

Water-Data Report 2009

06089000 SUN RIVER NEAR VAUGHN, MT

Upper Missouri Basin
Sun Subbasin

LOCATION.--Lat 47°31'33", long 111°30'40" referenced to North American Datum of 1927, in SE ¼ SW ¼ sec.32, T.21 N., R.2 E., Cascade County, MT, Hydrologic Unit 10030104, on right bank 2.3 mi downstream from Muddy Creek, 2.8 mi southeast of Vaughn, and at river mile 15.0.

DRAINAGE AREA.--1,849 mi².

SURFACE-WATER RECORDS

PERIOD OF RECORD.--April 1934 to current year. Monthly discharge for some months published in Water Supply Paper (WSP) 1309. Gage heights and discharge measurements only from July to October 1897 published as "near Great Falls."

REVISED RECORDS.-- WSP 786: 1934. WSP 1729: Drainage area. Water Data Report MT-03-1: Drainage area.

GAGE.--Water-stage recorder. Elevation of gage is 3,340 ft, referenced to the National Geodetic Vertical Datum of 1929. July 11 to Oct. 30, 1897, nonrecording gage at site 0.6 mi downstream at different elevation. Apr. 19 to Aug. 3, 1934, non-recording gage 1.4 mi downstream at different elevation. Aug. 4, 1934 to Oct. 15, 2002, water-stage recorder 1.4 mi downstream at different elevation.

REMARKS.--Records are good except for estimated daily discharges, which are poor. Flow is regulated by Gibson, Pishkun, Willow Creek, and Nilan Reservoirs. Diversion for irrigation of about 110,000 acres occurs upstream from station. U.S. Army Corps of Engineers satellite telemeter is located at the station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 1964 exceeded the stage of the June 1908 flood by about 3 ft and is the highest since 1908, from information by local residents.

06089000 SUN RIVER NEAR VAUGHN, MT—Continued

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	496	371	340	e310	e360	e380	320	812	4,140	486	737	546
2	449	371	340	e290	e400	e390	315	1,110	4,160	500	675	516
3	430	374	329	e260	e400	e400	333	1,710	2,900	544	696	539
4	404	364	e300	e280	e420	e350	343	2,030	1,600	604	635	527
5	397	372	e280	e300	e440	e320	325	2,260	1,060	640	644	542
6	376	360	e300	e330	e450	e300	317	2,240	907	650	665	598
7	360	353	e360	e360	e460	e310	315	2,100	976	701	839	583
8	330	354	e430	e400	e430	e340	316	2,040	1,120	672	1,440	508
9	351	352	e390	e380	e410	e300	324	1,990	1,220	677	1,130	475
10	376	348	e400	e360	e410	e260	328	1,950	1,040	699	909	457
11	412	347	e420	e370	e400	e250	327	1,930	735	716	789	490
12	434	343	e400	e370	e400	e290	321	1,710	552	624	740	506
13	452	347	e350	e360	e370	e330	315	1,330	522	678	631	533
14	446	361	e250	e350	e340	370	305	945	558	535	589	554
15	415	350	e270	e350	e320	405	314	877	842	463	654	480
16	439	343	e300	e380	e360	465	330	860	1,300	493	693	457
17	439	336	e320	e400	e380	372	322	852	1,580	612	686	424
18	424	331	e330	e380	e380	346	312	862	1,510	637	681	401
19	411	328	e340	e360	e370	340	306	1,200	1,340	605	623	382
20	412	328	e320	e340	e340	332	304	2,020	1,220	639	619	387
21	418	339	e280	e320	e330	333	300	2,340	1,210	576	572	443
22	407	331	e290	e290	e340	337	299	2,460	1,100	420	557	473
23	405	325	e300	e270	e360	314	293	2,510	1,400	439	568	511
24	397	313	e310	e250	e370	301	336	2,540	1,240	433	574	465
25	394	332	e320	e240	e320	293	365	2,800	999	479	544	366
26	406	337	e340	e220	e280	280	355	3,330	839	442	562	372
27	405	314	e350	e240	e340	274	354	3,430	795	473	549	417
28	406	325	e370	e300	e380	294	387	3,610	797	658	548	548
29	397	343	e360	e320	---	309	670	3,830	738	804	561	572
30	392	340	e360	e340	---	295	769	3,870	513	770	548	678
31	382	---	e340	e360	---	302	---	3,850	---	777	558	---
Total	12,662	10,332	10,389	10,080	10,560	10,182	10,520	65,398	38,913	18,446	21,216	14,750
Mean	408	344	335	325	377	328	351	2,110	1,297	595	684	492
Max	496	374	430	400	460	465	769	3,870	4,160	804	1,440	678
Min	330	313	250	220	280	250	293	812	513	420	544	366
Ac-ft	25,120	20,490	20,610	19,990	20,950	20,200	20,870	129,700	77,180	36,590	42,080	29,260

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1934 - 2009, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	374	334	297	254	263	317	478	1,549	2,466	763	558	438
Max	779	908	896	656	601	868	3,000	4,333	8,014	2,508	1,025	1,040
(WY)	(1952)	(1990)	(1996)	(1986)	(1986)	(1969)	(1934)	(1976)	(1964)	(1975)	(1975)	(1993)
Min	143	149	114	66.5	82.4	133	93.3	87.1	280	265	250	164
(WY)	(1937)	(1937)	(1936)	(1937)	(1936)	(1941)	(1941)	(1941)	(1941)	(1939)	(1940)	(1936)

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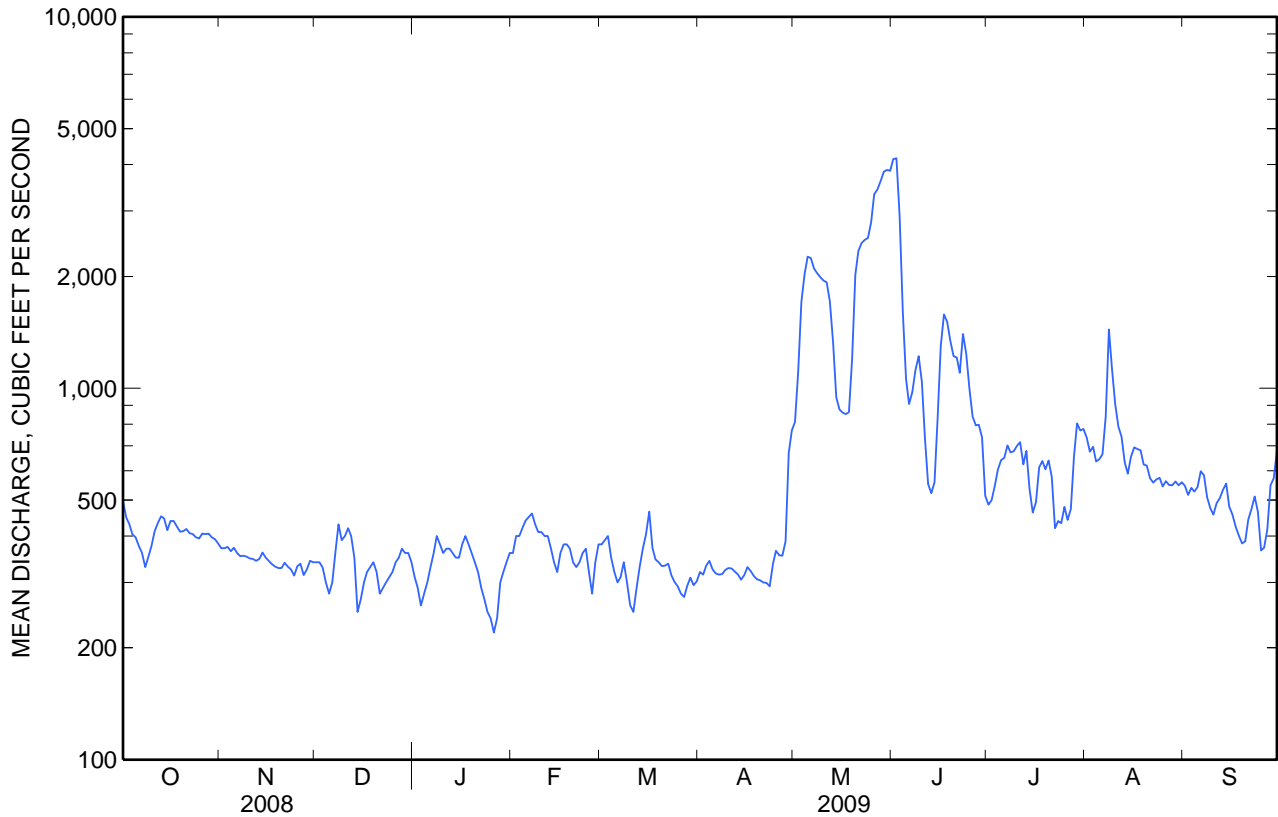
SUMMARY STATISTICS

	Calendar Year 2008		Water Year 2009		Water Years 1934 - 2009	
Annual total	263,549		233,448			
Annual mean	720		640		669	
Highest annual mean					1,307	1943
Lowest annual mean					210	1941
Highest daily mean	7,810	May 27	4,160	Jun 2	37,000	Jun 10, 1964
Lowest daily mean	90	Jan 21	220	Jan 26	23	May 26, 1941
Annual seven-day minimum	99	Jan 23	259	Jan 22	38	May 21, 1941
Maximum peak flow			4,250	Jun 2	^a 53,500	Jun 9, 1964
Maximum peak stage			4.58	Jun 2	^b 23.40	Jun 9, 1964
Instantaneous low flow					^c 20	Apr 24, 1944
Annual runoff (ac-ft)	522,700		463,000		484,700	
10 percent exceeds	2,270		1,210		1,350	
50 percent exceeds	350		400		355	
90 percent exceeds	154		303		178	

^a42,200 ft³/s in main channel plus 11,300 ft³/s in bypass channel.

^bFrom floodmark.

^cGage height, 0.52 ft, result of irrigation, site and datum then in use.



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WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1969 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1968 to September 2003.

WATER TEMPERATURE: October 1968 to September 1979, August 1999 to September 2003, October 2004 to current year.

INSTRUMENTATION.--Water temperature probe was installed in August 1999.

REMARKS.--Daily water temperature records are rated excellent to good, on site backup data was used from Aug 9 to Sep 25 due to the Met One probe being buried in the sediment. Backup data was rated good. Several unpublished observations of specific conductance and water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 2,610 microsiemens per centimeter ($\mu\text{S}/\text{cm}$) at 25°C, Apr. 8, 1977; minimum daily, 214 $\mu\text{S}/\text{cm}$ at 25°C, June 8, 1970.

WATER TEMPERATURE: Maximum, 29.5°C, July 14 and 18, 2002; minimum, 0.0°C on many days during winter.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURE: Maximum, 23.5°C, July 23 and 26; minimum, 0.0°C, many days November through March.

WATER-QUALITY DATA
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Part 1 of 2

[Remark codes: <, less than; E, estimated.]

Date	Time	Temperature, air, deg C (00020)	Instantaneous dis- charge, ft ³ /s (00061)	pH, water, unfltrd field, std units (00400)	Specific conduc- tance, wat un- f $\mu\text{S}/\text{cm}$ @ 25 deg C (00095)	Temperature, water, deg C (00010)	Ammonia water, fltrd, mg/L as N (00608)	Nitrate + nitrite water, fltrd, mg/L as N (00631)	Nitrite water, fltrd, mg/L as N (00613)	Ortho- phos- phate, water, fltrd, mg/L as P (00671)	Phos- phorus, water, unfltrd mg/L as P (00665)	Total nitro- gen, wat un- f by anal- ysis, mg/L (62855)	Selen- ium, water, unfltrd $\mu\text{g}/\text{L}$ (01147)
Nov 18...	1530	18.0	336	8.4	680	5.5	<.020	.908	.004	<.008	E.007	1.00	.76
Jan 28...	1445	2.0	300	8.3	675	.0	E.011	.854	.004	E.004	E.005	.90	.77
Mar 17...	1400	10.0	320	8.5	598	1.5	E.014	.988	.004	<.008	.012	1.10	1.3
Apr 28...	1600	1.0	387	8.5	605	4.5	.021	.382	.008	E.004	.010	.49	.81
May 28...	1915	25.0	3,730	8.3	310	14.5	<.020	.249	E.001	E.004	.129	.59	.27
Jun 23...	1545	26.0	1,530	8.5	437	15.5	<.020	.403	.010	E.005	.276	.85	.48
Jul 16...	1915	31.0	526	8.5	634	21.5	<.020	.675	.005	.018	.082	1.01	.85
Jul 30...	1145	21.0	747	8.5	610	17.0	<.020	.519	.009	E.006	.174	1.07	.78
Aug 11...	1345	30.0	798	8.5	608	20.0	<.020	.525	.004	E.008	.098	.88	.69

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WATER-QUALITY DATA
WATER YEAR OCTOBER 2008 TO
SEPTEMBER 2009

Part 2 of 2

[Remark codes: <, less than; E, estimated.]

Date	Suspnd. sedimnt sieve diametr percent <0.0625 mm (70331)	Sus- pended sedi- ment concen- tration mg/L (80154)	Sus- pended sedi- ment dis- charge, tons/d (80155)
Nov			
18...	77	34	31
Jan			
28...	83	15	12
Mar			
17...	95	10	8.6
Apr			
28...	98	8	8.4
May			
28...	66	227	2,290
Jun			
23...	94	254	1,050
Jul			
16...	95	63	89
30...	98	140	282
Aug			
11...	97	72	155

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TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
	October			November			December			January		
1	13.5	12.0	13.0	8.0	7.0	7.5	3.5	1.5	2.5	0.0	0.0	0.0
2	14.5	13.0	13.5	8.5	8.0	8.5	3.5	1.5	2.5	0.0	0.0	0.0
3	15.0	13.5	14.0	8.5	6.5	7.5	1.5	0.0	1.0	0.0	0.0	0.0
4	14.5	13.5	14.0	6.5	5.5	6.0	0.0	0.0	0.0	0.0	0.0	0.0
5	13.5	11.5	12.5	6.0	5.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0
6	11.5	10.0	10.5	5.0	4.0	4.5	0.5	0.0	0.0	0.0	0.0	0.0
7	11.0	9.5	10.0	5.0	4.0	4.5	1.0	0.0	0.5	0.0	0.0	0.0
8	9.5	8.5	9.0	6.0	4.5	5.5	1.5	0.5	1.0	0.0	0.0	0.0
9	8.5	6.5	7.5	6.5	5.5	6.0	0.5	0.0	0.5	0.0	0.0	0.0
10	6.5	5.0	6.0	6.0	5.0	6.0	1.0	0.0	0.5	0.0	0.0	0.0
11	5.0	4.5	4.5	5.0	4.0	4.5	1.0	0.0	0.5	0.0	0.0	0.0
12	4.5	3.5	4.0	5.0	3.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0
13	5.0	3.0	4.0	5.5	4.5	5.0	0.0	0.0	0.0	0.0	0.0	0.0
14	7.0	5.0	6.0	4.5	3.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0
15	7.0	6.0	6.5	4.5	3.5	4.0	0.0	0.0	0.0	0.0	0.0	0.0
16	7.0	6.0	6.5	5.0	4.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0
17	8.0	6.5	7.5	4.5	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
18	10.0	8.0	9.0	5.5	4.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
19	10.0	9.5	9.5	5.5	3.5	5.0	0.0	0.0	0.0	0.0	0.0	0.0
20	9.5	8.5	9.0	3.5	2.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
21	9.0	7.0	8.0	2.5	1.5	2.0	0.0	0.0	0.0	0.0	0.0	0.0
22	7.0	5.5	6.0	2.0	1.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
23	6.0	5.5	5.5	1.5	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0
24	5.5	4.5	5.0	1.5	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0
25	6.5	5.0	6.0	2.5	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
26	6.0	4.5	5.5	3.0	1.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0
27	4.5	3.5	4.5	1.5	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0
28	6.0	4.0	5.0	1.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
29	7.5	6.0	6.5	1.5	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0
30	8.5	7.5	8.0	2.0	1.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
31	8.0	7.0	7.5	---	---	---	0.0	0.0	0.0	0.0	0.0	0.0
Month	15.0	3.0	7.9	8.5	0.0	4.0	3.5	0.0	0.3	0.0	0.0	0.0

06089000 SUN RIVER NEAR VAUGHN, MT—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
	February			March			April			May		
1	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.0	4.0	8.5	5.0	7.0
2	0.0	0.0	0.0	0.0	0.0	0.0	5.5	3.5	4.5	9.5	7.5	8.5
3	0.0	0.0	0.0	1.0	0.0	0.5	7.0	4.0	5.5	10.5	7.5	9.0
4	0.0	0.0	0.0	2.5	1.0	1.5	5.5	4.5	5.0	10.5	8.5	9.5
5	0.0	0.0	0.0	1.5	0.0	1.0	7.0	4.0	5.5	10.0	9.0	9.5
6	0.0	0.0	0.0	0.5	0.0	0.0	8.5	5.5	7.0	9.5	7.5	8.0
7	0.0	0.0	0.0	1.0	0.0	0.0	10.5	7.5	9.0	9.0	8.0	8.5
8	0.0	0.0	0.0	0.0	0.0	0.0	11.5	9.5	10.5	10.0	8.0	9.0
9	0.0	0.0	0.0	0.0	0.0	0.0	11.5	9.5	10.5	10.5	8.5	9.5
10	0.0	0.0	0.0	0.0	0.0	0.0	12.0	9.5	10.5	10.5	8.5	9.5
11	0.0	0.0	0.0	0.0	0.0	0.0	13.0	10.5	11.5	10.5	9.0	10.0
12	0.0	0.0	0.0	0.0	0.0	0.0	12.5	10.5	11.5	10.5	9.0	9.5
13	0.0	0.0	0.0	0.0	0.0	0.0	12.0	10.5	11.0	9.5	7.0	8.5
14	0.0	0.0	0.0	0.5	0.0	0.0	10.5	7.5	9.5	11.5	9.0	10.5
15	0.0	0.0	0.0	0.5	0.0	0.0	7.5	6.0	6.5	13.0	11.0	12.0
16	0.0	0.0	0.0	0.5	0.0	0.0	7.0	5.5	6.0	14.0	11.0	12.5
17	0.0	0.0	0.0	1.5	0.0	0.5	9.0	5.5	7.5	14.0	12.5	13.0
18	0.0	0.0	0.0	3.0	1.0	2.0	11.5	9.0	10.0	15.0	11.0	13.0
19	0.0	0.0	0.0	3.5	1.5	2.5	13.0	10.5	11.5	16.5	14.0	15.5
20	0.0	0.0	0.0	5.5	2.5	3.5	13.5	11.0	12.5	15.5	12.0	13.5
21	0.0	0.0	0.0	6.5	4.0	5.5	15.5	12.0	14.0	12.0	10.0	11.0
22	0.0	0.0	0.0	6.0	4.5	5.5	15.0	12.5	14.0	12.5	10.5	11.5
23	0.0	0.0	0.0	5.5	4.0	4.5	12.5	7.5	10.0	14.0	11.5	12.5
24	0.0	0.0	0.0	6.0	4.0	5.0	8.5	6.0	7.5	13.5	12.0	13.0
25	0.0	0.0	0.0	4.5	1.5	3.5	7.5	6.5	7.0	12.5	11.0	11.5
26	0.0	0.0	0.0	3.5	1.0	2.0	7.5	6.5	7.0	13.0	11.0	12.0
27	0.0	0.0	0.0	3.5	1.0	2.0	8.0	6.0	7.5	13.0	12.0	12.5
28	0.0	0.0	0.0	5.0	2.5	3.5	6.0	3.0	4.5	13.0	12.0	12.5
29	---	---	---	4.5	2.5	3.5	3.0	1.0	2.0	13.0	12.5	12.5
30	---	---	---	4.5	1.0	2.5	6.0	1.5	3.5	13.0	12.5	13.0
31	---	---	---	4.5	2.5	3.5	---	---	---	13.0	12.5	13.0
Month	0.0	0.0	0.0	6.5	0.0	1.7	15.5	1.0	8.2	16.5	5.0	11.0

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TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2008 TO SEPTEMBER 2009

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
	June			July			August			September		
1	13.0	11.5	12.5	20.0	18.0	18.5	21.0	19.0	20.0	20.0	17.5	19.0
2	11.5	10.5	11.0	20.5	17.0	19.0	22.0	20.0	21.0	21.0	18.0	19.5
3	11.0	10.5	10.5	21.0	18.5	19.5	21.5	20.0	21.0	20.5	18.5	19.5
4	13.5	11.0	12.0	20.0	17.5	19.0	21.5	19.5	20.5	19.5	18.0	19.0
5	16.0	13.5	15.0	20.5	19.0	20.0	20.0	18.5	19.5	18.5	16.5	17.5
6	15.5	10.0	12.5	21.0	18.5	20.0	19.5	18.0	18.5	18.5	17.0	17.5
7	10.0	9.0	9.5	18.5	16.5	17.5	18.5	17.5	18.0	17.5	15.5	16.5
8	10.5	9.5	10.0	17.5	16.0	17.0	17.5	16.0	16.5	15.5	14.0	15.0
9	12.0	9.5	10.5	17.0	15.5	16.0	19.0	16.0	17.0	15.0	13.0	14.0
10	15.0	11.5	13.0	18.5	16.5	17.5	20.0	18.0	19.0	16.0	14.0	15.0
11	16.5	14.0	15.5	19.5	18.0	18.5	20.5	19.0	20.0	16.0	14.5	15.0
12	18.5	15.5	17.0	20.5	18.5	19.5	20.5	19.0	20.0	16.0	14.0	15.0
13	19.5	17.0	18.5	20.5	19.0	20.0	19.5	18.0	19.0	16.0	14.5	15.5
14	19.5	18.0	19.0	19.0	17.5	18.0	18.5	17.0	17.5	16.0	14.5	15.5
15	19.0	17.0	18.0	20.5	17.5	19.0	17.0	15.5	16.0	17.5	15.0	16.0
16	19.0	17.0	18.0	21.5	19.0	20.0	16.0	15.0	15.5	18.0	16.0	17.0
17	18.5	16.0	17.0	21.5	20.0	21.0	17.0	15.0	16.0	18.5	16.5	18.0
18	17.0	16.0	16.5	22.0	20.5	21.5	19.0	17.0	18.0	19.0	17.0	18.0
19	17.0	15.0	16.0	22.5	21.0	22.0	20.5	18.5	19.0	19.0	17.0	18.0
20	16.5	14.5	15.5	22.0	20.5	21.5	20.5	18.5	19.5	18.5	14.5	16.5
21	16.0	13.5	14.5	22.0	20.0	21.5	21.5	18.5	20.0	14.5	13.0	13.5
22	16.5	15.5	16.0	23.0	20.0	22.0	22.5	20.0	21.5	14.5	12.5	13.5
23	16.0	14.0	15.0	23.5	20.5	22.0	21.5	18.5	20.0	15.0	13.5	14.5
24	18.0	15.0	16.5	23.0	20.5	21.5	19.5	17.0	18.5	17.0	14.0	15.5
25	19.5	17.5	18.5	22.5	20.5	21.5	20.0	17.5	18.5	17.0	14.5	16.0
26	19.5	18.0	18.5	23.5	20.5	22.0	20.5	18.0	19.0	16.0	14.0	15.0
27	19.0	17.5	18.0	22.0	20.5	21.0	20.5	18.0	19.5	14.5	12.5	13.5
28	19.5	17.5	18.5	20.5	17.5	19.0	19.5	17.5	18.5	12.5	11.0	11.5
29	20.5	18.5	19.5	17.5	16.5	17.0	20.0	17.5	18.5	13.0	11.0	12.0
30	21.0	19.0	20.0	18.5	16.5	17.5	19.5	17.5	18.5	12.5	10.0	11.5
31	---	---	---	19.5	18.0	19.0	20.0	18.0	19.0	---	---	---
Month	21.0	9.0	15.4	23.5	15.5	19.6	22.5	15.0	18.8	21.0	10.0	15.8