0	0.996	0.000	144	12	9	1.6
			10-11	157.3	156.7	0.0	0.996	0.000	154	12	8	1.2
			11-12	143.8	143.2	0.0	0.996	0.000	158	9	8	1.0
			12-13						152	11	6	1.3
			13-14	117.3	116.7	0.0	0.995	0.000	154	10	8	1.2
			14-15	133.7	133.1	0.0	0.996	0.000	149	8	6	1.1
			15-16	142.6	142.0	0.0	0.996	0.000	162	8	10	0.7
			16-17	184.5	183.9	0.0	0.997	0.000	166	9	9	0.9
			17-18	214.6	214.0	0.0	0.997	0.000	170	9	15	0.9
			18-19	220.8	218.4	0.0	0.989	0.000	166	11	17	2.1
			19-20	212.3	209.9	0.0	0.989	0.000	181	10	20	3.3
			20-21	205.9	205.3	0.0	0.997	0.000	190	12	20	3.3
			21-22	194.1	191.7	0.0	0.988	0.000	194	12	20	3.6
			22-23	168.4	167.8	0.0	0.996	0.000	193	10	16	0.8
			23-24	153.8	153.2	0.0	0.996	0.000	185	7	12	0.9
82	NOV	2	0- 1	143.8	143.2	0.0	0.996	0.000	182	6	10	0.5
			1- 2	138.0	137.4	0.0	0.996	0.000	187	6	9	0.9
			2- 3	130.4	128.0	0.0	0.982	0.000	184	6	9	0.8
			3- 4	150.2	149.6	0.0	0.996	0.000	184	5	7	0.8
			4- 5	159.7	159.1	0.0	0.996	0.000	182	6	10	1.2
			5- 6	182.0	181.4	0.0	0.997	0.000	178	6	10	0.7
			6- 7	204.2	203.6	0.0	0.997	0.000	180	7	11	0.6
			7- 8	246.5	245.9	0.0	0.998	0.000	177	7	15	1.1
			8- 9	199.9	199.3	0.0	0.997	0.000	184	11	20	3.2
			9-10	180.1	179.5	0.0	0.997	0.000	181	10	16	1.0
			10-11	175.6	175.0	0.0	0.997	0.000	177	8	12	1.0
			11-12	191.1	190.5	0.0	0.997	0.000	172	8	12	0.5
			12-13	188.8	188.2	0.0	0.997	0.000	172	11	15	0.8
			13-14	183.6	183.0	0.0	0.997	0.000	182	13	16	0.7
			14-15	183.5	181.7	0.0	0.990	0.000	185	10	16	1.1
			15-16	208.4	207.8	0.0	0.997	0.000	184	11	15	0.8
			16-17	210.2	209.6	0.0	0.997	0.000	191	10	19	1.5
			17-18	214.6	214.0	0.0	0.997	0.000	191	11	18	5.2
			18-19	231.1	230.5	0.0	0.997	0.000	176	10	18	4.0
			19-20	253.8	251.4	0.0	0.991	0.000	176	10	19	3.5
			20-21	236.0	235.4	0.0	0.997	0.000	180	9	21	3.2
			21-22	219.6	219.0	0.0	0.997	0.000	182	11	21	0.8
			22-23	197.0	196.4	0.0	0.997	0.000	179	12	20	0.5
			23-24	186.5	185.9	0.0	0.997	0.000	180	11	17	0.7



DATE YR MON DY	TIME SPAN	RIVER FLOW	TURBN FLOW	SPILL FLOW	TURBN / RIVER	SPILL / RIVER	DIRECTION MEAN	DIRECTION SD	VELOCITY MEAN	VELOCITY SD
82 NOV 3	0- 1	177.1	174.7	0.0	0.986	0.000	183	10	15	0.5
	1- 2	140.6	140.0	0.0	0.996	0.000	179	9	13	0.6
	2- 3	132.3	131.7	0.0	0.995	0.000	180	6	9	0.6
	3- 4	133.8	133.2	0.0	0.996	0.000	176	5	8	0.5
	4- 5	139.7	139.1	0.0	0.996	0.000	175	6	7	0.5
	5- 6	171.8	171.2	0.0	0.997	0.000	170	6	7	0.4
	6- 7	196.1	193.7	0.0	0.988	0.000	177	7	12	0.9
	7- 8	208.3	207.7	0.0	0.997	0.000	169	6	13	0.5
	8- 9	173.5	172.9	0.0	0.997	0.000	172	10	16	0.8
	9-10	168.4	167.8	0.0	0.996	0.000	181	5	13	0.4
	10-11	149.1	148.6	0.0	0.997	0.000	178	8	12	0.6
	11-12	167.6	167.0	0.0	0.996	0.000	177	6	10	0.7
	12-13	163.5	162.9	0.0	0.996	0.000	163	78	0	0.0
	13-14	160.9	160.3	0.0	0.996	0.000	288	1	0	0.0
	14-15	162.6	160.2	0.0	0.985	0.000				
	15-16	161.0	160.4	0.0	0.996	0.000				
	16-17	169.0	168.4	0.0	0.996	0.000				
	17-18	201.8	201.2	0.0	0.997	0.000				
	18-19	199.5	198.9	0.0	0.997	0.000				
	19-20	187.4	185.0	0.0	0.987	0.000				
	20-21	167.7	167.1	0.0	0.996	0.000				
	21-22	153.7	151.3	0.0	0.984	0.000				
	22-23	130.7	128.3	0.0	0.982	0.000				
	23-24	128.3	125.9	0.0	0.981	0.000				
82 NOV 4	0- 1	110.0	109.4	0.0	0.995	0.000				
	1- 2	105.8	105.2	0.0	0.994	0.000				
	2- 3	96.7	96.1	0.0	0.994	0.000				
	3- 4	87.9	87.3	0.0	0.993	0.000				
	4- 5	95.0	92.6	0.0	0.975	0.000				
	5- 6	120.9	120.3	0.0	0.995	0.000				
	6- 7	148.7	148.1	0.0	0.996	0.000				
	7- 8	176.9	176.3	0.0	0.997	0.000				
	8- 9	171.2	170.6	0.0	0.996	0.000				
	9-10	158.3	157.7	0.0	0.996	0.000				
	10-11	157.5	156.9	0.0	0.996	0.000				
	11-12	150.7	150.1	0.0	0.996	0.000				
	12-13	156.7	156.1	0.0	0.996	0.000				
	13-14	149.2	148.6	0.0	0.996	0.000				
	14-15	157.3	156.7	0.0	0.996	0.000				
	15-16	157.2	156.6	0.0	0.996	0.000				
	16-17	165.0	162.6	0.0	0.985	0.000				
	17-18	200.6	200.0	0.0	0.997	0.000				
	18-19	208.5	207.9	0.0	0.997	0.000				
	19-20	199.3	198.7	0.0	0.997	0.000				
	20-21	192.1	189.7	0.0	0.988	0.000				
	21-22	174.3	173.7	0.0	0.997	0.000				
	22-23	149.5	148.9	0.0	0.996	0.000				
	23-24	131.5	130.9	0.0	0.995	0.000