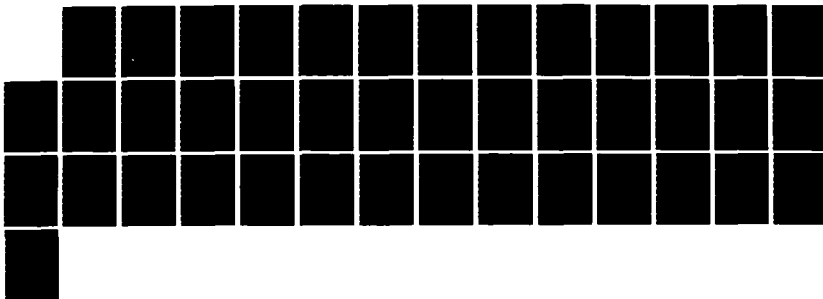


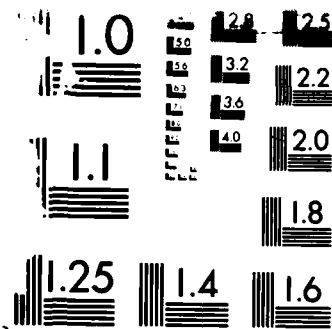
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TIDAL AND LUNAR DATA FOR POINT MUGU SAN NICHOLAS ISLAND 1/1
AND THE BARKING SANDS AREA DURING 1987(U) PACIFIC
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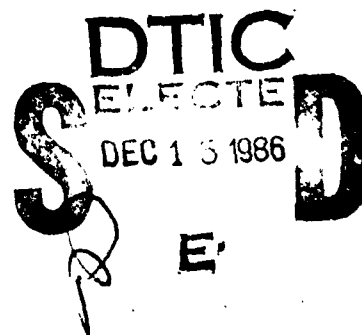
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TIDAL AND LUNAR DATA FOR
POINT MUGU, SAN NICOLAS ISLAND,
AND THE BARKING SANDS AREA
DURING 1987

Compiled by
RICH DIXON
Geophysics Division

31 December 1986



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PACIFIC MISSILE TEST CENTER

Point Mugu, California 93042

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PACIFIC MISSILE TEST CENTER

AN ACTIVITY OF THE NAVAL AIR SYSTEMS COMMAND

Mr. T. E. Battalino, Acting Head, Geophysical Sciences Branch; Mr. R. W. Dixon, Task Engineer; Mr. D. A. Lea, Program Manager; CDR F. M. Reynolds, Geophysics Officer/Program Manager; Mr. P. D. Wilson, Assistant Range Operations Officer; and Mr. C. L. Buchheit, Director, Range Directorate, have approved this report for publication.

W. R. HATTABAUGH
Technical Director

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19 ABSTRACT (Continue on reverse if necessary and identify by block number) Basic lunar and tidal data for Point Mugu, San Nicolas Island, and the Barking Sands Area during 1987 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.					
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INTRODUCTION

This publication combines into a single source all tidal and lunar data for operational locations of the Pacific Missile Test Center for use in Calendar Year 1987.

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. An appendix provides information regarding lunar phases. Since all such data change from year to year, this publication will be reissued annually.

Sunrise-sunset times for these locations, and associated solar data which do not change significantly from year to year, are issued as a single, permanent publication. Further information regarding any of these data may be obtained from the Geophysics Division of the Range Operations Department.

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, 1987.*

For Point Mugu and San Nicolas Island, all times listed are Pacific Standard Time (PST); add eight hours to obtain Greenwich Mean Time (GMT or Z).**

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

*National Ocean Survey, Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1987. Washington, D.C., GPO, 1986.

**When Daylight Savings Time (PDT) is in effect, 1 hour is to be added to the times given. In 1987, Pacific Daylight Time is scheduled to commence at 0200 PST on Sunday, 5 April (add 1 hour), and to end at 0200 PDT on Sunday, 27 October (subtract 1 hour).

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 1987 at Point Mugu are given in the even-numbered tables 4 through 26, and at San Nicolas Island in the odd-numbered tables 5 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.

Tidal Levels	Point Mugu	San Nicolas Island
	Height (Feet)	Height (Feet)
Extreme high water	7.3	6.7
Mean higher high water	5.3	4.9
Mean high water	4.5	4.1
Mean tide level*	2.7	2.5
Mean low water	0.9	0.8
Mean lower low water	0.0	0.0
Extreme low water	-2.0	-1.8

*The mean tide level is also called mean sea level.

Table 2. Tidal Ranges for Port Allen.

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

*The mean tide level is also called mean sea level.

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 (see tables 1 and 2) 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 is thus likely to be higher or lower than computed values may indicate. Information regarding the height of the tide at any time will be found in appendix A.

LUNAR DATA

Times of moonrise and moonset for the Point Mugu-San Nicolas Island area in 1987 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 1987 will be found in appendix B.

Table 3. Moonrise and Moonset, Point Mugu, California, 1987.
Pacific Standard Time

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Rise	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
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
1	0851 1858	0704 2115	0729 1759	0723 2156	0719 2241	0852 2324	0940 2247	1128 2232	1348 2319	1436 1436	1456 0156	1422 0304
2	0934 2013	0931 2219	0756 2103	0758 2258	0809 2331	0951 2353	1037 2311	1233 2304	1454 1454	1518 0034	1523 0303	1453 0409
3	1009 2123	0958 2321	0824 2207	0839 2357	0904 1050	1050 1050	1135 2336	1341 2344	1552 0023	1554 0148	1551 0409	1528 0515
4	1044 2229	1026 2321	0853 2316	0926 1013	1003 0015	1148 0020	1235 1339	1452 1602	1641 0136	1626 0300	1621 0515	1609 0620
5	1106 2331	1050 2322	0926 1013	1013 0031	1102 0052	1247 0045	1339 0032	1602 0033	1722 0252	1655 0410	1654 0622	1656 0722
6	1132 0032	1129 0123	1004 0312	1115 0138	1202 0124	1347 0110	1447 0033	1708 0133	1757 0408	1723 0518	1732 0729	1749 0819
7	1158 0032	1208 0223	1047 0111	1215 0219	1301 0153	1450 0136	1559 0109	1804 0243	1828 0521	1752 0626	1815 0834	1847 0910
8	1225 0132	1233 0321	1135 0208	1315 0254	1401 0219	1558 0204	1713 0153	1951 0401	1857 0632	1823 0733	1905 0935	1946 0953
9	1256 0232	1344 0415	1230 0253	1415 0325	1501 0245	1710 0238	1824 0249	1929 0519	1925 0740	1858 0841	2000 1030	2045 1030
10	1331 0332	1440 0504	1323 0343	1516 0353	1604 0310	1825 0318	1926 0356	2002 0634	1955 0847	1938 0947	2058 1117	2143 1101
11	1412 0431	1539 0546	1428 0422	1616 0419	1711 0338	1939 0409	2018 0512	2031 0746	2027 0954	2024 1050	2157 1157	2241 1128
12	1458 0527	1639 0623	1529 0456	1719 0445	1822 0409	2045 0511	2100 0630	2059 0855	2104 1100	2115 1148	2256 1231	2337 1153
13	1551 0620	1740 0655	1629 0525	1823 0511	1935 0445	2142 0622	2135 0746	2128 1001	2145 1203	2211 1239	2354 1301	2416 1216
14	1646 0706	1840 0724	1733 0552	1931 0540	2050 0530	2227 0738	2255 0858	2157 1106	2233 1303	2310 1323	2401 1352	2434 1306
15	1747 0747	1940 0750	1831 0618	2042 0612	2159 0625	2305 0853	2343 1006	2230 1210	2325 1358	2401 1401	2452 1352	2434 1306
16	1847 0822	2040 0815	1933 0643	2155 0652	2300 0730	2336 1005	2300 1111	2308 1313	2446 1446	2400 1433	2449 1416	2434 1334
17	1947 0853	2142 0840	2038 0710	2306 0739	2350 0841	2336 1113	2327 1215	2351 1414	0022 1527	0108 1501	0248 1441	0340 1408
18	2046 0923	2246 0907	2145 0739	2406 0836	2455 0955	2304 1214	2357 1317	1512 1512	0121 1602	0207 1526	0349 1508	0449 1469
19	2145 0946	2353 0937	2255 0813	2510 0942	0031 1107	0031 1320	0142 1420	0340 1603	0221 1632	0305 1551	0454 1539	0601 1540
20	2246 1011	2513 1013	2354 0834	2616 1053	0104 1215	0057 1422	0031 1521	0134 1648	0320 1659	0403 1615	0602 1616	0712 1643
21	2348 1036	0103 1056	0006 0943	2712 1205	0134 1321	0125 1524	0110 1621	0231 1727	0418 1724	0503 1641	0713 1701	0815 1754
22	0044 1104	0214 1148	0114 1042	2812 1315	0201 1424	0156 1626	0154 1716	0330 1801	0516 1748	0606 1709	0825 1757	0909 1910
23	0144 1136	0322 1252	0215 1150	2912 1422	0227 1526	0231 1727	0245 1806	0430 1830	0615 1813	0712 1742	0931 1902	0953 2026
24	0243 1215	0422 1303	0308 1302	3010 1528	0253 1628	0311 1826	0340 1849	0528 1856	0715 1839	0820 1822	1029 2014	1030 2138
25	0346 1303	0513 1316	0352 1415	3107 1631	0322 1731	0358 1920	0418 1926	0626 1920	0817 1908	0930 1910	1117 2128	1101 2247
26	0429 1402	0555 1433	0428 1526	3203 1734	0354 1833	0450 2008	0537 1958	0724 1944	0923 1942	1038 2007	1156 2239	1129 2353
27	0516 1512	0630 1545	0500 1634	3301 1838	0431 1934	0546 2049	0636 2026	0822 2009	1031 2023	1140 2113	1229 2348	1157 2353
28	0635 1624	0731 1653	0528 1740	3401 1941	0513 2032	0645 2125	0734 2051	0922 2035	1140 2113	1233 2224	1259 2359	1224 0058
29	0723 1745	0823 1745	0555 1845	3505 2044	0602 2125	0744 2155	0831 2115	1025 2105	1245 2213	1318 2336	1326 0055	1254 0202
30	0802 1859	0922 1849	0622 1949	3604 2145	0656 2211	0842 2222	0929 2139	1130 2141	1345 2321	1355 2355	1353 0200	1328 0307
31	0855 2009		0651 2053		0753 2250		1027 2204	1239 2225		1427 0047		1406 0411

TABLE 4
POINT MUGU TIDES
JANUARY 1987
34 DEC 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0314	2.1	0924	7.0	1654	-1.7	2322	4.1
2	0410	2.1	1013	6.6	1738	-1.3	1823	-1.8
3	0013	4.2	0510	2.2	1105	5.9	1906	-1.1
4	0100	4.3	0623	2.2	1158	5.0	1954	1.6
5	0152	4.5	0741	2.2	1304	4.1	2040	1.2
6	0245	4.7	0918	1.9	1431	3.4	2133	1.8
7	0336	4.9	1050	1.4	1623	2.9	2231	2.2
8	0426	5.1	1207	.8	1809	2.9	2324	2.5
9	0514	5.3	1256	.3	1924	3.1	2051	3.4
10	0554	5.4	1338	-1.1	2016	3.2	2120	3.4
11	0015	2.5	0634	5.6	1416	-4	2148	3.5
12	0057	2.5	0711	5.8	1445	-6	2217	3.5
13	0132	2.5	0743	5.9	1517	-7	2242	3.6
14	0208	2.5	0815	6.0	1548	-7	2310	3.7
15	0240	2.4	0847	5.9	1614	-7	2339	3.8
16	0316	2.3	0919	5.8	1642	-6	1803	.3
17	0351	2.3	0951	5.6	1712	-4	1834	.8
18	0430	2.3	1023	5.2	1736	-1	1906	1.3
19	0006	3.9	0520	2.3	1059	4.7	1948	1.9
20	0042	4.1	0619	2.2	1144	4.0	2047	2.3
21	0118	4.3	0735	2.1	1246	3.3	2218	2.5
22	0203	4.5	0918	1.7	1432	2.7	2337	2.5
23	0300	4.8	1053	1.0	1701	2.6	2057	3.9
24	0400	5.2	1203	.2	1844	2.9	2133	4
25	0503	5.7	1257	-6	1939	3.3	2208	4.3
26	0559	6.2	1344	-1.2	2019	3.6	2243	4.5
27	0038	2.4	0654	6.7	1426	-1.7	2322	4.7
28	0134	2.0	0745	6.9	1508	-1.9		
29	0227	1.7	0831	7.0	1548	-1.8		
30	0317	1.5	0916	6.9	1627	-1.5		
31	0406	1.3	1004	6.2	1702	-1.0		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 5
SAN NICOLAS ISLAND TIDES
JANUARY 1987
33 DEC 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0324	1.8	0931	6.2	1704	-1.5	2329	3.7
2	0420	1.8	1020	5.9	1748	-1.1	1833	-7
3	0020	3.8	0520	1.9	1112	5.3	1916	1.1
4	0107	3.9	0633	1.9	1205	4.5	2004	.5
5	0159	4.0	0751	1.9	1311	3.7	2050	1.1
6	0252	4.2	0928	1.7	1438	3.1	2143	1.6
7	0343	4.4	1100	1.2	1630	2.6	2241	1.9
8	0433	4.6	1217	.7	1816	2.6	2334	2.2
9	0521	4.8	1306	.5	1931	2.8	1813	.3
10	0601	4.8	1348	-1.1	2023	2.9	1916	1.1
11	0025	2.3	0641	5.0	1426	-4	2057	2.0
12	0107	2.3	0718	5.2	1455	-5	2146	1.7
13	0142	2.3	0750	5.3	1527	-6	2228	2.3
14	0218	2.2	0822	5.4	1558	-6	2347	2.3
15	0250	2.1	0854	5.3	1624	-6	1813	.3
16	0326	2.0	0926	5.2	1652	-5	1916	1.1
17	0401	2.0	0958	5.0	1722	-4	2057	2.0
18	0440	2.0	1030	4.7	1746	-1	2146	1.7
19	0013	3.5	0530	2.0	1106	4.2	2228	2.3
20	0049	3.7	0629	1.9	1151	3.6	2347	2.3
21	0125	3.9	0745	1.8	1253	3.0	1813	.3
22	0210	4.0	0928	1.5	1439	2.5	1916	1.1
23	0307	4.3	1103	.9	1708	2.4	2057	2.0
24	0407	4.7	1213	.2	1851	2.6	2146	1.7
25	0510	5.1	1307	-5	1946	3.0	2228	2.3
26	0606	5.5	1354	-1.1	2026	3.3	2347	2.3
27	0048	2.1	0701	6.0	1436	-1.5	1813	.3
28	0144	1.8	0752	6.2	1518	-1.7	1916	1.1
29	0237	1.5	0838	6.2	1558	-1.6	2057	2.0
30	0327	1.3	0923	6.1	1637	-1.3	2146	1.7
31	0416	1.1	1011	5.5	1712	-9	2228	2.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 6

POINT MUGU TIDES
FEBRUARY 1987

34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0459	1.3	1050	5.5	1738	-4	0000	4.7*		
2	0537	1.4	1139	4.6	1813	.4	---	---		
3	0604	4.7	0703	1.5	1236	3.7	1845	1.1		
4	0125	4.7	0829	1.5	1357	2.9	1917	1.8		
5	0218	4.6	1018	1.2	1630	2.5	1958	2.4		
6	0322	4.6	1143	.8	1900	2.8	2131	2.7		
7	0431	4.7	1243	.3	1952	3.1	2314	2.8		
8	0532	4.9	1326	-1	2019	3.3	---	---		
9	0617	2.7	0618	5.2	1358	-4	2041	3.5		
10	0100	2.5	0659	5.4	1428	-6	2058	3.6		
11	0134	2.3	0732	5.7	1456	-7	2116	3.7		
12	0208	2.1	0804	5.8	1518	-7	2134	3.9		
13	0237	1.9	0836	5.8	1543	-7	2156	4.0		
14	0312	1.6	0907	5.6	1604	-5	2218	4.2		
15	0347	1.5	0939	5.3	1630	-2	2240	4.3		
16	0425	1.4	1014	4.9	1651	.2	2305	4.5		
17	0505	1.3	1053	4.3	1714	.7	2333	4.6		
18	0600	1.2	1139	3.6	1738	1.2	---	---		
19	0008	4.7	0706	1.2	1244	2.9	1800	1.7		
20	0051	4.8	0845	1.0	1455	2.5	1827	2.3		
21	0158	4.8	1035	.5	---	---	---	---		
22	0325	5.0	1151	-1	1905	3.1	2221	2.8		
23	0449	5.4	1246	-8	1935	3.5	2351	2.5		
24	0556	5.9	1331	-1.2	2000	3.8	---	---		
25	0049	2.1	0649	6.3	1409	-1.5	2032	4.2		
26	0139	1.5	0739	6.5	1444	-1.5	2100	4.5		
27	0226	1.0	0825	6.4	1520	-1.3	2129	4.8		
28	0312	.7	0910	6.1	1552	-9	2200	5.0		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 7

SAN NICOLAS ISLAND TIDES
FEBRUARY 1987

33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0509	1.1	1057	4.9	1748	-4	0007	4.2*		
2	0607	1.2	1146	4.1	1823	.4	---	---		
3	0047	4.2	0713	1.3	1243	3.3	1855	1.0		
4	0132	4.2	0839	1.3	1404	2.6	1927	1.6		
5	0225	4.1	1028	1.1	1637	2.3	2008	2.1		
6	0329	4.1	1153	.7	1907	2.6	2141	2.5		
7	0438	4.2	1253	.3	1959	2.8	2324	2.6		
8	0539	4.4	1336	-1	2026	3.0	---	---		
9	0027	2.5	0625	4.7	1408	-4	2048	3.2		
10	0110	2.3	0706	4.8	1438	-5	2105	3.3		
11	0144	2.0	0739	5.1	1506	-6	2123	3.3		
12	0218	1.8	0811	5.2	1528	-6	2141	3.5		
13	0247	1.6	0843	5.2	1553	-6	2203	3.6		
14	0322	1.4	0914	5.0	1614	-4	2225	3.8		
15	0357	1.3	0946	4.8	1640	-2	2247	3.9		
16	0435	1.2	1021	4.4	1701	.2	2312	4.0		
17	0515	1.1	1100	3.9	1724	.6	2340	4.1		
18	0610	1.1	1146	3.3	1748	1.1	---	---		
19	0015	4.2	0716	1.1	1251	2.6	1810	1.5		
20	0058	4.3	0855	.9	1502	2.2	1837	2.0		
21	0205	4.3	1045	.4	---	---	---	---		
22	0332	4.5	1201	-1	1912	2.8	2231	2.6		
23	0456	4.8	1256	-7	1942	3.2	0001	2.3*		
24	0603	5.3	1341	-1.1	2007	3.4	---	---		
25	0059	1.8	0656	5.6	1419	-1.3	2039	3.8		
26	0149	1.3	0746	5.8	1454	-1.3	2107	4.0		
27	0236	.9	0832	5.7	1530	-1.1	2136	4.3		
28	0322	.6	0917	5.5	1602	-8	2207	4.5		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 8
POINT MUGU TIDES
MARCH 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0356	.5	0952	5.5	1620	- .4	2230	5.1
2	0443	.4	1034	4.8	1651	.3	2302	5.1
3	0531	.5	1121	4.0	1716	1.0	2334	5.0
4	0624	.7	1216	3.2	1738	1.6	---	---
5	0006	4.9	0736	.9	1343	2.6	---	---
6	0051	4.5	0923	1.0	---	---	---	---
7	0159	4.2	1108	.8	---	---	---	---
8	0340	4.2	1212	.4	1940	3.3	2319	2.9
9	0503	4.4	1255	0.0	1952	3.5	---	---
10	0015	2.6	0559	4.7	1326	- .2	2000	3.6
11	0054	2.3	0637	5.0	1353	- .4	2015	3.8
12	0123	1.9	0716	5.3	1417	- .5	2030	4.0
13	0155	1.5	0748	5.4	1439	- .4	2048	4.3
14	0227	1.1	0820	5.3	1501	- .3	2106	4.6
15	0259	.8	0856	5.2	1523	- .1	2128	4.8
16	0334	.5	0928	4.8	1545	.3	2150	5.0
17	0414	.3	1009	4.4	1606	.7	2216	5.2
18	0456	.2	1054	3.8	1631	1.2	2246	5.2
19	0550	.2	1150	3.2	1652	1.7	2323	5.2
20	0659	.3	1321	2.6	1717	2.2	---	---
21	0011	5.0	0832	.3	---	---	---	---
22	0128	4.8	1013	0.0	---	---	---	---
23	0312	4.8	1130	- .4	1841	3.4	2250	2.7
24	0444	5.0	1220	- .7	1903	3.9	0001	2.2*
25	0548	5.4	1302	- 1.0	1928	4.3	---	---
26	0054	1.5	0645	5.6	1339	- 1.0	1953	4.7
27	0139	.8	0731	5.6	1411	- .8	2021	5.0
28	0221	.3	0816	5.4	1443	- .4	2048	5.3
29	0303	- .1	0900	5.1	1510	0.0	2115	5.5
30	0342	- .3	0942	4.6	1537	.5	2141	5.5
31	0424	- .3	1026	4.0	1602	1.1	2209	5.4

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 9
SAN NICOLAS ISLAND TIDES
MARCH 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0406	.4	0959	4.9	1630	- .4	2237	4.6
2	0453	.4	1041	4.3	1701	.3	2309	4.6
3	0541	.4	1128	3.6	1726	.9	2341	4.5
4	0634	.6	1223	2.9	1748	1.4	---	---
5	0013	4.3	0746	.8	1350	2.4	1800	1.9
6	0058	4.0	0933	.9	---	---	---	---
7	0206	3.8	1118	.7	---	---	---	---
8	0347	3.8	1222	.4	1947	3.0	2329	2.6
9	0510	4.0	1305	0.0	1959	3.2	---	---
10	0025	2.4	0606	4.2	1336	- .2	2007	3.3
11	0104	2.0	0644	4.5	1403	- .4	2022	3.4
12	0133	1.7	0723	4.8	1427	- .4	2037	3.6
13	0205	1.3	0755	4.8	1449	- .4	2055	3.9
14	0237	1.0	0827	4.8	1511	- .3	2113	4.1
15	0309	.7	0903	4.7	1533	- .1	2135	4.3
16	0344	.4	0935	4.3	1555	.3	2157	4.5
17	0424	.3	1016	4.0	1616	.6	2223	4.7
18	0506	.2	1101	3.4	1641	1.1	2253	4.7
19	0600	.2	1157	2.9	1702	1.5	2330	4.7
20	0749	.3	1328	2.4	1727	1.9	---	---
21	0018	4.5	0842	.3	---	---	---	---
22	0135	4.3	1023	0.0	---	---	---	---
23	0319	4.3	1140	- .4	1848	3.1	2300	2.5
24	0451	4.5	1230	- .6	1910	3.5	0011	1.9*
25	0555	4.8	1312	- .9	1935	3.9	---	---
26	0104	1.3	0652	5.0	1349	- .9	2000	4.2
27	0149	.7	0738	5.0	1421	- .7	2028	4.5
28	0231	.3	0823	4.8	1453	- .4	2055	4.8
29	0313	- .1	0907	4.6	1520	0.0	2122	4.9
30	0352	- .3	0949	4.1	1547	.4	2148	4.9
31	0434	- .3	1033	3.6	1612	1.0	2216	4.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 12
POINT MUGU TIDES
MAY 1987
34 DEC 06 MIN N.

[illegible]

TABLE 13
SAN NICOLAS ISLAND TIDES
MAY 1987
33 DEC 16 MIN N, 119 DEC

DATE	TIME		HGT		TIME		HGT		TIME		HGT	
	PST	FT	PST	FT	PST	FT	PST	FT	PST	FT	PST	FT
1	0546	-2	1228	2.6	1606	2.2	2235	4.5				
2	0642	.1	2311	4.1	---	---	---	---				
3	0751	.3	0005	3.8	---	---	---	---				
4	0901	.4	---	---	---	---	---	---				
5	0131	3.5	1008	.4	---	---	---	---				
6	0311	3.3	1057	.4	1750	3.2	2226	2.6				
7	0431	3.3	1134	.4	1800	3.4	2329	2.2				
8	0531	3.4	1206	.5	1814	3.7	0014	1.7*				
9	0050	1.1	0625	3.5	1829	4.0	---	---				
10	0125	.4	0712	3.5	1235	.6	1848	4.4				
11	0204	-1	0800	3.5	1303	.8	1912	4.8				
12	0242	-6	0846	3.5	1333	1.0	1937	5.2				
13	0324	-1.0	0939	3.3	1403	1.2	2008	5.5				
14	0410	-4.1	1032	3.2	1436	1.5	2042	5.6				
15	0501	-1.2	1133	3.0	1514	1.8	2122	5.6				
16	0557	-1.1	1246	2.9	1553	2.0	2207	5.5				
17	0700	-9	1411	3.0	1642	2.3	2258	5.2				
18	0807	-6	1525	3.3	1754	2.6	0002	4.8*				
19	0121	4.3	0914	-4	1940	2.6	---	---				
20	0251	4.0	1012	-2	1620	3.6	2132	2.3				
21	0417	3.7	1012	.1	1702	4.0	2302	1.8				
22	0534	3.5	1147	.4	1738	4.4	0003	1.1*				
23	0056	.4	1147	.4	1811	4.8	---	---				
24	0139	-1	0637	3.4	1224	.8	1841	5.0				
25	0221	-4	0733	3.3	1256	1.1	1910	5.2				
26	0259	-6	0823	3.3	1332	1.4	1939	5.3				
27	0337	-7	0912	3.2	1400	1.7	2007	5.4				
28	0413	-7	0955	3.1	1429	1.9	2036	5.3				
29	0431	-5	1042	3.0	1457	2.1	2105	5.1				
30	0531	-4	1134	2.8	1526	2.3	2140	4.9				
31	0616	-2	1226	2.8	1554	2.5	2216	4.8				
			1331	2.8	1633	2.6	2251	4.4				

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAV

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 14

POINT MUGU TIDES

JUNE 1987

34 DEC 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0656	0.0	1434	3.2	1726	3.0	2331	4.5
2	0745	.3	1533	3.4	1904	3.1	2100	2.9
3	0828	4.1	0934	.5	1605	3.7	2230	2.5
4	0148	3.7	0917	.7	1629	4.0	2328	1.8
5	0318	3.4	1002	1.0	1652	4.4	---	---
6	0440	3.3	1040	1.2	1719	4.9	---	---
7	0014	1.0	0552	3.3	1119	1.5	1745	5.3
8	0059	.3	0655	3.4	1157	1.7	1820	5.8
9	0142	-.5	0750	3.5	1239	1.9	1855	6.3
10	0224	-1.1	0843	3.6	1321	2.1	1935	6.6
11	0309	-1.5	0937	3.6	1403	2.2	2021	6.8
12	0358	-1.7	1033	3.6	1452	2.3	2106	6.8
13	0447	-1.7	1125	3.7	1544	2.4	2156	6.6
14	0539	-1.5	1224	3.7	1644	2.5	2251	6.1
15	0631	-1.2	1319	3.9	1759	2.5	2350	5.5
16	0722	-.7	1418	4.2	1930	2.5	---	---
17	0100	4.8	0815	-.2	1511	4.5	2104	2.2
18	0222	4.1	0906	.4	1559	4.9	2232	1.6
19	0354	3.5	0958	1.0	1641	5.2	2342	1.0
20	0520	3.3	1047	1.5	1724	5.5	---	---
21	0638	.4	0638	3.2	1130	1.9	1759	5.7
22	0126	-.1	0740	3.3	1212	2.2	1836	5.9
23	0208	-.4	0833	3.3	1250	2.4	1907	6.0
24	0244	-.6	0918	3.4	1326	2.5	1940	6.0
25	0322	-.7	0956	3.4	1400	2.5	2014	6.0
26	0354	-.7	1033	3.4	1435	2.5	2047	5.9
27	0428	-.6	1110	3.4	1511	2.6	2121	5.8
28	0502	-.5	1147	3.4	1548	2.6	2154	5.5
29	0536	-.3	1224	3.5	1633	2.7	2232	5.2
30	0611	0.0	1301	3.6	1724	2.8	2307	4.8

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 15

SAN NICOLAS ISLAND TIDES

JUNE 1987

33 DEC 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0706	0.0	1441	2.9	1736	2.7	2338	4.0
2	0755	.3	1540	3.1	1914	2.8	---	---
3	0835	3.7	0844	.4	1612	3.3	2110	2.6
4	0155	3.3	0927	.6	1636	3.6	2240	2.2
5	0325	3.1	1012	.9	1659	4.0	2338	1.6
6	0447	3.0	1050	1.1	1726	4.4	---	---
7	0024	.9	0559	3.0	1129	1.3	1752	4.8
8	0109	.3	0702	3.1	1207	1.5	1827	5.2
9	0152	-.4	0757	3.2	1249	1.7	1902	5.6
10	0234	-1.0	0850	3.3	1331	1.8	1942	5.9
11	0319	-1.3	0944	3.3	1413	1.9	2028	6.1
12	0408	-1.5	1040	3.3	1502	2.0	2113	6.1
13	0457	-1.5	1132	3.3	1554	2.1	2203	5.9
14	0549	-1.3	1231	3.3	1654	2.2	2258	5.5
15	0641	-1.1	1326	3.5	1809	2.3	2357	4.9
16	0732	-.6	1425	3.8	1940	2.2	---	---
17	0107	4.3	0825	-.2	1518	4.0	2114	1.9
18	0229	3.7	0916	.4	1606	4.4	2242	1.4
19	0401	3.2	1008	.9	1648	4.7	2352	.9
20	0527	3.0	1057	1.3	1731	4.9	---	---
21	0648	.4	0645	2.9	1140	1.7	1806	5.1
22	0136	-.1	0747	3.0	1222	1.9	1843	5.3
23	0218	-.4	0840	3.0	1300	2.1	1914	5.4
24	0254	-.5	0925	3.1	1336	2.2	1947	5.4
25	0332	-.6	1003	3.1	1410	2.3	2021	5.4
26	0404	-.6	1040	3.1	1445	2.3	2054	5.3
27	0438	-.5	1117	3.1	1521	2.4	2128	5.2
28	0512	-.4	1154	3.1	1558	2.4	2201	4.9
29	0546	-.3	1231	3.2	1643	2.5	2239	4.7
30	0621	0.0	1308	3.3	1734	2.6	2314	4.3

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 16
POINT MUGU TIDES
JULY 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0645	3	1339	3.8	1834	2.8	2357	4.3
2	0717	.7	1418	4.0	1954	2.6	---	---
3	0053	3.7	0752	1.1	1456	4.3	2130	2.3
4	0221	3.2	0832	1.5	1535	4.7	2250	1.7
5	0407	2.9	0920	1.9	1617	5.1	2352	.9
6	0548	2.9	1016	2.2	1700	5.6	---	---
7	0041	.1	0702	3.1	1111	2.4	1746	6.1
8	0130	-.6	0757	3.4	1210	2.5	1835	6.6
9	0215	-1.2	0846	3.6	1307	2.4	1923	6.9
10	0302	-1.6	0932	3.8	1358	2.3	2012	7.1
11	0345	-1.7	1014	4.0	1452	2.2	2101	7.1
12	0430	-1.7	1058	4.2	1550	2.1	2153	6.8
13	0514	-1.4	1144	4.4	1646	2.0	2243	6.2
14	0557	-.9	1227	4.6	1752	2.0	2338	5.4
15	0642	-.2	1315	4.8	1905	2.0	---	---
16	0040	4.5	0724	.5	1404	4.9	2034	1.8
17	0157	3.7	0806	1.2	1456	5.1	2208	1.4
18	0339	3.1	0858	1.9	1550	5.3	2327	.9
19	0535	3.0	0957	2.4	1642	5.4	---	---
20	0031	.4	0703	3.2	1100	2.6	1732	5.6
21	0121	0.0	0803	3.4	1156	2.7	1815	5.7
22	0200	-.3	0842	3.5	1247	2.7	1857	5.9
23	0235	-.4	0910	3.6	1323	2.6	1930	6.0
24	0306	-.5	0939	3.7	1401	2.5	2006	6.0
25	0336	-.5	1004	3.8	1434	2.5	2037	6.0
26	0404	-.5	1029	3.8	1509	2.4	2109	5.9
27	0430	-.3	1054	3.9	1545	2.4	2141	5.7
28	0457	-.1	1119	4.1	1624	2.4	2214	5.3
29	0521	.2	1147	4.2	1707	2.3	2249	4.8
30	0544	.6	1216	4.3	1802	2.3	2330	4.2
31	0611	1.1	1248	4.5	1912	2.2	---	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 17
SAN NICOLAS ISLAND TIDES
JULY 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0655	.3	1346	3.4	1844	2.6	0004	3.9*
2	0727	.6	1425	3.6	2004	2.4	---	---
3	0100	3.3	0802	1.0	1503	3.9	2140	2.0
4	0228	2.9	0842	1.3	1542	4.2	2300	1.5
5	0414	2.6	0930	1.7	1624	4.6	0002	.8*
6	0555	2.6	1026	1.9	1707	5.0	---	---
7	0051	.1	0709	2.8	1121	2.1	1753	5.5
8	0140	-.5	0804	3.1	1220	2.2	1842	5.9
9	0225	-1.1	0853	3.3	1317	2.1	1930	6.2
10	0312	-1.4	0939	3.4	1408	2.0	2019	6.3
11	0355	-1.5	1021	3.6	1502	1.9	2108	6.3
12	0440	-1.5	1105	3.8	1600	1.8	2200	6.1
13	0524	-1.2	1151	4.0	1656	1.8	2250	5.5
14	0607	-.8	1234	4.1	1802	1.8	2345	4.8
15	0652	-.2	1322	4.3	1915	1.8	---	---
16	0047	4.0	0734	.4	1411	4.4	2044	1.6
17	0204	3.3	0816	1.1	1503	4.6	2218	1.2
18	0346	2.8	0908	1.7	1557	4.8	2337	.8
19	0542	2.7	1007	2.1	1649	4.8	---	---
20	0041	.4	0710	2.9	1110	2.4	1739	5.0
21	0131	0.0	0810	3.1	1206	2.5	1822	5.1
22	0210	-.3	0849	3.2	1257	2.5	1904	5.3
23	0245	-.4	0917	3.3	1333	2.4	1937	5.4
24	0316	-.4	0946	3.3	1411	2.3	2013	5.4
25	0346	-.4	1011	3.4	1444	2.2	2044	5.4
26	0414	-.4	1036	3.4	1519	2.1	2116	5.3
27	0440	-.3	1101	3.5	1555	2.1	2148	5.1
28	0507	-.1	1126	3.7	1634	2.1	2221	4.8
29	0531	.2	1154	3.8	1717	2.0	2256	4.3
30	0554	.5	1223	3.9	1812	2.0	2337	3.8
31	0621	1.0	1255	4.0	1922	1.9	---	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 18
POINT MUGU TIDES
AUGUST 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME	HGT	TIME	HGT	TIME	HGT	TIME	HGT	TIME	HGT
	PST	FT	PST	FT	PST	FT	PST	FT	PST	FT
1	0026	3.6	0637	1.6	1329	4.7	2038	2.0		
2	0150	3.0	0711	2.1	1419	4.9	2217	1.4		
3	0418	2.7	0757	2.5	1522	5.2	2332	.7		
4	0622	3.0	0926	2.7	1629	5.7	----	----		
5	0032	0.0	0717	3.3	1100	2.8	1729	6.1		
6	0118	-.7	0756	3.7	1209	2.6	1826	6.6		
7	0203	-1.2	0833	4.0	1310	2.4	1918	7.0		
8	0245	-1.4	0906	4.3	1400	2.0	2007	7.2		
9	0324	-1.5	0941	4.6	1452	1.7	2056	7.0		
10	0402	-1.2	1017	4.8	1543	1.4	2142	6.6		
11	0438	-.8	1054	5.1	1635	1.3	2230	5.9		
12	0515	-.1	1131	5.2	1734	1.3	2322	5.1		
13	0549	.6	1212	5.3	1838	1.3	----	----		
14	0021	4.1	0621	1.4	1255	5.2	1956	1.4		
15	0140	3.4	0700	2.1	1348	5.1	2134	1.3		
16	0356	3.0	0745	2.6	1451	5.0	2308	.9		
17	0626	3.2	0911	3.0	1605	5.1	----	----		
18	0017	.5	0726	3.5	1058	3.1	1712	5.2		
19	0102	.2	0758	3.7	1204	3.0	1804	5.4		
20	0140	0.0	0823	3.9	1249	2.7	1846	5.7		
21	0210	-.2	0838	4.0	1326	2.5	1922	5.9		
22	0239	-.3	0856	4.1	1358	2.3	1953	6.0		
23	0304	-.2	0918	4.2	1427	2.1	2025	5.9		
24	0326	-.1	0936	4.4	1459	1.9	2054	5.8		
25	0348	.1	0958	4.6	1534	1.7	2126	5.5		
26	0409	.3	1020	4.7	1609	1.6	2158	5.1		
27	0428	.7	1043	4.9	1648	1.5	2236	4.6		
28	0451	1.2	1107	5.0	1737	1.5	2318	4.0		
29	0512	1.7	1139	5.0	1835	1.5	----	----		
30	0019	3.3	0533	2.2	1219	5.1	2005	1.4		
31	0214	2.8	0552	2.5	1313	5.1	2152	1.1		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 19
SAN NICOLAS ISLAND TIDES
AUGUST 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME	HGT	TIME	HGT	TIME	HGT	TIME	HGT	TIME	HGT
	PST	FT	PST	FT	PST	FT	PST	FT	PST	FT
1	0033	3.3	0647	1.4	1336	4.2	2048	1.8		
2	0157	2.7	0721	1.8	1426	4.4	2227	1.2		
3	0425	2.5	0807	2.2	1529	4.7	2342	.6		
4	0629	2.7	0936	2.5	1636	5.1	----	----		
5	0042	0.0	0724	3.0	1110	2.6	1736	5.5		
6	0128	-.6	0803	3.3	1219	2.4	1833	5.9		
7	0213	-1.1	0840	3.6	1320	2.1	1925	6.2		
8	0255	-1.2	0913	3.9	1410	1.8	2014	6.4		
9	0334	-1.3	0948	4.1	1502	1.5	2103	6.2		
10	0412	-1.1	1024	4.3	1553	1.2	2149	5.9		
11	0448	-.7	1101	4.6	1645	1.1	2237	5.3		
12	0525	-.1	1138	4.7	1744	1.1	2329	4.6		
13	0559	.5	1219	4.8	1848	1.1	----	----		
14	0028	3.7	0631	1.2	1302	4.7	2006	1.2		
15	0147	3.1	0710	1.8	1355	4.6	2144	1.1		
16	0403	2.7	0755	2.4	1458	4.5	2318	.8		
17	0633	2.9	0921	2.7	1612	4.6	----	----		
18	0027	.4	0733	3.2	1108	2.8	1719	4.7		
19	0112	.2	0805	3.3	1214	2.7	1811	4.8		
20	0150	0.0	0830	3.5	1259	2.5	1853	5.1		
21	0220	-.2	0845	3.6	1336	2.3	1929	5.3		
22	0249	-.3	0903	3.7	1408	2.0	2000	5.4		
23	0314	-.2	0925	3.8	1437	1.8	2032	5.3		
24	0336	-.1	0943	4.0	1509	1.7	2101	5.2		
25	0358	.1	1005	4.1	1544	1.5	2133	4.9		
26	0419	.3	1027	4.2	1619	1.4	2205	4.6		
27	0438	.6	1114	4.5	1658	1.3	2243	4.1		
28	0501	1.1	1146	4.5	1747	1.3	2325	3.6		
29	0522	1.5	1166	4.5	1845	1.3	----	----		
30	0026	3.0	0543	1.9	1226	4.6	2015	1.2		
31	0221	2.6	0602	2.3	1320	4.6	2202	1.0		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 20

POINT MUGU TIDES
SEPTEMBER 1987

34 DEC 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	1443	5.2	2316	.5	---	---
2	0647	3.4	0938	3.2	1613	5.5
3	0017	-1	0708	3.8	1118	2.9
4	0102	-6	0733	4.1	1222	2.5
5	0141	-9	0802	4.5	1313	1.9
6	0217	-10	0830	4.9	1400	1.3
7	0252	-8	0901	5.3	1447	.9
8	0324	-5	0931	5.6	1533	.6
9	0356	.1	1003	5.7	1622	.5
10	0428	.7	1035	5.7	1712	.5
11	0454	1.4	1110	5.6	1810	.7
12	0006	3.7	0525	2.1	1146	5.4
13	0140	3.1	0547	2.6	1235	5.0
14	1346	4.7	2234	.9	---	---
15	1524	4.6	2343	.7	---	---
16	0707	3.8	1112	3.3	1647	4.8
17	0030	.4	0722	4.0	1207	2.9
18	0107	.2	0737	4.2	1241	2.5
19	0132	.1	0755	4.4	1313	2.2
20	0157	.1	0810	4.6	1345	1.8
21	0219	.2	0828	4.8	1415	1.4
22	0241	.3	0844	5.0	1445	1.1
23	0302	.6	0905	5.3	1519	.8
24	0321	.9	0927	5.4	1553	.7
25	0340	1.3	0948	5.6	1636	.6
26	0404	1.8	1017	5.6	1721	.6
27	0422	2.2	1049	5.5	1826	.7
28	0050	3.1	0441	2.6	1134	5.4
29	1242	5.2	2133	.6	---	---
30	1424	5.1	2252	.2	---	---

* -- TIDE OCCURS ON NEXT DATE.

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 21

SAN NICOLAS ISLAND TIDES
SEPTEMBER 1987

33 DEC 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	1450	4.7	2326	.4	---	---
2	0654	3.1	0948	2.9	1620	4.9
3	0027	-1	0715	3.4	1129	2.6
4	0112	-5	0740	3.7	1232	2.2
5	0151	-8	0809	4.0	1323	1.7
6	0227	-9	0837	4.4	1410	1.1
7	0302	-7	0908	4.8	1457	.8
8	0334	-4	0938	5.0	1543	.5
9	0406	.1	1010	5.1	1632	.4
10	0438	.6	1042	5.1	1722	.4
11	0504	1.2	1117	5.0	1820	.6
12	0013	3.3	0535	1.8	1153	4.8
13	0147	2.8	0557	2.4	1242	4.5
14	1353	4.2	2244	.8	---	---
15	1531	4.1	2353	.6	---	---
16	0714	3.4	1122	3.0	1654	4.3
17	0040	.4	0729	3.6	1217	2.6
18	0117	.2	0744	3.8	1251	2.3
19	0142	.1	0802	4.0	1323	1.9
20	0207	.1	0817	4.1	1355	1.6
21	0229	.2	0835	4.3	1425	1.2
22	0251	.3	0851	4.5	1455	1.0
23	0312	.5	0912	4.8	1529	.7
24	0331	.8	0934	4.8	1603	.6
25	0350	1.1	0955	5.0	1646	.5
26	0414	1.6	1024	5.0	1731	.5
27	0432	1.9	1056	4.9	1836	.6
28	0057	2.8	0451	2.4	1141	4.8
29	1249	4.7	2143	.5	---	---
30	1431	4.6	2302	.2	---	---

* -- TIDE OCCURS ON NEXT DATE.

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 22
POINT MUGUJ TIDES
OCTOBER 1987
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0612	3.8	1014	3.2	1605	5.3	2346	-2		
2	0636	4.2	1132	2.6	1716	5.5	---	---		
3	0031	-4	0658	4.7	1228	2.0	1815	5.8		
4	0107	-4	0723	5.1	1313	1.2	1905	5.9		
5	0142	-3	0751	5.6	1357	.6	1953	5.8		
6	0214	0.0	0820	5.9	1440	.1	2038	5.5		
7	0245	.5	0848	6.1	1522	-2	2124	5.0		
8	0312	1.0	0917	6.2	1608	-2	2209	4.5		
9	0339	1.6	0946	6.1	1653	-1	2302	3.9		
10	0404	2.1	1017	5.8	1742	.2	---	---		
11	0006	3.4	0426	2.5	1050	5.4	1848	.6		
12	0201	3.1	0427	3.0	1131	5.0	2007	.8		
13	1232	4.6	2141	.9	---	---	---	---		
14	0630	3.7	0855	3.6	1421	4.3	2250	.7		
15	0628	3.9	1100	3.3	1601	4.3	2340	.6		
16	0636	4.2	1148	2.8	1706	4.5	---	---		
17	0015	.5	0648	4.4	1223	2.3	1756	4.7		
18	0041	.5	0703	4.7	1256	1.8	1834	4.8		
19	0106	.6	0718	5.0	1328	1.3	1913	4.8		
20	0129	.7	0736	5.3	1359	.8	1951	4.8		
21	0151	1.0	0755	5.6	1432	.3	2027	4.6		
22	0214	1.2	0816	5.9	1507	0.0	2108	4.4		
23	0238	1.5	0842	6.1	1545	-2	2151	4.1		
24	0300	1.9	0910	6.2	1630	-3	2244	3.7		
25	0328	2.3	0946	6.1	1720	-2	2354	3.3		
26	0353	2.6	1024	5.9	1824	-1	---	---		
27	0133	3.1	0426	2.9	1118	5.6	1943	.1		
28	1230	5.2	2104	.1	---	---	---	---		
29	0453	3.8	0830	3.4	1412	4.9	2214	0.0		
30	0522	4.2	1026	2.8	1548	4.8	2307	0.0		
31	0550	4.7	1133	2.1	1704	4.9	2353	.1		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 23
SAN NICOLAS ISLAND TIDES
OCTOBER 1987
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0619	3.4	1024	2.9	1612	4.8	2356	-2		
2	0643	3.8	1142	2.4	1723	5.0	---	---		
3	0041	-4	0705	4.2	1238	1.8	1822	5.2		
4	0117	-4	0730	4.6	1323	1.1	1912	5.3		
5	0152	-3	0758	5.0	1407	.5	2000	5.2		
6	0224	0.0	0827	5.3	1450	.1	2045	4.9		
7	0255	.4	0855	5.5	1532	-2	2131	4.5		
8	0322	.9	0924	5.5	1618	-2	2216	4.0		
9	0349	1.4	0953	5.5	1703	-1	2309	3.5		
10	0414	1.8	1024	5.2	1752	.2	---	---		
11	0013	3.1	0436	2.3	1057	4.8	1858	.5		
12	0208	2.8	0437	2.7	1138	4.5	2017	.7		
13	1239	4.1	2151	.8	---	---	---	---		
14	0637	3.3	0905	3.3	1428	3.9	2300	.6		
15	0635	3.5	1110	3.0	1608	3.9	2350	.5		
16	0643	3.8	1158	2.6	1713	4.0	---	---		
17	0025	.4	0655	4.0	1233	2.0	1803	4.2		
18	0051	.4	0710	4.2	1306	1.6	1841	4.3		
19	0116	.5	0725	4.5	1338	1.1	1920	4.3		
20	0139	.6	0743	4.8	1409	.7	1958	4.3		
21	0201	.9	0802	5.0	1442	.3	2034	4.1		
22	0224	1.1	0823	5.3	1517	0.0	2115	4.0		
23	0248	1.3	0849	5.5	1555	-2	2158	3.7		
24	0310	1.7	0917	5.5	1640	-3	2251	3.3		
25	0338	2.0	0953	5.5	1730	-2	0001	3.0*		
26	0403	2.4	1031	5.3	1834	-1	---	---		
27	0140	2.8	0436	2.6	1125	5.0	1953	.1		
28	1237	4.7	2114	.1	---	---	---	---		
29	0500	3.4	0840	3.1	1419	4.4	2224	0.0		
30	0529	3.8	1036	2.6	1555	4.3	2317	0.0		
31	0557	4.2	1143	1.8	1711	4.4	0003	.1*		

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 24

POINT MUGU TIDES
NOVEMBER 1987

34 DEC 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0618	5.2	1226	1.3	1807	4.9	---	---
2	0030	.3	0647	5.7	1311	.6	1902	4.8
3	0102	.6	0715	6.1	1353	-.1	1951	4.7
4	0134	1.0	0742	6.3	1435	-.5	2038	4.4
5	0203	1.4	0811	6.4	1516	-.7	2124	4.1
6	0232	1.8	0848	6.4	1557	-.6	2213	3.8
7	0300	2.2	0911	6.2	1638	-.5	2307	3.5
8	0325	2.5	0939	5.9	1723	-.2	---	---
9	0013	3.3	0350	2.8	1012	5.5	1819	.1
10	0151	3.2	0405	3.1	1053	5.1	1920	.4
11	1142	4.6	2029	.6	---	---	---	---
12	0510	3.6	0745	3.5	1301	4.2	2135	.7
13	0322	3.9	1007	3.2	1444	3.9	2226	.8
14	0336	4.2	1116	2.7	1610	3.9	2306	.9
15	0551	4.5	1158	2.2	1716	3.9	2337	1.0
16	0609	4.9	1233	1.5	1808	3.9	0008	1.2*
17	0625	5.3	1309	.8	1854	4.0	---	---
18	0033	1.4	0647	5.7	1341	.2	1940	4.0
19	0102	1.6	0713	6.0	1419	-.3	2024	3.9
20	0131	1.8	0742	6.3	1458	-.7	2112	3.9
21	0202	2.0	0814	6.5	1540	-1.0	2201	3.7
22	0237	2.3	0850	6.6	1628	-1.0	2259	3.6
23	0313	2.5	0932	6.5	1718	-1.0	---	---
24	0006	3.4	0356	2.7	1020	6.2	1816	-.8
25	0122	3.5	0457	2.9	1118	5.8	1919	-.5
26	0238	3.7	0635	3.1	1227	5.2	2023	-.2
27	0337	4.1	0834	2.9	1354	4.6	2122	.1
28	0422	4.6	1012	2.4	1530	4.2	2219	.4
29	0501	5.1	1127	1.6	1656	4.0	2306	.8
30	0537	5.5	1222	.8	1805	3.9	2348	1.2

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 25

SAN NICOLAS ISLAND TIDES

NOVEMBER 1987

33 DEC 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0625	4.7	1236	1.1	1814	4.4	---	---
2	0040	.3	0654	5.1	1321	.5	1909	4.3
3	0112	.5	0722	5.5	1403	-.1	1958	4.2
4	0144	.9	0749	5.6	1445	-.4	2045	4.0
5	0213	1.2	0818	5.7	1526	-.6	2131	3.7
6	0242	1.6	0847	5.7	1607	-.5	2220	3.4
7	0310	1.9	0918	5.5	1648	-.4	2314	3.2
8	0335	2.3	0946	5.3	1733	-.2	---	---
9	0020	3.0	0400	2.6	1019	4.9	1829	.1
10	0158	2.9	0415	2.8	1100	4.6	1930	.4
11	1149	4.1	2039	.5	---	---	---	---
12	0517	3.3	0755	3.2	1308	3.8	2145	.6
13	0529	3.5	1017	2.9	1451	3.5	2236	.7
14	0543	3.8	1126	2.5	1617	3.5	2316	.8
15	0558	4.0	1208	1.9	1723	3.5	2347	.9
16	0616	4.4	1243	1.3	1815	3.5	0018	1.1*
17	0632	4.8	1319	.7	1901	3.6	---	---
18	0043	1.2	0654	5.1	1351	.2	1947	3.6
19	0112	1.4	0720	5.4	1429	-.3	2031	3.5
20	0141	1.6	0749	5.6	1508	-.6	2119	3.5
21	0212	1.8	0821	5.8	1550	-.9	2208	3.3
22	0247	2.0	0857	5.9	1638	-.9	2306	3.3
23	0323	2.2	0939	5.8	1728	-.9	---	---
24	0013	3.1	0406	2.5	1027	5.5	1826	-.7
25	0129	3.2	0507	2.6	1125	5.2	1929	-.4
26	0245	3.3	0645	2.8	1234	4.7	2033	-.2
27	0344	3.7	0844	2.6	1401	4.1	2132	.1
28	0429	4.1	1022	2.1	1537	3.8	2229	.4
29	0508	4.6	1137	1.4	1703	3.6	2316	.7
30	0544	4.9	1232	.7	1812	3.5	2358	1.1

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 26

POINT MUGU TIDES
DECEMBER 1987

34 DEC 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0609	5.9	1312	.1	1907	3.9	---	---
2	0026	1.5	0642	6.2	1354	-4	2002	3.8
3	0058	1.8	0714	6.4	1433	-7	2052	3.7
4	0134	2.1	0746	6.4	1512	-9	2136	3.7
5	0206	2.4	0816	6.3	1550	-8	2220	3.5
6	0237	2.5	0848	6.2	1628	-7	2307	3.4
7	0306	2.6	0920	5.9	1708	-5	2356	3.4
8	0341	2.8	0956	5.6	1750	-2	---	---
9	0051	3.3	0420	2.9	1034	5.2	1832	.1
10	0154	3.4	0517	3.1	1113	4.8	1919	.4
11	0253	3.6	0641	3.2	1206	4.3	2007	.7
12	0338	3.8	0836	3.1	1318	3.7	2053	1.0
13	0410	4.1	1017	2.6	1454	3.3	2134	1.3
14	0439	4.5	1125	2.0	1627	3.1	2216	1.6
15	0503	4.9	1211	1.3	1745	3.2	2259	1.8
16	0535	5.3	1250	.5	1849	3.3	2338	2.0
17	0603	5.8	1331	-2	1942	3.4	---	---
18	0019	2.1	0639	6.2	1411	-8	2032	3.6
19	0101	2.2	0718	6.6	1453	-1.2	2119	3.6
20	0147	2.3	0759	6.8	1535	-1.5	2206	3.7
21	0229	2.3	0843	6.9	1620	-1.6	2254	3.7
22	0319	2.4	0932	6.8	1709	-1.5	2344	3.8
23	0414	2.4	1021	6.4	1756	-1.2	---	---
24	0039	3.9	0518	2.5	1116	5.8	1845	-7
25	0131	4.1	0637	2.5	1216	5.0	1936	-1
26	0227	4.5	0814	2.3	1335	4.2	2037	.5
27	0319	4.8	0952	1.8	1507	3.5	2120	1.1
28	0408	5.2	1112	1.1	1652	3.2	2216	1.6
29	0456	5.5	1218	.4	1822	3.2	2306	2.0
30	0540	5.8	1310	-2	1930	3.3	2356	2.3
31	0617	6.0	1355	-6	2024	3.4	---	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 27

SAN NICOLAS ISLAND TIDES
DECEMBER 1987

33 DEC 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0616	5.3	1322	.1	1914	3.5	---	---
2	0036	1.3	0649	5.5	1404	-4	2009	3.4
3	0108	1.6	0721	5.7	1443	-6	2059	3.3
4	0144	1.8	0753	5.7	1522	-8	2143	3.3
5	0216	2.1	0823	5.6	1600	-7	2227	3.2
6	0247	2.2	0855	5.5	1638	-6	2314	3.1
7	0316	2.4	0927	5.3	1718	-4	0003	3.1*
8	0351	2.6	1003	5.0	1800	-2	---	---
9	0058	3.0	0430	2.6	1041	4.7	1842	.1
10	0201	3.1	0527	2.8	1120	4.3	1929	.4
11	0300	3.3	0651	2.9	1213	3.9	2017	.6
12	0345	3.4	0846	2.8	1325	3.3	2103	.9
13	0417	3.7	1027	2.4	1501	3.0	2144	1.1
14	0446	4.0	1135	1.8	1634	2.8	2226	1.4
15	0510	4.4	1221	1.1	1752	2.9	2309	1.6
16	0542	4.8	1300	.4	1856	3.0	2348	1.8
17	0610	5.2	1341	-2	1949	3.1	---	---
18	0029	1.8	0646	5.5	1421	-7	2039	3.3
19	0111	1.9	0725	5.9	1503	-1.1	2126	3.3
20	0157	2.0	0806	6.1	1545	-1.3	2213	3.3
21	0239	2.0	0850	6.2	1630	-1.4	2301	3.3
22	0329	2.1	0939	6.1	1719	-1.3	2351	3.4
23	0424	2.1	1028	5.7	1806	-1.1	---	---
24	0046	3.5	0528	2.2	1123	5.2	1855	-6
25	0138	3.7	0647	2.2	1223	4.5	1946	-1
26	0234	4.0	0824	2.0	1342	3.8	2037	.4
27	0326	4.3	1002	1.6	1514	3.2	2130	1.0
28	0415	4.7	1122	1.0	1659	2.9	2226	1.4
29	0503	4.9	1228	.4	1829	2.9	2316	1.8
30	0547	5.2	1320	-2	1937	3.0	0006	2.0*
31	0624	5.4	1405	-5	2031	3.1	---	---

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

Table 28. Moonrise and Moonset, Barking Sands, Hawaii, 1987.
Hawaii-Aleutian Standard Time

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Rise	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
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
1	0910 2016	0947 2205	0815 2045	0834 2217	0843 2253	1009 2346	1040 2326	1203 2336	1402	1452 0046	1537 0255	1523 0341
2	0958 2123	1021 2300	0850 2141	0916 2314	0935 2343	1102	1130 2356	1300	1506 0046	1541 0154	1613 0353	1602 0439
3	1040 2225	1055 2355	0925 2217	1002	1028	1154 0021	1222	1502 0016	1606 0151	1624 0300	1648 0451	1644 0538
4	1117 2322	1130	1001 2334	1052 0009	1123 0030	1246 0054	1315 0028	1508 0103	1700 0300	1703 0404	1725 0550	1730 0637
5	1151	1206 0350	1041	1144 0102	1217 0111	1338 0126	1412 0102	1616 0157	1748 0409	1740 0506	1806 0649	1821 0736
6	1224 0017	1246 0145	1124 0030	1238 0151	1311 0149	1431 0157	1513 0139	1721 0300	1830 0517	1816 0606	1850 0750	1915 0832
7	1257 0111	1330 0240	1210 0126	1333 0235	1403 0223	1527 0230	1619 0223	1821 0410	1909 0621	1853 0705	1938 0849	2010 0923
8	1331 0204	1419 0334	1301 0219	1423 0315	1456 0256	1628 0307	1728 0315	1913 0522	1946 0723	1931 0805	2030 0947	2105 1009
9	1408 0257	1509 0427	1354 0310	1521 0352	1550 0328	1733 0348	1837 0415	1959 0632	2022 0823	2013 0905	2125 1041	2159 1050
10	1447 0352	1601 0516	1447 0357	1615 0426	1645 0401	1842 0437	1941 0524	2039 0739	2059 0923	2059 1005	2220 1131	2251 1126
11	1534 0446	1658 0602	1544 0440	1709 0459	1745 0436	1952 0533	2037 0636	2116 0842	2139 1022	2149 1104	2315 1214	2341 1159
12	1623 0540	1733 0643	1639 0519	1804 0531	1848 0515	2059 0638	2126 0747	2152 0942	2221 1121	2241 1200	2351	2230
13	1716 0632	1847 0721	1732 0555	1901 0605	1955 0600	2158 0748	2204 0855	2228 1040	2308 1219	2336 1251	0008 1328	0031 1300
14	1810 0725	1943 0755	1826 0629	2001 0642	2104 0652	2250 0859	2246 0958	2305 1138	2358 1316	0031 1338	0059 1401	0121 1331
15	1905 0804	2033 0843	1920 0701	2105 0722	2212 0751	2334 1007	2321 1058	2344 1235	0051 1409	0031 1419	0150 1432	0213 1403
16	1959 0844	2126 0900	2015 0733	2212 0804	2314 0857	0012 1110	2355 1155	0027 1429	0051 1458	0125 1457	0241 1502	0308 1439
17	2052 0920	2221 0932	2112 0807	2319 0903	0008 1113	0047 1306	0030 1346	0114 1524	0145 1543	0217 1531	0333 1534	0407 1520
18	2145 0954	2318 1007	2212 0844	0003	0008 1113	0047 1306	0030 1346	0114 1524	0145 1543	0217 1531	0333 1534	0407 1520
19	2237 1026	0016 1127	2316 0926	0023 1108	0055 1217	0121 1401	0107 1443	0205 1615	0334 1658	0400 1633	0524 1647	0617 1706
20	2330 1059	0016 1127	0014	0121 1215	0135 1318	0155 1456	0147 1539	0258 1702	0426 1731	0452 1705	0626 1732	0725 1810
21	0022 1217	0021 1108	0021 1108	0211 1321	0212 1415	0229 1551	0231 1635	0353 1745	0518 1803	0545 1738	0732 1824	0829 1920
22	0025 1206	0229 1315	0126 1210	0255 1423	0246 1510	0307 1647	0319 1728	0447 1823	0609 1834	0640 1814	0838 1924	0927 2030
23	0124 1246	0334 1419	0228 1316	0334 1523	0317 1605	0348 1744	0410 1818	0540 1858	0701 1905	0739 1854	0944 2029	1017 2138
24	0227 1312	0436 1528	0324 1423	0413 1620	0353 1700	0433 1839	0534 1904	0632 1930	0754 1938	0842 1941	1043 2137	1100 2242
25	0334 1426	0531 1637	0413 1528	0444 1716	0428 1756	0522 1932	0558 1945	0723 2001	0849 2015	0946 2034	1136 2244	1139 2342
26	0443 1529	0619 1743	0456 1631	0513 1811	0507 1853	0615 2021	0652 2022	0814 2032	0948 2057	1051 2134	1222 2348	1215
27	0550 1638	0742 1847	0535 1731	0553 1908	0550 1950	0709 2105	0745 2056	0905 2103	1050 2144	1153 2239	1302	1249 0040
28	0641 1756	0840 1947	0611 1824	0631 2005	0617 2045	0803 2145	0846 2128	0958 2137	1154 2239	1249 2346	1338 0049	1324 0137
29	0744 1859	0940 2047	0645 1926	0710 2102	0747 2137	0857 2221	0926 2158	1054 2215	1258 2340	1338	1413 0147	1401 0234
30	0830 1955	1040 2147	0720 2023	0755 2139	0820 2225	0949 2254	1017 2229	1154 2258	1358	1422 0051	1448 0244	1442 0332
31	0910 2107		0756 2120	0915 2309			1109 2301	1257 2340		1501 0154		1526 0430

TABLE 29

PORT ALLEN TIDES
JANUARY 1987

21 DEC 34 MIN N, 159 DEC 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0443	2.2	1228	0.0	1649	.5	2202	-2
2	0525	2.1	1307	0.0	1747	.5	2255	0.0
3	0608	1.9	1347	0.0	1857	.6	---	---
4	2353	1.3*	0647	1.7	1425	0.0	2013	.8
5	0059	.4	0726	1.4	1501	0.0	2135	.9
6	0237	.6	0806	1.1	1537	0.0	2249	1.2
7	0448	.7	0845	.9	1611	0.0	---	---
8	2348	1.4*	0705	.6	0945	.7	1651	0.0
9	0036	1.5	0827	.4	1100	.5	1730	0.0
10	0121	1.7	0919	.3	1209	.4	1808	-1
11	0156	1.8	0951	.3	1309	.4	1850	-1
12	0230	1.9	1023	.3	1357	.4	1932	-1
13	0304	1.9	1052	.2	1438	.4	2008	-1
14	0335	2.0	1119	.2	1517	.5	2043	-1
15	0406	1.9	1145	.2	1553	.5	2118	-1
16	0434	1.9	1211	.2	1631	.5	2150	0.0
17	0503	1.8	1234	.1	1715	.6	2232	.1
18	0531	1.7	1257	.1	1807	.7	2314	.3
19	0600	1.5	1323	.1	1907	.8	---	---
20	0614	.4	0632	1.3	1350	.1	2016	.9
21	0131	.6	0701	1.1	1424	0.0	2135	1.1
22	0337	.7	0742	.9	1503	0.0	2245	1.4
23	0615	.6	0841	.7	1553	-1	---	---
24	2347	1.6*	0755	.4	1621	.5	1648	-1
25	0041	1.8	0847	.3	1157	.4	1746	-2
26	0132	2.0	0926	.1	1311	.4	1845	-3
27	0219	2.1	1003	0.0	1410	.4	1937	-3
28	0301	2.2	1036	0.0	1501	.5	2029	-3
29	0343	2.1	1111	-1	1549	.6	2118	-2
30	0422	2.0	1143	-1	1637	.7	2210	-1
31	0457	1.9	1212	-1	1730	.9	2259	.1

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 30

PORT ALLEN TIDES
FEBRUARY 1987

21 DEC 34 MIN N, 159 DEC 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0531	1.6	1241	0.0	1822	.9	---	---
2	2353	.3*	0603	1.4	1311	0.0	1921	1.0
3	0102	.4	0635	1.1	1339	0.0	2033	1.1
4	0235	.6	0700	.9	1412	0.0	2146	1.3
5	0509	.6	0712	.7	1451	0.0	2300	1.4
6	1545	.1	---	---	---	---	---	---
7	0000	1.5	1644	.1	---	---	---	---
8	0050	1.6	0911	.3	1215	.4	1746	0.0
9	0132	1.7	0932	.3	1314	.4	1838	0.0
10	0208	1.8	0951	.2	1355	.5	1920	0.0
11	0241	1.8	1009	.2	1432	.6	2002	-1
12	0309	1.8	1031	.1	1504	.6	2041	-1
13	0338	1.8	1052	.1	1539	.7	2117	0.0
14	0403	1.7	1111	.1	1615	.8	2155	0.0
15	0430	1.6	1129	.1	1654	.9	2240	.2
16	0457	1.4	1151	0.0	1739	1.0	2326	.3
17	0521	1.3	1214	0.0	1832	1.1	---	---
18	0028	.4	0549	1.0	1240	0.0	1933	1.2
19	0153	.5	0618	.9	1315	0.0	2043	1.4
20	0414	.5	0646	.6	1358	0.0	2206	1.4
21	1501	0.0	2320	1.6	---	---	---	---
22	0759	.3	1039	.3	1618	0.0	---	---
23	0021	1.8	0831	.2	1218	.3	1738	-1
24	0112	2.0	0900	.1	1323	.5	1844	-1
25	0159	2.0	0929	0.0	1412	.6	1942	-2
26	0241	2.0	0957	-1	1454	.8	2034	-2
27	0317	1.9	1023	-1	1537	.9	2123	-1
28	0355	1.7	1047	-1	1619	1.0	2215	0.0

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 31

PORT ALLEN TIDES

MARCH 1987

21 DEC 54 MIN N, 159 DEG 35 MIN W - MANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0427	1.5	1113	-1	1704	1.2	2304	.2
2	0456	1.3	1136	-1	1749	1.3	---	---
3	0501	.3	0524	1.1	1159	0.0	1838	1.3
4	0105	.4	0549	.9	1223	0.0	1934	1.3
5	0241	.5	0608	.7	1254	.1	2043	1.4
6	1328	.1	2158	1.4	---	---	---	---
7	1435	.2	2311	1.4	---	---	---	---
8	0807	.3	1100	.3	1601	.2	---	---
9	0809	1.5	0822	.3	1218	.4	1722	.2
10	0054	1.6	0839	.2	1307	.5	1819	.1
11	0132	1.6	0855	.2	1342	.6	1908	.1
12	0204	1.6	0917	.1	1417	.8	1954	0.0
13	0233	1.6	0932	.1	1449	.9	2036	0.0
14	0301	1.5	0950	0.0	1521	1.0	2118	.1
15	0330	1.4	1008	0.0	1556	1.2	2203	.1
16	0355	1.3	1028	.1	1635	1.3	2250	.2
17	0423	1.1	1050	-1	1717	1.4	---	---
18	2347	.3*	0448	.9	1112	-1	1803	1.4
19	0056	.3	0520	.8	1143	-1	1902	1.5
20	0232	.4	0552	.6	1220	0.0	2011	1.5
21	0456	.3	0644	.4	1307	0.0	2130	1.6
22	0635	.3	0915	.3	1427	.1	2247	1.6
23	0714	.2	1124	.3	1609	.1	---	---
24	2351	1.7*	0746	.1	1233	.5	1736	.1
25	0045	1.8	0813	0.0	1322	.7	1845	.1
26	0130	1.7	0839	-1	1406	.9	1945	0.0
27	0209	1.6	0905	-1	1445	1.1	2039	0.0
28	0248	1.4	0928	-1	1524	1.3	2132	.1
29	0320	1.3	0950	-1	1603	1.4	2223	.2
30	0348	1.1	1009	-1	1642	1.4	2315	.2
31	0417	.9	1031	-1	1717	1.5	---	---

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 32

PORT ALLEN TIDES

APRIL 1987

21 DEC 54 MIN N, 159 DEG 35 MIN W - MANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0012	.3	0445	.8	1053	-1	1759	1.5
2	0118	.3	0510	.6	1118	0.0	1848	1.5
3	0249	.4	0535	.5	1143	.1	1946	1.4
4	1222	.2	2055	1.4	---	---	---	---
5	0624	.3	0848	.3	1329	.3	2207	1.4
6	0650	.3	1107	.4	1512	.3	2309	1.4
7	0711	.2	1209	.5	1645	.3	---	---
8	2357	1.4*	0733	.1	1248	.7	1759	.3
9	0039	1.4	0753	.1	1320	.9	1856	.2
10	0115	1.4	0810	0.0	1354	1.0	1948	.2
11	0147	1.4	0829	0.0	1427	1.2	2038	.2
12	0219	1.2	0847	-1	1502	1.4	2125	.2
13	0251	1.1	0908	-1	1537	1.5	2217	.2
14	0322	.9	0930	-2	1613	1.7	2311	.2
15	0354	.8	0955	-2	1658	1.8	---	---
16	0014	.3	0430	.6	1026	-2	1747	1.8
17	0128	.3	0509	.4	1059	-1	1843	1.8
18	0301	.3	0607	.3	1143	0.0	1948	1.7
19	0437	.2	0752	.3	1238	.1	2100	1.7
20	0536	.1	1009	.3	1414	.2	2209	1.6
21	0618	0.0	1135	.5	1605	.3	2313	1.5
22	0650	0.0	1230	.8	1738	.3	---	---
23	0006	1.4	0717	-1	1313	.9	1853	.3
24	0051	1.4	0743	-1	1355	1.2	1959	.3
25	0131	1.2	0809	-2	1430	1.4	2053	.2
26	0208	1.0	0830	-2	1506	1.5	2149	.2
27	0242	.9	0852	-2	1541	1.7	2241	.2
28	0314	.7	0914	-2	1616	1.7	2333	.3
29	0345	.6	0936	-1	1652	1.7	---	---
30	0029	.3	0416	.5	1000	-1	1733	1.7

* -- TIDE OCCURS ON PREVIOUS DATE.

PORT ALLEN TIDES
MAY 1987

21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

[illegible]

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 35

PORT ALLEN TIDES

JULY 1987

21 DEG 54 MIN N, 159 DEG 35 MIN W - MANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0216	.2	0732	.6	1202	.4	1901	1.4	0154	.2	0856	1.2	1459	.8	1912	.9	0154	.2	0856	1.2
2	0243	.1	0842	.8	1315	.5	1936	1.3	0219	.1	1007	1.4	1731	.7	1954	.8	0219	.1	1007	1.4
3	0313	.1	0952	.9	1456	.7	2015	1.1	0319	.1	1114	1.6	1932	.5	2127	.6	0319	.1	1114	1.6
4	0345	0.0	1054	1.2	1701	.7	2104	.9	0414	0.0	1213	1.9	2024	.4	2317	.5	0414	0.0	1213	1.9
5	0421	0.0	1149	1.4	1853	.6	2206	.7	0514	0.0	1304	2.0	2103	.3	---	---	0514	0.0	1304	2.0
6	0459	-.1	1235	1.7	2016	.4	2322	.6	0614	.5	1400	.6	1351	2.1	---	---	0614	.5	1400	.6
7	0542	-.2	1323	2.0	2115	.3	---	---	0714	.6	1519	2.2	1436	2.2	2210	.2	0714	.6	1519	2.2
8	0633	.5	0631	-.2	1408	2.1	2200	.2	0824	.8	1659	-.1	1558	2.1	2242	.1	0824	.8	1659	-.1
9	0719	.4	0719	-.3	1453	2.2	2242	.1	0924	.9	1758	0.0	1637	2.0	2314	.1	0924	.9	1758	0.0
10	0808	.4	0808	-.3	1537	2.3	2321	.1	1034	.9	1859	0.0	---	---	---	---	1034	.9	1859	0.0
11	0857	.5	0857	-.3	1622	2.2	---	---	1134	.1*	2003	1.0	1043	.2	---	---	1134	.1	2003	1.0
12	0949	.5	0949	-.2	1705	2.1	1705	2.1	1234	.1	2159	1.1	1142	.3	1747	1.5	1234	.1	2159	1.1
13	0003	0.0	0426	.5	0949	-.2	1744	2.0	1334	.1	2303	1.3	1251	.5	1819	1.3	1334	.1	2303	1.3
14	0038	0.0	0522	.6	1039	0.0	1826	1.7	1434	.1	0802	1.4	1419	.7	1847	1.0	1434	.1	0802	1.4
15	0117	0.0	0628	.8	1137	.2	1905	1.4	1534	.2	0912	1.4	1640	.7	1912	.8	1534	.2	0912	1.4
16	0152	0.0	0737	.9	1243	.4	1905	1.4	1640	.7	1028	1.5	---	---	---	---	1640	.7	1028	1.5
17	0227	0.0	0853	1.0	1409	.6	1941	1.2	1737	.2	1136	1.7	2026	.4	2228	.5	1737	.2	1136	1.7
18	0303	0.0	1008	1.3	1611	.7	2023	.9	1837	.2	1238	1.8	2044	.4	---	---	1837	.2	1238	1.8
19	0340	0.0	1111	1.4	1828	.7	2115	.8	1942	.3	1313	1.9	2106	.3	---	---	1942	.3	1313	1.9
20	0418	0.0	1209	1.6	2014	.5	2227	.6	2004	.5	1424	2.0	2128	.3	---	---	2004	.5	1424	2.0
21	0504	0.0	1257	1.8	2110	.4	---	---	2102	.6	1521	1.9	2230	.3	---	---	2102	.6	1521	1.9
22	0549	.5*	0549	0.0	1339	1.9	2144	.3	2200	.8	1623	.2	2210	.3	---	---	2200	.8	1623	.2
23	0634	.5	0634	0.0	1416	2.0	2213	.3	2242	.9	1749	.2	2247	.3	---	---	2242	.9	1749	.2
24	0716	.5	0716	0.0	1451	2.0	2239	.3	2324	.9	1831	.2	2306	.3	---	---	2324	.9	1831	.2
25	0800	.5	0755	0.0	1524	2.0	2303	.3	2401	1.0	1907	.2	2347	.6	---	---	2401	1.0	1907	.2
26	0837	.6	0833	0.0	1554	2.0	2329	.3	2501	1.1	2027	.3	2374	1.5	---	---	2501	1.1	2027	.3
27	0909	.6	0909	.1	1621	1.9	---	---	2601	1.1	2107	.4	2401	1.4	---	---	2601	1.1	2107	.4
28	0947	.7	0947	.1	1650	1.8	1650	1.8	2701	1.2	2159	1.4	2451	1.6	---	---	2701	1.2	2159	1.4
29	1026	.8	1026	.3	1715	1.7	1715	1.7	2801	1.2*	2247	1.4	2501	1.7	---	---	2801	1.2	2247	1.4
30	1108	.9	1108	.3	1743	1.5	1743	1.5	2901	1.2	2347	1.5	2601	1.7	---	---	2901	1.2	2347	1.5
31	1201	.9	1201	.5	1812	1.4	1812	1.4	3001	1.2	2447	1.5	2701	1.7	---	---	3001	1.2	2447	1.5
32	1246	1.1	1246	.7	1840	1.2	1840	1.2	3101	1.2	2547	1.6	2801	1.7	---	---	3101	1.2	2547	1.6

* -- TIDE OCCURS ON PREVIOUS DATE.

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 37

PORT ALLEN TIDES
SEPTEMBER 1987

21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0223	.2	1041	1.8	1926	.4	2200	.5
2	0341	.2	1147	1.9	2001	.3	---	---
3	2348	.6*	0504	.2	1241	2.0	2027	.3
4	0054	.7	0613	.1	1329	2.1	2055	.2
5	0145	.9	0716	.1	1412	2.1	2124	.2
6	0231	1.0	0811	.1	1451	2.0	2152	.1
7	0313	1.2	0903	.1	1527	1.9	2217	.1
8	0355	1.3	0956	.2	1604	1.7	2242	.1
9	0441	1.4	1051	.3	1636	1.4	2308	.1
10	0528	1.5	1151	.4	1704	1.2	2335	.2
11	0615	1.6	1301	.6	1736	1.0	---	---
12	2359	.2*	0714	1.6	1437	.7	1758	.8
13	0030	.3	0820	1.6	---	---	---	---
14	0107	.3	0933	1.6	---	---	---	---
15	0212	.3	1047	1.7	1930	.4	2306	.6
16	0341	.4	1145	1.7	1952	.4	---	---
17	0012	.7	0507	.4	1231	1.8	2013	.3
18	0057	.8	0606	.3	1310	1.8	2035	.3
19	0129	.9	0659	.3	1344	1.8	2050	.3
20	0201	1.0	0745	.3	1413	1.7	2108	.3
21	0233	1.1	0826	.3	1441	1.6	2126	.3
22	0305	1.3	0908	.3	1506	1.5	2142	.2
23	0337	1.4	0950	.3	1535	1.4	2202	.2
24	0412	1.5	1039	.4	1600	1.3	2220	.2
25	0454	1.6	1132	.5	1625	1.1	2244	.2
26	0536	1.7	1233	.6	1654	.9	2310	.2
27	0632	1.7	1405	.6	1726	.8	---	---
28	2342	.2*	0734	1.8	1615	.5	1811	.6
29	0030	.3	0852	1.8	1802	.4	2035	.5
30	0143	.3	1008	1.8	1844	.3	2254	.6

* -- TIDE OCCURS ON PREVIOUS DATE.

TABLE 38

PORT ALLEN TIDES
OCTOBER 1987

21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT	TIME HST	HGT FT
1	0326	.3	1114	1.9	1916	.3	---	---
2	0006	.7	0502	.3	1209	1.9	1941	.2
3	0055	.9	0618	.3	1257	1.9	2009	.1
4	0141	1.1	0720	.3	1339	1.8	2031	.1
5	0221	1.4	0820	.3	1418	1.6	2057	.1
6	0300	1.5	0915	.3	1456	1.4	2120	.1
7	0339	1.7	1009	.3	1528	1.3	2142	.1
8	0418	1.8	1105	.3	1600	1.0	2206	.1
9	0457	1.9	1208	.4	1629	.9	2228	.1
10	0543	1.9	1313	.5	1657	.7	2253	.2
11	0632	1.8	1446	.5	1729	.6	2319	.3
12	0727	1.7	---	---	---	---	---	---
13	2355	.3*	0833	1.7	1755	.4	2112	.5
14	0102	.4	0944	1.6	1824	.4	2311	.6
15	0252	.5	1045	1.6	1849	.3	---	---
16	0000	.8	0432	.5	1134	1.6	1908	.3
17	0042	.9	0544	.5	1217	1.6	1929	.3
18	0110	1.1	0647	.4	1255	1.5	1947	.2
19	0142	1.3	0737	.4	1327	1.4	2005	.2
20	0214	1.4	0825	.4	1359	1.4	2023	.1
21	0245	1.6	0915	.3	1427	1.2	2045	.1
22	0317	1.8	1004	.3	1459	1.0	2103	0.0
23	0356	1.9	1056	.4	1525	.9	2128	0.0
24	0435	2.0	1155	.4	1600	.8	2156	0.0
25	0521	2.0	1305	.4	1638	.6	2227	.1
26	0611	2.0	1431	.4	1731	.5	2306	.2
27	0712	2.0	1602	.3	1909	.4	---	---
28	0000	.3	0821	1.9	1702	.3	2129	.5
29	0124	.4	0929	1.8	1741	.2	2309	.7
30	0317	.5	1033	1.7	1820	.1	---	---
31	0004	.9	0504	.5	1132	1.6	1848	.1

* -- TIDE OCCURS ON PREVIOUS DATE.

PORT ALLEN TIDES
NOVEMBER 1987
21 DEC 54 MIN N.

[illegible]

* -- TIDE OCCURS ON PREVIOUS DATE.

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 either numerical or graphical methods. One example of each method 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:

Time	Height	Time	Height	Time	Height	Time	Height
0039	4.9	0814	0.2	1510	3.1	1933	2.4

Find the height of the tide at 0300.

Numerical Method

The duration of fall is $08^h 14^m - 00^h 39^m = 7^h 35^m$.

The time after high water for which the height is required is $03^h 00^m - 00^h 39^m = 02^h 21^m$.

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

Entering table A-1 at the duration of fall of $7^h 40^m$, which is the nearest value to $7^h 35^m$, the nearest value on the horizontal line to $2^h 21^m$ is $2^h 18^m$ after high water. Following down this column to its intersection with a range of 4.5 feet which is the nearest tabular value to 4.7 feet, one obtains 0.9 which, being calculated from high water, must be subtracted from it. The approximate height at $03^h 00^m$ is, therefore, $4.9 - 0.9 = 4.0$ feet.

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

*This information is adapted from table 3 of the data source for this publication (see page 1).

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

		Time from the nearest high water or low water															
Duration of rise or fall, see footnote.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. 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	2 08
	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	2 19
	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	2 29
	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	2 40
	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	2 50
	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	3 00
	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	3 12
	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	3 22
	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	3 33
	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	3 44
	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	3 54
	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	4 05
	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	4 16
	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	4 27
	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	4 37
	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	4 48
	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	4 58
	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	5 10
	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	5 20
	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	5 30
	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	5 40
		Correction to height															
Range of tide, see footnote.	Ft.	Ft.	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	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
	1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5
	1.5	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	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	0.2	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	1.1	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	1.6
	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	2.0
	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	2.2
	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	2.5
	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	2.8
	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	3.0
	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	3.2
	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	3.5
	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	3.8
	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	4.2
	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	4.4
	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	4.6
	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	4.9
	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	5.3
	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	5.5
	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	5.7
	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	6.0
	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	6.3
	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	6.6
	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	6.8
	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	7.1
	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	7.5
	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	7.8
	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	8.0
	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	8.3
	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	8.6
	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	8.8
	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	9.0
	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	9.3
	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	9.7
	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	9.9
	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	10.1
	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	10.4
	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	10.7
	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	10.9

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 their 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.

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.

When the nearest tide is high water, subtract the correction.

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 full 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.

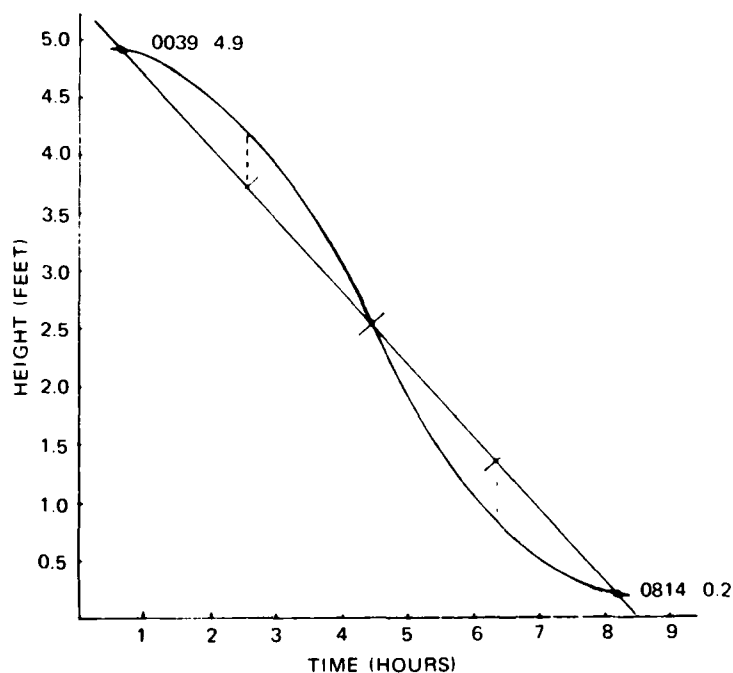


Figure A-1. Tidal Curve for Solution of the Problem.

APPENDIX B

EQUINOXES, SOLSTICES, AND LUNAR PHASES DURING 1987

The dates and times for Vernal and Autumnal Equinoxes and Summer and Winter Solstices during 1987 are listed in the table B-1. The 1987 dates and times for phases of the moon are given in table B-2. Both tables have been calculated for Point Mugu and San Nicolas Island. Two hours must be subtracted for times in the Barking Sands area.

Table B-1. Equinoxes and Solstices, 1987, Point Mugu and San Nicolas Island.

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for times in the Barking Sands area.

Vernal Equinox	20 March, 1952 PST	Beginning of Spring; day and night of equal length.
Summer Solstice	21 June, 1411 PST	Beginning of Summer; greatest duration of daylight.
Autumnal Equinox	23 September, 0545 PST	Beginning of Autumn; day and night of equal length.
Winter Solstice	22 December, 0146 PST	Beginning of Winter; greatest duration of darkness.

Table B-2. Lunar Phases, 1987, Point Mugu and San Nicolas Island.

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for times in the Barking Sands area.

Phase	January		February		March		April	
	Date	Time	Date	Time	Date	Time	Date	Time
First Quarter	06	1434	05	0821	07	0358	05	2348
Full Moon	14	1830	13	1258	15	0513	13	1831
Last Quarter	22	1445	21	0056	22	0822	20	1415
New Moon	29	0544	27	1651	29	0446	27	1734
Phase	May		June		July		August	
	Date	Time	Date	Time	Date	Time	Date	Time
First Quarter	05	1826	04	1053	04	0034	02	1124
Full Moon	13	0450	11	1249	10	1933	09	0217
Last Quarter	19	2002	18	0302	17	1217	16	0025
New Moon	27	0713	25	1237	25	1237	24	0359
First Moon	--	----	--	----	--	----	31	1948
Phase	September		October		November		December	
	Date	Time	Date	Time	Date	Time	Date	Time
Full Moon	07	1013	06	2012	05	0846	05	0001
First Quarter	14	1544	14	1006	13	0634	13	0341
New Moon	22	1908	22	0928	20	2233	20	1025
First Quarter	30	0239	29	0910	27	1637	27	0201

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 ($27.32 +$ 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 midnight.
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.

APPENDIX C
SUNRISE AND SUNSET TABLES

Sunrise, Sunset, and Duration of Twilight for Point Mugu, CA
34°07' N, 119°07' W

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
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
1	0702	1658	0654	1727	0626	1753	0544	1817	0507	1840	0446	1903	1
2	0703	1659	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	1855	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: 27 min. Nautical: 58 min.		Average twilight Civil: 26 min. Nautical: 55 min.		Average twilight Civil: 25 min. Nautical: 54 min.		Average twilight Civil: 26 min. Nautical: 57 min.		Average twilight Civil: 28 min. Nautical: 61 min.		Average twilight Civil: 29 min. Nautical: 65 min.		
Date	July		August		September		October		November		December		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
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	1906	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: 29 min. Nautical: 63 min.		Average twilight Civil: 26 min. Nautical: 58 min.		Average twilight Civil: 25 min. Nautical: 55 min.		Average twilight Civil: 25 min. Nautical: 54 min.		Average twilight Civil: 27 min. Nautical: 57 min.		Average twilight Civil: 28 min. Nautical: 59 min.		

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

**Sunrise, Sunset, and Duration of Twilight for Barking Sands, Kauai, HI
22°02' N, 159°47' W**

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

Date	January		February		March		April		May		June		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
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	1809	0717	1830	0659	1844	0630	1855	0606	1906	0555	1920	3
4	0719	1809	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	0651	1847	0622	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	0638	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	0608	1905	0555	1918	0559	1927	30
31	0718	1828			0633	1854			0555	1918			31
	Average twilight Civil: 24 min. Nautical: 51 min.		Average twilight Civil: 23 min. Nautical: 49 min.		Average twilight Civil: 22 min. Nautical: 46 min.		Average twilight Civil: 23 min. Nautical: 50 min.		Average twilight Civil: 24 min. Nautical: 53 min.		Average twilight Civil: 25 min. Nautical: 55 min.		
Date	July		August		September		October		November		December		Date
	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	Sunrise	Sunset	
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: 25 min. Nautical: 54 min.		Average twilight Civil: 23 min. Nautical: 50 min.		Average twilight Civil: 22 min. Nautical: 48 min.		Average twilight Civil: 23 min. Nautical: 49 min.		Average twilight Civil: 24 min. Nautical: 51 min.		Average twilight Civil: 24 min. Nautical: 52 min.		

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

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