

Naval Air Warfare Center Weapons Division

Point Mugu,
CA 93042-5001

NAWCWPNS TM 7667

2

AD-A276 036



Tidal and Lunar Data For Point Mugu, San Nicolas Island, and The Barking Sands Area During 1994

by
Charles Fisk
and
Bernard Cohenour
Geophysics Division
Range Operations Department

DTIC
C

DECEMBER 1993

Approved for Public Release; Distribution is Unlimited

94 2 16 024

94-05155



FOREWORD

This publication combines a single source for all tidal and lunar data for operational locations of the Naval Air Warfare Center for use in Calendar Year 1994.

Mr. R. Helvey, Head Geophysics Analysis Branch; Mr. C. Fisk and Mr. B. Cohenour, Task Engineers; Mr. J.S. Rosenthal, Head, Geophysics Division; Mr. W. Leslie, Associate Range Operations Officer; CAPT M.D. Barrett, Range Operations Officer; and Dr. R.J. Warnagieris, Director, Sea Range Directorate, have approved this report for publication.

J. Rosenthal, Head
Geophysics Division
Range Operations Department
31 December 1993

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE DECEMBER 1993	3. REPORT TYPE AND DATES COVERED Annual		
4. TITLE AND SUBTITLE Tidal and Lunar Data for Point Mugu, San Nicolas Island, and the Barking Sands Area During 1994		5. FUNDING NUMBERS		
6. AUTHOR(S) Charles J. Fisk and Bernard C. Cohenour				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Air Warfare Center Weapons Division Geophysics Division, Code P354 Point Mugu, CA 93042-5001		8. PERFORMING ORGANIZATION REPORT NUMBER NAWCWPNS TM 7667		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSORING/MONITORING AGENCY REPORT NUMBER		
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited		12b. DISTRIBUTION CODE		
13. ABSTRACT (Maximum 200 words) Basic lunar and tidal data for Point Mugu, San Nicolas Island and the Barking Sands area during 1994 are provided. The data presented are: (1) Tidal data; (2) times of moonrise and moonset; (3) times of lunar phases; and (4) times of sunrise and sunset.				
14. SUBJECT TERMS Barking Sands, Hawaii Point Mugu, CA		San Nicolas Island, CA Tide Tables		15. NUMBER OF PAGES 39
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED		16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED		20. LIMITATION OF ABSTRACT

CONTENTS

Introduction	3
Data Source and Time References	3
Tidal Data	4
Lunar Data	4
Appendixes	
A. Height of the Tide at Any Time	A-1
B. Equinoxes, Solstices, and Lunar Phases During 1994	B-1
C. Sunrise and Sunset Tables	C-1
Figures	
A-1. Tidal Curve for Solution to Problem	A-4
Tables	
1. Tidal Ranges for Point Mugu and San Nicolas Island	4
2. Tidal Ranges for Port Allen	4
3. Moonrise and Moonset, Point Mugu, 1994	5
4. Point Mugu Tides, January 1994	6
5. Point Mugu Tides, February 1994	6
6. Point Mugu Tides, March 1994	7
7. Point Mugu Tides, April 1994	7
8. Point Mugu Tides, May 1994	8
9. Point Mugu Tides, June 1994	8
10. Point Mugu Tides, July 1994	9
11. Point Mugu Tides, August 1994	9
12. Point Mugu Tides, September 1994	10
13. Point Mugu Tides, October 1994	10
14. Point Mugu Tides, November 1994	11
15. Point Mugu Tides, December 1994	11
16. San Nicolas Island Tides, January 1994	12
17. San Nicolas Island Tides, February 1994	12
18. San Nicolas Island Tides, March 1994	13
19. San Nicolas Island Tides, April 1994	13
20. San Nicolas Island Tides, May 1994	14
21. San Nicolas Island Tides, June 1994	14
22. San Nicolas Island Tides, July 1994	15
23. San Nicolas Island Tides, August 1994	15
24. San Nicolas Island Tides, September 1994	16
25. San Nicolas Island Tides, October 1994	16
26. San Nicolas Island Tides, November 1994	17
27. San Nicolas Island Tides, December 1994	17

CONTENTS

Tables: (Cont.)

28. Moonrise and Moonset, Barking Sands 1994	18
29. Port Allen Tides, January 1994	19
30. Port Allen Tides, February 1994	19
31. Port Allen Tides, March 1994	20
32. Port Allen Tides, April 1994	20
33. Port Allen Tides, May 1994	21
34. Port Allen Tides, June 1994	21
35. Port Allen Tides, July 1994	22
36. Port Allen Tides, August 1994	22
37. Port Allen Tides, September 1994	23
38. Port Allen Tides, October 1994	23
39. Port Allen Tides, November 1994	24
40. Port Allen Tides, December 1994	24
A-1. Height of the Tide at Any Time	A-2
B-1. Equinoxes, Solstices, and Lunar Phases 1994	B-2
C-1. Sunrise and Sunset for Point Mugu (January-June)	C-2
C-2. Sunrise and Sunset for Point Mugu (July-December)	C-3
C-3. Sunrise and Sunset for Barking Sands (January-June)	C-4
C-4. Sunrise and Sunset for Barking Sands (July-December)	C-5

NAWCWPNS TM 7667

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Date	
Library Codes	
Dist	Avail and/or Special
A-1	

INTRODUCTION

This publication combines a single source for all tidal and lunar data for operational locations of the Naval Air Warfare Center Weapons Division for use in Calendar Year 1994.

The data presentations are in two main divisions: one for Point Mugu and San Nicolas Island, and the other for the Barking Sands area. Within each division, the times of moonrise and moonset and tidal data are given. Appendixes provide information on lunar phases, sunrise and sunset times and calculation of the tide at any time. This publication is issued annually. Information regarding this data may be obtained from the Geophysics Division of the Range Operations Department.

Special tidal data requests (ranges, heights at any time, and/or graphical depictions of each) for Point Mugu, San Nicolas Island, or Barking Sands, as well as for other locations, can be made by contacting the authors of this report at the Naval Air Warfare Center Weapons Division (805) 989-8383.

DATA SOURCE AND TIME REFERENCES

The data given here have been prepared from information contained in Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1994 published by the National Ocean Service.

For Point Mugu and San Nicolas Island, all times listed are Pacific Standard Time (PST), add eight hours to obtain Universal Coordinated Time (UCT or Z). When Daylight Savings Time (PDT) is in effect, one hour is to be added to the times given. In 1994, Pacific Daylight Time is scheduled to commence at 0200 PST on Sunday, 3 April, and to end at 0200 PDT on Sunday, 30 October.

For the Barking Sands Area, all times listed are Alaska-Hawaii Standard Time (AHST); add ten hours to obtain UCT. Daylight Savings Time is not observed in Hawaii.

TIDAL DATA

The ranges of tidal heights that may be expected at Point Mugu and San Nicolas Island are shown in Table 1. The range of heights for the primary harbor in the Barking Sands area, Port Allen, is shown in Table 2. The times and height of high and low tides for 1994 at Point Mugu are given in Tables 4 through 15, and at San Nicolas Island in Tables 16 through 27. Similar tide data for Port Allen are given in Tables 29 through 40.

TABLE 1. Tidal Ranges for Point Mugu and San Nicolas Island

Point Mugu		
Tidal Levels	Height (Ft)	Occurrence
Extreme high water	8.52	2018, May 24
Mean tide level (mean sea level)	2.74	
Extreme low water	-1.66	0336, May 25
Tidal Ranges	Height	Occurrence
Maximum	8.48	Dec 03
Minimum	1.42	Mar 18

San Nicolas Island		
Tidal Levels	Height (Ft)	Occurrence
Extreme high water	6.30	0848, Dec 03
Mean tide level (mean sea level)	2.51	
Extreme low water	-1.52	0824, May 24
Tidal Ranges	Height	Occurrence
Maximum	7.78	Feb 07
Minimum	1.31	Feb 20

TABLE 2. Tidal Ranges for Port Allen

Tidal Levels	Height (Ft)
Extreme high water	2.6
Mean higher high water	1.6
Mean high water	1.2
Mean tide level (mean sea level)	0.7
Mean low water	0.2
Mean lower low water	0.0
Extreme low water	-0.4

These tables list the times and heights of high and low tide for each month of the year and chronologically through each day. The heights are all measured from mean lower low water and are values for a sea unaffected by wind waves or swell. The height and character of the sea surface are influenced by factors other than the predictable positions of the moon and sun, and thus are likely to be higher or lower than computed values indicate.

LUNAR DATA

Times of moonrise and moonset for the Point Mugu-San Nicolas Island area in 1994 are given in Table 3, and for the Barking Sands area in Table 28, preceding the tidal data for the respective stations. Information regarding the phases of the moon in 1994 is found in Appendix B.

TABLE 3. Moonrise and Moonset, Point Mugu, 1994

Location: W119 07', N34 07'			Point Mugu, California Rise and Set for the Moon for 1994												Astronomical Applications Dept. U.S. Naval Observatory Washington, D.C. 20392-5420											
			Pacific Standard Time																							
Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.			
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set		
01	2119	0926	2334	0953	2230	0833	0953	1045	0013	1227	1302	0010	1428	0205	1521	0405	1546	0510	1555							
02	2223	1001	1035	2337	0918	0025	1053	0032	1145	0043	1322	0019	1357	0054	1519	0308	1559	0515	1630	0619	1653					
03	2329	1037	0040	1120	1008	0113	1154	0108	1243	0114	1416	0054	1451	0143	1608	0414	1636	0626	1719	0725	1756					
04	1113	0145	1210	0040	1102	0155	1254	0141	1339	0145	1510	0132	1544	0237	1654	0424	1728	0521	1716	0737	1814	0824	1902			
05	0035	1152	0246	1305	0138	1200	0233	1352	0211	1434	0218	1605	0214	1637	0335	1737	0529	1806	0630	1758	0844	1914	0917	2008		
06	0141	1234	0342	1404	0229	1259	0307	1449	0241	1528	0255	1659	0301	1728	0435	1818	0635	1843	0741	1843	0945	2017	1002	2113		
07	0248	1322	0432	1505	0315	1359	0338	1544	0312	1622	0334	1752	0352	1816	0537	1856	0742	1923	0850	1934	1039	2122	1042	2216		
08	0352	1414	0516	1606	0355	1458	0409	1639	0344	1716	0418	1844	0448	1900	0640	1932	0850	2005	0957	2030	1126	2225	1118	2315		
09	0453	1512	0556	1706	0431	1557	0439	1733	0418	1811	0507	1933	0546	1941	0745	2008	0958	2051	1100	2129	1207	2327	1152			
10	0549	1614	0631	1804	0505	1653	0510	1827	0455	1904	0600	2019	0647	2020	0850	2045	1105	2142	1156	2230	1244		1224	0013		
11	0638	1716	0704	1902	0536	1749	0542	1922	0536	1957	0656	2102	0748	2056	0955	2124	1208	2237	1245	2332	1318	0026	1256	0109		
12	0721	1818	0734	1957	0606	1844	0617	2016	0622	2048	0754	2141	0851	2131	1102	2206	1307	2335	1329		1350	0124	1328	0204		
13	0759	1918	0805	2052	0636	1939	0655	2109	0711	2135	0854	2218	0954	2207	1208	2253	1400		1407	0034	1422	0220	1403	0258		
14	0833	2017	0835	2147	0708	2033	0738	2201	0804	2220	0955	2254	1058	2243	1313	2344	1447	0036	1443	0134	1454	0315	1440	0352		
15	0904	2113	0907	2241	0741	2128	0824	2251	0901	2301	1057	2329	1203	2323	1415		1529	0138	1516	0232	1527	0409	1521	0445		
16	0934	2208	0941	2336	0817	2221	0915	2337	0959	2340	1200		1309		1512	0040	1606	0239	1547	0329	1603	0504	1606	0537		
17	1004	2303	1018		0856	2315	1009		1100		1305	0004	1416	0006	1603	0140	1641	0339	1619	0425	1641	0557	1654	0627		
18	1034	2357	1059	0030	0940		1107	0021	1202	0016	1412	0042	1521	0054	1649	0243	1714	0438	1652	0520	1723	0650	1746	0714		
19	1107		1145	0123	1028	0006	1208	0102	1306	0052	1520	0123	1623	0149	1730	0346	1746	0535	1726	0615	1809	0741	1840	0758		
20	1142	0052	1237	0215	1121	0056	1310	0141	1411	0128	1629	0210	1719	0248	1807	0448	1818	0631	1803	0709	1858	0830	1936	0839		
21	1221	0147	1333	0305	1218	0142	1415	0218	1519	0205	1735	0302	1810	0351	1841	0549	1851	0727	1842	0803	1951	0916	2034	0917		
22	1305	0241	1434	0352	1319	0226	1522	0255	1630	0246	1836	0401	1855	0456	1914	0647	1926	0822	1926	0855	2045	0958	2132	0953		
23	1355	0335	1539	0435	1423	0308	1632	0333	1740	0331	1931	0504	1934	0600	1946	0745	2004	0916	2012	0945	2142	1038	2232	1027		
24	1450	0428	1645	0516	1529	0347	1743	0413	1850	0422	2019	0609	2010	0702	2018	0841	2045	1009	2103	1033	2240	1115	2333	1101		
25	1550	0517	1753	0555	1637	0425	1855	0457	1955	0519	2101	0714	2043	0802	2052	0936	2129	1101	2156	1118	2339	1150		1137		
26	1654	0602	1902	0633	1747	0503	2006	0545	2053	0620	2138	0817	2115	0900	2127	1031	2218	1151	2252	1159		1225	0036	1214		
27	1759	0645	2011	0711	1858	0542	2113	0639	2144	0725	2212	0918	2146	0957	2206	1125	2310	1238	2350	1239	0041	1301	0141	1255		
28	1906	0724	2121	0751	2010	0624	2213	0738	2228	0829	2244	1016	2219	1052	2248	1218		1322	1316		0144	1338	0248	1341		
29	2013	0801			2120	0710	2306	0840	2306	0932	2315	1113	2253	1147	2335	1309	0005	1404	0050	1352	0250	1418	0506	1434		
30	2120	0838			2228	0800	2352	0943	2341	1033	2346	1208	2329	1241		1359	0104	1443	0153	1429	0359	1504	0502	1533		
31	2227	0915			2329	0855				1131			1335		0026	1446			0258	1506			0605	1637		

Add one hour for daylight time, if and when in use.

TABLE 4. Point Mugu Tides, January 1994

January 1994

Mugu Lagoon (Ocean Piers), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time
* - Alternate Data Source (Port Huemene)

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	5.55	0454	1.94	1042	5.23	1754	-0.32
2	4.43	0018	4.26	0534	1.95	1138	4.59
3	3.73	0106	4.43	0718	1.90	1236	3.85
4	3.41	0200	4.45	0854	1.63	1406	3.19
5	3.07	0306	4.94	1030	1.07	1612	2.88
6	4.93	0412	3.28	1148	0.35	1754	3.01
7	6.00	0512	5.66	1248	-0.34	1906	3.30
8	6.90	0606	6.02	1336	-0.88	1954	3.60
9	7.53	0706	1.94	0454	6.30	1418	-1.23
10	7.83	0810	1.81	0536	6.45	1454	-1.39
11	7.9	0901	1.7	0612	6.6	1518	-1.3
12	7.5	0944	1.7	0652	6.4	1553	-1.1
13	6.9	0326	1.7	0730	6.1	0627	-0.8
14	6.1	0409	1.7	1007	5.8	1659	-0.3
15	5.1	0453	1.8	1045	5.0	1730	0.1
16	3.7	0007	1.9	0342	2.0	1124	4.4
17	3.2	0047	4.4	0445	2.1	1210	3.7
18	2.7	0133	4.4	0808	2.1	1316	3.1
19	2.5	0237	4.4	0954	1.9	1515	2.7
20	3.1	0328	4.3	1119	1.6	1734	2.7
21	3.73	0436	4.31	1230	0.78	1854	2.83
22	4.55	0518	4.03	1306	0.28	1930	3.11
23	5.35	0600	5.18	1336	-0.17	1954	3.36
24	6.08	0636	2.14	0442	5.53	1406	-0.55
25	6.87	0718	1.91	0718	5.83	1436	-0.84
26	7.04	0816	1.66	0754	6.03	1506	-1.02
27	7.12	0916	1.42	0836	6.08	1542	-1.04
28	6.84	0318	1.22	0918	5.94	1612	-0.91
29	6.18	0354	1.10	0954	5.59	1640	-0.60
30	5.18	0454	1.05	1042	5.03	1718	-0.14
31	3.91	0548	1.07	1130	4.33	1754	0.42

TABLE 5. Point Mugu Tides, February 1994

February 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	3.83	0024	4.85	0654	1.11	1236	3.56
2	3.86	0118	4.88	0836	1.02	1412	2.94
3	4.26	0230	4.94	1018	0.67	1624	2.79
4	4.95	0342	5.09	1136	0.14	1806	3.06
5	5.72	0454	5.35	1236	-0.37	1906	3.42
6	6.38	0554	5.63	1324	-0.75	1948	3.74
7	6.80	0042	1.79	0648	5.84	1354	-0.96
8	6.94	0130	1.52	0730	5.93	1436	-1.00
9	6.80	0212	1.29	0812	5.89	1506	-0.91
10	6.41	0248	1.13	0842	5.71	1536	-0.70
11	5.80	0324	1.04	0912	5.41	1554	-0.39
12	5.02	0354	1.03	0940	5.00	1630	-0.02
13	4.10	0436	1.09	1018	4.51	1654	0.41
14	3.46	0510	1.22	1054	3.96	1718	0.87
15	2.05	0606	1.38	1142	3.38	1742	1.32
16	2.67	0012	4.21	0712	1.54	1236	2.81
17	2.54	0054	4.10	0848	1.56	1436	2.39
18	2.77	0206	4.04	1042	1.27	1812	2.51
19	3.34	0336	4.15	1148	0.81	1848	2.84
20	4.11	0448	4.44	1230	0.33	1900	3.14
21	4.92	0530	4.82	1306	-0.10	1924	3.46
22	5.67	0018	1.99	0818	5.21	1336	-0.46
23	6.26	0106	1.56	0700	5.54	1406	-0.72
24	6.59	0142	1.12	0742	5.75	1436	-0.83
25	6.58	0224	0.70	0824	5.78	1506	-0.79
26	6.18	0306	0.35	0906	5.61	1542	-0.58
27	5.46	0354	0.13	0954	5.22	1612	-0.20
28	5.23	0442	0.06	1042	4.65	1648	0.30
29							
30							
31							

TABLE 6. Point Mugu Tides, March 1994

March 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	5.07	0542	0.13	1142	3.97	1730	0.87
2	3.03	0648	0.29	1248	3.32	1812	1.46
3	4.63	0042	5.01	0818	0.38	1430	2.90
4	4.56	0154	4.82	0954	0.27	1630	2.96
5	4.80	0324	4.77	1112	-0.02	1754	3.30
6	5.21	0442	4.90	1212	-0.31	1848	3.66
7	5.57	0548	5.08	1254	-0.49	1924	3.97
8	5.75	0042	1.51	0642	5.21	1336	-0.54
9	5.72	0124	1.15	0724	5.25	1406	-0.47
10	5.48	0206	0.86	0754	5.18	1436	-0.31
11	5.09	0236	0.64	0836	5.01	1454	-0.08
12	4.56	0312	0.50	0900	4.76	1524	0.20
13	4.38	0342	0.43	0936	4.44	1548	0.53
14	4.22	0418	0.45	1006	4.06	1612	0.88
15	4.01	0454	0.55	1042	3.64	1630	1.25
16	3.68	0536	0.72	1130	3.18	1654	1.62
17	3.29	0630	0.92	1230	2.75	1718	1.98
18	1.42	0742	1.05	1424	2.48	1736	2.32
19	3.02	0054	4.02	0924	1.00	1724	2.64
20	3.21	0224	3.94	1042	0.72	1754	2.96
21	3.70	0354	4.08	1136	0.38	1818	3.30
22	4.33	0454	4.38	1212	0.06	1836	3.69
23	4.92	0548	4.73	1248	-0.20	1900	4.12
24	5.36	0048	1.12	0636	5.01	1324	-0.35
25	5.55	0130	0.50	0724	5.19	1354	-0.37
26	5.66	0212	-0.06	0818	5.19	1430	-0.24
27	6.19	0254	-0.51	0854	5.02	1506	0.02
28	6.55	0348	-0.76	0954	4.68	1542	0.39
29	6.52	0436	-0.82	1048	4.22	1624	0.85
30	6.13	0536	-0.68	1148	3.72	1706	1.35
31	3.73	0636	-0.43	1306	3.30	1754	1.84

TABLE 7. Point Mugu Tides, April 1994

April 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	5.25	0018	5.07	0754	-0.18	1436	3.14
2	4.72	0124	4.68	0918	-0.05	1612	3.30
3	4.47	0254	4.42	1036	-0.05	1718	3.62
4	4.44	0418	4.37	1136	-0.07	1806	3.95
5	4.46	0524	4.41	1218	-0.05	1842	4.24
6	4.42	0036	1.21	0624	4.45	1254	0.05
7	4.45	0118	0.81	0712	4.44	1330	0.21
8	4.40	0154	0.48	0748	4.37	1354	0.41
9	4.71	0224	0.23	0824	4.25	1418	0.64
10	4.95	0254	0.04	0854	4.08	1442	0.88
11	5.07	0330	-0.06	0930	3.08	1506	1.13
12	5.02	0406	-0.07	1006	3.63	1530	1.39
13	4.83	0442	0.00	1042	3.36	1554	1.67
14	4.52	0518	0.13	1136	3.08	1624	1.96
15	4.12	0606	0.31	1242	2.85	1654	2.24
16	2.30	0706	0.46	1406	2.76	1736	2.50
17	3.63	0006	4.17	0818	0.54	1548	2.91
18	3.43	0124	3.94	0924	0.50	1642	3.21
19	3.46	0254	3.85	1024	0.39	1718	3.60
20	3.78	0418	3.95	1112	0.28	1742	4.06
21	4.36	0518	4.14	1154	0.21	1812	4.57
22	4.88	0030	0.70	0618	4.34	1236	0.21
23	5.61	0118	-0.03	0712	4.47	1318	0.29
24	6.63	0206	-0.67	0812	4.49	1354	0.46
25	7.32	0254	-1.14	0854	4.40	1436	0.70
26	7.59	0342	-1.39	0954	4.20	1518	1.01
27	7.42	0430	-1.41	1048	3.95	1554	1.35
28	6.86	0524	-1.23	1154	3.69	1648	1.72
29	6.03	0624	-0.91	1254	3.52	1748	2.07
30	4.04	0730	-0.53	1418	3.51	1912	2.31

TABLE 8. Point Mugu Tides, May 1994

May 1994

Mugu Lagoon (Ocean Pier), CA

34° 06' 0" North, 119° 06' 0" West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.77	0054	4.58	0836	-0.19	1530	3.67
2	4.04	0218	4.12	0942	0.08	1630	3.94
3	3.91	0342	3.85	1042	0.31	1718	4.22
4	3.96	0500	3.73	1130	0.52	1754	4.48
5	3.97	0624	3.70	1212	0.73	1830	4.70
6	4.26	0106	0.64	0654	3.68	1242	0.94
7	4.78	0142	0.28	0742	3.66	1312	1.14
8	5.20	0218	-0.02	0818	3.63	1342	1.32
9	5.51	0248	-0.23	0854	3.58	1406	1.49
10	5.67	0318	-0.37	0930	3.50	1436	1.66
11	5.69	0354	-0.43	1006	3.41	1506	1.83
12	5.57	0430	-0.41	1048	3.30	1536	2.02
13	5.31	0506	-0.33	1136	3.20	1606	2.21
14	4.93	0548	-0.20	1236	3.15	1648	2.40
15	4.45	0636	-0.03	1336	3.19	1742	2.57
16	3.21	0724	0.14	1436	3.35	1906	2.63
17	3.75	0842	0.06	0824	0.31	1530	3.64
18	3.59	0206	3.74	0918	0.46	1612	4.04
19	3.93	0342	3.57	1012	0.60	1654	4.53
20	4.32	0454	3.58	1106	0.73	1730	5.06
21	5.20	0018	0.38	0606	3.70	1154	0.87
22	6.41	0112	-0.37	0706	3.84	1236	1.01
23	7.38	0154	-1.01	0806	3.94	1324	1.15
24	7.97	0248	-1.45	0906	3.99	1412	1.30
25	8.13	0336	-1.66	0954	3.99	1454	1.47
26	7.85	0424	-1.64	1048	3.94	1548	1.66
27	7.19	0512	-1.42	1142	3.89	1636	1.88
28	6.24	0554	-1.05	1242	3.86	1736	2.10
29	4.49	0654	-0.59	1342	3.89	1848	2.25
30	4.66	0030	4.55	0748	-0.11	1436	4.01
31	3.83	0130	3.93	0842	0.36	1536	4.19

TABLE 9. Point Mugu Tides, June 1994

June 1994

Mugu Lagoon (Ocean Pier), CA

34° 06' 0" North, 119° 06' 0" West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	3.63	0254	3.45	0936	0.77	1624	4.40
2	3.50	0424	3.19	1024	1.12	1706	4.62
3	3.72	0006	1.12	0536	3.12	1112	1.40
4	4.38	0054	0.67	0648	3.16	1154	1.62
5	4.97	0130	0.27	0736	3.24	1230	1.78
6	5.47	0206	-0.06	0818	3.32	1306	1.88
7	5.86	0236	-0.32	0854	3.39	1336	1.95
8	6.12	0312	-0.51	0930	3.44	1412	2.01
9	6.23	0342	-0.62	1000	3.48	1442	2.08
10	6.19	0418	-0.65	1036	3.51	1518	2.15
11	5.96	0448	-0.61	1118	3.55	1554	2.24
12	5.54	0524	-0.40	1200	3.61	1648	2.33
13	4.93	0606	-0.27	1248	3.72	1742	2.40
14	3.90	0648	0.01	1336	3.91	1854	2.37
15	3.83	0024	4.15	0730	0.35	1424	4.18
16	3.82	0136	3.64	0824	0.72	1518	4.54
17	4.01	0312	3.27	0918	1.06	1606	4.97
18	4.10	0454	3.17	1018	1.35	1654	5.44
19	5.71	0012	0.20	0612	3.30	1118	1.53
20	6.80	0106	-0.51	0712	3.53	1212	1.63
21	7.63	0154	-1.06	0806	3.75	1306	1.66
22	8.09	0242	-1.42	0854	3.93	1354	1.66
23	8.14	0324	-1.56	0948	4.07	1448	1.67
24	7.78	0406	-1.49	1030	4.15	1536	1.72
25	7.05	0448	-1.23	1118	4.20	1624	1.82
26	6.05	0530	0.03	1206	4.22	1718	1.95
27	4.87	0612	0.33	1248	4.24	1818	2.09
28	4.06	0654	0.22	1342	4.28	1930	2.16
29	3.58	0048	3.85	0736	0.77	1424	4.35
30	3.10	0200	3.25	0824	1.28	1518	4.46
						2054	2.07
						2230	1.76

TABLE 10. Point Mugu Tides, July 1994

July 1994

Hugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	3.32	0336	2.88	0912	1.70	1612	4.63
2	2.82	0524	2.82	1012	2.01	1654	4.83
3	4.24	0036	0.84	0642	2.96	1106	2.19
4	4.91	0118	0.41	0736	3.15	1154	2.26
5	5.51	0148	0.04	0812	3.33	1242	2.24
6	6.01	0224	-0.26	0842	3.50	1318	2.19
7	6.38	0254	-0.49	0912	3.65	1354	2.11
8	6.57	0324	-0.64	0942	3.79	1430	2.04
9	6.55	0354	-0.69	1012	3.92	1512	1.98
10	6.28	0424	-0.63	1042	4.06	1554	1.95
11	5.73	0454	-0.46	1118	4.19	1636	1.94
12	4.92	0530	-0.17	1154	4.34	1736	1.94
13	4.28	0606	0.23	1242	4.51	1842	1.90
14	4.00	0012	4.13	0648	0.71	1330	4.70
15	3.74	0130	3.49	0736	1.21	1430	4.94
16	4.49	0312	3.07	0836	1.66	1530	5.24
17	5.88	0506	3.05	0948	1.97	1636	5.60
18	6.79	0054	0.48	0624	3.31	1054	2.08
19	7.43	0148	-0.90	0806	3.92	1206	2.03
20	7.71	0230	-1.14	0842	4.17	1354	1.88
21	7.62	0306	1.17	0910	4.36	1436	1.58
22	7.17	0348	-1.03	0954	4.49	1524	1.52
23	6.41	0418	-0.73	1036	4.56	1606	1.55
24	5.42	0454	-0.31	1112	4.59	1654	1.64
25	4.38	0524	0.18	1154	4.56	1742	1.78
26	3.79	0554	0.72	1230	4.51	1842	1.92
27	3.20	0012	3.80	0630	1.27	1318	4.46
28	2.67	0112	3.20	0706	1.77	1400	4.44
29	3.02	0300	2.79	0754	2.21	1506	4.50
30	2.16	0518	2.80	0906	2.52	1606	4.67

TABLE 11. Point Mugu Tides, August 1994

August 1994

Hugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	3.90	0006	1.03	0636	3.05	1036	2.63
2	4.64	0048	0.60	0712	3.30	1136	2.56
3	5.33	0124	0.22	0748	3.54	1224	2.39
4	5.91	0154	-0.10	0818	3.77	1306	2.17
5	6.32	0224	-0.33	0842	4.01	1342	1.93
6	6.53	0254	-0.48	0906	4.24	1418	1.69
7	6.46	0324	-0.50	0936	4.47	1454	1.49
8	6.07	0354	-0.39	1000	4.69	1542	1.33
9	5.38	0424	-0.14	1030	4.87	1630	1.25
10	4.77	0454	0.24	1106	5.01	1724	1.23
11	4.36	0530	0.73	1148	5.10	1824	1.25
12	3.92	0006	3.96	0612	1.28	1248	5.14
13	4.19	0136	3.36	0654	1.82	1348	5.18
14	4.74	0336	3.10	0812	2.26	1506	5.29
15	5.46	0524	3.28	0948	2.46	1618	5.51
16	6.40	0630	3.64	1112	2.35	1724	5.80
17	6.40	0048	-0.34	0712	3.99	1212	2.08
18	6.78	0130	-0.58	0748	4.30	1306	1.76
19	6.84	0212	-0.66	0818	4.55	1348	1.48
20	6.60	0242	-0.58	0848	4.75	1430	1.26
21	6.08	0312	-0.36	0918	4.88	1506	1.14
22	5.34	0342	-0.04	0954	4.94	1548	1.12
23	4.58	0412	0.36	1024	4.94	1624	1.18
24	4.07	0436	0.81	1054	4.88	1706	1.31
25	3.48	0506	1.29	1124	4.77	1754	1.49
26	2.95	0530	1.76	1154	4.62	1824	1.67
27	2.74	0042	3.18	0554	2.20	1248	4.47
28	2.84	0242	2.83	0630	2.59	1348	4.37
29	3.27	0524	2.97	0806	2.90	1512	4.42
30	1.74	0618	3.26	1012	2.91	1624	4.66
31	4.21	0012	0.77	0642	3.55	1124	2.68

TABLE 12. Point Mugu Tides, September 1994

September 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.89	0048	0.42	0706	3.83	1212	2.34
2	5.46	0118	0.14	0736	4.14	1248	1.94
3	5.85	0142	-0.06	0754	4.46	1330	1.52
4	5.99	0212	-0.15	0824	4.80	1406	1.10
5	5.83	0242	-0.12	0848	5.12	1448	0.75
6	5.35	0312	0.06	0918	5.39	1530	0.49
7	5.21	0348	0.38	0948	5.58	1618	0.37
8	5.27	0424	0.81	1024	5.65	1712	0.38
9	5.10	0454	1.32	1112	5.60	1818	0.50
10	4.83	0518	3.79	0542	1.85	1206	5.44
11	4.67	0148	3.39	0642	2.35	1318	5.24
12	4.79	0354	3.39	0818	2.67	1442	5.14
13	5.12	0518	3.70	0954	2.62	1606	5.21
14	3.10	0612	4.08	1118	2.28	1718	5.39
15	5.61	0024	-0.08	0648	4.43	1218	1.85
16	5.71	0106	-0.13	0724	4.72	1306	1.43
17	5.56	0142	-0.06	0754	4.96	1342	1.09
18	5.20	0212	0.13	0812	5.13	1424	0.83
19	4.86	0236	0.38	0836	5.25	1454	0.68
20	4.67	0306	0.69	0900	5.29	1530	0.62
21	4.62	0330	1.04	0936	5.27	1606	0.65
22	4.42	0354	1.41	0954	5.19	1642	0.76
23	4.09	0418	1.78	1030	5.04	1724	0.95
24	3.68	0442	2.16	1054	4.84	1818	1.16
25	3.28	0506	3.16	0506	2.51	1136	4.60
26	3.04	0530	2.97	0530	2.84	1236	4.37
27	3.10	0506	3.16	0718	3.12	1354	4.23
28	3.44	0536	3.46	0948	3.05	1530	4.31
29	3.93	0554	3.77	1054	2.67	1636	4.54
30	2.66	0618	4.12	1154	2.17	1730	4.83

TABLE 13. Point Mugu Tides, October 1994

October 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.66	0024	0.43	0642	4.52	1230	1.59
2	4.95	0054	0.31	0712	4.95	1312	0.98
3	5.08	0130	0.30	0736	5.38	1354	0.41
4	5.83	0206	0.40	0812	5.77	1436	-0.06
5	6.44	0236	0.61	0842	6.06	1524	-0.38
6	6.72	0312	0.93	0918	6.21	1612	-0.50
7	6.62	0354	1.33	0954	6.18	1706	-0.44
8	6.20	0436	1.78	1042	5.97	1806	-0.23
9	5.60	0500	3.77	0524	2.24	1136	5.61
10	5.01	0200	3.61	0636	2.63	1248	5.20
11	4.63	0336	3.75	0824	2.76	1418	4.87
12	4.49	0448	4.08	1006	2.52	1548	4.74
13	4.45	0536	4.45	1118	2.04	1654	4.75
14	3.25	0618	4.78	1218	1.53	1754	4.77
15	4.63	0030	0.42	0648	5.05	1254	1.07
16	4.66	0106	0.61	0718	5.26	1336	0.70
17	5.00	0136	0.83	0742	5.42	1412	0.42
18	5.27	0154	1.00	0800	5.52	1448	0.24
19	5.41	0224	1.34	0824	5.56	1518	0.15
20	5.39	0248	1.60	0848	5.54	1554	0.15
21	5.22	0312	1.86	0918	5.45	1630	0.23
22	4.92	0336	2.13	0948	5.30	1706	0.38
23	4.50	0406	2.41	1018	5.08	1754	0.58
24	4.04	0030	3.23	0436	2.68	1054	4.81
25	3.61	0154	3.17	0518	2.95	1142	4.50
26	3.28	0336	3.32	0654	3.15	1254	4.20
27	3.15	0430	3.61	0906	3.04	1418	4.02
28	3.23	0454	3.96	1036	2.58	1548	4.04
29	3.62	0524	4.39	1130	1.94	1700	4.19
30	3.66	0554	4.87	1218	1.21	1754	4.38
31	4.91	0012	0.76	0624	5.38	1254	0.47

TABLE 14. Point Mugu Tides, November 1994

November 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht	Time	Ht
1	6.09	0048	0.82	0654	5.87	1342	-0.21	1948	4.61
2	7.05	0124	0.95	0736	6.29	1430	-0.75	2036	4.59
3	7.66	0206	1.13	0812	6.57	1518	-1.09	2130	4.47
4	7.86	0248	1.37	0854	6.66	1606	-1.20	2224	4.28
5	7.63	0330	1.67	0942	6.54	1654	-1.09	2324	4.07
6	7.02	0418	1.99	1024	6.20	1754	-0.82		
7	6.15	0504	3.91	0518	2.32	1118	5.70	1854	-0.45
8	5.18	0136	3.89	0636	2.58	1224	5.11	1954	-0.07
9	4.30	0254	4.04	0812	2.62	1342	4.56	2106	0.26
10	3.78	0400	4.32	0948	2.33	1518	4.17	2206	0.54
11	3.85	0454	4.64	1106	1.83	1636	3.99	2254	0.78
12	3.91	0536	4.93	1206	1.30	1748	3.93	2348	1.02
13	4.36	0612	5.18	1254	0.82	1842	3.91		
14	4.95	0624	1.25	0642	5.38	1330	0.43	1930	3.89
15	5.40	0054	1.47	0706	5.53	1406	0.12	2012	3.86
16	5.73	0124	1.65	0736	5.64	1436	-0.09	2042	3.82
17	5.92	0154	1.82	0754	5.70	1512	-0.22	2118	3.75
18	5.98	0218	1.96	0824	5.71	1542	-0.27	2154	3.67
19	5.89	0248	2.11	0848	5.65	1618	-0.24	2236	3.58
20	5.66	0318	2.27	0924	5.52	1654	-0.14	2324	3.48
21	5.30	0348	2.45	0854	5.32	1730	0.02		
22	4.83	0012	3.42	0424	2.64	1030	5.04	1812	0.21
23	4.26	0106	3.43	0518	2.81	1112	4.68	1854	0.42
24	3.63	0206	3.55	0630	2.93	1206	4.27	1948	0.64
25	3.02	0306	3.79	0818	2.81	1324	3.85	2042	0.84
26	3.14	0354	4.15	0954	2.36	1454	3.58	2142	1.01
27	3.45	0424	4.60	1106	1.66	1630	3.53	2236	1.15
28	4.26	0506	5.11	1154	0.86	1742	3.66	2324	1.26
29	5.60	0542	5.65	1254	0.05	1848	3.84		
30	6.82	0012	1.35	0624	6.16	1336	-0.66	1948	4.01

TABLE 15. Point Mugu Tides, December 1994

December 1994

Mugu Lagoon (Ocean Pier), CA

34° 06.0' North, 119° 06.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht	Time	Ht
1	7.78	0054	1.42	0712	6.57	1424	-1.20	2042	4.13
2	8.35	0142	1.49	0754	6.83	1512	-1.53	2130	4.19
3	8.48	0230	1.59	0842	6.87	1554	-1.61	2218	4.20
4	8.15	0318	1.71	0924	6.69	1642	-1.46	2312	4.17
5	7.41	0412	1.89	1012	6.29	1730	-1.13		
6	6.36	0006	4.15	0506	2.08	1100	5.70	1824	-0.66
7	5.11	0100	4.16	0618	2.26	1154	4.99	1912	-0.13
8	3.85	0200	4.24	0736	2.33	1300	4.26	2012	0.41
9	3.50	0300	4.40	0918	2.16	1424	3.64	2106	0.90
10	3.31	0400	4.61	1048	1.74	1606	3.29	2206	1.30
11	3.61	0454	4.84	1154	1.22	1730	3.20	2254	1.60
12	4.33	0530	5.06	1242	0.73	1842	3.26	2342	1.82
13	4.96	0606	5.26	1324	0.31	1930	3.36		
14	5.48	0024	1.96	0642	5.44	1354	-0.03	2012	3.46
15	5.89	0054	2.03	0712	5.60	1430	-0.29	2048	3.54
16	6.19	0130	2.07	0742	5.72	1454	-0.46	2118	3.60
17	6.36	0206	2.09	0806	5.79	1530	-0.57	2148	3.64
18	6.38	0236	2.11	0836	5.79	1554	-0.59	2218	3.67
19	6.23	0306	2.15	0906	5.70	1630	-0.53	2254	3.69
20	5.98	0342	2.21	0942	5.51	1706	-0.39	2336	3.72
21	5.38	0424	2.30	1018	5.21	1736	-0.17		
22	4.67	0018	3.79	0512	2.38	1054	4.79	1812	0.12
23	3.79	0054	3.90	0612	2.42	1142	4.27	1854	0.48
24	3.22	0148	4.09	0736	2.34	1248	3.69	1942	0.87
25	3.12	0242	4.37	0918	1.98	1424	3.18	2036	1.25
26	3.41	0336	4.75	1048	1.33	1612	2.99	2142	1.56
27	4.66	0424	5.21	1154	0.54	1742	3.13	2248	1.73
28	5.94	0518	5.71	1248	-0.24	1854	3.41	2348	1.77
29	7.09	0606	6.18	1336	-0.90	1948	3.71		
30	7.95	0042	1.71	0654	6.57	1418	-1.39	2036	3.97
31	8.44	0136	1.61	0748	6.79	1454	-1.65	2124	4.17

TABLE 16. San Nicolas Island Tides, January 1994

January 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	5.09	0506	1.78	1054	4.79	1800	-0.29
2	4.06	0030	3.90	0606	1.79	1142	4.21
3	3.42	0118	4.06	0724	1.74	1248	3.53
4	3.13	0212	4.27	0900	1.49	1418	2.92
5	3.54	0318	4.53	1042	0.98	1618	2.64
6	4.52	0418	4.84	1154	0.32	1806	2.76
7	5.50	0518	5.19	1254	-0.31	1912	3.03
8	6.33	0612	5.52	1348	-0.80	2006	3.30
9	6.90	0048	1.78	0854	5.78	1430	-1.13
10	7.18	0142	1.66	0742	5.91	1506	-1.27
11	4.16	0448	4.71	1200	0.55	1754	2.98
12	4.82	0542	4.92	1254	0.10	1906	3.12
13	5.33	0006	1.62	0624	5.09	1342	-0.24
14	5.67	0054	1.68	0706	5.21	1418	-0.46
15	5.85	0130	1.69	0742	5.27	1454	-0.58
16	5.88	0212	1.68	0812	5.27	1530	-0.60
17	5.78	0248	1.67	0842	5.22	1554	-0.56
18	5.54	0318	1.67	0912	5.09	1630	-0.45
19	5.16	0354	1.69	0948	4.88	1654	-0.27
20	4.62	0430	1.75	1018	4.59	1724	-0.03
21	3.42	0442	4.13	1236	0.72	1906	2.60
22	4.17	0530	4.42	1312	0.26	1942	2.85
23	4.90	0612	4.75	1342	-0.15	2006	3.08
24	5.57	0042	1.96	0854	5.07	1412	-0.50
25	6.11	0124	1.75	0730	5.34	1448	-0.77
26	6.46	0206	1.52	0806	5.53	1518	-0.93
27	6.53	0248	1.30	0842	5.57	1554	-0.96
28	6.27	0330	1.12	0924	5.44	1624	-0.83
29	5.67	0412	1.00	1006	5.12	1654	-0.55
30	4.74	0506	0.96	1048	4.61	1730	-0.13
31	3.58	0554	0.98	1142	3.97	1806	-0.38

TABLE 17. San Nicolas Island Tides, February 1994

February 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	3.51	0036	4.45	0706	1.02	1248	3.27
2	3.53	0130	4.47	0842	0.94	1424	2.70
3	3.91	0242	4.52	1024	0.62	1636	2.56
4	4.54	0354	4.67	1148	0.13	1812	2.81
5	5.25	0506	4.90	1248	0.34	1912	3.13
6	5.84	0606	5.16	1336	-0.69	1954	3.43
7	6.23	0054	1.64	0854	5.35	1412	-0.88
8	6.36	0142	1.39	0736	5.44	1448	-0.92
9	6.23	0224	1.18	0818	5.40	1518	-0.83
10	5.87	0254	1.03	0854	5.23	1542	-0.64
11	5.32	0330	0.95	0924	4.96	1606	-0.36
12	4.60	0406	0.94	0954	4.58	1636	-0.01
13	3.76	0442	1.00	1030	4.13	1700	0.38
14	3.17	0524	1.12	1106	3.63	1730	0.79
15	1.88	0618	1.27	1148	3.10	1754	1.21
16	2.45	0018	3.86	0724	1.41	1242	2.58
17	2.33	0106	3.76	0854	1.43	1442	2.19
18	2.54	0212	3.71	1054	1.16	1618	2.31
19	3.87	0342	3.80	1154	0.74	1854	2.60
20	3.77	0454	4.07	1236	0.30	1912	2.88
21	4.51	0542	4.42	1312	-0.09	1936	3.17
22	5.20	0024	1.82	0830	4.78	1342	-0.42
23	5.74	0112	1.43	0712	5.08	1412	-0.66
24	6.04	0148	1.02	0754	5.27	1448	-0.77
25	6.03	0236	0.64	0830	5.30	1518	-0.73
26	5.67	0318	0.32	0912	5.14	1554	-0.53
27	5.01	0406	0.12	0954	4.79	1624	-0.19
28	4.80	0454	0.06	1048	4.26	1654	0.27

TABLE 18. San Nicolas Island Tides, March 1994

March 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.64	0554	0.12	1148	3.64	1742	0.80
2	2.78	0634	0.26	1254	3.04	1818	1.34
3	4.24	0054	4.59	0824	0.35	1442	2.66
4	4.18	0206	4.42	1000	0.24	1642	2.10
5	4.40	0336	4.38	1118	-0.02	1806	3.03
6	4.77	0454	4.49	1224	-0.28	1854	3.36
7	5.10	0006	1.73	0554	4.66	1312	-0.45
8	5.27	0054	1.38	0648	4.78	1348	-0.49
9	5.24	0136	1.05	0730	4.81	1418	-0.43
10	5.03	0218	0.79	0806	4.74	1448	-0.28
11	4.66	0248	0.59	0842	4.59	1512	-0.07
12	4.18	0324	0.45	0912	4.37	1530	0.19
13	3.94	0348	0.40	0948	4.07	1554	0.48
14	3.87	0424	0.41	1018	3.72	1618	0.81
15	3.68	0500	0.51	1054	3.33	1636	1.15
16	3.37	0542	0.66	1136	2.92	1706	1.49
17	3.02	0642	0.04	1236	2.52	1730	1.82
18	1.31	0754	0.97	1430	2.27	1748	2.12
19	2.77	0054	3.68	0936	0.91	1730	2.42
20	2.95	0230	3.61	1054	0.66	1806	2.71
21	3.39	0354	3.74	1148	0.35	1824	3.02
22	3.97	0506	4.02	1218	0.05	1848	3.38
23	4.51	0006	1.59	0554	4.33	1254	-0.18
24	4.92	0054	1.03	0648	4.60	1330	-0.32
25	5.09	0136	0.46	0736	4.75	1400	-0.34
26	5.19	0218	-0.06	0824	4.76	1442	-0.22
27	5.67	0312	-0.46	0906	4.60	1516	0.02
28	6.01	0354	-0.70	0954	4.29	1554	0.36
29	5.98	0448	-0.75	1054	3.87	1636	0.78
30	5.62	0548	-0.62	1154	3.41	1718	1.24
31	3.42	0648	-0.39	1312	3.03	1812	1.69

TABLE 19. San Nicolas Island Tides, April 1994

April 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.81	0024	4.65	0806	-0.16	1448	2.88
2	4.33	0136	4.29	0924	-0.04	1624	3.03
3	4.18	0306	4.05	1042	-0.04	1730	3.32
4	4.07	0430	4.00	1142	-0.07	1818	3.62
5	4.09	0536	4.05	1230	-0.04	1848	3.99
6	4.06	0048	1.11	0630	4.08	1312	0.05
7	4.08	0130	0.74	0718	4.07	1342	0.20
8	4.04	0206	0.44	0754	4.00	1406	0.38
9	4.31	0236	0.21	0830	3.09	1430	0.59
10	4.54	0312	0.04	0906	3.74	1454	0.80
11	4.64	0336	-0.05	0942	3.55	1512	1.03
12	4.60	0412	-0.07	1018	3.33	1536	1.28
13	4.43	0448	0.00	1054	3.08	1600	1.53
14	4.14	0524	0.12	1142	2.82	1616	1.79
15	3.78	0618	0.28	1248	2.61	1706	2.05
16	2.11	0718	0.42	1412	2.53	1748	2.30
17	3.33	0012	3.82	0830	0.49	1554	2.67
18	3.15	0130	3.61	0936	0.46	1648	2.95
19	3.17	0254	3.53	1036	0.36	1724	3.30
20	3.46	0424	3.62	1118	0.26	1754	3.72
21	3.99	0530	3.80	1200	0.19	1824	4.19
22	4.48	0036	0.64	0630	3.98	1242	0.19
23	5.14	0124	-0.03	0724	4.10	1324	0.27
24	6.08	0212	-0.62	0818	4.12	1406	0.42
25	6.71	0306	-1.05	0906	4.03	1448	0.64
26	6.96	0354	-1.28	0954	3.85	1530	0.92
27	6.80	0442	-1.29	1054	3.62	1612	1.24
28	6.29	0536	-1.12	1154	3.39	1654	1.58
29	5.53	0636	-0.83	1306	3.23	1754	1.90
30	3.71	0742	-0.49	1430	3.22	1918	2.11

TABLE 21. San Nicolas Island Tides, June 1994

June 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht	Time	Ht
1	3.32	0306	3.16	0942	0.71	1636	4.03	2312	1.47
2	3.21	0436	2.92	1030	1.03	1718	4.24		
3	3.41	0012	1.03	0548	2.86	1242	1.29	1754	4.44
4	4.02	0106	0.61	0654	2.90	1206	1.48	1824	4.63
5	4.56	0142	0.25	0742	2.97	1242	1.63	1854	4.81
6	5.02	0218	-0.06	0824	3.04	1318	1.72	1924	4.96
7	5.37	0248	-0.29	0854	3.11	1348	1.79	1954	5.08
8	5.61	0324	-0.46	0936	3.16	1424	1.85	2024	5.15
9	5.71	0354	-0.57	1012	3.19	1448	1.91	2054	5.15
10	5.67	0424	-0.60	1048	3.22	1524	1.98	2130	5.07
11	5.46	0454	-0.56	1130	3.26	1606	2.06	2206	4.91
12	5.08	0530	-0.44	1212	3.31	1654	2.14	2248	4.64
13	4.52	0612	-0.25	1254	3.41	1754	2.20	2330	4.27
14	3.57	0654	0.01	1342	3.58	1906	2.17		
15	3.51	0030	3.81	0742	0.32	1430	3.83	2036	1.97
16	3.50	0142	3.33	0836	0.66	1524	4.16	2206	1.52
17	3.68	0318	2.99	0930	0.98	1612	4.56	2324	0.88
18	3.75	0454	2.91	1030	1.23	1706	4.99		
19	5.23	0024	0.18	0618	3.03	1242	1.41	1754	5.41
20	6.24	0112	-0.46	0724	3.23	1218	1.49	1842	5.77
21	6.99	0200	-0.97	0818	3.44	1312	1.52	1930	6.02
22	7.42	0248	-1.30	0906	3.61	1400	1.52	2012	6.12
23	7.46	0330	-1.43	0954	3.73	1454	1.53	2054	6.03
24	7.13	0418	-1.37	1036	3.81	1548	1.58	2142	5.76
25	6.47	0454	-1.13	1124	3.05	1636	1.67	2230	5.33
26	5.55	0542	-0.76	1212	3.87	1730	1.79	2312	4.78
27	4.46	0642	-0.30	1254	3.89	1830	1.92	2354	4.16
28	3.72	0706	0.20	1348	3.92	1942	1.98		
29	3.28	0054	3.53	0748	0.71	1436	3.98	2106	1.89
30	2.92	0212	2.98	0830	1.17	1530	4.09	2236	1.61

TABLE 20. San Nicolas Island Tides, May 1994

May 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.38	0106	4.20	0842	-0.18	1542	3.37
2	3.71	0230	3.78	0948	0.07	1642	3.61
3	3.59	0354	3.53	1048	0.28	1730	3.07
4	3.63	0512	3.42	1142	0.47	1806	4.11
5	3.64	0036	0.98	0612	3.39	1224	0.67
6	3.90	0118	0.59	0654	3.38	1254	0.86
7	4.38	0154	0.25	0748	3.36	1324	1.05
8	4.77	0230	-0.01	0824	3.33	1354	1.21
9	5.05	0254	-0.21	0854	3.28	1418	1.37
10	5.20	0330	-0.34	0942	3.21	1442	1.52
11	5.22	0400	-0.39	1018	3.12	1512	1.68
12	5.10	0436	-0.38	1054	3.03	1542	1.85
13	4.86	0512	-0.30	1148	2.94	1612	2.03
14	4.52	0554	-0.18	1242	2.89	1654	2.20
15	4.08	0648	-0.03	1342	2.92	1754	2.36
16	2.94	0736	0.13	1442	3.07	1918	2.41
17	3.44	0048	3.72	0836	0.28	1536	3.34
18	3.29	0212	3.42	0930	0.42	1618	3.71
19	3.60	0348	3.27	1024	0.55	1654	4.15
20	3.96	0506	3.29	1112	0.67	1742	4.63
21	4.76	0024	0.35	0618	3.39	1200	0.80
22	5.88	0118	-0.34	0718	3.52	1242	0.92
23	6.76	0206	-0.92	0818	3.61	1330	1.05
24	7.31	0254	-1.32	0912	3.66	1424	1.19
25	7.45	0348	-1.52	0954	3.65	1506	1.35
26	7.20	0436	-1.50	1054	3.61	1554	1.53
27	6.59	0524	-1.30	1148	3.56	1648	1.73
28	5.72	0612	-0.96	1248	3.54	1748	1.93
29	4.11	0706	-0.54	1348	3.57	1854	2.70
30	4.27	0036	4.17	0754	-0.10	1448	3.67
31	3.51	0142	3.60	0848	0.33	1548	3.84

TABLE 23. San Nicolas Island Tides, August 1994

August 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time

Date	Range	Time	Ht	Time	Ht	Time	Ht	Time	Ht
1	3.58	0012	0.95	0648	2.79	1042	2.41	1718	4.52
2	4.26	0054	0.55	0742	3.03	1148	2.34	1754	4.81
3	4.88	0136	0.20	0754	3.25	1236	2.19	1842	5.08
4	5.41	0206	-0.09	0824	3.46	1318	1.99	1918	5.33
5	5.80	0236	-0.31	0848	3.67	1354	1.77	1954	5.49
6	5.98	0306	-0.44	0912	3.89	1430	1.55	2030	5.55
7	5.92	0336	-0.46	0942	4.10	1512	1.36	2106	5.46
8	5.57	0406	-0.36	1012	4.30	1548	1.22	2148	5.21
9	4.93	0430	-0.13	1042	4.47	1636	1.14	2230	4.80
10	4.37	0500	0.22	1118	4.59	1730	1.13	2318	4.25
11	4.08	0536	0.67	1154	4.67	1830	1.15	1954	1.12
12	3.59	0618	3.63	0618	1.17	1254	4.71	2136	0.91
13	3.84	0142	3.08	0712	1.67	1354	4.75	2136	0.91
14	4.35	0342	2.84	0824	2.07	1512	4.85	2306	0.50
15	2.80	0530	3.01	0934	2.25	1624	5.05	1730	5.32
16	5.27	0012	0.05	0636	3.34	1124	2.16	1824	5.55
17	5.87	0054	-0.31	0718	3.66	1224	1.91	1824	5.55
18	6.21	0142	-0.54	0754	3.94	1312	1.62	1912	5.68
19	6.27	0218	-0.60	0830	4.17	1354	1.35	1934	5.67
20	6.05	0248	-0.53	0854	4.35	1436	1.16	2036	5.52
21	5.57	0318	-0.33	0930	4.47	1512	1.05	2112	5.24
22	4.90	0348	-0.03	0954	4.53	1554	1.02	2148	4.86
23	4.20	0424	0.33	1030	4.53	1636	1.08	2224	4.41
24	3.73	0448	0.75	1054	4.47	1718	1.20	2306	3.91
25	3.19	0518	1.18	1130	4.37	1812	1.37	2348	3.39
26	2.71	0542	1.61	1206	4.23	1912	1.53	2042	1.58
27	2.52	0548	2.91	0606	2.01	1254	4.10	2218	1.40
28	2.61	0248	2.60	0642	2.38	1354	4.01	2218	1.40
29	2.99	0536	2.72	0812	2.66	1524	4.05	2330	1.06
30	1.60	0630	2.99	1018	2.67	1636	4.27	1730	4.56
31	3.86	0018	0.71	0654	3.25	1130	2.46	1730	4.56

TABLE 22. San Nicolas Island Tides, July 1994

July 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	3.04	0348	2.64	0918	1.56	1624	4.24
2	2.59	0536	2.59	1018	1.84	1706	4.43
3	3.86	0042	0.77	0648	2.72	1118	2.01
4	4.50	0130	0.37	0742	2.89	1212	2.07
5	5.05	0154	0.04	0818	3.05	1254	2.06
6	5.51	0236	-0.24	0848	3.20	1330	2.01
7	5.85	0306	-0.45	0918	3.34	1406	1.94
8	6.82	0336	-0.58	0948	3.47	1442	1.87
9	6.00	0406	-0.63	1024	3.59	1518	1.82
10	5.75	0430	-0.58	1054	3.72	1600	1.79
11	5.26	0500	-0.42	1130	3.85	1642	1.78
12	4.51	0536	-0.15	1206	3.98	1742	1.78
13	3.92	0612	0.21	1248	4.13	1854	1.74
14	3.66	0018	3.78	0654	0.65	1336	4.31
15	3.42	0136	3.20	0748	1.11	1436	4.53
16	4.11	0318	2.81	0848	1.52	1536	4.81
17	3.33	0512	2.80	0954	1.81	1642	5.14
18	5.39	0024	0.09	0630	3.03	1112	1.91
19	6.22	0112	-0.44	0730	3.32	1212	1.86
20	6.81	0154	-0.83	0818	3.59	1306	1.72
21	7.07	0236	-1.04	0854	3.82	1400	1.57
22	6.99	0312	-1.08	0930	3.99	1442	1.45
23	6.57	0354	-0.94	1006	4.12	1536	1.40
24	5.88	0430	-0.67	1042	4.18	1618	1.42
25	4.97	0506	-0.29	1118	4.20	1706	1.50
26	4.01	0536	0.17	1154	4.18	1754	1.63
27	3.47	0612	0.66	1236	4.14	1854	1.76
28	2.93	0018	3.49	0642	1.16	1324	4.09
29	2.45	0118	2.93	0718	1.62	1412	4.07
30	2.77	0312	2.55	0800	2.02	1518	4.13
31	1.98	0530	2.57	0912	2.31	1618	4.28

TABLE 25. San Nicolas Island Tides, October 1994

October 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht	Time	Ht
1	4.27	0030	0.39	0654	4.14	1242	1.46	1830	4.66
2	4.53	0112	0.28	0718	4.54	1324	0.90	1918	4.82
3	4.66	0142	0.27	0742	4.93	1406	0.38	1954	4.06
4	5.35	0218	0.37	0818	5.29	1448	-0.06	2048	4.76
5	5.91	0248	0.56	0848	5.56	1536	-0.35	2136	4.53
6	6.16	0324	0.86	0924	5.69	1624	-0.46	2224	4.18
7	6.07	0406	1.22	1006	5.67	1712	-0.40	2324	3.79
8	5.69	0442	1.63	1054	5.47	1812	-0.21		
9	5.13	0042	3.45	0530	2.05	1148	5.14	1924	0.01
10	4.59	0212	3.31	0642	2.41	1254	4.76	2042	0.17
11	4.24	0348	3.44	0836	2.53	1424	4.46	2206	0.22
12	4.12	0454	3.74	1018	2.31	1554	4.34	2312	0.23
13	4.08	0542	4.08	1130	1.87	1706	4.35	2354	0.27
14	2.98	0624	4.38	1230	1.40	1806	4.37		
15	4.25	0042	0.38	0654	4.63	1312	0.98	1854	4.35
16	4.27	0118	0.55	0724	4.83	1348	0.64	1936	4.28
17	4.58	0148	0.76	0748	4.97	1418	0.39	2018	4.16
18	4.84	0206	0.99	0812	5.06	1454	0.22	2054	4.00
19	4.96	0230	1.23	0836	5.09	1524	0.14	2130	3.82
20	4.94	0254	1.47	0854	5.08	1600	0.14	2206	3.61
21	4.79	0318	1.71	0924	5.00	1642	0.21	2248	3.38
22	4.51	0348	1.95	0954	4.86	1718	0.35	2336	3.15
23	4.13	0418	2.21	1024	4.66	1806	0.53		
24	3.71	0036	2.96	0448	2.46	1854	4.41	1854	0.70
25	3.31	0206	2.90	0530	2.70	1948	4.13	2006	0.82
26	3.80	0342	3.04	0706	2.89	2054	3.85	2112	0.85
27	2.88	0436	3.31	0912	2.78	2148	3.68	2206	0.80
28	2.96	0506	3.63	1042	2.36	2254	3.70	2254	0.74
29	3.32	0536	4.02	1136	1.77	2312	3.84	2336	0.70
30	3.35	0606	4.46	1224	1.11	1806	4.01		
31	4.58	0018	0.70	0636	4.93	1312	0.43	1854	4.16

TABLE 24. San Nicolas Island Tides, September 1994

September 1994

San Nicolas Island, CA

33° 16.0' North, 119° 30.0' West

Tidal range, highs, and lows in feet.

Pacific Standard Time (PST) - Add one hour for Daylight Savings Time.

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	4.48	0054	0.39	0718	3.51	1224	2.14
2	5.00	0130	0.13	0742	3.79	1254	1.78
3	5.36	0154	-0.06	0754	4.09	1342	1.39
4	5.49	0224	-0.14	0830	4.40	1418	1.01
5	5.35	0254	-0.11	0854	4.69	1454	0.69
6	4.91	0324	0.06	0924	4.94	1542	0.45
7	4.78	0354	0.35	0954	5.11	1624	0.34
8	4.83	0430	0.74	1036	5.18	1718	0.35
9	4.67	0506	1.21	1124	5.13	1824	0.46
10	4.42	0030	3.48	0548	1.70	1218	4.98
11	4.26	0154	3.10	0648	2.15	1324	4.80
12	4.39	0354	3.10	0830	2.45	1448	4.71
13	4.69	0524	3.39	1012	2.40	1612	4.78
14	2.84	0618	3.74	1130	2.09	1724	4.94
15	5.15	0036	-0.08	0654	4.06	1230	1.69
16	5.23	0118	-0.12	0730	4.33	1318	1.31
17	5.18	0154	-0.05	0754	4.55	1348	1.00
18	4.77	0218	0.12	0824	4.71	1430	0.76
19	4.46	0242	0.35	0848	4.81	1500	0.62
20	4.29	0312	0.64	0912	4.85	1536	0.57
21	4.24	0336	0.95	0942	4.83	1618	0.59
22	4.05	0406	1.29	1006	4.76	1654	0.70
23	3.75	0430	1.64	1036	4.62	1736	0.87
24	3.37	0454	1.98	1106	4.44	1830	1.06
25	3.00	0042	2.90	0518	2.30	1142	4.22
26	2.79	0236	2.72	0542	2.61	1242	4.00
27	2.84	0312	2.90	0730	2.86	1406	3.87
28	3.15	0548	3.17	0954	2.80	1542	3.95
29	3.68	0606	3.46	1106	2.45	1648	4.17
30	2.44	0630	3.78	1200	1.99	1742	4.43

TABLE 28. Moonrise and Moonset, Barking Sands, 1994

Astronomical Applications Dept.
U.S. Naval Observatory
Washington, D.C. 20392-5420

Barking Sands, Kauai, Hawaii
Rise and Set for the Moon for 1994

Hawaii Standard Time

Location: W159 47', N22 02'

	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
Day	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
01	2213	1005	1054	2300	0937	1107	0021	1152	0057	1316	0043	1338	0120	1452	0232	1557	0306	1600	0447	1645	0539	1706		
02	2312	1046	0007	1141	1028	0049	1206	0105	1247	0132	1405	0120	1428	0207	1543	0327	1643	0404	1642	0551	1735	0646	1806	
03	1128	0109	1231	0003	1121	0139	1303	0145	1340	0208	1455	0159	1519	0257	1632	0425	1726	0504	1726	0658	1829	0750	1910	
04	0011	1210	0210	1325	0104	1217	0225	1359	0222	1431	0244	1545	0241	1610	0349	1720	0523	1809	0606	1811	0804	1927	0850	2014
05	0112	1254	0309	1421	0201	1314	0306	1452	0257	1521	0321	1635	0326	1701	0444	1806	0622	1852	0710	1859	0909	2028	0945	2117
06	0213	1342	0405	1518	0254	1411	0344	1544	0332	1610	0402	1726	0414	1751	0541	1851	0723	1936	0814	1950	1010	2130	1034	2217
07	0315	1434	0457	1616	0342	1508	0421	1634	0407	1659	0445	1817	0506	1840	0639	1934	0824	2021	0920	2045	1106	2232	1119	2314
08	0417	1529	0544	1713	0426	1602	0456	1724	0444	1749	0531	1907	0559	1927	0737	2015	0927	2109	1024	2143	1156	2331	1159	
09	0516	1628	0627	1808	0506	1656	0531	1813	0522	1840	0620	1957	0655	2012	0835	2057	1030	2200	1125	2242	1241	1237	0008	
10	0612	1727	0707	1902	0544	1747	0607	1903	0603	1930	0712	2044	0751	2055	0935	2140	1133	2254	1221	2342	1322	0028	1314	0100
11	0703	1826	0745	1953	0620	1838	0644	1953	0647	2021	0806	2130	0848	2136	1035	2225	1234	2350	1313		1400	0122	1351	0151
12	0750	1924	0820	2044	0655	1928	0723	2043	0734	2111	0901	2213	0945	2217	1136	2312	1332		1400	0041	1437	0214	1428	0241
13	0832	2019	0855	2134	0730	2017	0805	2134	0824	2159	0957	2255	1042	2258	1237		1426	0049	1442	0138	1514	0305	1507	0331
14	0911	2112	0931	2224	0806	2107	0849	2224	0916	2246	1053	2335	1140	2340	1339	0003	1515	0148	1522	0233	1550	0355	1548	0422
15	0947	2203	1007	2314	0844	2158	0937	2314	1010	2330	1149		1240		1439	0057	1601	0246	1600	0326	1628	0445	1631	0512
16	1022	2252	1045		0924	2248	1028		1105		1247	0016	1341	0025	1536	0154	1643	0342	1636	0418	1708	0536	1718	0602
17	1057	2342	1126	0004	1007	2339	1121	0002	1201	0013	1346	0057	1444	0113	1629	0254	1722	0437	1713	0508	1750	0626	1806	0651
18	1132		1211	0055	1053		1216	0048	1258	0054	1448	0141	1546	0206	1718	0353	1800	0530	1750	0559	1834	0716	1857	0739
19	1209	0032	1259	0147	1142	0029	1312	0133	1356	0135	1551	0228	1647	0303	1803	0452	1836	0622	1828	0649	1921	0806	1949	0824
20	1249	0122	1351	0238	1234	0119	1410	0216	1456	0217	1656	0319	1744	0403	1845	0549	1913	0714	1909	0740	2010	0854	2042	0908
21	1332	0213	1446	0329	1329	0207	1509	0258	1558	0301	1800	0416	1837	0504	1924	0645	1951	0804	1952	0830	2101	0941	2135	0950
22	1419	0306	1544	0418	1427	0254	1611	0341	1703	0348	1901	0516	1925	0605	2001	0738	2030	0855	2037	0920	2153	1025	2229	1030
23	1510	0358	1644	0505	1526	0340	1714	0425	1809	0438	1957	0618	2009	0704	2038	0830	2111	0946	2124	1009	2246	1108	2324	1109
24	1605	0450	1745	0551	1627	0424	1819	0512	1916	0534	2048	0720	2050	0801	2115	0921	2155	1036	2214	1057	2339	1149		1149
25	1702	0541	1847	0636	1729	0508	1926	0601	2019	0633	2134	0821	2128	0856	2153	1012	2241	1126	2306	1143	1229	0019	1229	
26	1802	0630	1950	0720	1832	0552	2033	0655	2118	0735	2216	0919	2204	0948	2233	1102	2330	1215	2359	1228	0034	1309	0117	1312
27	1903	0717	2053	0804	1937	0638	2137	0753	2211	0838	2254	1014	2241	1040	2315	1153		1302		1310	0130	1350	0217	1359
28	2003	0801	2157	0849	2043	0726	2238	0853	2259	0939	2331	1107	2318	1130		1243	0021	1349	0053	1352	0229	1433	0319	1450
29	2104	0844			2149	0817	2332	0954	2341	1037	1158	1220	2356	1220	0000	1333	0114	1433	0149	1433	0330	1519	0424	1546
30	2205	0927			2253	0912		1054	1132		0007	1248		1311	0048	1423	0210	1517	0246	1515	0433	1610	0528	1647
31	2306	1010			2353	1009			0020	1225			0037	1401	0138	1511			0345	1559			0630	1751

TABLE 29. Port Allen Tides, January 1994

January 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST)

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.82	0542	1.82	1306	0.03	1836	0.87
2	1.65	0624	1.64	1342	-0.01	1948	0.99
3	1.44	0654	0.53	0654	1.41	1424	-0.03
4	1.44	0742	0.69	0746	1.16	1512	-0.06
5	1.70	0454	0.71	0854	0.92	1554	-0.08
6	0.84	0654	0.56	1018	0.73	1654	-0.11
7	1.98	0036	1.84	0806	0.41	1142	0.62
8	2.19	0124	2.02	0854	0.26	1254	0.58
9	2.33	0206	2.13	0936	0.16	1348	0.59
10	2.37	0248	2.19	1018	0.10	1436	0.62
11	0.90	0630	0.59	1036	0.86	1718	-0.04
12	1.69	0042	1.63	0748	0.48	1148	0.75
13	1.84	0124	1.77	0842	0.37	1248	0.70
14	1.95	0154	1.87	0924	0.28	1336	0.68
15	2.00	0236	1.93	0954	0.23	1418	0.68
16	1.99	0312	1.94	1030	0.19	1454	0.70
17	1.94	0342	1.93	1054	0.17	1536	0.72
18	1.84	0412	1.89	1124	0.15	1612	0.74
19	1.68	0442	1.82	1154	0.14	1654	0.77
20	1.60	0506	1.73	1224	0.13	1736	0.80
21	0.57	0730	0.56	1024	0.63	1654	0.06
22	1.62	0036	1.63	0818	0.43	1148	0.60
23	1.83	0118	1.79	0848	0.32	1248	0.61
24	2.01	0154	1.90	0918	0.22	1336	0.65
25	2.13	0230	1.99	0948	0.15	1418	0.71
26	2.17	0254	2.03	1012	0.08	1454	0.79
27	2.11	0336	2.02	1042	0.03	1542	0.87
28	1.96	0412	1.94	1112	-0.02	1630	0.97
29	1.87	0442	1.81	1142	-0.05	1718	1.06
30	1.71	0518	1.63	1218	-0.08	1818	1.15
31	1.49	0554	1.41	1254	-0.08	1924	1.24

TABLE 30. Port Allen Tides, February 1994

February 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST)

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.41	0118	0.50	0636	1.17	1336	-0.07
2	1.52	0254	0.62	0724	0.93	1430	-0.05
3	1.66	0512	0.60	0836	0.72	1530	-0.03
4	0.63	0654	0.46	1018	0.60	1636	-0.03
5	1.83	0012	1.78	0754	0.32	1148	0.57
6	1.97	0106	1.89	0836	0.20	1254	0.62
7	2.85	0148	1.96	0912	0.13	1348	0.69
8	2.06	0230	1.97	0942	0.09	1430	0.78
9	1.98	0254	1.93	1006	0.06	1512	0.86
10	1.83	0336	1.84	1030	0.05	1548	0.94
11	1.67	0406	1.72	1054	0.05	1624	1.01
12	1.53	0430	1.58	1118	0.05	1654	1.07
13	1.37	0454	1.43	1142	0.06	1742	1.12
14	1.19	0524	1.26	1212	0.07	1830	1.15
15	1.09	0024	0.48	0554	1.10	1242	0.10
16	1.11	0136	0.60	0618	0.93	1318	0.12
17	1.17	0324	0.66	0654	0.77	1354	0.15
18	1.27	0542	0.60	0806	0.64	1454	0.16
19	1.42	0654	0.48	1006	0.56	1612	0.14
20	0.49	0736	0.36	1136	0.58	1712	0.09
21	1.67	0042	1.69	0806	0.26	1236	0.65
22	1.83	0118	1.79	0836	0.17	1324	0.76
23	1.93	0154	1.85	0854	0.08	1406	0.89
24	1.94	0236	1.85	0924	0.01	1448	1.04
25	1.86	0306	1.80	0954	-0.06	1530	1.18
26	1.79	0342	1.69	1024	-0.11	1612	1.31
27	1.66	0418	1.53	1054	-0.13	1654	1.41
28	1.62	0454	1.33	1130	-0.14	1754	1.48

TABLE 31. Port Allen Tides, March 1994

March 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.62	0018	0.29	0536	1.12	1206	-0.11
2	1.59	0136	0.42	0618	0.90	1248	-0.05
3	1.56	0318	0.48	0718	0.71	1342	0.01
4	1.55	0512	0.43	0848	0.58	1454	0.08
5	1.57	0630	0.33	1036	0.55	1612	0.11
6	0.52	0724	0.23	1154	0.62	1730	0.10
7	1.65	0036	1.72	0754	0.15	1254	0.74
8	1.67	0124	1.73	0830	0.10	1342	0.87
9	1.63	0154	1.69	0854	0.07	1418	0.99
10	1.57	0236	1.62	0918	0.05	1454	1.10
11	1.48	0306	1.52	0942	0.03	1530	1.20
12	1.38	0330	1.40	0954	0.03	1554	1.28
13	1.31	0354	1.26	1024	0.03	1636	1.34
14	1.34	0424	1.15	1048	0.04	1712	1.37
15	1.33	0454	1.01	1112	0.06	1754	1.39
16	1.30	0030	0.41	0524	0.88	1142	0.09
17	1.26	0136	0.48	0554	0.76	1212	0.13
18	1.22	0306	0.51	0642	0.64	1254	0.18
19	1.22	0442	0.46	0806	0.55	1354	0.23
20	1.27	0554	0.37	0954	0.55	1524	0.24
21	1.36	0636	0.28	1124	0.64	1642	0.22
22	0.62	0706	0.18	1218	0.78	1754	0.16
23	1.53	0036	1.61	0736	0.09	1306	0.96
24	1.62	0118	1.61	0806	-0.01	1348	1.16
25	1.65	0154	1.56	0836	-0.09	1430	1.36
26	1.69	0236	1.47	0906	-0.15	1512	1.53
27	1.86	0318	1.34	0936	-0.19	1554	1.67
28	1.96	0354	1.18	1012	-0.20	1648	1.76
29	1.96	0436	1.00	1048	-0.18	1736	1.78
30	1.87	0036	0.21	0524	0.83	1124	-0.11
31	1.73	0148	0.28	0618	0.68	1212	-0.02
						1836	0.08
						1924	0.06
						2006	0.05
						2054	0.08
						2130	0.12
						2212	0.18
						2254	0.25
						2336	0.33
						1836	1.39
						1936	1.39
						2042	1.40
						2154	1.45
						2254	1.51
						2348	1.57
						1854	0.09
						1948	0.04
						2042	0.01
						2136	0.02
						2230	0.06
						2330	0.13
						1030	1.76
						1936	1.71

TABLE 32. Port Allen Tides, April 1994

April 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.55	0318	0.30	0730	0.57	1306	0.09
2	1.39	0442	0.27	0906	0.54	1418	0.20
3	1.34	0548	0.21	1048	0.61	1548	0.27
4	1.35	0630	0.15	1154	0.75	1712	0.28
5	0.81	0706	0.10	1248	0.91	1824	0.26
6	1.38	0042	1.44	0736	0.06	1330	1.07
7	1.33	0124	1.36	0754	0.03	1406	1.22
8	1.35	0154	1.27	0824	0.01	1436	1.35
9	1.47	0230	1.17	0848	-0.01	1506	1.45
10	1.55	0254	1.07	0912	-0.02	1542	1.53
11	1.60	0330	0.97	0930	-0.01	1612	1.58
12	1.61	0354	0.87	0954	0.00	1648	1.61
13	1.59	0430	0.77	1024	0.03	1724	1.61
14	1.53	0036	0.31	0454	0.60	1054	0.07
15	1.45	0136	0.33	0548	0.60	1124	0.12
16	1.35	0242	0.33	0648	0.54	1212	0.19
17	1.23	0348	0.30	0812	0.52	1312	0.27
18	1.24	0448	0.23	0948	0.59	1436	0.34
19	1.29	0530	0.15	1106	0.75	1612	0.36
20	1.33	0606	0.06	1154	0.96	1736	0.32
21	1.23	0642	-0.03	1248	1.20	1848	0.26
22	1.56	0036	1.32	0712	-0.12	1336	1.44
23	1.86	0124	1.22	0748	-0.19	1418	1.67
24	2.09	0206	1.11	0824	-0.24	1454	1.85
25	2.24	0254	0.98	0854	-0.27	1548	1.97
26	2.28	0336	0.85	0936	-0.25	1630	2.02
27	2.21	0424	0.73	1012	-0.20	1718	2.01
28	2.05	0042	0.11	0518	0.63	1054	-0.11
29	1.81	0148	0.13	0618	0.55	1142	0.02
30	1.54	0254	0.14	0736	0.53	1236	0.16

TABLE 33. Port Allen Tides, May 1994

May 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.41	0354	0.13	0906	0.56	1348	0.31
2	1.38	0448	0.11	1030	0.72	1518	0.43
3	1.21	0530	0.07	1136	0.89	1654	0.47
4	1.12	0606	0.04	1230	1.06	1812	0.46
5	1.25	0636	0.01	1306	1.75	1918	0.41
6	1.44	0700	0.06	1306	1.75	1918	0.41
7	1.60	0712	0.96	1306	1.75	1918	0.41
8	1.72	0718	1.66	1306	1.75	1918	0.41
9	1.80	0724	2.07	1306	1.75	1918	0.41
10	1.84	0724	2.07	1306	1.75	1918	0.41
11	1.85	0724	2.07	1306	1.75	1918	0.41
12	1.82	0724	2.07	1306	1.75	1918	0.41
13	1.75	0724	2.07	1306	1.75	1918	0.41
14	1.63	0724	2.07	1306	1.75	1918	0.41
15	1.47	0724	2.07	1306	1.75	1918	0.41
16	1.41	0724	2.07	1306	1.75	1918	0.41
17	1.34	0724	2.07	1306	1.75	1918	0.41
18	1.28	0724	2.07	1306	1.75	1918	0.41
19	1.22	0724	2.07	1306	1.75	1918	0.41
20	1.16	0724	2.07	1306	1.75	1918	0.41
21	1.09	0724	2.07	1306	1.75	1918	0.41
22	1.02	0724	2.07	1306	1.75	1918	0.41
23	0.95	0724	2.07	1306	1.75	1918	0.41
24	0.88	0724	2.07	1306	1.75	1918	0.41
25	0.81	0724	2.07	1306	1.75	1918	0.41
26	0.74	0724	2.07	1306	1.75	1918	0.41
27	0.67	0724	2.07	1306	1.75	1918	0.41
28	0.60	0724	2.07	1306	1.75	1918	0.41
29	0.53	0724	2.07	1306	1.75	1918	0.41
30	0.46	0724	2.07	1306	1.75	1918	0.41
31	0.39	0724	2.07	1306	1.75	1918	0.41

TABLE 34. Port Allen Tides, June 1994

June 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.08	0424	0.04	1106	1.02	1630	0.64
2	1.20	0454	0.02	1154	1.22	1806	0.62
3	1.41	0536	-0.01	1242	1.40	1918	0.55
4	1.60	0612	-0.03	1324	1.57	2018	0.46
5	1.76	0624	0.76	1354	-0.05	2054	0.46
6	1.88	0624	0.76	1354	-0.05	2054	0.46
7	1.97	0624	0.76	1354	-0.05	2054	0.46
8	2.02	0624	0.76	1354	-0.05	2054	0.46
9	2.03	0624	0.76	1354	-0.05	2054	0.46
10	2.00	0624	0.76	1354	-0.05	2054	0.46
11	1.90	0624	0.76	1354	-0.05	2054	0.46
12	1.73	0624	0.76	1354	-0.05	2054	0.46
13	1.62	0624	0.76	1354	-0.05	2054	0.46
14	1.50	0624	0.76	1354	-0.05	2054	0.46
15	1.35	0624	0.76	1354	-0.05	2054	0.46
16	1.21	0624	0.76	1354	-0.05	2054	0.46
17	1.07	0624	0.76	1354	-0.05	2054	0.46
18	0.94	0624	0.76	1354	-0.05	2054	0.46
19	0.81	0624	0.76	1354	-0.05	2054	0.46
20	0.68	0624	0.76	1354	-0.05	2054	0.46
21	0.55	0624	0.76	1354	-0.05	2054	0.46
22	0.42	0624	0.76	1354	-0.05	2054	0.46
23	0.29	0624	0.76	1354	-0.05	2054	0.46
24	0.16	0624	0.76	1354	-0.05	2054	0.46
25	0.03	0624	0.76	1354	-0.05	2054	0.46
26	0.10	0624	0.76	1354	-0.05	2054	0.46
27	0.17	0624	0.76	1354	-0.05	2054	0.46
28	0.24	0624	0.76	1354	-0.05	2054	0.46
29	0.31	0624	0.76	1354	-0.05	2054	0.46
30	0.38	0624	0.76	1354	-0.05	2054	0.46

TABLE 35. Port Allen Tides, July 1994

July 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.25	0354	0.08	1124	1.33	1754	0.74
2	1.44	0442	0.06	1212	1.50	1924	0.64
3	1.62	0524	0.04	1254	1.66	2018	0.52
4	1.78	0606	0.02	1330	1.79	2054	0.42
5	1.92	0648	0.66	0642	-0.01	1406	1.91
6	2.02	0136	0.65	0724	-0.03	1442	1.99
7	2.09	0218	0.66	0754	-0.05	1512	2.04
8	2.10	0254	0.69	0836	-0.04	1548	2.06
9	2.04	0342	0.72	0912	-0.01	1618	2.03
10	1.90	0424	0.78	0954	0.06	1648	1.96
11	1.73	0506	0.11	0512	0.85	1036	0.18
12	1.60	0542	0.08	0612	0.94	1130	0.33
13	1.43	0612	0.05	0712	1.05	1236	0.51
14	1.23	0654	0.03	0830	1.19	1354	0.67
15	1.38	0236	0.00	0948	1.38	1554	0.74
16	1.61	0330	-0.02	1054	1.59	1754	0.67
17	1.85	0424	-0.04	1154	1.81	1924	0.52
18	2.06	0518	-0.07	1254	1.99	2024	0.36
19	2.23	0618	0.69	0612	-0.10	1342	2.13
20	2.32	0124	0.70	0706	-0.11	1424	2.21
21	2.33	0218	0.74	0754	-0.11	1506	2.22
22	2.24	0306	0.80	0842	-0.07	1542	2.17
23	2.05	0348	0.86	0924	0.01	1618	2.06
24	1.79	0430	0.93	1006	0.12	1648	1.91
25	1.47	0518	0.99	1048	0.27	1724	1.74
26	1.39	0624	0.16	0606	1.06	1136	0.43
27	1.18	0654	0.17	0706	1.12	1230	0.60
28	1.01	0130	0.19	0806	1.20	1348	0.74
29	1.09	0206	0.20	0918	1.30	1530	0.82
30	1.21	0254	0.21	1030	1.42	1742	0.78
31	1.35	0342	0.21	1130	1.56	1912	0.67

TABLE 36. Port Allen Tides, August 1994

August 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.51	0436	0.20	1218	1.71	1954	0.56
2	1.68	0530	0.16	1254	1.84	2030	0.46
3	1.83	0630	0.74	0618	0.12	1336	1.94
4	1.95	0118	0.78	0706	0.07	1412	2.02
5	2.01	0206	0.85	0748	0.04	1448	2.06
6	2.00	0242	0.93	0824	0.04	1518	2.05
7	1.91	0324	1.03	0912	0.08	1548	1.99
8	1.75	0406	1.13	0954	0.16	1624	1.88
9	1.62	0454	1.23	1042	0.28	1654	1.72
10	1.10	0548	1.33	1136	0.43	1730	1.53
11	1.33	0624	0.09	0648	1.42	1248	0.59
12	1.42	0654	0.09	0754	1.51	1418	0.71
13	1.51	0148	0.11	0912	1.62	1618	0.73
14	1.62	0248	0.13	1030	1.76	1806	0.62
15	1.76	0354	0.14	1136	1.90	1918	0.49
16	1.88	0506	0.13	1230	2.01	1954	0.30
17	1.98	0630	0.80	0606	0.10	1318	2.09
18	2.02	0124	0.88	0654	0.09	1354	2.11
19	1.98	0212	0.99	0754	0.09	1442	2.07
20	1.86	0254	1.09	0836	0.12	1512	1.98
21	1.67	0330	1.18	0918	0.19	1548	1.86
22	1.49	0406	1.26	0954	0.28	1618	1.71
23	1.31	0448	1.33	1042	0.39	1642	1.55
24	1.13	0530	1.38	1130	0.52	1712	1.38
25	0.77	0618	1.41	1224	0.64	1742	1.22
26	1.15	0618	0.28	0712	1.43	1336	0.75
27	1.14	0654	0.32	0812	1.46	1512	0.80
28	1.16	0142	0.36	0924	1.52	1712	0.75
29	1.23	0242	0.38	1036	1.61	1830	0.65
30	1.34	0354	0.38	1130	1.72	1912	0.55
31	1.48	0454	0.34	1218	1.82	1942	0.46

TABLE 37. Port Allen Tides, September 1994

September 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST)

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.61	0018	0.88	0554	0.28	1254	1.90
2	1.72	0106	0.99	0648	0.22	1336	1.94
3	1.76	0148	1.12	0736	0.18	1412	1.94
4	1.72	0224	1.27	0824	0.17	1448	1.89
5	1.66	0306	1.41	0912	0.19	1518	1.79
6	1.55	0348	1.55	0954	0.25	1554	1.65
7	1.57	0436	1.66	1054	0.35	1630	1.48
8	1.63	0524	1.74	1154	0.46	1712	1.29
9	1.20	0624	1.78	1306	0.57	1754	1.10
10	1.64	0018	0.16	0730	1.80	1442	0.61
11	1.59	0106	0.22	0842	1.81	1624	0.61
12	1.55	0212	0.30	0954	1.85	1748	0.52
13	1.55	0336	0.34	1106	1.89	1842	0.42
14	1.58	0454	0.35	1206	1.92	1924	0.34
15	1.63	0030	0.98	0606	0.32	1254	1.92
16	1.62	0118	1.13	0654	0.30	1336	1.87
17	1.56	0154	1.27	0754	0.29	1412	1.79
18	1.46	0236	1.39	0836	0.31	1442	1.68
19	1.34	0312	1.50	0924	0.35	1512	1.55
20	1.36	0348	1.58	1006	0.40	1542	1.42
21	1.39	0418	1.64	1048	0.47	1606	1.29
22	1.39	0454	1.67	1130	0.54	1636	1.16
23	1.36	0536	1.67	1224	0.61	1706	1.04
24	1.29	0624	1.66	1320	0.67	1748	0.92
25	0.96	0718	1.64	1454	0.69	1836	0.82
26	1.21	0036	0.43	0818	1.64	1624	0.64
27	1.16	0136	0.49	0930	1.65	1730	0.57
28	1.21	0254	0.49	1030	1.69	1812	0.48
29	1.33	0424	0.51	1124	1.73	1842	0.40
30	1.44	0006	1.02	0536	0.45	1212	1.75
						1912	0.31

NAWCWPNS TM 7667

TABLE 38. Port Allen Tides, October 1994

October 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST)

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.51	0048	1.20	0636	0.39	1254	1.74
2	1.54	0130	1.40	0730	0.33	1330	1.69
3	1.52	0212	1.60	0824	0.29	1412	1.60
4	1.75	0248	1.78	0918	0.28	1448	1.48
5	1.91	0336	1.93	1012	0.30	1530	1.33
6	2.00	0418	2.03	1106	0.34	1612	1.18
7	1.98	0506	2.07	1212	0.40	1654	1.02
8	1.88	0554	2.05	1324	0.45	1748	0.88
9	1.53	0654	2.00	1442	0.47	1854	0.77
10	1.63	0030	0.29	0806	1.92	1606	0.44
11	1.47	0142	0.42	0918	1.85	1712	0.38
12	1.47	0312	0.51	1024	1.78	1754	0.31
13	1.45	0448	0.54	1124	1.72	1836	0.26
14	1.41	0024	1.16	0554	0.52	1212	1.64
15	1.35	0112	1.34	0706	0.49	1254	1.54
16	1.33	0148	1.50	0754	0.46	1336	1.43
17	1.48	0224	1.64	0842	0.44	1406	1.32
18	1.59	0254	1.75	0930	0.44	1436	1.21
19	1.66	0324	1.82	1012	0.44	1512	1.11
20	1.68	0354	1.86	1054	0.46	1542	1.01
21	1.66	0430	1.88	1136	0.48	1612	0.92
22	1.61	0506	1.87	1230	0.50	1648	0.84
23	1.51	0548	1.84	1324	0.52	1730	0.77
24	1.39	0636	1.79	1430	0.51	1830	0.71
25	1.26	0724	1.74	1530	0.48	1954	0.70
26	1.27	0042	0.50	0824	1.69	1624	0.42
27	1.29	0206	0.59	0924	1.63	1706	0.34
28	1.32	0348	0.63	1018	1.58	1742	0.26
29	1.35	0512	0.60	1118	1.52	1812	0.17
30	1.36	0030	0.63	0630	0.53	1206	1.44
31	1.63	0112	1.63	0730	0.44	1254	1.35
						1918	0.08

TABLE 39. Port Allen Tides, November 1994

November 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	1.92	0154	1.86	0830	0.35	1336	1.24
2	2.16	0236	2.05	0924	0.29	1424	1.12
3	2.30	0318	2.19	1024	0.26	1512	1.01
4	2.33	0406	2.26	1118	0.25	1554	0.89
5	2.25	0454	2.26	1218	0.26	1648	0.80
6	2.06	0542	2.20	1318	0.27	1748	0.73
7	1.81	0636	2.08	1424	0.27	1854	0.70
8	1.67	0706	0.30	0730	1.93	1524	0.26
9	1.53	0112	0.47	0830	1.77	1618	0.23
10	1.46	0248	0.61	0930	1.60	1706	0.20
11	1.29	0430	0.67	1030	1.45	1742	0.16
12	1.18	0512	1.28	0554	0.66	1124	1.31
13	1.37	0054	1.47	0706	0.60	1212	1.16
14	1.57	0130	1.64	0806	0.54	1254	1.07
15	1.72	0206	1.77	0854	0.48	1330	0.98
16	1.83	0236	1.88	0942	0.43	1412	0.90
17	1.89	0312	1.94	1018	0.39	1442	0.84
18	1.91	0342	1.98	1054	0.37	1518	0.78
19	1.89	0412	1.99	1142	0.36	1554	0.73
20	1.82	0448	1.98	1218	0.35	1636	0.69
21	1.72	0524	1.94	1306	0.34	1724	0.66
22	1.56	0554	1.88	1348	0.32	1818	0.66
23	1.50	0642	1.79	1436	0.29	1936	0.70
24	1.44	0724	0.46	0724	1.68	1518	0.24
25	1.36	0130	0.59	0818	1.55	1554	0.18
26	1.29	0312	0.69	0912	1.40	1642	0.11
27	1.23	0454	0.69	1018	1.25	1718	0.03
28	1.57	0012	1.51	0630	0.60	1118	1.12
29	1.91	0054	1.77	0742	0.47	1218	1.00
30	2.28	0142	2.01	0842	0.34	1312	0.91

TABLE 40. Port Allen Tides, December 1994

December 1994

Port Allen, Hanapepe Bay, HI

21° 54.0' North, 159° 35.0' West

Tidal range, highs, and lows in feet.

Alaska-Hawaii Standard Time (AHST).

Date	Range	Time	Ht	Time	Ht	Time	Ht
1	2.41	0224	2.19	0936	0.24	1406	0.83
2	2.52	0312	2.31	1030	0.16	1454	0.77
3	2.50	0354	2.35	1118	0.12	1548	0.72
4	2.37	0436	2.31	1206	0.11	1642	0.70
5	2.12	0524	2.21	1254	0.11	1742	0.69
6	1.92	0606	2.05	1342	0.12	1848	0.72
7	1.72	0654	1.84	1430	0.13	2006	0.73
8	1.50	0748	0.47	0736	1.62	1518	0.12
9	1.29	0212	0.65	0824	1.40	1554	0.11
10	1.22	0406	0.75	0910	1.19	1642	0.09
11	0.97	0554	0.73	1018	1.02	1718	0.06
12	1.47	0030	1.50	0718	0.64	1118	0.89
13	1.66	0112	1.67	0818	0.53	1212	0.79
14	1.82	0148	1.80	0906	0.44	1306	0.74
15	1.93	0224	1.90	0942	0.36	1348	0.70
16	2.01	0254	1.97	1018	0.30	1430	0.68
17	2.04	0324	2.02	1048	0.26	1506	0.66
18	2.03	0354	2.03	1124	0.23	1542	0.66
19	1.96	0424	2.01	1154	0.20	1624	0.66
20	1.83	0454	1.96	1230	0.18	1706	0.68
21	1.72	0530	1.88	1254	0.16	1754	0.72
22	1.63	0606	1.76	1336	0.13	1906	0.79
23	1.50	0642	1.60	1412	0.09	2018	0.91
24	1.36	0112	0.58	0724	1.41	1454	0.05
25	1.34	0254	0.71	0818	1.20	1542	0.00
26	1.66	0454	0.71	0918	1.00	1630	-0.06
27	0.96	0642	0.59	1036	0.84	1718	-0.13
28	2.03	0042	1.84	0754	0.42	1154	0.74
29	2.28	0130	2.05	0854	0.27	1254	0.69
30	2.46	0212	2.20	0936	0.15	1354	0.67
31	2.53	0254	2.20	1018	0.07	1448	0.69

NAWCWPNS TM 7667

APPENDIX A

APPENDIX A**HEIGHT OF THE TIDE AT ANY TIME**

The height of the tide at times intermediate to the times of high and low water is needed on occasion, and may be computed by numerical methods. An example of the method, (adapted from Table 3 of the data source), is presented here, using the predicted tides for a day at Point Mugu.

Problem: Given that the predicted times and heights of the tides are:

<u>TIME</u>	<u>HEIGHT</u>
0039	4.9
0814	0.2
1510	3.1
1933	2.4

What is the height of the tide at 0300?

Numerical Method

The duration of fall is $08\text{h } 14\text{m} - 00\text{h } 39\text{m} = 7\text{h } 35\text{m}$

The time after high water is $03\text{h } 00\text{m} - 00\text{h } 39\text{m} = 2\text{h } 21\text{m}$

The range of tide is $4.9 - 0.2 = 4.7$ feet

Entering Table A-1 at the duration of fall of 7h 40m, which is the nearest value to 6h 35m, the nearest value on the horizontal line to 2h 21m is 2h 18m after high water. Following down this column to its intersection with a range of 4.5 feet which is the nearest value to 4.7 feet, one obtains 0.9 which, being calculated from high water, must be subtracted from 4.9. The approximate height at 0300 is therefore 4.0 feet.

When the duration of rise or fall is greater than 10h 40m, enter the table with one-half the given duration and with one-half the time from nearest high or low water; but if the duration of rise or fall is less than 4h 00m, enter the table with double the given duration and time.

TABLE A-1. Height of the Tide at Any Time

Duration of rise or fall, see footnote	h.m.	Time from the nearest high water or low water														
		h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.
4 00	0 08	0 16	0 24	0 32	0 40	0 48	0 56	1 04	1 12	1 20	1 28	1 36	1 44	1 52	2 00	
4 20	0 09	0 17	0 26	0 35	0 43	0 52	1 01	1 09	1 18	1 27	1 35	1 44	1 53	2 01	2 10	
4 40	0 09	0 19	0 28	0 37	0 47	0 56	1 05	1 15	1 24	1 33	1 43	1 52	2 01	2 11	2 20	
5 00	0 10	0 20	0 30	0 40	0 50	1 00	1 10	1 20	1 30	1 40	1 50	2 00	2 10	2 20	2 30	
5 20	0 11	0 21	0 32	0 43	0 53	1 04	1 15	1 25	1 36	1 47	1 57	2 08	2 19	2 29	2 40	
5 40	0 11	0 23	0 34	0 45	0 57	1 08	1 19	1 31	1 42	1 53	2 05	2 16	2 27	2 39	2 50	
6 00	0 12	0 24	0 36	0 48	1 00	1 12	1 24	1 36	1 48	2 00	2 12	2 24	2 36	2 48	3 00	
6 20	0 13	0 25	0 38	0 51	1 03	1 16	1 29	1 41	1 54	2 07	2 19	2 32	2 45	2 57	3 10	
6 40	0 13	0 27	0 40	0 53	1 07	1 20	1 33	1 47	2 00	2 13	2 27	2 40	2 53	3 07	3 20	
7 00	0 14	0 28	0 42	0 56	1 10	1 24	1 38	1 52	2 06	2 20	2 34	2 48	3 02	3 16	3 30	
7 20	0 15	0 29	0 44	0 59	1 13	1 28	1 43	1 57	2 12	2 27	2 41	2 56	3 11	3 25	3 40	
7 40	0 15	0 31	0 46	1 01	1 17	1 32	1 47	2 03	2 18	2 33	2 49	3 04	3 19	3 35	3 50	
8 00	0 16	0 32	0 48	1 04	1 20	1 36	1 52	2 08	2 24	2 40	2 56	3 12	3 28	3 44	4 00	
8 20	0 17	0 33	0 50	1 07	1 23	1 40	1 57	2 13	2 30	2 47	3 03	3 20	3 37	3 53	4 10	
8 40	0 17	0 35	0 52	1 09	1 27	1 44	2 01	2 19	2 36	2 53	3 11	3 28	3 45	4 03	4 20	
9 00	0 18	0 36	0 54	1 12	1 30	1 48	2 06	2 24	2 42	3 00	3 18	3 36	3 54	4 12	4 30	
9 20	0 19	0 37	0 56	1 15	1 33	1 52	2 11	2 29	2 48	3 07	3 25	3 44	4 03	4 21	4 40	
9 40	0 19	0 39	0 58	1 17	1 37	1 56	2 15	2 35	2 54	3 13	3 33	3 52	4 11	4 31	4 50	
10 00	0 20	0 40	1 00	1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00	4 20	4 40	5 00	
10 20	0 21	0 41	1 02	1 23	1 43	2 04	2 25	2 45	3 06	3 27	3 47	4 08	4 29	4 49	5 10	
10 40	0 21	0 43	1 04	1 25	1 47	2 08	2 29	2 51	3 12	3 33	3 55	4 16	4 37	4 59	5 20	
Range of tide, see footnote	Ft.	Correction to Height														
		Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5
1.5	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.7	0.8
2.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
2.5	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	
3.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.2	1.3	1.5	
3.5	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.4	1.6	1.8	
4.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0	
4.5	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2	
5.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	1.0	1.2	1.5	1.7	2.0	2.2	2.5	
5.5	0.0	0.1	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.4	1.6	1.9	2.2	2.5	2.8	
6.0	0.0	0.1	0.1	0.3	0.4	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.7	3.0	
6.5	0.0	0.1	0.2	0.3	0.4	0.6	0.8	1.1	1.3	1.6	1.9	2.2	2.6	2.9	3.2	
7.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.2	1.4	1.8	2.1	2.4	2.8	3.1	3.5	
7.5	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.2	1.5	1.9	2.2	2.6	3.0	3.4	3.8	
8.0	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.3	1.6	2.0	2.4	2.8	3.2	3.6	4.0	
8.5	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.1	2.5	2.9	3.4	3.8	4.2	
9.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.5	1.9	2.2	2.7	3.1	3.6	4.0	4.5	
9.5	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.6	2.0	2.4	2.8	3.3	3.8	4.3	4.8	
10.0	0.0	0.1	0.2	0.4	0.7	1.0	1.3	1.7	2.1	2.5	3.0	3.5	4.0	4.5	5.0	
10.5	0.0	0.1	0.3	0.5	0.7	1.0	1.3	1.7	2.2	2.6	3.1	3.6	4.2	4.7	5.2	
11.0	0.0	0.1	0.3	0.5	0.7	1.1	1.4	1.8	2.3	2.8	3.3	3.8	4.4	4.9	5.5	
11.5	0.0	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	2.9	3.4	4.0	4.6	5.1	5.8	
12.0	0.0	0.1	0.3	0.5	0.8	1.1	1.5	2.0	2.5	3.0	3.6	4.1	4.8	5.4	6.0	
12.5	0.0	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.1	3.7	4.3	5.0	5.6	6.2	
13.0	0.0	0.1	0.3	0.6	0.9	1.2	1.7	2.2	2.7	3.2	3.9	4.5	5.1	5.8	6.5	
13.5	0.0	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.4	4.0	4.7	5.3	6.0	6.8	
14.0	0.0	0.2	0.3	0.6	0.9	1.3	1.8	2.3	2.9	3.5	4.2	4.8	5.5	6.3	7.0	
14.5	0.0	0.2	0.4	0.6	1.0	1.4	1.9	2.4	3.0	3.6	4.3	5.0	5.7	6.5	7.2	
15.0	0.0	0.2	0.4	0.6	1.0	1.4	1.9	2.5	3.1	3.8	4.4	5.2	5.9	6.7	7.5	
15.5	0.0	0.2	0.4	0.7	1.0	1.5	2.0	2.6	3.2	3.9	4.6	5.4	6.1	6.9	7.8	
16.0	0.0	0.2	0.4	0.7	1.1	1.5	2.1	2.6	3.3	4.0	4.7	5.5	6.3	7.2	8.0	
16.5	0.0	0.2	0.4	0.7	1.1	1.6	2.1	2.7	3.4	4.1	4.9	5.7	6.5	7.4	8.2	
17.0	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.8	3.5	4.2	5.0	5.9	6.7	7.6	8.5	
17.5	0.0	0.2	0.4	0.8	1.2	1.7	2.2	2.9	3.6	4.4	5.2	6.0	6.9	7.8	8.8	
18.0	0.0	0.2	0.4	0.8	1.2	1.7	2.3	3.0	3.7	4.5	5.3	6.2	7.1	8.1	9.0	
18.5	0.1	0.2	0.5	0.8	1.2	1.8	2.4	3.1	3.8	4.6	5.5	6.4	7.3	8.3	9.2	
19.0	0.1	0.2	0.5	0.8	1.3	1.8	2.4	3.1	3.9	4.8	5.6	6.6	7.5	8.5	9.5	
19.5	0.1	0.2	0.5	0.8	1.3	1.9	2.5	3.2	4.0	4.9	5.8	6.7	7.7	8.7	9.8	
20.0	0.1	0.2	0.5	0.9	1.3	1.9	2.6	3.3	4.1	5.0	5.9	6.9	7.9	9.0	10.0	

1. Obtain from the predictions the high water and low water, one of which is before and the other after the time for which the height is required. The difference between the times of occurrence of these tides is the duration of rise or fall, and the difference between heights is the range of tide for the above table. Find the difference between the nearest high or low water and the time for which the height is required.
2. Enter the table with the duration of rise or fall, printed in heavy-faced type, which most nearly agrees with the actual value, and on that horizontal line find the time from the nearest high or low water which agrees most nearly with the corresponding actual difference. The correction sought is in the column directly below on the line with the range of tide.
3. When the nearest tide is high water, subtract the correction.
4. When the nearest tide is low water, add the correction.

GRAPHICAL METHOD

If the height of the tide is required for a number of times on a certain day the fill tide curve for the day, may be obtained by the *one-quarter, one-tenth rule*. The procedure is as follows:

1. On cross-section paper plot the high and low water points in the order of their occurrence for the day, measuring time horizontally and height vertically. These are the basic points for the curve.
2. Draw light straight lines connecting the points representing successive high and low waters.
3. Divide each of these straight lines into four equal parts. The halfway point of each line gives another point for the curve.
4. At the quarter point adjacent to high water, draw a vertical line above the point, and at the quarter point adjacent to low water, draw a vertical line below the point, making the length of these lines equal to one-tenth of the range between the high and low waters used. The points marking the ends of these vertical lines give two additional intermediate points for the curve.
5. Draw a smooth curve through the points of high and low waters and the intermediate points, making the curve well rounded near high and low waters. This curve will approximate the actual tide curve and heights for any time of the day may be readily scaled from it. The resulting graph is shown in Figure A-1.

CAUTION

Both methods presented are based on the assumption that the rise and fall conform to simple cosine curves. Therefore the heights obtained will be approximate. The roughness of approximation will vary as the tide curve differs from a cosine curve.

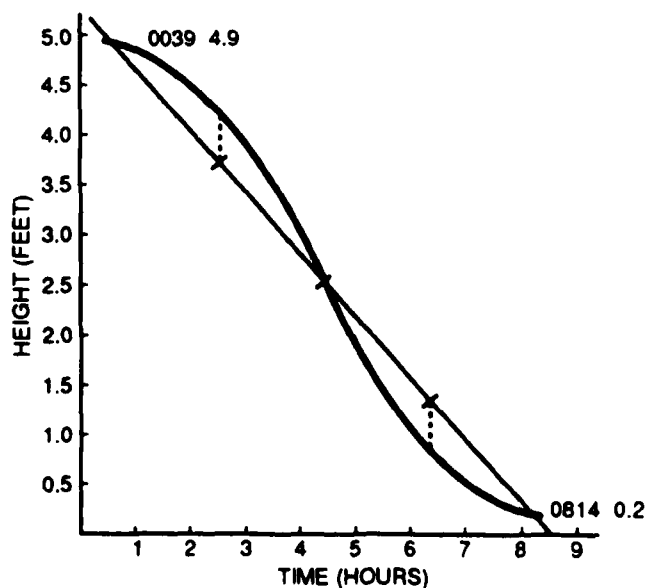


FIGURE A-1. Tidal Curve for Solution of the Problem.

NAWCWPNS TM 7667

APPENDIX B

APPENDIX B

EQUINOXES, SOLSTICES, AND LUNAR PHASES 1994

The dates and times for Vernal and Autumnal Equinoxes and Summer and Winter Solstices during 1994 are listed in Table B-1. The 1994 dates and times for phases of the moon are given in Table B-2. Times are Pacific Standard Time, add 1 hour when Daylight Savings Time is in effect; add 2 hours for times in the Barking Sands area.

TABLE B-1. Equinoxes and Solstices, 1994, Point Mugu Area

Vernal Equinox	20 March	1228 PST	Beginning of Spring Day and night equal length
Summer Solstice	21 June	0648 PST	Beginning of Summer Greatest duration daylight
Autumnal Equinox	22 September	2219 PST	Beginning of Autumn Day and night equal length
Winter Solstice	21 December	1823 PST	Beginning of Winter Greatest duration darkness

TABLE B-2. Lunar Phases, 1994, Point Mugu Area

	JANUARY		FEBRUARY		MARCH		APRIL	
	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
Last Quarter	4	1600	3	0006	4	0853	2	1855
New Moon	11	1510	10	0630	11	2305	10	1617
First Quarter	19	1227	18	0947	20	0404	18	1834
Full Moon	27	0523	25	1715	27	0309	25	1145
	MAY		JUNE		JULY		AUGUST	
	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
New Moon	10	0907	9	0026	8	1337	7	0045
First Quarter	18	0450	16	1156	15	1712	13	2257
Full Moon	24	1939	23	0333	22	1216	20	2247
Last Quarter	31	2002	30	1131	30	0440	28	2241
Last Quarter	2	0632	--	----	--	----	--	----
	SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
New Moon	5	1033	4	1955	3	0535	2	1554
First Quarter	12	0334	11	1117	9	2214	9	1306
Full Moon	19	1200	19	0418	17	2257	17	1817
Last Quarter	27	1623	27	0844	25	2304	25	1106

Because the earth's period of revolution about the sun (365.24+ days) is not evenly divisible by the moon's period of revolution about the earth (27.321 days), the dates and times of lunar phases, moonrise and moonset, and tidal data must be recomputed for each year. The following information, however, is based on geometrical relationships and holds true for all times:

1. The New Moon rises at sunrise, crosses the meridian at noon, and sets at sunset.
2. The First Quarter Moon rises at noon, crosses the meridian at sunset, and sets at sunrise.
3. The Full Moon rises at sunset, crosses the meridian at midnight, and sets at sunrise.
4. The Last Quarter Moon rises at midnight, crosses the meridian at sunrise and sets at noon.

NAWCWPNS TM 7667

APPENDIX C
SUNRISE AND SUNSET TABLES

TABLE C-1 Sunrise and Sunset for Point Mugu (January-June)

Sunrise, Sunset, and Duration of Twilight for Point Mugu, CA.
 34°07' N. 119°07' W
 (January to June)

Note: All times are Pacific Standard Time. (120th meridian).
 Add 1 hour when Daylight Savings Time is in effect.

Date	January		February		March		April		May		June		Date
	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	
1	0702	1638	0654	1727	0626	1753	0544	1817	0507	1840	0446	1903	1
2	0703	1639	0653	1728	0624	1753	0543	1818	0506	1841	0446	1903	2
3	0703	1700	0652	1729	0623	1754	0541	1819	0505	1842	0445	1904	3
4	0703	1700	0652	1730	0622	1755	0540	1819	0504	1843	0445	1904	4
5	0703	1701	0651	1731	0621	1756	0539	1820	0503	1843	0445	1905	5
6	0703	1702	0650	1732	0619	1757	0537	1821	0502	1844	0445	1905	6
7	0703	1703	0649	1733	0618	1758	0536	1822	0502	1845	0445	1906	7
8	0703	1704	0648	1734	0617	1758	0535	1822	0501	1846	0444	1906	8
9	0703	1705	0647	1734	0615	1759	0533	1823	0500	1846	0444	1907	9
10	0703	1705	0647	1735	0614	1800	0532	1824	0459	1847	0444	1907	10
11	0703	1706	0646	1736	0613	1801	0531	1825	0458	1848	0444	1908	11
12	0703	1707	0645	1737	0611	1802	0530	1825	0457	1849	0444	1908	12
13	0703	1708	0644	1738	0610	1802	0528	1826	0456	1849	0444	1909	13
14	0702	1709	0643	1739	0609	1803	0527	1827	0456	1850	0444	1909	14
15	0702	1710	0642	1740	0607	1804	0526	1828	0455	1851	0444	1909	15
16	0702	1711	0641	1741	0606	1805	0525	1829	0454	1852	0444	1910	16
17	0702	1712	0640	1742	0605	1806	0523	1829	0453	1852	0444	1910	17
18	0701	1713	0638	1743	0603	1806	0522	1830	0453	1853	0445	1910	18
19	0701	1714	0637	1744	0602	1807	0521	1831	0452	1854	0445	1911	19
20	0701	1715	0636	1745	0601	1808	0520	1832	0451	1855	0445	1911	20
21	0700	1716	0635	1746	0559	1809	0518	1832	0451	1844	0445	1911	21
22	0700	1717	0634	1747	0558	1809	0517	1833	0450	1856	0445	1911	22
23	0659	1718	0633	1747	0556	1810	0516	1834	0450	1857	0446	1911	23
24	0659	1719	0632	1748	0555	1811	0515	1835	0449	1857	0446	1912	24
25	0658	1720	0630	1749	0554	1812	0514	1835	0449	1858	0446	1912	25
26	0658	1721	0629	1750	0552	1813	0513	1836	0448	1859	0446	1912	26
27	0657	1722	0628	1751	0551	1813	0512	1837	0448	1900	0447	1912	27
28	0657	1723	0627	1752	0550	1814	0511	1838	0447	1900	0447	1912	28
29	0656	1724	0626	1752	0548	1815	0509	1839	0447	1901	0447	1912	29
30	0655	1725			0547	1816	0508	1839	0447	1901	0448	1912	30
31	0655	1726			0546	1816			0446	1902			31
Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:	
27 min.		26 min.		25 min.		26 min.		28 min.		29 min.			
Nautical:		Nautical:		Nautical:		Nautical:		Nautical:		Nautical:		Nautical:	
58 min.		55 min.		54 min.		57 min.		61 min.		65 min.			

Retain for use in future years. These data valid through 2020.

TABLE C-2 Sunrise and Sunset for Point Mugu (July-December)

Sunrise, Sunset, and Duration of Twilight for Point Mugu, CA.
 34°07' N. 119°07' W
 (July to December)

Note: All times are Pacific Standard Time (120th meridian):
 add 1 hour when Daylight Savings Time is in effect:

July		August		September		October		November		December		Date	
Date	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Date
1	0448	1912	0507	1858	0530	1823	0551	1741	0616	1704	0644	1647	1
2	0449	1912	0508	1857	0530	1821	0551	1740	0617	1703	0645	1647	2
3	0449	1912	0509	1856	0531	1820	0552	1738	0618	1702	0646	1647	3
4	0450	1912	0510	1855	0532	1819	0553	1737	0619	1701	0646	1647	4
5	0450	1912	0510	1854	0532	1817	0554	1736	0620	1700	0647	1647	5
6	0451	1911	0511	1853	0533	1816	0554	1734	0621	1659	0648	1647	6
7	0451	1911	0512	1852	0534	1815	0555	1733	0621	1658	0649	1647	7
8	0452	1911	0512	1851	0535	1813	0556	1732	0622	1658	0650	1647	8
9	0452	1911	0513	1850	0535	1812	0557	1730	0623	1657	0650	1647	9
10	0453	1910	0514	1849	0536	1810	0557	1729	0624	1656	0651	1647	10
11	0453	1910	0515	1848	0537	1809	0558	1728	0625	1655	0652	1647	11
12	0454	1910	0515	1847	0537	1808	0559	1726	0626	1655	0653	1648	12
13	0454	1909	0516	1846	0538	1806	0600	1725	0627	1654	0653	1648	13
14	0455	1909	0517	1845	0539	1805	0601	1724	0628	1653	0654	1648	14
15	0456	1909	0518	1844	0539	1803	0601	1723	0629	1653	0655	1648	15
16	0456	1908	0518	1843	0540	1802	0602	1721	0630	1652	0655	1649	16
17	0457	1908	0519	1841	0541	1801	0603	1720	0631	1652	0656	1649	17
18	0458	1907	0520	1840	0541	1759	0604	1719	0632	1651	0657	1650	18
19	0458	1907	0520	1839	0542	1758	0605	1718	0633	1651	0657	1650	19
20	0459	1906	0521	1838	0543	1756	0606	1717	0634	1650	0658	1650	20
21	0500	1905	0522	1837	0544	1755	0606	1715	0635	1650	0658	1651	21
22	0500	1905	0523	1835	0544	1754	0607	1714	0636	1649	0659	1651	22
23	0501	1904	0523	1834	0545	1752	0608	1713	0637	1649	0659	1652	23
24	0502	1904	0524	1833	0546	1751	0609	1712	0637	1649	0700	1653	24
25	0502	1903	0525	1832	0546	1749	0610	1711	0638	1648	0700	1653	25
26	0503	1902	0525	1830	0547	1748	0611	1710	0639	1648	0700	1654	26
27	0504	1902	0526	1829	0548	1747	0611	1709	0640	1648	0701	1654	27
28	0504	1901	0527	1828	0549	1745	0612	1708	0641	1647	0701	1655	28
29	0505	1900	0528	1827	0549	1744	0613	1707	0642	1647	0702	1656	29
30	0506	1859	0528	1825	0550	1742	0614	1706	0643	1647	0702	1656	30
31	0507	1858	0529	1824			0615	1705			0702	1657	31
Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:			
29 min.		26 min.		25 min.		25 min.		27 min.		28 min.			
Nautical: 63 min.		Nautical: 58 min.		Nautical: 55 min.		Nautical: 54 min.		Nautical: 57 min.		Nautical: 59 min.			

Retain for use in future years. These data valid through 2020.

TABLE C-3 Sunrise and Sunset for Barking Sands (January-June)

Sunrise, Sunset, and Duration of Twilight for Barking Sands, Kauai, HI
(January to June)
22°02' N, 159°47' W

Note: All times are Alaska-Hawaii Standard Time. (150th Meridian)

Date	January		February		March		April		May		June		Date
	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	Sun- rise	Sun- set	
1	0718	1807	0718	1828	0700	1843	0632	1854	0607	1905	0555	1919	1
2	0719	1808	0717	1829	0659	1843	0631	1855	0607	1906	0555	1919	2
3	0719	1909	0717	1830	0659	1844	0630	1855	0606	1906	0555	1920	3
4	0719	1909	0716	1830	0658	1844	0629	1855	0606	1906	0555	1920	4
5	0719	1810	0716	1831	0657	1845	0628	1856	0605	1907	0555	1920	5
6	0720	1811	0715	1831	0656	1845	0627	1856	0604	1907	0555	1921	6
7	0720	1811	0715	1832	0655	1846	0627	1856	0604	1908	0555	1921	7
8	0720	1812	0714	1833	0654	1846	0626	1857	0603	1908	0555	1921	8
9	0720	1813	0714	1833	0653	1846	0625	1857	0603	1909	0555	1922	9
10	0720	1813	0713	1834	0653	1847	0624	1857	0602	1909	0555	1922	10
11	0720	1814	0713	1834	0652	1847	0623	1858	0602	1909	0555	1922	11
12	0721	1815	0712	1835	0650	1848	0621	1858	0601	1910	0555	1923	12
13	0721	1815	0712	1835	0650	1848	0621	1858	0601	1910	0555	1923	13
14	0721	1816	0711	1836	0649	1848	0620	1859	0600	1911	0555	1923	14
15	0721	1817	0710	1836	0648	1848	0620	1859	0600	1911	0555	1924	15
16	0721	1818	0710	1837	0647	1849	0619	1859	0559	1912	0555	1924	16
17	0721	1818	0709	1837	0646	1849	0618	1900	0559	1912	0556	1924	17
18	0721	1819	0709	1838	0645	1850	0617	1900	0559	1913	0556	1925	18
19	0721	1820	0708	1838	0644	1850	0616	1900	0558	1913	0556	1925	19
20	0720	1820	0707	1839	0643	1850	0615	1901	0558	1914	0556	1925	20
21	0720	1821	0706	1839	0642	1851	0615	1901	0558	1914	0556	1925	21
22	0720	1822	0706	1840	0641	1851	0614	1902	0557	1914	0557	1925	22
23	0720	1822	0705	1840	0641	1851	0613	1902	0557	1915	0557	1926	23
24	0720	1823	0704	1841	0640	1852	0612	1902	0557	1915	0557	1926	24
25	0720	1824	0703	1841	0639	1852	0612	1903	0557	1916	0557	1926	25
26	0719	1824	0703	1842	0639	1852	0611	1903	0556	1916	0558	1926	26
27	0719	1825	0702	1842	0637	1853	0610	1904	0556	1917	0558	1926	27
28	0719	1826	0701	1843	0636	1853	0609	1904	0556	1917	0558	1926	28
29	0719	1826	0701	1843	0635	1853	0609	1904	0556	1917	0558	1926	29
30	0718	1827			0634	1854	0609	1904	0555	1918	0559	1927	30
31	0718	1828			0633	1854	0608	1905	0555	1918			31
Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:	
24 min.		23 min.		22 min.		23 min.		24 min.		25 min.			
Nautical:		Nautical:		Nautical:		Nautical:		Nautical:		Nautical:			
51 min.		49 min.		45 min.		50 min.		53 min.		55 min.			

Retain for use in future years. These data valid through 2020.

TABLE C-4 Sunrise and Sunset for Barking Sands (July-December)

Sunrise, Sunset, and Duration of Twilight for Barking Sands, Kauai, HI
 22°02' N. 159°47' W
 (July to December)

NOTE: All times are Alaska-Hawaii Standard Time (150th Meridian)

Date	July Sun- rise	July Sun- set	August Sun- rise	August Sun- set	September Sun- rise	September Sun- set	October Sun- rise	October Sun- set	November Sun- rise	November Sun- set	December Sun- rise	December Sun- set	Date
1	0559	1927	0611	1919	0622	1856	0630	1827	0643	1802	0702	1755	1
2	0559	1927	0612	1919	0622	1855	0631	1826	0643	1802	0702	1755	2
3	0600	1927	0612	1918	0623	1854	0631	1825	0644	1801	0703	1755	3
4	0600	1927	0612	1918	0623	1853	0631	1824	0645	1801	0703	1755	4
5	0600	1927	0613	1917	0623	1852	0632	1823	0645	1800	0704	1755	5
6	0601	1927	0613	1916	0623	1851	0632	1822	0646	1800	0705	1756	6
7	0601	1927	0614	1916	0624	1850	0632	1821	0646	1759	0705	1756	7
8	0602	1927	0614	1915	0624	1849	0633	1820	0647	1759	0706	1756	8
9	0602	1926	0614	1914	0624	1848	0633	1819	0647	1758	0707	1756	9
10	0602	1926	0615	1914	0625	1847	0633	1819	0648	1758	0707	1757	10
11	0603	1926	0615	1913	0625	1846	0634	1818	0649	1758	0708	1757	11
12	0603	1926	0616	1912	0625	1845	0634	1817	0649	1757	0709	1757	12
13	0603	1926	0616	1912	0625	1844	0634	1816	0650	1757	0709	1758	13
14	0604	1926	0616	1911	0626	1843	0635	1815	0650	1757	0710	1758	14
15	0604	1926	0617	1910	0626	1842	0635	1814	0651	1756	0710	1758	15
16	0605	1925	0617	1909	0626	1841	0636	1813	0652	1756	0711	1759	16
17	0605	1925	0617	1909	0626	1840	0636	1813	0652	1756	0712	1759	17
18	0606	1925	0618	1908	0627	1839	0636	1812	0653	1756	0712	1800	18
19	0606	1925	0618	1907	0627	1838	0637	1811	0654	1755	0713	1800	19
20	0606	1924	0618	1906	0627	1837	0637	1810	0654	1755	0713	1800	20
21	0607	1924	0619	1905	0628	1836	0638	1810	0655	1755	0714	1801	21
22	0607	1924	0619	1905	0628	1836	0638	1809	0656	1755	0714	1801	22
23	0608	1923	0619	1904	0628	1835	0639	1808	0656	1755	0715	1802	23
24	0608	1923	0620	1903	0628	1834	0639	1807	0657	1755	0715	1803	24
25	0608	1922	0620	1902	0629	1833	0639	1807	0658	1755	0716	1803	25
26	0609	1922	0620	1901	0629	1832	0640	1806	0658	1755	0716	1804	26
27	0609	1922	0621	1900	0629	1831	0640	1805	0659	1755	0716	1804	27
28	0610	1921	0621	1859	0630	1830	0641	1805	0700	1755	0717	1805	28
29	0610	1921	0621	1859	0630	1829	0641	1804	0700	1755	0717	1805	29
30	0610	1920	0621	1858	0630	1828	0642	1803	0701	1755	0718	1806	30
31	0611	1920	0622	1857			0642	1803			0718	1807	31
Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:		Average Twilight Civil:	
23 min.		23 min.		22 min.		23 min.		24 min.		24 min.		24 min.	
Nautical:		Nautical:		Nautical:		Nautical:		Nautical:		Nautical:		Nautical:	
54 min.		50 min.		48 min.		49 min.		51 min.		52 min.		52 min.	

Retain for use in future years. These data valid through 2020.

INITIAL DISTRIBUTION

EXTERNAL

- 4 Naval Air Systems Command, Washington, DC
 - AIR-OOD4 (2)
 - AIR-42 (1)
 - AIR-540 (1)
- 12 Defense Technical Information Center, Cameron Station, Alexandria, VA
 - DTIC-DDA (12)
- 1 Naval Air Warfare Center, Liaison Office, Naval Air Systems Command, Washington, DC
 - JP-2, RM 608 (1)
- 1 Commander Third Fleet, FPO San Francisco, CA
 - Staff Oceanographer (N36) (1)
- 4 Naval Civil Engineering Laboratory, Port Hueneme, CA
 - Code L08A (Library) (1)
 - Code L52 (C. Matthews) (1)
 - Code L63 (E. Durlas) (1)
 - (D. Pendleton) (1)
- 1 Naval Oceanography Command Facility, Naval Air Station, North Island San Diego, CA
- 1 Camp Pendelton, CA
 - MEF-G7 (S2) (1)
- 1 Surf and Weather Office, Marine Corps Base, Camp Pendelton, CA
- 1 Naval Western Oceanography Center, Box 113, Pearl Harbor, HI
- 1 Detachment 30, 6th Weather Wing, Vandenberg AFB, CA
- 1 Antarctic Development Squadron SIX, Point Mugu, CA
- 1 Naval Air Reserve Forces (NAVAIRES), Point Mugu, CA
- 14 Pacific Missile Range Facility, Hawaiian Area, Barking Sands, Kekaha, Kaua, HI
 - Code 7001 (1)
 - Code 7003 (1)
 - Code 7030 (2)
 - Code 7300 (1)
 - Code 7320 (2)
 - Code 7322 (5)
 - Code 7330 (2)
- 1 National Weather Service, Weather Service Forecast Office, 11102 Federal Building, 11000 Wilshire Boulevard, Los Angeles, CA
- 1 USDA Soil Conservation Service, P.O. Box 260, 3380 Somis Rd., Somis, CA
- 1 Ventura College, Biology Department, 4667 Telegraph Road, Ventura, CA
 - Mr. Thor Willsrud (1)
- 3 County of Ventura, 800 S. Victoria Avenue, Ventura, CA
 - Flood Control District (1)
 - Public Works Agency (1)
 - Sheriff Department/Emergency Services (1)
- 1 Camarillo Daily News, 1000 Avenida Acaso, Camarillo, CA
- 1 Dr. Victor Bobrow, OD, 461 W. Fifth St., Oxnard, CA

INTERNAL

- 1 NAWCWPNS, Pt. Mugu, CA
Code 00 (RADM Newman) (1)
- 1 NAWCWFNS, Pt. Mugu, CA
Code 01 (CAPT Cook) (1)
- 1 Test & Evaluation
Code P03 (Mr. Wroust) (1)
- 10 Technical Library, Bldg. 511-A
Code P6433A
- 2 Reports Library
Code P6433
- 2 HARPOON/SLAM Program Office
Code P038BA (LCDR Converse)
- 5 Sea Range Directorate
Code P03B (R. J. Warnagieris)
- 1 Range Operations Department
Code P3501 (Leslie)
- 2 Range Oper. Control Systems Division
Code P35201 (LCDR Walters)
- 120 Geophysics Division
Code P3542 (Fisk)
- 10 Surface craft Division
Code P356 (LCDR Buchanan)
- 3 Systems Maintenance Engr. Br.
Code P3632 (Weal)
- 1 Systems Engr. Section
Code P36111 (Revell)
- 1 Data Processing Division
Code P3723 (Burdullis)
- 5 Surface Targets Div.
Code P3842 (Rail)
- 1 Naval Air Station
Code P07 (CAPT Laughter)
- 1 Air Operations Officer
Code P76 (CDR Bronson)
- 1 Administrative Office
Code P7604
- 1 Air Traffic Control Facility
Code P763 (LCDR Gentry)
- 16 Environmental Division
Code P732 (Dow) (2)
Code P73202 (Keeney) (12)
Code P7332 (Cervantes) (2)
- 3 Facilities Mgmt. Engr. Div.
Code P7343 (Qualls)
- 10 OIC, San Nicolas Island
Code P79 (LCDR Geyer)

INTERNAL

- 7 Security Department
 - Code P744 (Jenkins) (4)
 - Code P742 (Boner) (3)
- 2 Aircraft Maintenance Dept.
 - Code P77 (CDR Noziglia) (1)
- 1 Code HACTR2D (Osborne) (1)