Coastal Engineering Technical Note

SELECTED TIDAL VALUES FOR DESIGN

PURPOSE: To provide tidal parameters for 134 selected tide stations for use in design of coastal projects. The summarized data also provide a means for quick comparison between geographic regions.

BACKGROUND: The design of most coastal construction projects requires *local* tide and tidal datum information. Such parameters as tide range, highest and lowest predicted water levels, and the extreme observed high and low water levels are important design parameters. In addition, these water levels need to be related to a known elevation called a *tidal datum* (see CETN-I-12).

The Tables presented below provide a summary of useful tide parameters for design which are gathered from a number of sources. These sources are the National Ocean Survey (NOS) tide tables, tidal bench marks, tidal probability tables (see Harris, 1981 and CETN-I-13), and the Supplement to Special Report No. 7 (discussed later). This is the first time that this information has been presented together in convenient form. Besides providing the coastal engineer with immediate design values for a given tide station, it is also possible to make quick comparisons in the tidal parameters between different geographical regions. For example, a design approach which was successful at Atlantic City, New Jersey may not be the right approach for Savannah, Georgia where the mean tide range is nearly double that of Atlantic City. Of course other criteria will also affect the design analysis.

TABLE 1 - PRIMARY TIDE STATIONS: Table 1 gives tidal information for 49 U.S. tide stations. Tidal probability statistics for all of these stations have been given by Harris (1981). Of these stations, 45 are NOS Primary Tide Stations (or reference stations) and four (Atlantic City, NJ; Crescent City, CA; South Beach, OR; and Friday Harbor, WA) are secondary stations which were included in Harris' calculations. It should also be noted that:

TABLE 1 - PRIMARY TIDE STATIONS

NAME	LATITUDE	LONGITUDE	GAGE LOCATION	TIDE RANGE MEAN	TIDE RANGE DIURNAL	TIDE RANGE SPRING	TIDAL DATUM	MSL	MTL	NGVD 1929	EXTREME HIGH TIDES PREDICTED	EXTREME HIGH TIDES OBSERVED	EXTREME LOW TIDES PREDICTED	EXTREME LOW TIDES OBSERVED
EAST COAST														
EASTPORT, ME.	44°54.2'N	66°59.1'W	BAY	17.89	18.73	20.7	MLW	9.01	9.10	9.00	22.0	23.1	-4.1	-4.4
PORTLAND, ME.	43°39.6'N	70°14.8'W	BAY	8.91	9.68	10.4	MLW	4.46	4.50	4.28	11.4	13.9	-2.5	-3.7
BOSTON, MA.	42°21.3'N	71°03.0'W	BAY	9.58	10.35	11.0	MLW[a]	4.86	4.75	4.59	12.1	13.9	-2.5	-3.8
NEWPORT, RI.	41°30.3'N	71°19.6'W	BAY	3.62	3.93	4.4	MLW	1.69	1.75	1.37	5.1	13.5	-1.3	-2.9
NEW LONDON, CT.	41°21.6'N	72°05.5'W	RIVER	2.56	2.93	3.1	MLW	1.34	1.30	0.97	3.8	10.7	-1.0	-3.4
BRIDGEPORT, CT.	41°10.4'N	73°10.9'W	BAY	6.67	7.13	7.7	MLW	3.36	3.35	2.86	9.0	12.4	-2.1	-3.5[E]
WILLETS PT., NY.	40°47.6'N	73°46.9'W	BAY	7.17	7.65	8.3	MLW	3.58	3.55	3.02	8.9	16.7	-1.9	-4.1
NEW YORK, NY. (The Battery)	40°42.0'N	74°00.9'W	RIVER/BAY	4.48	4.94	5.4	MLW	2.29	2.25	1.81	6.1	10.2	-1.6	-4.2
ALBANY, NY.	42°39.0'N	73°45.0'W	RIVER	4.83	5.40	5.0	MLW	2.51	2.50	**	6.3	**	-1.1	**
SANDY HOOK, NJ.	40°28.0'N	74°00.6'W	BAY	4.67	5.13	5.6	MLW	2.34	3.30	1.79	6.4	10.3	-1.6	-4.1
ATLANTIC CITY, NJ.	39°21.3'N	74°25.1'W	OCEAN	4.08	4.59	5.0	MLW	2.07	2.05	1.70	5.9	8.9	-1.4	-3.7
PHILADELPHIA, PA.	39°57.2'N	75°08.3'W	RIVER	5.91	6.33	6.2	MLW	3.09	3.10	2.14	7.8	10.7	-1.1	-6.6
REDDY POINT, DE.	39°33.7'N	75°34.0'W	RIVER	5.51	5.92	6.0	MLW	2.77	2.75	2.45	6.8	10.0[E]	-1.3	-6.3
BREAKWATER HARBOR, DE.	38°46.9'N	75°07.2'W	BAY	4.12	4.60	4.9	MLW	2.08	2.05	1.69	5.8	9.5	-1.3	-3.9
BALTIMORE, MD.	39°16.0'N	76°34.7'W	BAY	1.03	1.38	**	MLW[b]	0.52	0.55	0.15	2.0	7.9	-0.9	-4.9
WASHINGTON, D.C.	38°52.3'N	77°01.2'W	RIVER	2.76	2.96	3.3	MLW[c]	1.37	1.45	0.91	3.8	11.4	-1.1	-4.7
HAMPTON ROADS, VA.(Sewells Pt.)	36°56.7'N	76°19.8'W	RIVER/BAY	2.44	2.67	3.0	MLW	1.22	1.25	1.28	3.7	8.5	-0.8	-3.1
WILMINGTON, NC.	34°13.6'N	77°57.2'W	RIVER	4.26	4.59	4.5	MLW	2.24	2.10	1.52	5.4	8.2	-0.9	-1.7
CHARLESTON, SC.	32°46.9'N	79°55.5'N	BAY	5.17	5.69	6.1	MLW[d]	2.67	2.60	2.34	7.0	10.4	-1.6	-3.6
SAVANNAH RIVER ENTRANCE, GA.	32°02.1'N	80°54.2'W	RIVER	6.94	7.48	8.1	MLW	3.56	3.45	3.32	9.4	11.1	-2.0	-4.4
SAVANNAH, GA.	32°05.0'N	81°05.0'W	RIVER	7.61	8.19	8.6	MLW	3.96	**	**	9.8	**	-1.9	**
MAYPORT, FL.	30°23.5'N	81°25.9'W	RIVER	4.46	4.87	5.3	MLW	2.27	2.25	2.00	6.2	7.4	-1.6	-3.2
MIAMI HARBOR ENTRANCE, FL.	25°46.1'N	80°07.9'W	OCEAN	2.52	2.74	3.0	MLW	1.26	1.25	0.96	3.8	6.4	-1.1	-1.6
KEY WEST, FL.	24°33.2'N	81°48.5'W	OCEAN	1.26	1.80	1.6	MLW	0.64	0.65	0.42	2.4	3.8	-1.0	-1.6
GULF COAST														
ST. PETERSBURG, TAMPA BAY, FL.	27°46.4'N	82°37.3'W	BAY	1.42	2.19	2.3	MLLW	1.14	1.15	0.83	3.1	5.3	-1.0	-2.2
ST. MARKS, FL.	30°04.7'N	84°10.7'W	RIVER	2.41	3.37	-	MLLW	1.86	1.80	**	4.5	8.0	-1.6	-3.5[E]
PENSACOLA, FL.	30°24.2'N	87°12.8'W	BAY	1.18	1.30	-	MLLW	0.63	0.65	0.33	2.1	8.9	-1.0	-2.2
MOBILE, AL.	30°42.4'N	88°02.6'W	BAY	1.27	1.44	-	MLLW	0.70	0.75	**	2.4	9.0[E]	-1.2	-3.0[E]
GALVESTON, TX.	29°18.8'N	94°47.2'W	BAY	0.91	1.42	-	MLLW	0.85	0.70	0.70	2.0	11.4	-1.1	-5.3
SAN JUAN, P.R.	18°27.0'N	66°05.4'W	BAY	1.15	1.66	1.3	MLW	0.58	0.55	N/A	2.2	2.4	-0.9	-1.1
PACIFIC COAST														
SAN DIEGO, CA.	32°42.9'N	117°10.4'W	BAY	4.20	5.96	-	MLLW	3.06	2.95	2.79	7.9	8.3	-2.1	-2.8
LOS ANGELES, CA. (Outer Harbor)	33°43.2'N	118°15.3'W	BAY	3.78	5.45	-	MLLW	2.82	2.80	2.72	7.3	7.8	-1.9	-2.6
SAN FRANCISCO, CA.(Golden gate)	37°48.4'N	122°27.9'W	BAY	3.97	5.73	-	MLLW[e]	3.14	3.10	2.86	7.1	8.4	-2.0	-2.7
HUMBOLDT BAY, CA	40°44.7'N	124°13.6'W	OCEAN	4.50	6.40	-	MLLW	3.44	3.60	**	8.3	9.5[E]	-2.3	-3.0[E]
CRESCENT CITY CA.	41°44.7'N	124°11.0'W	OCEAN	5.04	6.97	-	MLLW	3.75	3.75	3.63	9.0	10.1	-2.5	-2.8
SOUTH BEACH, OR.	44°37.5'N	124°02.6'W	BAY	6.26	8.36	-	MLLW	4.48	4.50	4.01	10.6	12.3	-3.1	-3.0[E]
ASTORIA, OR.	46°12.5'N	123°46.0'W	RIVER/BAY	6.47	8.37	-	MLLW	4.38	4.35	3.05	10.3	12.1	-2.0	-2.8
ABERDEEN, WA.	46°58.0'N	123°51.3'W	BAY	7.77	9.89	-	MLLW	5.35	5.45	**	12.6	14.9	-3.2	-2.9
PORT TOWNSEND, WA.	48°06.9'N	122°45.0'W	BAY	5.04	8.20	-	MLLW	4.80	5.10	4.74	9.9	12.0[E]	-3.8	-4.5[E]
SEATTLE, WA.	47°36.2'N	122°20.2'W	BAY	7.69	11.31	-	MLLW	6.48	6.60	6.25	13.4	14.8	-4.3	-4.7
FRIDAY HARBOR, WA.	48°32.8'N	123°00.4'W	BAY	4.68	7.78	-	MLLW	4.55	4.75	4.42	9.7	10.9	-3.7	-3.9
KETCHIKAN, AK.	55°20.0'N	131°37.5'W	BAY	12.92	15.38	-	MLLW	8.02	7.95	**	19.6	21.2	-4.6	-5.2
JUNEAU, AK.	58°17.9'N	134°24.7'W	BAY	14.03	16.54	-	MLLW	8.72	8.50	**	21.0	23.2	-4.8	-5.2
SITKA, AK.	57°03.1'N	135°20.5'W	BAY	7.77	10.01	-	MLLW	5.32	5.30	**	13.0	14.6	-3.5	-3.8
CORDOVA, AK.	60°33.5'N	145°45.1'W	BAY	9.90	12.31	-	MLLW	6.51	6.45	**	15.7	16.3	-4.0	-4.9
ANCHORAGE, AK.	61°14.5'N	149°53.2'W	BAY	25.88	28.90	-	MLLW	16.18	15.25	**	34.2	35.5[E]	-6.0	-6.5[E]
KODIAK IS., AK.	57°44.4'N	152°29.0'W	BAY	6.80	8.83	-	MLLW	4.54	4.45	**	11.2	13.0[E]	-2.7	-4.0[E]
DUTCH HARBOR, AK	53°53.5'N	166°32.2'W	BAY	2.28	3.69	-	MLLW	2.17	2.30	**	5.0	6.6	-1.8	-2.7
HONOLULU, HI.	21°18.4'N	157°47.5'W	OCEAN	1.23	1.89	-	MLLW	0.81	0.80	N/A	2.7	3.5	-0.4	-1.3

NOTES:
(a) Boston Low Water Datum = -0.30 feet MLW
(b) Balt. Low Water Datum = -0.42 feet MLW
(c) D.C. Low Water Datum = -0.52 feet MLW
(d) Charleston LW Datum = -0.31 feet MLW
(e) San Francison LW Datum = -0.20 feet MLW

E Estimated
** Missing Data
N/A Not Available

1. All values are given in feet.
2. MLW (Mean Low Water) or MLLW (Mean Lower Low Water) in the *Tidal Datum* column is the zero reference elevation for the given station, i.e., the tidal datum is at elevation 0.00 feet.
3. All tidal elevations are given relative to the datum. For example, the location of MTL (Mean Tide Level) for Eastport, Maine is 9.10 feet above MLW.
4. The values for *Predicted Extreme High Tide* and *Predicted Extreme Low Tide* were calculated from the probability tables (Harris, 1981 and CETN-I-13) and adjusted to the tidal datum.

TABLE 2 - SECONDARY TIDE STATIONS: Table 2 provides tidal data for 85 NOS Secondary Tide Stations in the U.S. Less information is given for the secondary stations because such information as tidal probability statistics are not available, although tidal constituents from which to calculate this information are available for some of the stations. It should be noted that:

1. All values are given in feet.
2. The tidal datum for the East Coast (where a spring tide range is given) is MLW. The tidal datum for the Gulf and Pacific Coasts (where diurnal tide range is given) is MLLW.
3. All tide elevations are given relative to the tidal datum.

SUPPLEMENT TO SPECIAL REPORT NO. 7: Additional tide information is provided in an unbound supplement to *Tides and Tidal Datums in the U.S.* (SR-7) by Harris (1981). The tables contained in the Supplement were compiled from output generated by the computer program used to produce the tidal probability tables in SR-7. There is a set of 23 tables for each of the 55 tide stations given in SR-7 (also see list on page 2 of CETN-I-13). Each district has received a yellow paper copy of the tables for those stations applicable to their district. The supplemental tables contain the monthly value, the annual value, the 19-year epoch value for each month, and the total value for the 19-year epoch of the following tidal parameters: Mean Higher High Water, Mean High Water, Mean Low Water, Mean Lower Low Water, Sea Level, Highest High Water, Highest Low Water, Highest Lower Low Water, Maximum Diurnal Range, Maximum Semi-diurnal Range, Lowest Higher High Water, Lowest High Water, Lowest Low Water, Minimum Semi-diurnal Range, Minimum Diurnal Range, Minimum Tide Fall, Maximum Tide Fall, Mean Diurnal Tide Range, Mean Tide Range, and tidal distribution statistics. For further information on the Supplement contact: CEREN-CD at (202) 325-7122.

TABLE 2 - SECONDARY TIDE STATIONS

NAME	LATITUDE	LONGITUDE	GAGE LOCATION	TIDE RANGE MEAN	TIDE RANGE SPRING	MTL	NGVD 1929	HIGHEST RECORDED	LOWEST RECORDED
MAINE									
CUTLER, LITTLE RIVER	44°39.4'N	67°12.6'W	BAY	13.4	15.5	6.70	6.91	18.5[E]	-4.5
BAR HARBOR, MT. DESERT ISLAND	44°23.5'N	68°12.3'W	BAY	10.5	12.1	5.25	**	14.8	-4.0[E]
ROCKLAND, PENOBSCOT BAY	44°06.3'N	69°06.2'W	BAY	9.7	11.2	4.85	4.50	14.2	-3.5[E]
SEAVEY IS.(PORTSMOUTH NAVAL SHIPYARD)	43°04.9'N	70°44.7'W	BAY	8.1	9.3	4.05	3.83	12.5	-3.4
MASSACHUSETTS									
CAPE COD CANAL ENTR., CAPE COD BAY	41°46.3'N	70°30.4'W	BAY	8.7	10.1	4.35	**	13.0[E]	-3.5[E]
WOODS HOLE (OCEANOGRAPHIC INST.)	41°31.5'N	70°40.4'W	BAY	1.8	2.2	0.90	**	11.0	-2.8
BUZZARDS BAY, CAPE COD CANAL	41°44.5'N	70°37.1'W	BAY	3.5	4.1	1.75	1.41	15.4	-2.5[E]
NANTUCKET, NANTUCKET ISLAND	41°17.2'N	70°05.7'W	BAY	3.0	3.6	1.50	**	7.0[E]	-2.5[E]
RHODE ISLAND									
PROVIDENCE (STATE PIER NO. 1)	41°48.4'N	71°24.1'W	BAY	4.6	5.7	2.30	1.85	17.7	-3.4
NEW YORK									
MONTAUK, LONG ISLAND	41°02.9'N	71°57.6'W	BAY	2.1	2.5	1.05	0.80	10.5[E]	-2.6
PORT JEFFERSON, LONG ISLAND	40°57.0'N	73°04.6'W	BAY	6.6	7.6	3.30	2.86	11.4	-3.5
NEW ROCHELLE, LONG ISLAND SOUND	40°53.6'N	73°46.9'W	BAY	7.2	8.6	3.60	3.12	16.0[E]	-4.1
NEW JERSEY									
LONG BRANCH FISHING PIER	40°18.2'N	73°58.6'W	OCEAN	4.4	5.3	2.20	**	10.0[E]	-4.0[E]
CAPE MAY FERRY TERMINAL	38°58.1'N	74°57.6'W	BAY	4.9	5.8	2.45	1.96	10.5[E]	-3.5[E]
TRENTON, DELAWARE RIVER	40°11.3'N	74°45.3'W	RIVER	6.8	7.1	3.40	**	**	**
DELAWARE									
INDIAN RIVER INLET (C.G. BASE)	38°36.6'N	75°04.2'W	RIVER/BAY	2.2	2.5	1.10	**	7.5[E]	-3.0[E]
MARYLAND									
OCEAN CITY	38°19.8'N	75°05.2'W	OCEAN	3.4	4.1	1.70	**	8.5[E]	-2.5[E]
CAMBRIDGE, CHOPTANK RIVER	38°34.5'N	76°04.3'W	RIVER	1.6	1.8	0.80	1.61	7.5[E]	-3.5[E]
MATAPEAKE	38°57.5'N	76°21.3'W	BAY	1.0	1.2	0.50	**	8.0[E]	-5.0[E]
HAVRE DE GRACE	39°32.3'N	76°05.4'W	BAY	1.8	2.0	0.90	0.25	8.5[E]	-5.0[E]
ANNAPOLIS, NAVAL ACADEMY	38°59.1'N	76°29.2'W	RIVER	0.9	1.0	0.45	0.11	6.3	-3.8
SOLOMONS ISLAND, PATUXENT RIVER	38°19.0'N	76°27.2'W	RIVER/BAY	1.2	1.4	0.60	0.38	6.5[E]	-3.5[E]
VIRGINIA									
KIPTOPEAKE BEACH	37°10.0'N	75°59.3'W	BAY	2.7	3.2	1.35	1.42	8.5[E]	-2.5[E]
COLONIAL BEACH, POTOMAC RIVER	38°15.2'N	76°57.7'W	RIVER	1.7	1.9	0.85	**	10.0[E]	-4.5[E]
LEWISETTA	37°59.7'N	76°27.8'W	RIVER	1.3	1.5	0.65	**	10.0[E]	-4.5[E]
GLOUCESTER POINT, YORK RIVER	37°14.8'N	76°30.0'W	RIVER/BAY	2.4	2.9	1.20	1.24	10.0	-3.0[E]
PORTSMOUTH-NORFOLK NAVAL SHIPYARD	36°49.3'N	76°17.6'W	RIVER/BAY	2.8	3.4	1.40	1.44	9.2	-3.1
NORTH CAROLINA									
DUKE MARINE LAB BEAUFORT	34°43.0'N	76°40.2'W	RIVER/BAY	3.0	3.6	1.50	**	7.0[E]	-2.0[E]
ATLANTIC BEACH	34°41.6'N	76°42.7'W	OCEAN	3.9	4.3	1.95	**	13.0[E]	-2.5[E]
SOUTHPORT	33°55.1'N	78°00.9'W	RIVER	4.2	4.6	2.10	**	11.2	-2.2
SOUTH CAROLINA									
EDISTO BEACH, EDISTO ISLAND	32°30.1'N	80°17.8'W	OCEAN	6.0	6.9	3.00	**	15.0[E]	-3.5[E]
BEAUFORT	32°25.8'N	80°40.2'W	RIVER	7.4	8.7	3.70	**	14.5[E]	-4.0[E]
FLORIDA									
FERNANDINA BEACH AMELIA RIVER	30°40.3'N	81°28.0'W	RIVER/BAY	6.0	7.0	3.00	2.84	13.7	-3.9
DAYTONA BEACH (OCEAN)	29°13.7'N	81°00.3'W	OCEAN	4.1	4.9	2.05	1.92	7.0	-2.5[E]
					DIURNAL				
FORT MEYERS, CALOOSAHATCHEE RIVER	26°38.8'N	81°52.3'W	RIVER	0.6	1.2	0.60	0.05	4.6	-2.7
CLEARWATER BEACH	27°58.6'N	82°49.9'W	OCEAN	1.8	2.6	0.90	**	6.5[E]	-3.5[E]
CEDAR KEY, WAY KEY	29°08.1'N	83°01.9'W	OCEAN	2.6	3.5	1.30	1.03	7.5	-4.0
APALACHICOLA, APPALACHICOLA BAY	29°43.6'N	84°58.9'W	BAY	0.9	1.7	0.80	0.36	6.2	-2.0[E]

[E] ESTIMATED

** MISSING DATA

TABLE 2 - CONTINUED

NAME	LATITUDE	LONGITUDE	GAGE LOCATION	TIDE RANGE MEAN	TIDE RANGE DIURNAL	MTL	NGVD 1929	HIGHEST RECORDED	LOWEST RECORDED
LOUISIANA									
GRAND ISLE, BAYOU RIGUAD	29°15.5'N	89°58.0'W	BAY	0.5	1.0	0.50	0.11	4.8	-2.5[E]
TEXAS									
SABINE PASS (USCG STATION)	29°42.3'N	93°51.2'W	RIVER	1.0	1.9	0.90	0.67	8.1	-3.0[E]
MORGAN'S POINT, GALVESTON BAY	29°40.6'N	94°59.1'W	BAY	**	1.4	0.70	0.49	11.5[E]	**
GALVESTON PLEASURE PIER	29°17.2'N	94°47.4'W	OCEAN	1.1	2.1	1.05	1.11	10.3	-3.1
FREEPORT HARBOR	28°56.8'N	95°18.5'W	BAY	0.9	1.8	0.90	0.50	12.4	-2.8
ROCKPORT, ARANSAS BAY	28°01.3'N	97°02.8'W	BAY	**	0.3	0.15	-0.36	6.1	-1.7
PORT MANSFIELD, LAGUNA MADRE	26°33.3'N	97°25.8'W	BAY	**	0.2	0.10	0.04	4.0[E]	-2.0[E]
PADRE ISLAND (SOUTH)	26°04.1'N	97°09.1'W	BAY	0.7	1.4	0.70	0.89	7.4	-2.5[E]
PORT ISABEL	26°03.6'N	97°12.9'W	BAY	0.7	1.3	0.65	0.79	5.0[E]	-2.0[E]
CALIFORNIA									
IMPERIAL BEACH	32°34.7'N	117°08.1'W	OCEAN	3.8	5.3	2.75	1.85	8.0[E]	-3.0[E]
LA JOLLA	32°52.0'N	117°15.5'W	OCEAN	3.6	5.2	2.70	2.57	7.4	-2.6
NEWPORT BAY ENTRANCE	33°36.2'N	117°53.0'W	BAY	3.7	5.3	2.75	2.65	7.3	-2.1
CABRILLO BEACH	33°42.4'N	118°16.4'W	BAY	3.8	5.4	2.80	**	8.0[E]	-2.5[E]
LONG BEACH NAVAL SHIPYARD	33°45.1'N	118°13.6'W	BAY	3.9	5.4	2.85	**	7.5[E]	-2.5[E]
SANTA MONICA	34°00.4'N	118°29.9'W	OCEAN	3.7	5.4	2.80	**	7.5	-2.7
RINCON ISLAND, MUSSEL SHOALS	34°20.9'N	119°26.6'W	OCEAN	3.7	5.4	2.80	3.85	7.5[E]	-2.5[E]
PORT SAN LUIS WHARF	35°10.1'N	120°45.1'W	OCEAN	3.6	5.3	2.80	2.72	7.7	-2.5[E]
SAN MATEO BRIDGE (WEST SIDE)	37°34.8'N	122°15.2'W	BAY	5.8	7.6	4.10	**	10.0[E]	-2.5[E]
ALAMEDA (NAVAL AIR STATION)	37°46.5'N	122°17.9'W	BAY	4.7	6.4	3.45	3.03	9.0	-2.5[E]
POINT REYES, DRAKES BAY	37°59.5'N	122°58.5'W	BAY	3.9	5.7	3.10	**	8.0[E]	-2.5[E]
PORT CHICAGO, SUISUN BAY	38°03.4'N	122°02.3'W	RIVER/BAY	3.4	4.6	2.35	**	7.5[E]	-2.5[E]
OREGON									
PORT ORFORD	42°44.4'N	124°29.9'W	OCEAN	5.3	7.3	3.95	**	11.0[E]	-3.0[E]
CHARLESTON, COOS BAY	43°20.7'N	124°19.3'W	BAY	5.7	7.5	4.05	4.05	10.5[E]	-3.0[E]
DEPOE BAY	44°48.6'N	124°03.6'W	BAY	6.1	8.2	4.45	**	11.5[E]	-3.0[E]
GARIBALDI, TILLAMOCK BAY	45°33.5'N	123°54.7'W	BAY	5.9	7.8	4.20	3.35	11.5[E]	-3.0[E]
WASHINGTON									
TOKE POINT, WILLAPA BAY	46°42.3'N	123°57.0'W	BAY	6.7	8.7	4.65	**	14.0	-4.0
NEAH BAY, STRAIT OF JUAN DE FUCA	48°22.1'N	124°37.0'W	BAY	5.5	7.9	4.35	4.24	12.0	-3.8
PORT ANGELES	48°07.5'N	123°26.4'W	BAY	4.2	7.2	4.40	**	11.0[E]	-4.0[E]
POULSBO, LIBERTY BAY	47°43.5'N	122°38.3'W	BAY	7.9	11.6	6.75	**	15.0[E]	-4.5[E]
CHERRY POINT, STRAIT OF GEORGIA	48°51.8'N	122°44.9'W	BAY	5.6	9.0	5.40	**	12.5[E]	-4.5[E]
ALASKA									
SKAGWAY, TAIYA INLET	59°27.0'N	135°19.5'W	BAY	14.1	16.7	8.65	**	23.4	-6.0
YAKUTAT, YAKUTAT BAY	59°32.8'N	139°44.1'W	BAY	7.8	10.1	5.30	**	14.9	-3.9
VALDEZ, PORT VALDEZ	61°07.5'N	146°21.4'W	BAY	9.4	11.8	6.20	**	16.5	-5.8
SEWARD, RESURRECTION BAY	60°07.2'N	149°25.6'W	BAY	8.3	10.5	5.45	**	14.8	-4.2
NIKISHKA	60°41.2'N	151°23.8'W	BAY	17.7	20.4	10.85	**	25.8	-6.2
SAND POINT, POPOF IS.	55°20.2'N	160°30.1'W	OCEAN	5.2	7.3	4.00	**	11.0[E]	-3.5[E]
HAWAII									
NAWILIWILI, KAUAI ISLAND	21°57.5'N	159°21.4'W	BAY	1.1	1.8	0.75	N/A	3.1	-1.0[E]
MOKUOLOE ISLAND, KANEOHE BAY, OAHU IS.	21°26.1'N	157°47.5'W	OCEAN	1.2	2.0	1.00	N/A	3.3	-1.0[E]
KAHULUI, KAHULUI HARBOR, MAUI IS.	20°53.9'N	156°28.2'W	BAY	1.5	2.3	1.15	N/A	3.6	-1.2
HILO, KUHIO BAY, HAWAII IS.	19°44.0'N	155°03.5'W	BAY	1.6	2.4	1.10	N/A	3.8	-1.6
PACIFIC OCEAN									
WAKE ISLAND	19°17.4'N	166°37.3'E	BAY	2.1	**	1.05	N/A	3.5	-2.0
KWAJALEIN, MARSHALL ISLANDS	08°44.2'N	167°44.2'E	BAY	3.5	**	1.74	N/A	5.5	-1.8
JOHNSTON ISLAND	16°44.7'N	169°31.0'W	OCEAN	1.8	2.1	1.00	N/A	5.1	-1.7
SAND ISLAND, MIDWAY ISLANDS	28°12.8'N	177°22.0'W	BAY	0.8	1.2	0.60	N/A	4.1	-1.0
PAGO PAGO, AMERICAN SAMOA	14°16.7'S	170°40.9'W	BAY	2.6	**	1.30	N/A	4.3	-1.2
APRA HARBOR, GUAM	13°26.5'N	144°39.2'E	BAY	1.7	2.4	1.45	N/A	3.3	-1.6
TRUK ATOLL, CAROLINE ISLANDS	07°26.8'N	151°50.7'E	OCEAN	**	1.8	0.90	N/A	3.1	-1.2

N/A NOT AVAILABLE
** MISSING DATA
E ESTIMATED

********** EXAMPLE **********

PROBLEM: A dredged material containment dike in Narragansett Bay near Newport, RI., is to be constructed with a crest elevation one foot above the predicted extreme high tide level. Hydrographic charts of the project site show a depth of 4.5 feet below MLW. The only survey bench mark in the area is at a land elevation of 9.87 feet above the NGVD of 1929.

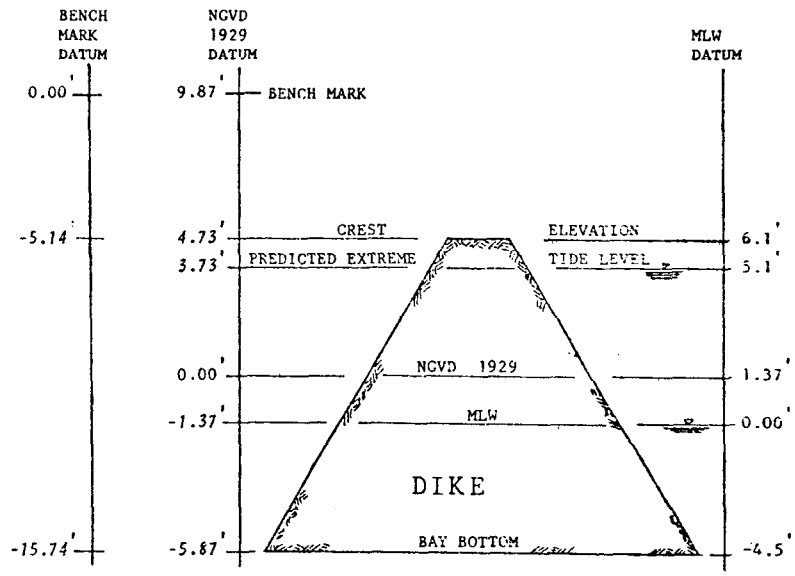
FIND:

(a) The elevation of the crest and the toe of the dike relative to the existing bench mark.

(b) The total height of the structure.

SOLUTION:

(a) From Table 1 for Newport, RI., the values of predicted high tide level and the elevation of NGVD 1929 relative to MLW are obtained. The crest elevation is one foot above the predicted extreme high water. These values are shown on the figure under MLW DATUM. The next step is to convert these values to elevations relative to NGVD 1929. This is done by subtracting the elevation of NGVD 1929 from the values.



The resulting elevations are shown in italics in the figure under NGVD 1929 DATUM (which includes the land-based bench mark). The final step is to adjust the crest and toe elevations relative to the bench mark, which is taken as the zero reference.

Crest Elevation = 4.73 - 9.87 = -5.14 feet (relative to bench mark)

Toe Elevation = -5.87 - 9.87 = -15.74 feet (relative to bench mark)

(b) The total height of the structure = -5.14 - (-15.74) = 10.60 feet.

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