

Water-Data Report 2009

05325000 MINNESOTA RIVER AT MANKATO, MN

Minnesota Basin
Middle Minnesota Subbasin

LOCATION.--Lat 44°10'08", long 94°00'11" referenced to North American Datum of 1927, in SE ¼ SW ¼ sec.7, T.108 N., R.26 W., Blue Earth County, MN, Hydrologic Unit 07020007, on right bank 300 ft downstream from Memorial bridge in Mankato, 2.0 mi downstream from Blue Earth River and at mile 106.2 upstream from Mississippi River.

DRAINAGE AREA.--14,900 mi².

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May 1903 to current year (no winter records 1904, 1906-10, 1918-29). Monthly discharge only for some periods, published in WSP 1308. Published as "near Mankato": 1903-21.

REVISED RECORDS.--WSP 875: 1917. WSP 955: Drainage area. WSP 1085: 1929. WSP 1238: 1903, 1908, 1919. WSP 1508: 1916(M), 1918(M), 1926(M), 1928, 1930, 1932(M), 1938(M). WDR-MN-76-1: 1881(M).

GAGE.--Water-stage recorder. Datum of gage is 747.92 ft above sea level (NGVD of 1929). Prior to Oct. 19, 1921, nonrecording gage, at site 1.8 mi upstream at datum 6.4 ft higher. Mar. 15, 1922 to Nov. 30, 1924, nonrecording gage, and Dec. 1, 1924 to May 24, 1971, recorder at site 0.2 mi upstream at present datum. May 25, 1971 to Aug. 14, 1977, recorder at site 0.5 mi upstream at present datum. Aug. 14, 1977 to July 27, 1978, nonrecording gage; and from July 28, 1978 to Sept. 30, 1993, recording gage at site 0.7 mi upstream of present site.

REMARKS.--Records good except those for estimated daily discharges, which are fair to poor.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage, 29.9 ft, Apr. 26, 1881, near present site and datum, from floodmark (estimated discharge, 110,000 ft³/s).

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DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	301	1,030	1,460	e816	e610	e1,360	14,200	8,130	2,370	3,260	927	1,030
2	306	973	1,420	e792	e625	e1,400	15,300	7,720	2,240	3,040	782	1,010
3	301	932	1,450	e796	e629	e1,430	16,700	7,400	2,160	2,800	933	994
4	289	835	1,050	e775	e596	e1,490	17,700	7,010	2,100	2,510	898	893
5	288	798	e1,020	e775	e574	e1,470	18,400	6,920	2,040	2,300	799	757
6	282	932	e998	e751	e574	e1,580	18,300	6,680	1,990	2,130	781	646
7	328	980	e955	e743	e582	e1,630	18,100	6,510	2,020	2,030	794	549
8	373	982	e939	e739	e596	e1,740	17,000	6,360	2,290	1,950	706	466
9	394	969	e929	e747	e607	e2,190	16,300	6,600	2,570	1,870	681	420
10	447	1,000	e929	e733	e712	e2,910	15,400	6,530	3,370	1,870	672	406
11	512	1,150	e929	e733	e961	e2,950	14,700	6,550	4,630	1,840	662	385
12	536	1,300	e899	e729	e1,310	e2,830	14,100	6,450	4,780	1,930	717	376
13	607	1,460	e880	e707	e1,610	e3,030	13,700	6,430	4,510	3,100	920	397
14	650	1,740	e899	e686	e1,860	e2,750	13,200	6,160	4,290	3,410	1,070	385
15	677	1,790	e939	e657	e1,770	2,660	12,800	5,810	4,190	3,530	932	368
16	684	1,630	e896	e641	e1,760	2,950	12,600	5,550	4,160	2,990	913	349
17	690	1,740	e889	e625	e1,780	3,710	12,000	5,220	4,150	2,520	892	339
18	676	1,760	e878	e614	e1,890	4,570	11,400	4,980	4,010	2,630	816	329
19	665	1,730	e887	e607	e1,880	5,560	11,000	4,780	4,160	2,550	873	313
20	665	1,720	e905	e602	e1,850	6,610	10,500	4,390	4,180	2,060	1,040	301
21	642	1,520	e901	e599	e1,670	6,810	10,100	4,280	4,090	1,970	1,040	300
22	688	1,220	e882	e596	e1,540	7,160	9,590	4,040	3,970	1,780	1,020	305
23	715	1,150	e890	e596	e1,550	8,030	9,130	3,820	4,120	1,820	988	297
24	726	1,130	e880	e610	e1,590	10,400	8,800	3,600	4,510	1,640	965	297
25	750	1,280	e851	e637	e1,600	12,100	8,450	3,340	4,740	1,520	1,130	341
26	828	1,380	e816	e653	e1,550	13,400	8,280	3,290	4,620	1,420	1,160	339
27	885	1,470	e775	e641	e1,420	13,500	8,170	3,210	4,460	1,350	1,110	350
28	920	1,430	e775	e629	e1,390	12,900	7,930	3,040	4,200	1,180	1,110	417
29	994	1,400	e783	e625	---	12,600	8,070	2,830	3,930	1,090	1,120	490
30	1,050	1,510	e808	e622	---	12,800	8,290	2,640	3,610	1,000	1,100	592
31	1,080	---	e851	e626	---	13,300	---	2,450	---	1,110	1,060	---
Total	18,949	38,941	29,363	21,102	35,086	177,820	380,210	162,720	108,460	66,200	28,611	14,441
Mean	611	1,298	947	681	1,253	5,736	12,670	5,249	3,615	2,135	923	481
Max	1,080	1,790	1,460	816	1,890	13,500	18,400	8,130	4,780	3,530	1,160	1,030
Min	282	798	775	596	574	1,360	7,930	2,450	1,990	1,000	662	297
Ac-ft	37,590	77,240	58,240	41,860	69,590	352,700	754,100	322,800	215,100	131,300	56,750	28,640
Cfs/m	0.04	0.09	0.06	0.05	0.08	0.38	0.85	0.35	0.24	0.14	0.06	0.03
In.	0.05	0.10	0.07	0.05	0.09	0.44	0.95	0.41	0.27	0.17	0.07	0.04

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	1,788	1,618	1,087	703	861	4,526	9,897	6,313	6,531	4,565	2,335	1,683
Max	14,600	8,569	4,770	3,562	5,569	18,230	52,910	25,740	34,230	33,130	23,520	11,070
(WY)	(1969)	(1996)	(1983)	(2006)	(2006)	(1983)	(2001)	(2001)	(1993)	(1993)	(1993)	(1993)
Min	66.1	83.5	80.9	61.5	58.4	132	609	101	194	58.3	37.4	56.6
(WY)	(1934)	(1934)	(1934)	(1940)	(1940)	(1934)	(1931)	(1934)	(1934)	(1934)	(1934)	(1934)

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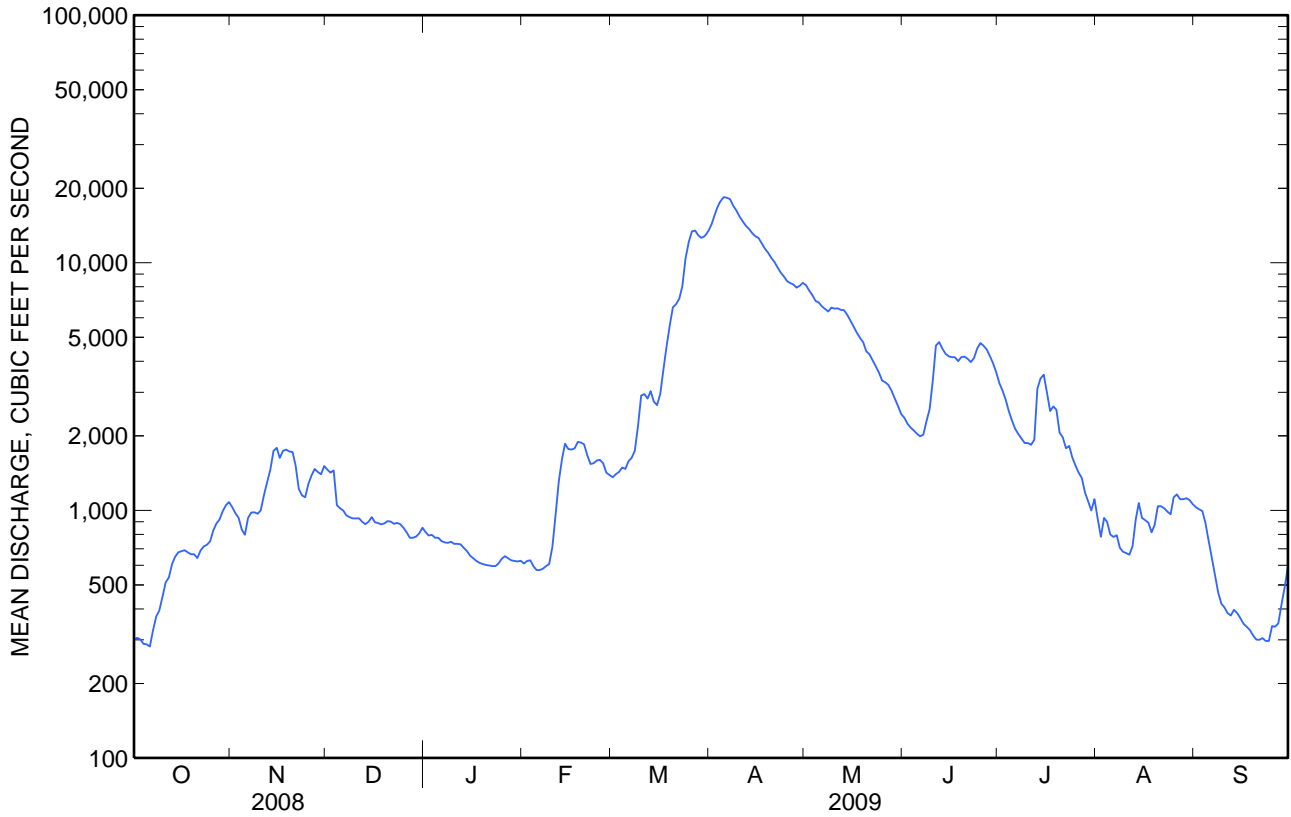
SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1903 - 2009	
Annual total	1,569,310		1,081,903			
Annual mean	4,288		2,964		^a 3,656	
Highest annual mean					14,890	1993
Lowest annual mean					136	1934
Highest daily mean	21,600	May 6	18,400	Apr 5	92,700	Apr 10, 1965
Lowest daily mean	282	Oct 6	282	Oct 6	31	Aug 3, 1934
Annual seven-day minimum	297	Sep 30	299	Oct 1	33	Jul 29, 1934
Maximum peak flow			^b 19,000	Apr 7	94,100	Apr 10, 1965
Maximum peak stage			^b 13.75	Apr 7	30.11	Jun 21, 1993
Instantaneous low flow			275	Oct 6	^c 26	Aug 4, 1934
Annual runoff (ac-ft)	3,113,000		2,146,000		2,648,000	
Annual runoff (cfsm)	0.288		0.199		0.245	
Annual runoff (inches)	3.92		2.70		3.33	
10 percent exceeds	13,200		8,150		9,850	
50 percent exceeds	1,440		1,310		1,350	
90 percent exceeds	580		574		190	

^a Median of annual mean discharges is 3,000 ft³/s.

^b Due in part to regulation.

^c Minimum observed.



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WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963-66, 1968 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE: October 1967 to September 30, 1981, October 1982 to current year (fragmentary records).

SPECIFIC CONDUCTANCE: October 1971 to June 1976, October, 2002 to current year (fragmentary records).

SUSPENDED-SEDIMENT DISCHARGE: October 1967 to current year.

REMARKS.--Specific conductance and water temperature values were obtained by an observer at the time of sediment sampling and approximately monthly by U.S. Geological Survey personnel. Sediment samples were collected up to daily by an observer for October and November, 2007, and from early March to end of water year. In general, daily concentrations and loads for the open-water period are considered fair to poor. During the winter period, when fewer samples were collected, daily sediment concentrations and loads are based primarily on concentrations of sediment in samples that were collected monthly, and on trends of daily water-discharge records. In addition, a sediment transport curve developed using existing data for the 2008 water year was used to help estimate sediment concentrations and loads for some periods. Sediment records for the winter period are considered poor.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum observed, 1,070 $\mu\text{S}/\text{cm}$, Mar. 11, 2008; minimum observed, 288 $\mu\text{S}/\text{cm}$, Mar. 16, 2007.

WATER TEMPERATURE: Maximum observed, 31.5 C, Aug. 6, 2001; minimum observed, 0.0 C on many days most winters.

SEDIMENT CONCENTRATION: Maximum daily mean, 2,850 mg/L, Aug. 7, 1968; minimum daily mean, 9 mg/L, Jan. 15-19, 1991.

SEDIMENT LOAD: Maximum daily, 414,000 tons, June 21, 1993; minimum daily, 5.2 tons, Nov. 6, 1976.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum observed, 1,040 $\mu\text{S}/\text{cm}$, Oct. 18; minimum observed, 471 $\mu\text{S}/\text{cm}$, Aug. 19.

WATER TEMPERATURES: Maximum observed, 28.0 C, July 10; minimum observed, 0.0 C, Feb. 25, (assumed to be 0.0 C, many days during winter).

SEDIMENT CONCENTRATION: Maximum daily mean, 767 mg/L, Mar. 24; minimum daily mean, 12 mg/L, Feb. 25-27.

SEDIMENT LOAD: Maximum daily, 24,400 tons, Mar. 25; minimum daily, 28 tons, Feb. 5.

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**SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY INSTANTANEOUS VALUES**

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	---	---	---	---	---	---	591	---	662	---	---	---
2	---	---	---	---	---	---	---	---	---	---	---	805
3	---	---	---	---	---	---	564	---	677	---	---	798
4	---	833	---	---	---	---	---	735	---	---	---	---
5	---	---	---	---	---	---	572	---	716	---	---	---
6	887	---	---	---	---	---	571	732	---	704	---	---
7	---	---	---	---	---	---	---	---	---	---	---	---
8	---	---	---	---	---	---	584	---	---	---	734	---
9	810	---	---	---	---	---	---	---	662	---	---	---
10	---	---	---	---	---	---	---	666	763	723	---	---
11	---	---	---	---	---	---	617	703	592	---	---	786
12	---	---	---	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	641	---	702	---	---
14	---	---	---	---	---	---	590	---	618	---	783	---
15	---	---	---	---	---	---	559	643	---	686	---	---
16	1,020	---	---	---	---	701	670	---	---	---	---	---
17	---	---	---	---	---	---	---	---	708	696	---	---
18	1,040	---	---	---	---	611	630	670	---	---	---	---
19	---	---	---	---	---	541	---	---	630	---	471	800
20	---	825	---	---	---	---	---	672	626	---	---	---
21	---	---	---	---	---	---	652	---	---	688	636	---
22	---	---	---	---	---	---	---	720	---	---	---	---
23	---	---	---	---	---	618	---	671	---	---	826	---
24	---	882	---	---	---	549	756	---	690	682	---	---
25	---	---	---	---	896	540	---	---	659	---	---	---
26	---	---	---	---	---	---	---	767	---	---	---	808
27	---	---	---	---	---	---	728	721	---	---	---	---
28	---	---	---	---	---	567	---	---	678	---	798	---
29	---	---	---	---	---	---	---	666	692	782	---	---
30	---	---	---	---	---	---	745	---	668	---	---	---
31	---	---	---	---	---	593	---	---	---	---	---	---
Mean	---	---	---	---	---	---	---	---	---	---	---	---
Max	---	---	---	---	---	---	---	---	---	---	---	---
Min	---	---	---	---	---	---	---	---	---	---	---	---

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TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009
DAILY INSTANTANEOUS VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	---	---	---	---	---	---	4.1	---	23.2	---	---	---
2	---	---	---	---	---	---	---	---	---	---	---	19.4
3	---	---	---	---	---	---	6.5	---	---	---	---	24.0
4	---	14.0	---	---	---	---	---	16.0	---	---	---	---
5	---	---	---	---	---	---	5.0	---	22.5	---	---	---
6	19.5	---	---	---	---	---	5.5	17.0	---	27.0	---	---
7	---	---	---	---	---	---	---	---	16.0	---	---	---
8	---	---	---	---	---	---	6.5	---	---	---	22.0	---
9	---	---	---	---	---	---	---	---	16.5	---	---	---
10	13.5	---	---	---	---	---	---	14.5	17.2	28.0	---	---
11	---	---	---	---	---	---	7.0	16.5	17.1	---	---	24.5
12	---	---	---	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	16.5	---	24.8	---	---
14	---	---	---	---	---	---	11.2	---	22.5	---	25.1	---
15	---	---	---	---	---	---	12.1	17.0	---	25.0	---	---
16	13.9	---	---	---	---	4.5	11.6	---	---	---	---	---
17	---	---	---	---	---	---	---	---	23.5	20.0	---	---
18	---	6.8	---	---	---	2.8	14.5	19.0	---	---	---	---
19	---	---	---	---	---	2.5	---	---	24.0	---	---	26.5
20	---	1.2	---	---	---	---	---	22.5	25.5	---	---	---
21	---	---	---	---	---	---	13.0	---	---	23.0	---	---
22	---	---	---	---	---	---	---	20.0	---	---	---	---
23	---	---	---	---	---	4.5	---	19.8	---	---	25.0	---
24	---	0.3	---	---	---	5.5	16.0	---	24.0	26.0	---	---
25	---	---	---	---	0.0	4.2	---	---	25.5	---	---	---
26	---	---	---	---	---	---	---	19.8	---	---	---	---
27	---	---	---	---	---	---	12.0	18.5	---	---	---	---
28	---	---	---	---	---	---	---	---	26.1	---	23.5	---
29	---	---	---	---	---	---	---	22.5	25.0	---	---	---
30	---	---	---	---	---	---	---	---	23.5	---	---	---
31	---	---	---	---	---	4.5	---	---	---	---	---	---
Mean	---	---	---	---	---	---	---	---	---	---	---	---
Max	---	---	---	---	---	---	---	---	---	---	---	---
Min	---	---	---	---	---	---	---	---	---	---	---	---

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SUSPENDED-SEDIMENT
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Mean	Sediment	Mean	Sediment	Mean	Sediment	Mean	Sediment	Mean	Sediment	Mean	Sediment
	concentration (mg/L)	discharge (tons/day)	concentration (mg/L)	discharge (tons/day)	concentration (mg/L)	discharge (tons/day)	concentration (mg/L)	discharge (tons/day)	concentration (mg/L)	discharge (tons/day)	concentration (mg/L)	discharge (tons/day)
	October		November		December		January		February		March	
1	72	56	53	148	43	168	21	46	18	30	13	47
2	56	46	52	137	40	154	21	44	18	30	13	49
3	46	37	50	126	38	147	21	44	18	31	13	51
4	59	38	46	103	36	102	20	43	18	29	13	54
5	60	47	47	101	35	97	20	42	18	28	18	70
6	72	55	63	159	34	92	20	41	18	29	24	103
7	79	70	56	147	34	87	20	40	19	29	38	166
8	86	87	48	126	33	83	20	40	19	30	59	278
9	89	94	47	122	32	80	20	40	19	31	81	476
10	80	96	46	125	31	79	20	39	19	37	83	649
11	68	93	47	146	31	77	20	39	29	74	62	494
12	62	89	51	179	30	73	19	38	44	154	52	399
13	65	105	55	219	29	69	19	37	59	254	52	424
14	52	91	60	282	28	69	19	35	54	270	53	392
15	40	73	68	326	28	70	19	34	37	177	54	384
16	26	49	79	346	27	65	19	33	34	160	58	461
17	22	40	90	422	26	63	19	32	30	146	98	981
18	20	37	102	484	25	60	19	31	27	139	195	2,400
19	18	33	116	542	25	59	18	30	24	123	316	4,740
20	19	35	127	591	24	59	18	30	22	110	363	6,470
21	21	37	107	439	23	56	18	29	20	90	415	7,620
22	23	43	84	278	22	54	18	29	18	74	466	9,010
23	23	45	70	217	22	53	18	29	16	66	533	11,600
24	24	47	65	200	22	52	18	30	14	59	767	21,400
25	27	54	64	219	22	50	18	31	12	53	749	24,400
26	31	69	60	225	22	48	18	32	12	51	632	22,900
27	36	86	56	223	21	45	18	31	12	48	519	18,900
28	44	109	53	204	21	45	18	31	13	47	408	14,200
29	51	137	49	187	21	45	18	30	---	---	365	12,400
30	52	149	46	187	21	46	18	30	---	---	357	12,300
31	53	154	---	---	21	48	18	30	---	---	354	12,700
Total	---	2,201	---	7,210	---	2,295	---	1,090	---	2,399	---	186,518

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SUSPENDED-SEDIMENT
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Mean		Mean		Mean		Mean		Mean		Mean	
	concentration (mg/L)	Sediment discharge (tons/day)	concentration (mg/L)	Sediment discharge (tons/day)	concentration (mg/L)	Sediment discharge (tons/day)	concentration (mg/L)	Sediment discharge (tons/day)	concentration (mg/L)	Sediment discharge (tons/day)	concentration (mg/L)	Sediment discharge (tons/day)
	April		May		June		July		August		September	
1	405	15,400	161	3,540	148	946	151	1,330	66	164	65	182
2	384	15,800	158	3,290	144	871	142	1,160	68	143	66	180
3	347	15,600	154	3,080	135	786	133	1,010	70	177	70	187
4	330	15,800	150	2,840	123	697	124	839	72	176	70	168
5	322	16,000	141	2,640	110	607	115	713	75	161	68	139
6	318	15,700	133	2,400	101	546	106	612	77	163	67	116
7	477	23,200	146	2,570	95	517	102	559	79	170	65	96
8	481	22,200	165	2,840	89	546	99	524	81	155	63	80
9	200	8,820	184	3,280	84	583	97	488	82	150	62	70
10	182	7,570	200	3,530	110	1,020	94	475	81	147	60	66
11	175	6,930	165	2,910	187	2,350	100	497	81	145	59	61
12	209	7,950	160	2,790	188	2,420	110	575	81	156	58	59
13	247	9,120	173	3,000	156	1,890	118	985	80	199	58	62
14	286	10,200	173	2,890	126	1,460	147	1,360	80	231	57	59
15	317	11,000	167	2,620	122	1,380	183	1,740	79	198	57	56
16	227	7,700	160	2,400	126	1,420	162	1,320	77	191	56	53
17	245	7,970	154	2,170	136	1,520	125	854	76	184	55	51
18	292	9,000	147	1,980	163	1,770	120	853	75	165	55	49
19	290	8,580	146	1,880	209	2,360	123	849	74	174	55	46
20	280	7,940	146	1,730	229	2,590	126	702	73	205	55	45
21	269	7,300	137	1,590	249	2,750	129	683	72	201	56	46
22	236	6,120	125	1,370	271	2,900	129	619	70	194	58	47
23	197	4,850	141	1,460	292	3,250	128	631	69	185	59	47
24	158	3,750	132	1,280	302	3,670	127	563	69	179	60	48
25	143	3,270	112	1,010	242	3,090	115	471	68	208	61	56
26	138	3,090	94	835	208	2,600	101	390	68	212	57	52
27	134	2,950	104	904	182	2,190	88	319	68	203	66	62
28	140	3,000	108	885	156	1,770	74	236	67	201	90	101
29	151	3,290	107	821	148	1,570	62	182	67	202	126	167
30	161	3,600	119	849	155	1,510	61	166	66	197	160	256
31	---	---	134	888	---	---	63	191	66	189	---	---
Total	---	283,700	---	66,272	---	51,579	---	21,896	---	5,625	---	2,707

Total
suspended
sediment
discharge
(tons)

Year 633,492

05325000 MINNESOTA RIVER AT MANKATO, MN—Continued

WATER-QUALITY DATA
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Part 1 of 1

Date	Time	Sample type code	Medium code	Suspnd. sedimnt sieve diametr percent <0.0625 mm (70331)
Oct				
30...	1143	9	WS	82
30...	1147	9	WS	70
30...	1159	9	WS	83
Apr				
01...	1304	9	WS	44
Jul				
29...	1418	9	WS	92
Sep				
02...	1155	9	WS	98