Appendix B

Design Charts And Formulas Used For Wind Wave Runup Analysis

WIND WAVE-RUNUP AND WIND SETUP CALCULATIONS AT WEBB TRACT

1. Data for "fastest mile of record" are from generalized charts published by USACE (1976) and USBR (1981).
2. Wave runup calculation procedures are from Shore Protection Manual by USACE (1984).
3. Reservoir setup calculation procedures are from Freeboard Criteria and Guildlines by USBR (1981).

	Short	Medium	Long	Frank Tk	
Fetch (miles) =	0.34	0.60	1.29	3.22	=> input
Fastest Mile Speed (overland @ 25-ft. level), mph =	60	60	60	60	=> input
1-mile travel time (Figure 3-12), seconds =	60	60	60	60	
U_t/U_{3600} (Figure 3-13) =	1.240	1.240	1.240	1.240	=> input
One-hour avg. speed ($U_{t=3600}$)=	48.4	48.4	48.4	48.4	
$U_{t=3600s}/U_{3600}$ (60 min. duration, Fig. 3-13) =	1.000	1.000	1.000	1.000	
$U_{t=3000s}/U_{3600}$ (50 min. duration, Fig. 3-13) =	1.000	1.000	1.000	1.000	
$U_{t=2820s}/U_{3600}$ (47 min. duration, Fig. 3-13) =	1.004	1.004	1.004	1.004	
$U_{t=2400s}/U_{3600}$ (40 min. duration, Fig. 3-13) =	1.005	1.005	1.005	1.005	
$U_{t=1800s}/U_{3600}$ (30 min. duration, Fig. 3-13) =	1.010	1.010	1.010	1.010	
$U_{t=1200s}/U_{3600}$ (20 min. duration, Fig. 3-13) =	1.020	1.020	1.020	1.020	
$U_{t=600s}/U_{3600}$ (10 min. duration, Fig. 3-13) =	1.047	1.047	1.047	1.047	

Calculate Wave Characteristics (for Deep Water Conditions i.e. d/L > 1/2):

	Short	Medium	Long	Frank Tk	Short	Medium	Long	Frank Tk	Short	Medium	Long	Frank Tk
	Average Speed (mph)				**Over Water Adj. = 0.9 (fetch < 10 mi.)**				**Calculate U_A (mph)**			
60-minute duration =	48.4	48.4	48.4	48.4	43.5	43.5	43.5	43.5	61.1	61.1	61.1	61.1
50-minute duration =	48.4	48.4	48.4	48.4	43.5	43.5	43.5	43.5	61.1	61.1	61.1	61.1
47-minute duration =	48.6	48.6	48.6	48.6	43.7	43.7	43.7	43.7	61.4	61.4	61.4	61.4
40-minute duration =	48.6	48.6	48.6	48.6	43.8	43.8	43.8	43.8	61.5	61.5	61.5	61.5
30-minute duration =	48.9	48.9	48.9	48.9	44.0	44.0	44.0	44.0	61.9	61.9	61.9	61.9
20-minute duration =	49.4	49.4	49.4	49.4	44.4	44.4	44.4	44.4	62.6	62.6	62.6	62.6
10-minute duration =	*50.7*	*50.7*	*50.7*	*50.7*	*45.6*	*45.6*	*45.6*	*45.6*	*64.7*	*64.7*	*64.7*	*64.7*
					FETCH LIMITED							
	Calculate H_{mo} (feet)				**Calculate T_m (seconds)**				**Calculate t (hours)**			
60-minute duration =	1.07	1.42	2.09	3.30	1.54	1.86	2.40	3.25	0.20	0.29	0.48	0.89
50-minute duration =	1.07	1.42	2.09	3.30	1.54	1.86	2.40	3.25	0.20	0.29	0.48	0.89
47-minute duration =	1.08	1.43	2.10	3.32	1.54	1.86	2.40	3.26	0.20	0.29	0.48	0.89
40-minute duration =	1.08	1.43	2.10	3.32	1.54	1.86	2.40	3.26	0.20	0.29	0.48	0.89
30-minute duration =	1.09	1.44	2.11	3.34	1.54	1.86	2.41	3.26	0.20	0.29	0.48	0.88
20-minute duration =	1.10	1.46	2.14	3.38	1.55	1.87	2.42	3.28	0.20	0.29	0.48	0.88
10-minute duration =	*1.13*	*1.51*	*2.21*	*3.49*	*1.57*	*1.89*	*2.44*	*3.31*	*0.19*	*0.28*	*0.47*	*0.87*
					FULLY DEVELOPED							
	Calculate H_{mo} (feet)				**Calculate T_m (seconds)**				**Calculate t (hours)**			
60-minute duration =	60.5	60.5	60.5	60.5	22.64	22.64	22.64	22.64	55.27	55.27	55.27	55.27
50-minute duration =	60.5	60.5	60.5	60.5	22.64	22.64	22.64	22.64	55.27	55.27	55.27	55.27
47-minute duration =	61.1	61.1	61.1	61.1	22.76	22.76	22.76	22.76	55.54	55.54	55.54	55.54
40-minute duration =	61.2	61.2	61.2	61.2	22.78	22.78	22.78	22.78	55.61	55.61	55.61	55.61
30-minute duration =	62.0	62.0	62.0	62.0	22.92	22.92	22.92	22.92	55.95	55.95	55.95	55.95
20-minute duration =	63.5	63.5	63.5	63.5	23.20	23.20	23.20	23.20	56.63	56.63	56.63	56.63
10-minute duration =	*67.7*	*67.7*	*67.7*	*67.7*	*23.96*	*23.96*	*23.96*	*23.96*	*58.48*	*58.48*	*58.48*	*58.48*

Calculate Runup and Setup:

d_s/H_o' >3 Cot (theta) = 6 R/H_o' (Fig. 7-12) = 0.66

k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.056
k (Fig. 7-13) for Ho'=4' - 12' = 1.072

	Ho'/gT^2				Runup (uncorrected)				Runup (corrected for scale effects)				Runup (corrected for riprap) Cot (theta) = 6			
													Short	Medium	Long	Frank Tk
60-minute duration =	0.014	0.013	0.011	0.010	0.7	0.9	1.4	2.2	0.7	1.0	1.5	2.3	0.2	0.3	0.5	0.7
50-minute duration =	0.014	0.013	0.011	0.010	0.7	0.9	1.4	2.2	0.7	1.0	1.5	2.3	0.2	0.3	0.5	0.7
47-minute duration =	0.014	0.013	0.011	0.010	0.7	0.9	1.4	2.2	0.8	1.0	1.5	2.3	0.2	0.3	0.5	0.8
40-minute duration =	0.014	0.013	0.011	0.010	0.7	0.9	1.4	2.2	0.8	1.0	1.5	2.3	0.2	0.3	0.5	0.8
30-minute duration =	0.014	0.013	0.011	0.010	0.7	1.0	1.4	2.2	0.8	1.0	1.5	2.3	0.2	0.3	0.5	0.8
20-minute duration =	0.014	0.013	0.011	0.010	0.7	1.0	1.4	2.2	0.8	1.0	1.5	2.4	0.2	0.3	0.5	0.8
10-minute duration =	*0.014*	*0.013*	*0.012*	*0.010*	*0.7*	*1.0*	*1.5*	*2.3*	*0.8*	*1.1*	*1.5*	*2.4*	0.3	0.3	0.5	0.8

Calculate Runup and Setup:

d_s/H_o' >3 Cot (theta) = 5 R/H_o' (Fig. 7-12) = 0.79

k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.072
k (Fig. 7-13) for Ho'=4' - 12' = 1.093

	Ho'/gT^2				Runup (uncorrected)				Runup (corrected for scale effects)				Runup (corrected for riprap) Cot (theta) = 5			
													Short	Medium	Long	Frank Tk
60-minute duration =	0.014	0.013	0.011	0.010	0.8	1.1	1.7	2.6	0.9	1.2	1.8	2.8	0.3	0.4	0.6	0.9
50-minute duration =	0.014	0.013	0.011	0.010	0.8	1.1	1.7	2.6	0.9	1.2	1.8	2.8	0.3	0.4	0.6	0.9
47-minute duration =	0.014	0.013	0.011	0.010	0.9	1.1	1.7	2.6	0.9	1.2	1.8	2.8	0.3	0.4	0.6	0.9
40-minute duration =	0.014	0.013	0.011	0.010	0.9	1.1	1.7	2.6	0.9	1.2	1.8	2.8	0.3	0.4	0.6	0.9
30-minute duration =	0.014	0.013	0.011	0.010	0.9	1.1	1.7	2.6	0.9	1.2	1.8	2.8	0.3	0.4	0.6	0.9
20-minute duration =	0.014	0.013	0.011	0.010	0.9	1.2	1.7	2.7	0.9	1.2	1.8	2.9	0.3	0.4	0.6	0.9
10-minute duration =	*0.014*	*0.013*	*0.012*	*0.010*	*0.9*	*1.2*	*1.7*	*2.8*	*1.0*	*1.3*	*1.9*	*3.0*	0.3	0.4	0.6	1.0

d_s/H_o' >3 Cot (theta) = 4 R/H_o' (Fig. 7-12) = 0.98

k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.093
k (Fig. 7-13) for Ho'=4' - 12' = 1.115

	Ho'/gT^2				Runup (uncorrected)				Runup (corrected for scale effects)				Runup (corrected for riprap) Cot (theta) = 4			
													Short	Medium	Long	Frank Tk
60-minute speed =	0.014	0.013	0.011	0.010	1.1	1.4	2.0	3.2	1.1	1.5	2.2	3.5	0.4	0.5	0.7	1.1
50-minute speed =	0.014	0.013	0.011	0.010	1.1	1.4	2.0	3.2	1.1	1.5	2.2	3.5	0.4	0.5	0.7	1.1
47-minute speed =	0.014	0.013	0.011	0.010	1.1	1.4	2.1	3.3	1.2	1.5	2.2	3.6	0.4	0.5	0.7	1.2
40-minute speed =	0.014	0.013	0.011	0.010	1.1	1.4	2.1	3.3	1.2	1.5	2.3	3.6	0.4	0.5	0.7	1.2
30-minute speed =	0.014	0.013	0.011	0.010	1.1	1.4	2.1	3.3	1.2	1.5	2.3	3.6	0.4	0.5	0.7	1.2
20-minute speed =	0.014	0.013	0.011	0.010	1.1	1.4	2.1	3.3	1.2	1.6	2.3	3.6	0.4	0.5	0.7	1.2
10-minute speed =	*0.014*	*0.013*	*0.012*	*0.010*	*1.1*	*1.5*	*2.2*	*3.4*	*1.2*	*1.6*	*2.4*	*3.7*	0.4	0.5	0.8	1.2

d_s/H_o' >3 Cot (theta) = 3 R/H_o' (Fig. 7-12) = 1.3

k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.12
k (Fig. 7-13) for Ho'=4' - 12' = 1.148

	Ho'/gT^2				Runup (uncorrected)				Runup (corrected for scale effects)				Runup (corrected for riprap) Cot (theta) = 3			
													Short	Medium	Long	Frank Tk
60-minute speed =	0.014	0.013	0.011	0.010	1.4	1.9	2.7	4.3	1.6	2.1	3.0	4.8	0.5	0.7	1.0	1.6
50-minute speed =	0.014	0.013	0.011	0.010	1.4	1.9	2.7	4.3	1.6	2.1	3.0	4.8	0.5	0.7	1.0	1.6
47-minute speed =	0.014	0.013	0.011	0.010	1.4	1.9	2.7	4.3	1.6	2.1	3.1	4.8	0.5	0.7	1.0	1.6
40-minute speed =	0.014	0.013	0.011	0.010	1.4	1.9	2.7	4.3	1.6	2.1	3.1	4.8	0.5	0.7	1.0	1.6
30-minute speed =	0.014	0.013	0.011	0.010	1.4	1.9	2.7	4.3	1.6	2.1	3.1	4.9	0.5	0.7	1.0	1.6
20-minute speed =	0.014	0.013	0.011	0.010	1.4	1.9	2.8	4.4	1.6	2.1	3.1	4.9	0.5	0.7	1.0	1.6
10-minute speed =	*0.014*	*0.013*	*0.012*	*0.010*	*1.5*	*2.0*	*2.9*	*4.5*	*1.7*	*2.2*	*3.2*	*5.1*	0.5	0.7	1.0	1.7
									Wave Runup+Setup for 3:1 (H:V) =>				**0.6**	**0.8**	**1.1**	**1.8**

	Short	Medium	Long	Frank Tk	
Water Depth (D) =	32	32	32	32	=> input
Setup (S) =	**0.01**	**0.03**	**0.05**	0.14	

Correct for Riprap,	
R/Ho' (1.5 slope, Fig.7-12) =	**2**
R/Ho' (Fig. 7-15,d_s/H_o'=3) =	**0.65**
Correction Factor =	**0.325**

Some Definitions

H_s = Significant wave height (define only for deep water conditions, see SPM Pg. 3-2)
H_{mo} = Spectrally based signifinat wave height (SPM, Pg. 3-39)
$H_{mo} \sim H_s$ (for deep water conditions)
$H_{mo} < H_s$ (for shallow water conditions)

WIND WAVE-RUNUP AND WIND SETUP CALCULATIONS AT BACON ISLAND:

1. Data for "fastest mile of record" are from generalized charts published by USACE (1976) and USBR (1981).
2. Wave runup calculation procedures are from Shore Protection Manual by USACE (1984).
3. Reservoir setup calculation procedures are from Freeboard Criteria and Guidelines by USBR (1981).

	Short	Medium	Long	Mildred Is	
Fetch (miles) =	0.39	0.69	*(not used)*	2.04	=> input
Fastest Mile Speed (overland @ 25-ft. level), mph =	60	60		60	=> input
1-mile travel time (Figure 3-12), seconds =	60	60		60	
U_t/U_{3600} (Figure 3-13) =	1.240	1.240		1.240	=> input
One-hour avg. speed ($U_{t=3600}$)=	48.4	48.4		48.4	
$U_{t=3600s}/U_{3600}$ (60 min. duration, Fig. 3-13) =	1.000	1.000		1.000	
$U_{t=3000s}/U_{3600}$ (50 min. duration, Fig. 3-13) =	1.000	1.000		1.000	
$U_{t=2820s}/U_{3600}$ (47 min. duration, Fig. 3-13) =	1.004	1.004		1.004	
$U_{t=2400s}/U_{3600}$ (40 min. duration, Fig. 3-13) =	1.005	1.005		1.005	
$U_{t=1800s}/U_{3600}$ (30 min. duration, Fig. 3-13) =	1.010	1.010		1.010	
$U_{t=1200s}/U_{3600}$ (20 min. duration, Fig. 3-13) =	1.020	1.020		1.020	
$U_{t=600s}/U_{3600}$ (10 min. duration, Fig. 3-13) =	1.047	1.047		1.047	

Calculate Wave Characteristics (for Deep Water Conditions i.e. d/L > 1/2):

	Short	Medium	Long	Mildred Is	Short	Medium	Long	Mildred Is	Short	Medium	Long	Mildred Is
	Average Speed (mph)				**Over Water Adj. = 0.9 (fetch < 10 mi.)**				**Calculate U_A (mph)**			
60-minute duration =	48.4	48.4		48.4	43.5	43.5		43.5	61.1	61.1		61.1
50-minute duration =	48.4	48.4		48.4	43.5	43.5		43.5	61.1	61.1		61.1
47-minute duration =	48.6	48.6		48.6	43.7	43.7		43.7	61.4	61.4		61.4
40-minute duration =	48.6	48.6		48.6	43.8	43.8		43.8	61.5	61.5		61.5
30-minute duration =	48.9	48.9		48.9	44.0	44.0		44.0	61.9	61.9		61.9
20-minute duration =	49.4	49.4		49.4	44.4	44.4		44.4	62.6	62.6		62.6
10-minute duration =	50.7	50.7		50.7	45.6	45.6		45.6	64.7	64.7		64.7
					FETCH LIMITED							
	Calculate H_{mo} (feet)				**Calculate T_m (seconds)**				**Calculate t (hours)**			
60-minute duration =	1.15	1.53		2.63	1.61	1.95		2.79	0.22	0.32		0.65
50-minute duration =	1.15	1.53		2.63	1.61	1.95		2.79	0.22	0.32		0.65
47-minute duration =	1.15	1.54		2.64	1.61	1.95		2.80	0.22	0.32		0.65
40-minute duration =	1.16	1.54		2.64	1.61	1.95		2.80	0.22	0.32		0.65
30-minute duration =	1.16	1.55		2.66	1.62	1.95		2.80	0.22	0.32		0.65
20-minute duration =	1.18	1.57		2.69	1.62	1.96		2.81	0.22	0.32		0.65
10-minute duration =	1.22	1.62		2.78	1.64	1.98		2.84	0.21	0.31		0.64
					FULLY DEVELOPED							
	Calculate H_{mo} (feet)				**Calculate T_m (seconds)**				**Calculate t (hours)**			
60-minute duration =	60.5	60.5		60.5	22.64	22.64		22.64	55.27	55.27		55.27
50-minute duration =	60.5	60.5		60.5	22.64	22.64		22.64	55.27	55.27		55.27
47-minute duration =	61.1	61.1		61.1	22.76	22.76		22.76	55.54	55.54		55.54
40-minute duration =	61.2	61.2		61.2	22.78	22.78		22.78	55.61	55.61		55.61
30-minute duration =	62.0	62.0		62.0	22.92	22.92		22.92	55.95	55.95		55.95
20-minute duration =	63.5	63.5		63.5	23.20	23.20		23.20	56.63	56.63		56.63
10-minute duration =	67.7	67.7		67.7	23.96	23.96		23.96	58.48	58.48		58.48

Calculate Runup and Setup:

	d_s/H_o' >3	Cot (theta) = 6		R/H_o' (Fig. 7-12) = 0.66			k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.056 k (Fig. 7-13) for Ho'=4' - 12' = 1.072			Short	Medium	Long	Mildred Is
	H_o/gT^2			Runup (uncorrected)			Runup (corrected for scale effects)			Cot (theta) = 6 Runup (corrected for riprap)			
60-minute duration =	0.014	0.013	0.010	0.8	1.0	1.7	0.8	1.1	1.8	0.3	0.3		0.6
50-minute duration =	0.014	0.013	0.010	0.8	1.0	1.7	0.8	1.1	1.8	0.3	0.3		0.6
47-minute duration =	0.014	0.013	0.010	0.8	1.0	1.7	0.8	1.1	1.8	0.3	0.3		0.6
40-minute duration =	0.014	0.013	0.010	0.8	1.0	1.7	0.8	1.1	1.8	0.3	0.3		0.6
30-minute duration =	0.014	0.013	0.011	0.8	1.0	1.8	0.8	1.1	1.9	0.3	0.4		0.6
20-minute duration =	0.014	0.013	0.011	0.8	1.0	1.8	0.8	1.1	1.9	0.3	0.4		0.6
10-minute duration =	0.014	0.013	0.011	0.8	1.1	1.8	0.8	1.1	1.9	0.3	0.4		0.6

Calculate Runup and Setup:

	d_s/H_o' >3	Cot (theta) = 5		R/H_o' (Fig. 7-12) = 0.79			k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.072 k (Fig. 7-13) for Ho'=4' - 12' = 1.093			Short	Medium	Long	Mildred Is
	H_o/gT^2			Runup (uncorrected)			Runup (corrected for scale effects)			Cot (theta) = 5 Runup (corrected for riprap)			
60-minute duration =	0.014	0.013	0.010	0.9	1.2	2.1	1.0	1.3	2.2	0.3	0.4		0.7
50-minute duration =	0.014	0.013	0.010	0.9	1.2	2.1	1.0	1.3	2.2	0.3	0.4		0.7
47-minute duration =	0.014	0.013	0.010	0.9	1.2	2.1	1.0	1.3	2.2	0.3	0.4		0.7
40-minute duration =	0.014	0.013	0.010	0.9	1.2	2.1	1.0	1.3	2.2	0.3	0.4		0.7
30-minute duration =	0.014	0.013	0.011	0.9	1.2	2.1	1.0	1.3	2.3	0.3	0.4		0.7
20-minute duration =	0.014	0.013	0.011	0.9	1.2	2.1	1.0	1.3	2.3	0.3	0.4		0.7
10-minute duration =	0.014	0.013	0.011	1.0	1.3	2.2	1.0	1.4	2.4	0.3	0.4		0.8

	d_s/H_o' >3	Cot (theta) = 4		R/H_o' (Fig. 7-12) = 0.98			k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.093 k (Fig. 7-13) for Ho'=4' - 12' = 1.115			Short	Medium	Long	Mildred Is
	H_o/gT^2			Runup (uncorrected)			Runup (corrected for scale effects)			Cot (theta) = 4 Runup (corrected for riprap)			
60-minute speed =	0.014	0.013	0.010	1.1	1.5	2.6	1.2	1.6	2.8	0.4	0.5		0.9
50-minute speed =	0.014	0.013	0.010	1.1	1.5	2.6	1.2	1.6	2.8	0.4	0.5		0.9
47-minute speed =	0.014	0.013	0.010	1.1	1.5	2.6	1.2	1.6	2.8	0.4	0.5		0.9
40-minute speed =	0.014	0.013	0.010	1.1	1.5	2.6	1.2	1.6	2.8	0.4	0.5		0.9
30-minute speed =	0.014	0.013	0.011	1.1	1.5	2.6	1.2	1.7	2.8	0.4	0.5		0.9
20-minute speed =	0.014	0.013	0.011	1.2	1.5	2.6	1.3	1.7	2.9	0.4	0.5		0.9
10-minute speed =	0.014	0.013	0.011	1.2	1.6	2.7	1.3	1.7	3.0	0.4	0.6		1.0

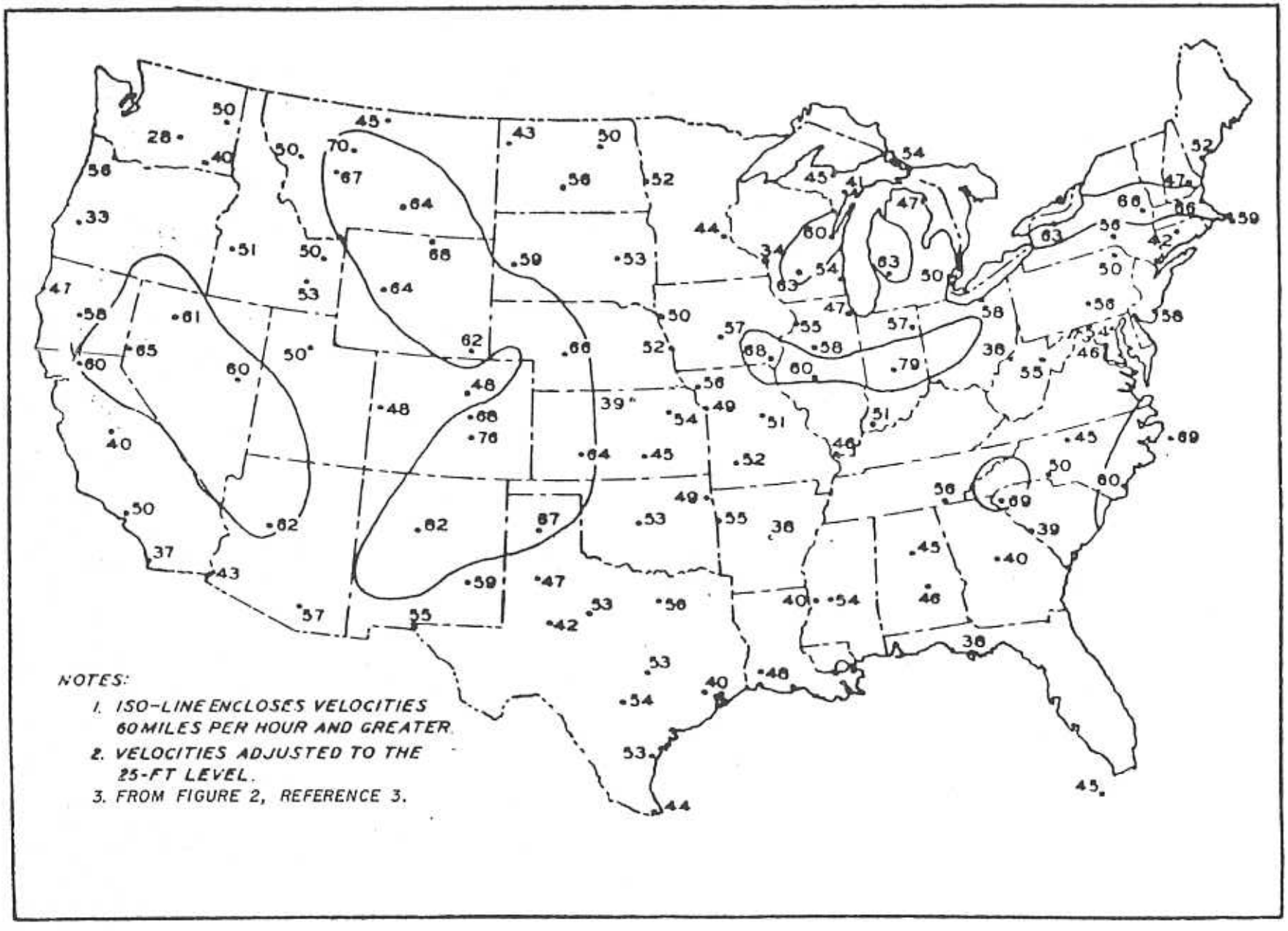
	d_s/H_o' >3	Cot (theta) = 3		R/H_o' (Fig. 7-12) = 1.3			k (Fig. 7-13) for Ho'=1.5' - 4.5' = 1.12 k (Fig. 7-13) for Ho'=4' - 12' = 1.148			Short	Medium	Long	Mildred Is
	H_o/gT^2			Runup (uncorrected)			Runup (corrected for scale effects)			Cot (theta) = 3 Runup (corrected for riprap)			
60-minute speed =	0.014	0.013	0.010	1.5	2.0	3.4	1.7	2.2	3.8	0.5	0.7		1.2
50-minute speed =	0.014	0.013	0.010	1.5	2.0	3.4	1.7	2.2	3.8	0.5	0.7		1.2
47-minute speed =	0.014	0.013	0.010	1.5	2.0	3.4	1.7	2.2	3.8	0.5	0.7		1.2
40-minute speed =	0.014	0.013	0.010	1.5	2.0	3.4	1.7	2.2	3.8	0.5	0.7		1.3
30-minute speed =	0.014	0.013	0.011	1.5	2.0	3.5	1.7	2.3	3.9	0.6	0.7		1.3
20-minute speed =	0.014	0.013	0.011	1.5	2.0	3.5	1.7	2.3	3.9	0.6	0.7		1.3
10-minute speed =	0.014	0.013	0.011	1.6	2.1	3.6	1.8	2.4	4.0	0.6	0.8		1.3
									Wave Runup+Setup for 3:1 (H:V) =>	**0.6**	**0.8**		**1.4**

	Short	Medium	Long	Mildred Is	
Water Depth, ft (D) =	32	32		32	=> input
Setup, ft (S) =	**0.02**	**0.03**		**0.09**	

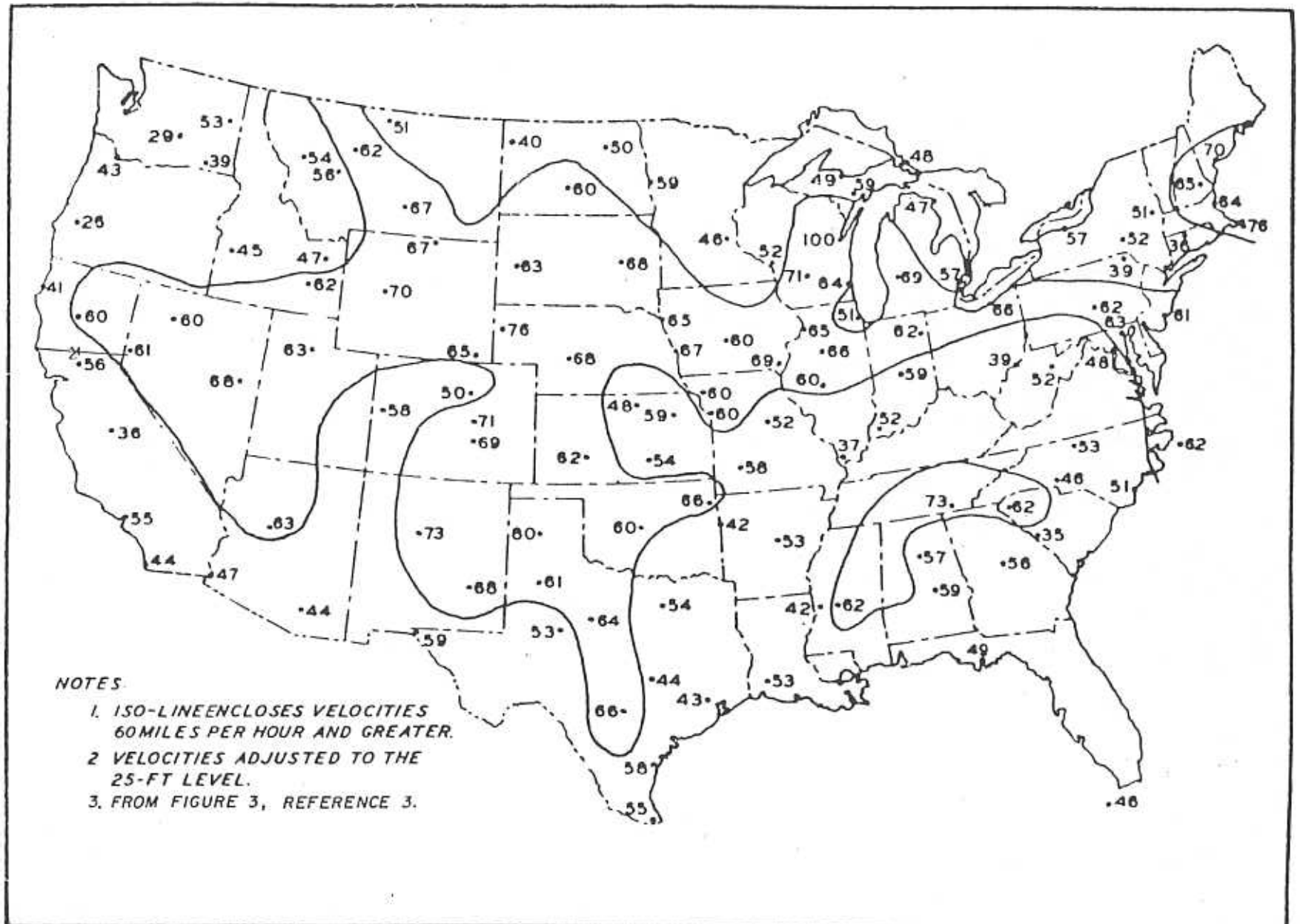
Correct for Riprap,	
R/Ho' (1.5 slope, Fig.7-12) =	**2**
R/Ho' (Fig. 7-15,d_s/H_o'=3) =	**0.65**
Correction Factor =	**0.325**

Some Definitions

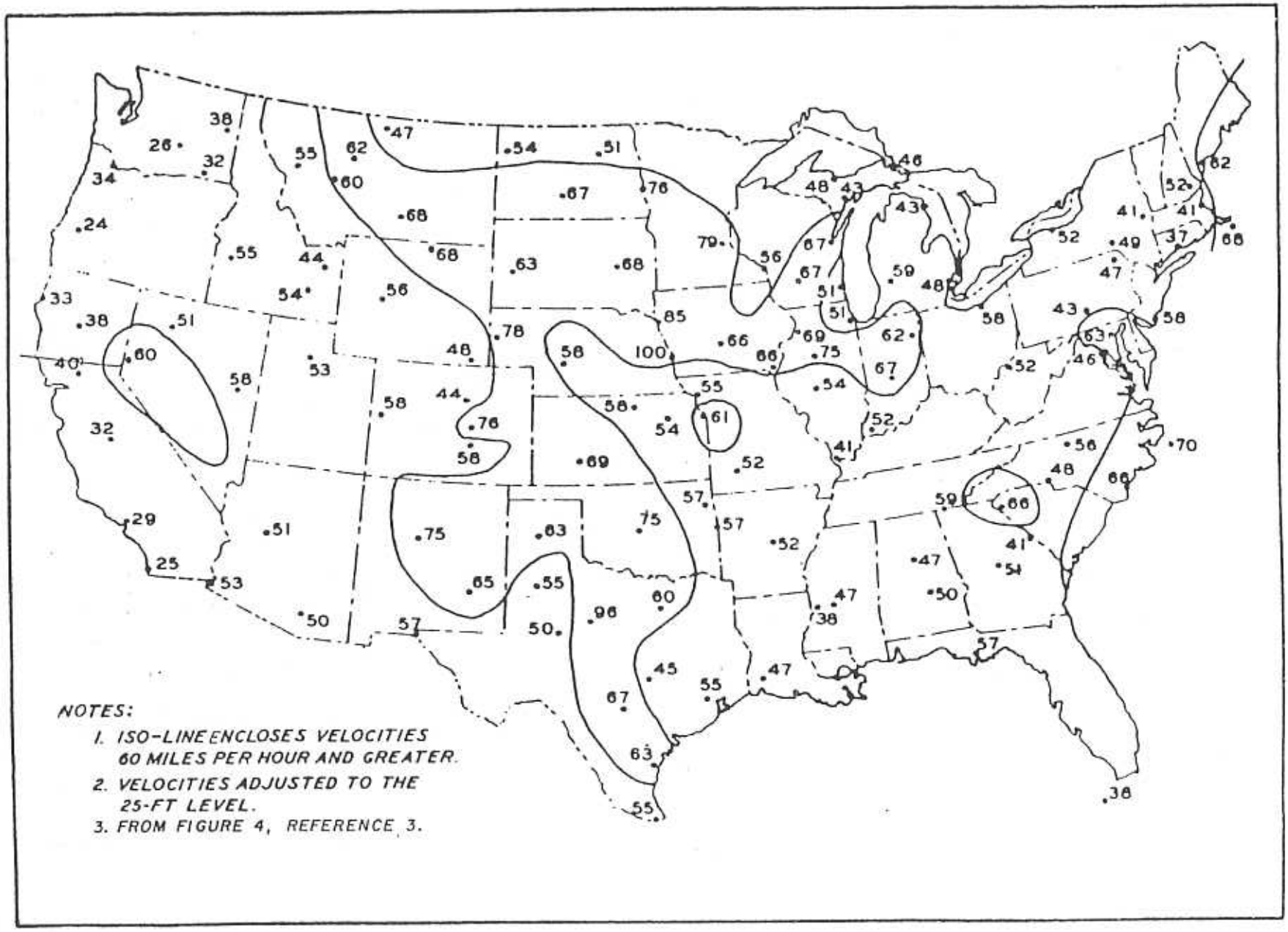
H_s = Significant wave height (define only for deep water conditions, see SPM Pg. 3-2)
H_{mo} = Spectrally based signifinat wave height (SPM, Pg. 3-39)
$H_{mo} \sim H_s$ (for deep water conditions)
$H_{mo} < H_s$ (for shallow water conditions)



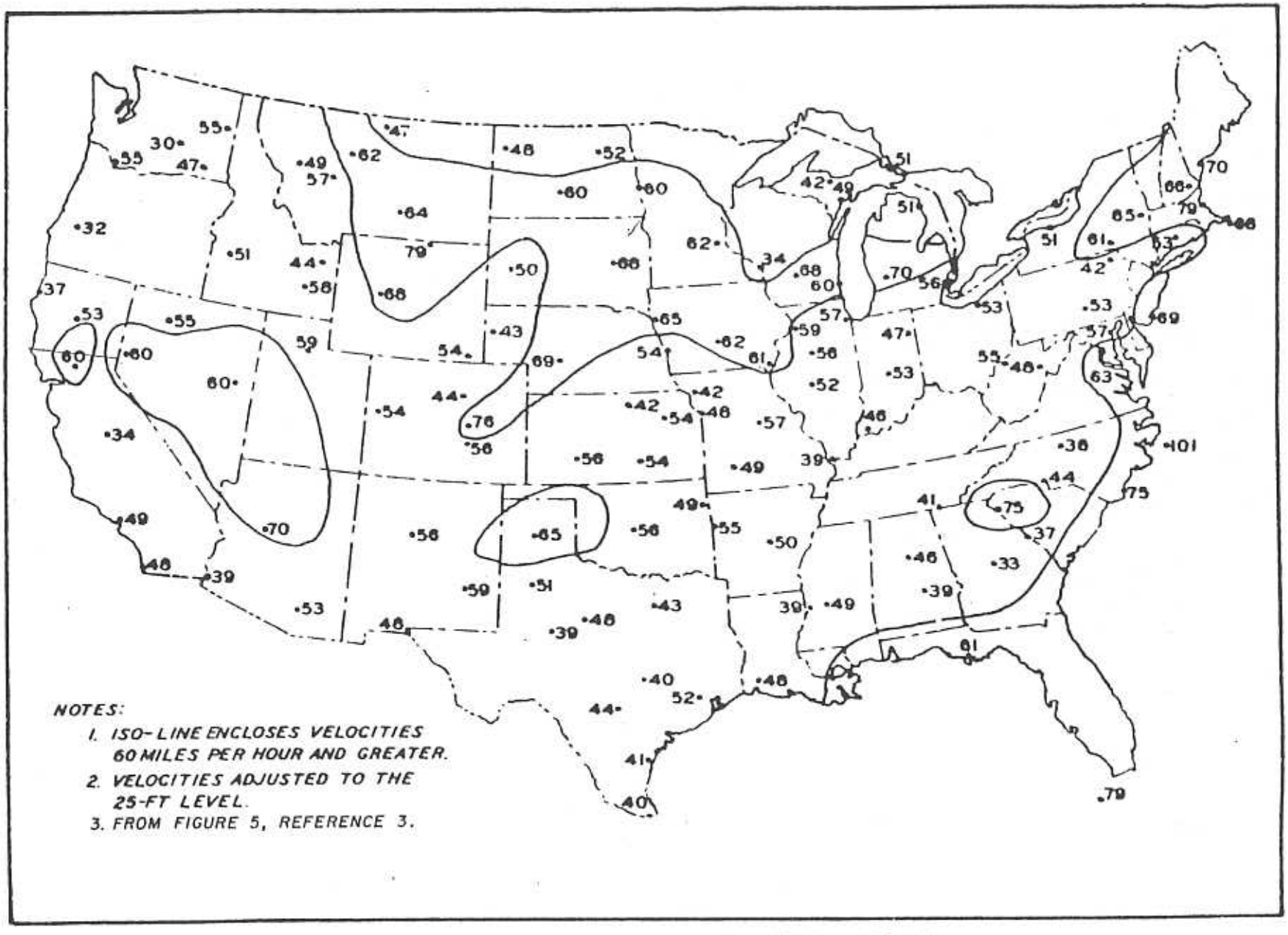
FASTEST MILE OF RECORD-WINTER



FASTEST MILE OF RECORD-SPRING



FASTEST MILE OF RECORD-SUMMER



FASTEST MILE OF RECORD - FALL

Table 3-2. Deepwater wave forecasting equation.

Dimensionless	Metric Units	
	H(m), T(s), U_A(m/s), F(m), t(s)	H(m), T(s), U_A(m/s), F(km), t(hr)
FETCH LIMITED, (F, U)		
$\frac{gH_{m_o}}{U_A^2} = 1.6\times10^{-3}\left(\frac{gF}{U_A^2}\right)^{1/2}$ (3-33)	$H_{m_o} = 5.112\times10^{-4}\ U_A F^{1/2}$ (3-33a)	$H_{m_o} = 1.616\times10^{-2}\ U_A F^{1/2}$ (3-33b)
$\frac{gT_m}{U_A} = 2.857\times10^{-1}\left(\frac{gF}{U_A^2}\right)^{1/3}$ (3-34)	$T_m = 6.238\times10^{-2}\left(U_A F\right)^{1/3}$ (3-34a)	$T_m = 6.236\times10^{-1}\left(U_A F\right)^{1/3}$ (3-34b)
$\frac{gt}{U_A} = 6.88\times10^{1}\left(\frac{gF}{U_A^2}\right)^{2/3}$ (3-35)	$t = 3.215\times10^{1}\left(\frac{F^2}{U_A}\right)^{1/3}$ (3-35a)	$t = 8.93\times10^{-1}\left(\frac{F^2}{U_A}\right)^{1/3}$ (3-35b)
FULLY DEVELOPED		
$\frac{gH_{m_o}}{U_A^2} = 2.433\times10^{-1}$ (3-36)	$H_{m_o} = 2.482\times20^{-2}\ U_A^2$ (3-36a)	$H_{m_o} = 2.4821\times10^{-2}\ U_A^2$ (3-36b)
$\frac{gT_m}{U_A} = 8.134$ (3-37)	$T_m = 8.30\times10^{-1}\ U_A$ (3-37a)	$T_m = 8.30\times10^{-1}\ U_A$ (3-37b)
$\frac{gt}{U_A} = 7.15\times10^{4}$ (3-38)	$t = 7.296\times10^{3}\ U_A$ (3-38a)	$t = 2.027\ U_A$ (3-38b)
NOTATIONS	$g = 9.8\ m/s^2$	$g = 9.8\ m/s^2$ 1 kilometer = 1000 m 1 hour = 3600 s

	English Units	
H(ft), T(s), U_A(ft/s), F(ft), t(s)	H(ft), T(s), U_A(mi/hr) F(m), t(hr)	H(ft), T(s), U_A (kn), F(nmi), t(hr)
FETCH LIMITED (F, U)		
$H_{m_o} = 2.82\times10^{-4}\ U_A F^{1/2}$ (3-33c)	$H_{m_o} = 3.01\times10^{-2}\ U_A F^{1/2}$ (3-33d)	$H_{m_o} = 3.714\times10^{-2}\ U_A F^{1/2}$ (3-33e)
$T_m = 2.825\times10^{-2}\left(U_A F\right)^{1/3}$ (3-34c)	$T_m = 5.59\times10^{-1}\left(U_A F\right)^{1/3}$ (3-34d)	$T_m = 6.14\times10^{-1}\left(U_A F\right)^{1/3}$ (3-34e)
$t = 2.16\times10^{1}\left(\frac{F^2}{U_A}\right)^{1/3}$ (3-35c)	$t = 1.603\left(\frac{F^2}{U_A}\right)^{1/3}$ (3-35d)	$t = 1.680\left(\frac{F^2}{U_A}\right)^{1/3}$ (3-35e)
FULLY DEVELOPED		
$H_{m_o} = 7.553\times10^{-3}\ U_A^2$ (3-36c)	$H_{m_o} = 1.625\times10^{-2}\ U_A^2$ (3-36d)	$H_{m_o} = 2.154\times10^{-2}\ U_A^2$ (3-36e)
$T_m = 2.53\times10^{-1}\ U_A$ (3-37c)	$T_m = 3.706\times10^{-1}\ U_A$ (3-37d)	$T_m = 4.244\times10^{-1}\ U_A$ (3-37e)
$t = 2.220\times10^{3}\ U_A$ (3-38c)	$t = 9.045\times10^{-1}\ U_A$ (3-38d)	$t = 1.04\ U_A$ (3-38e)
NOTATIONS $g = 32.2\ ft/s^2$	$g = 32.2\ ft/s^2$ 1 mile = 5280 ft miles per hour = 1.467 ft/s 1 hour = 3600 s	$g = 32.2\ ft/s^2$ 1 nautical mile = 6080 ft 1 knot = 1.689 ft/s 1 hour = 3600 s

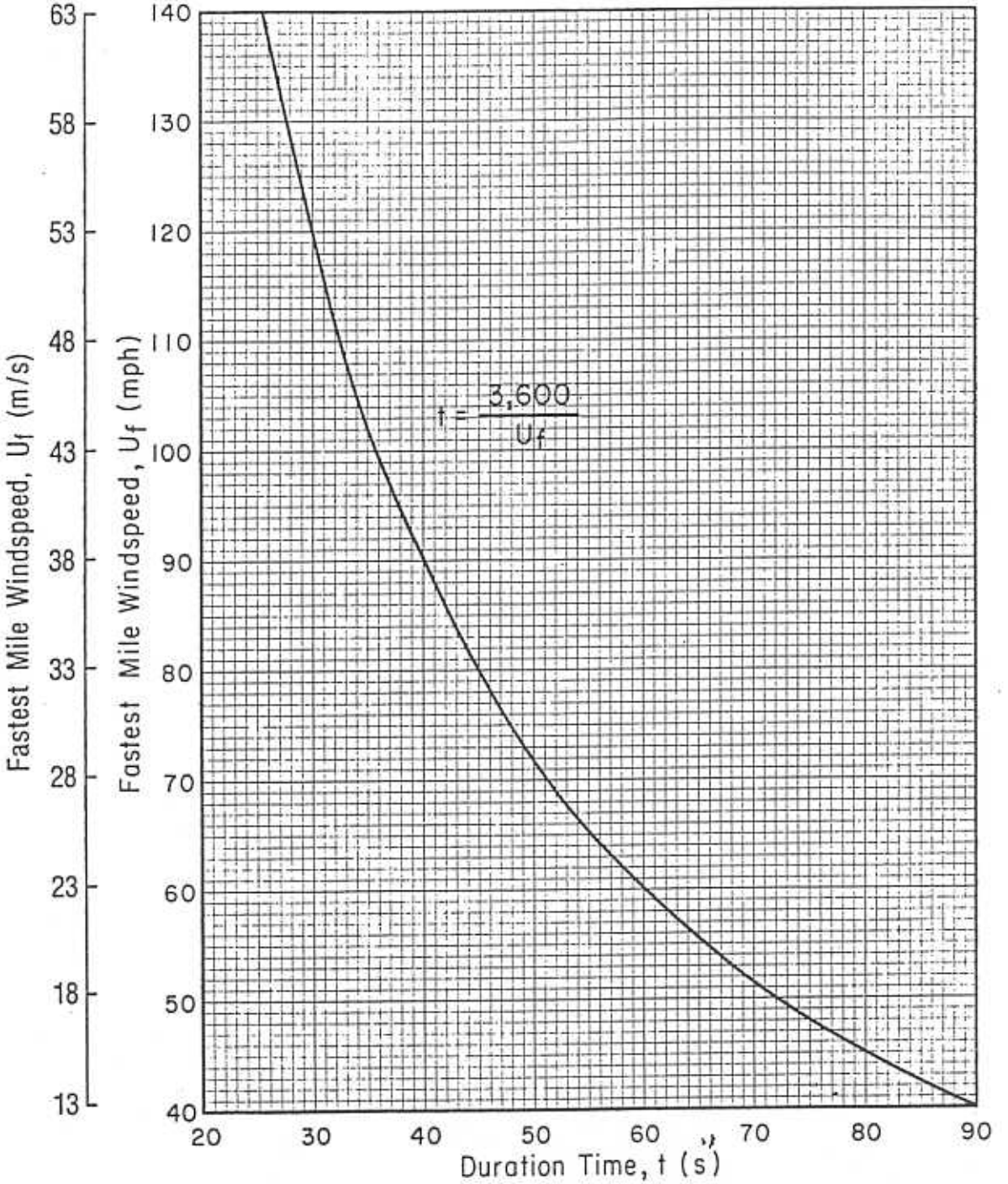


Figure 3-12. Duration of the fastest mile windspeed as a function of windspeed.

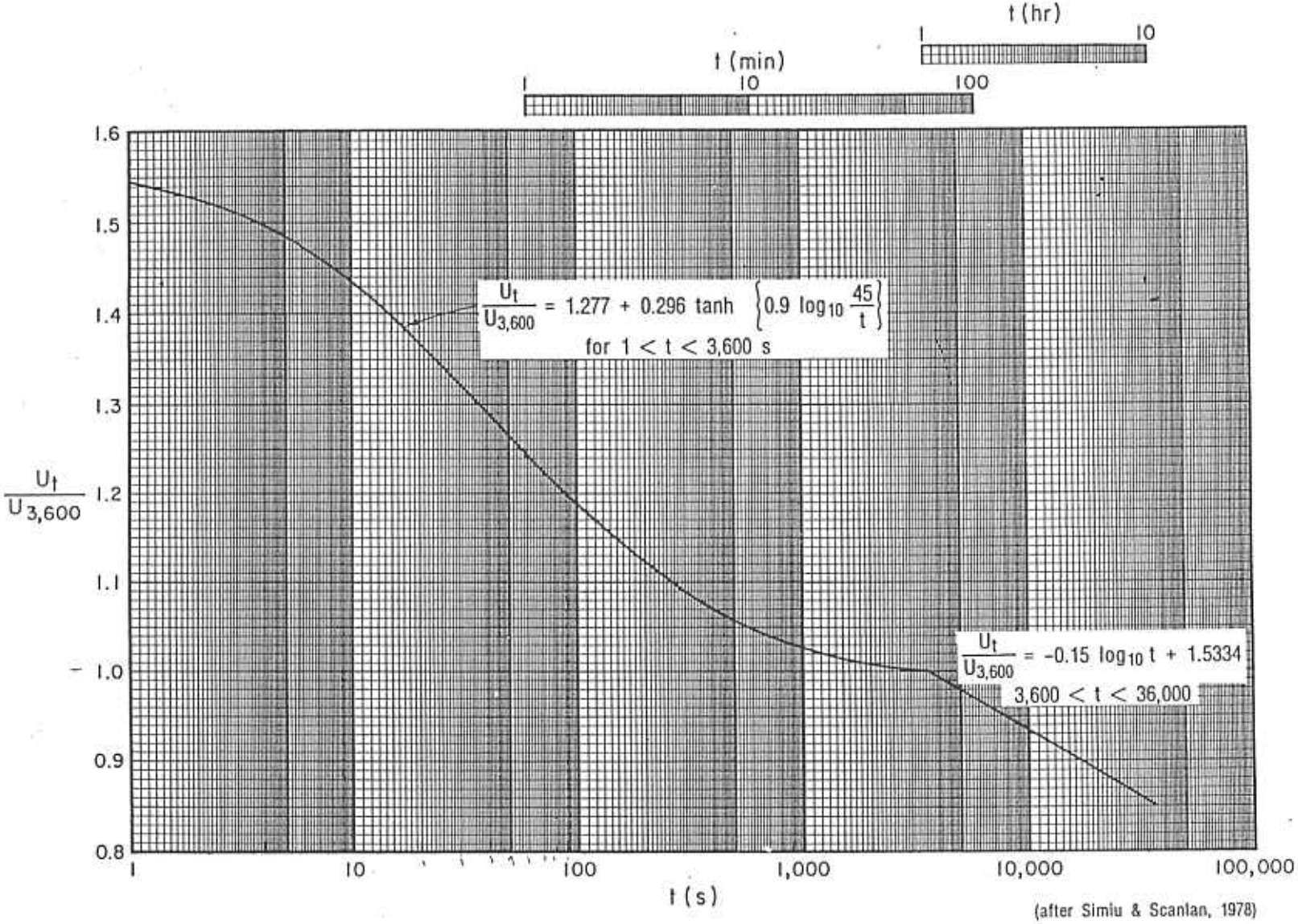
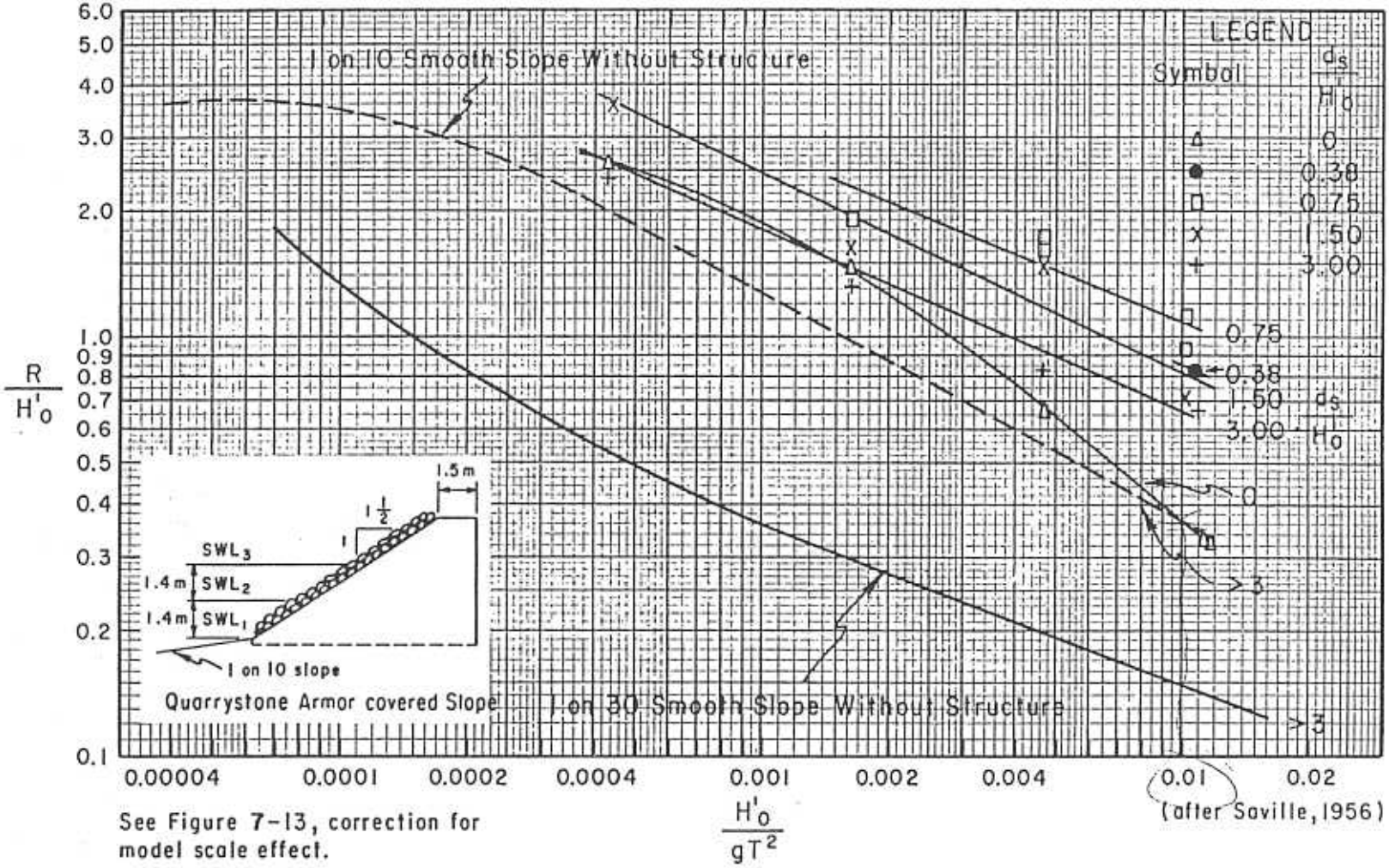


Figure 3-13. Ratio of windspeed of any duration, U_t, to the 1-hour windspeed, U_{3600}.



See Figure 7-13, correction for model scale effect.

Figure 7-15. Wave runup on impermeable, quarrystone, 1:1.5 slope versus H'_o/gT^2.

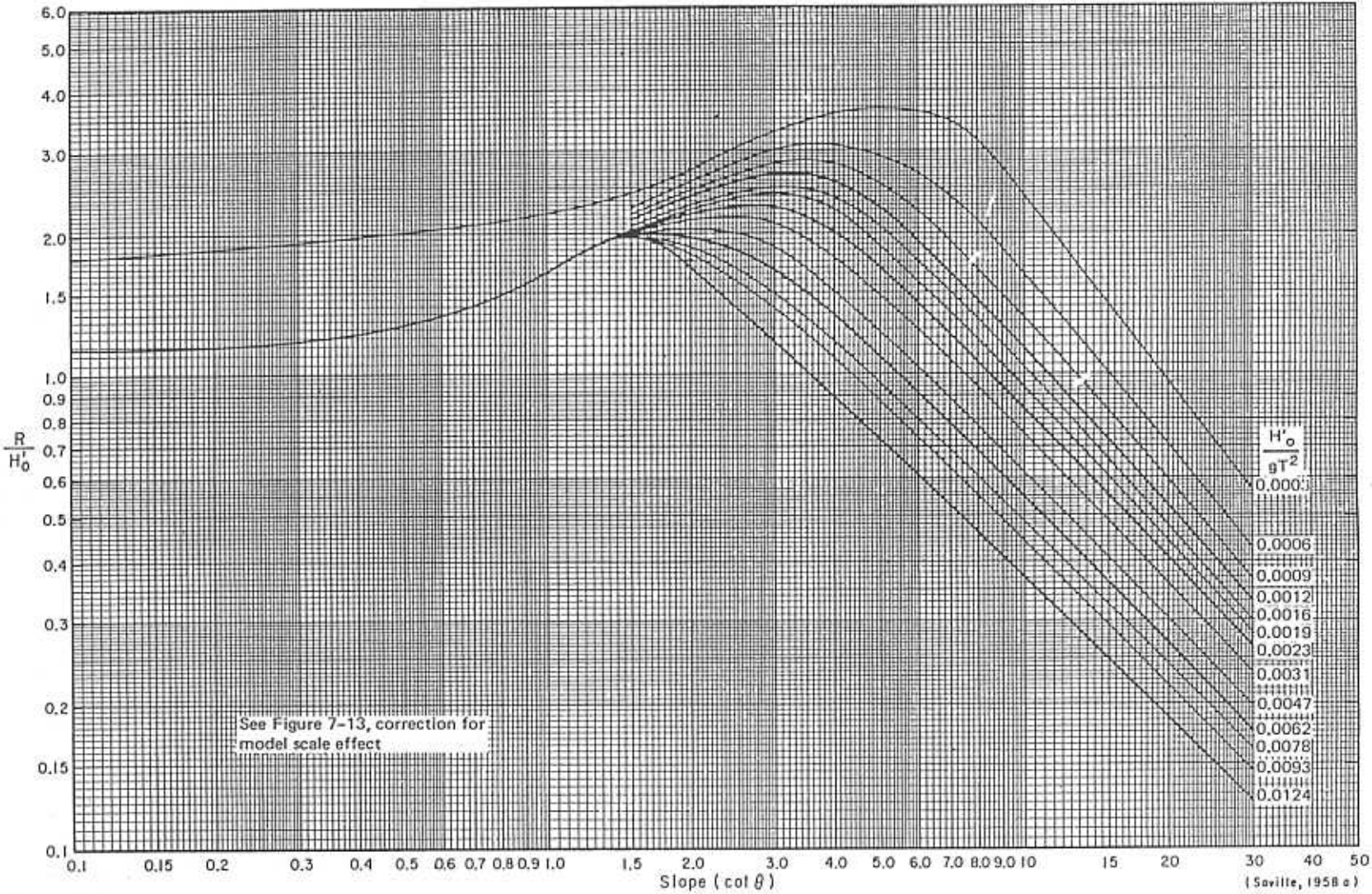


Figure 7-12. Wave runup on smooth, impermeable slopes when $d_s/H_o' \geq 3.0$.

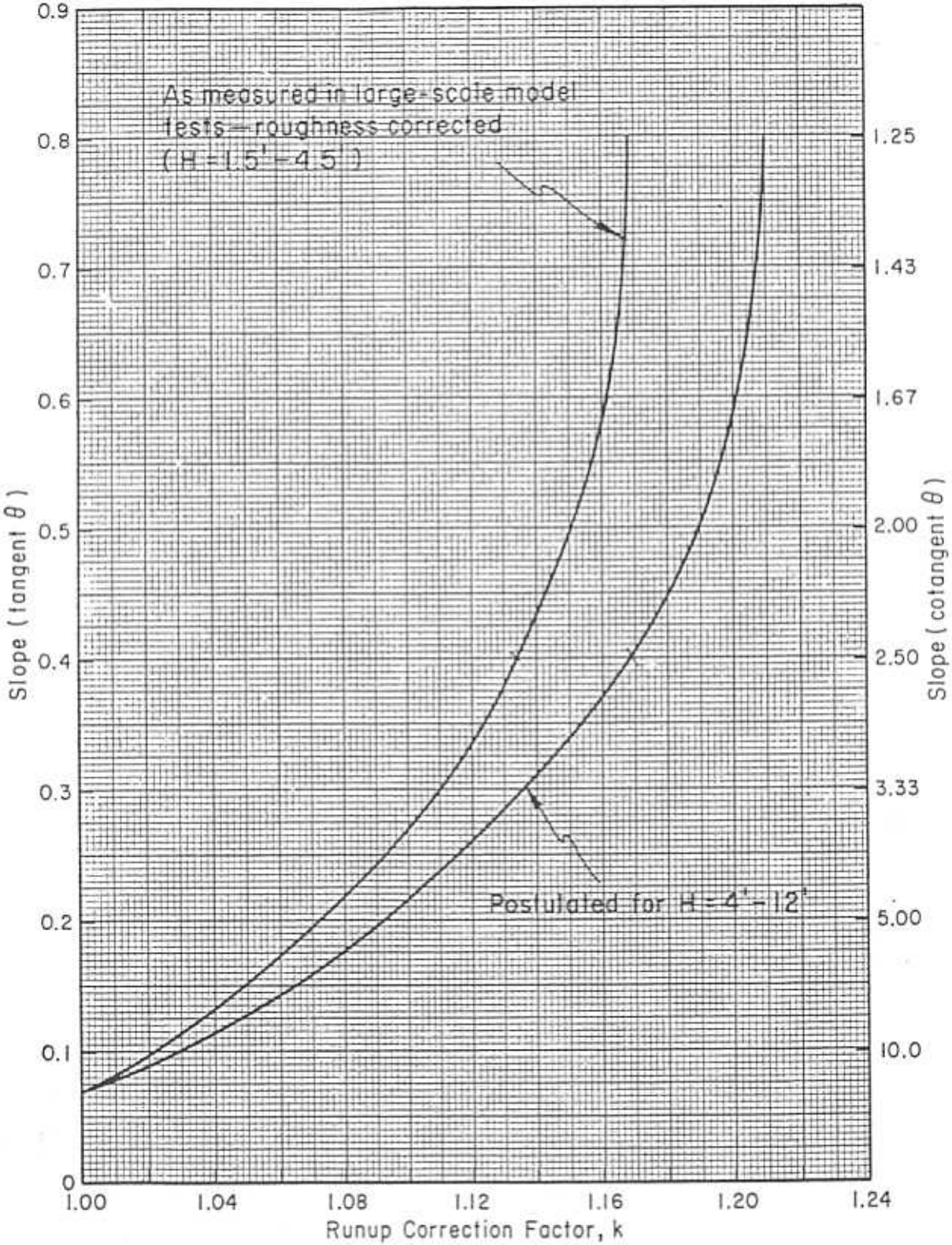


Figure 7-13. Runup correction for scale effects.

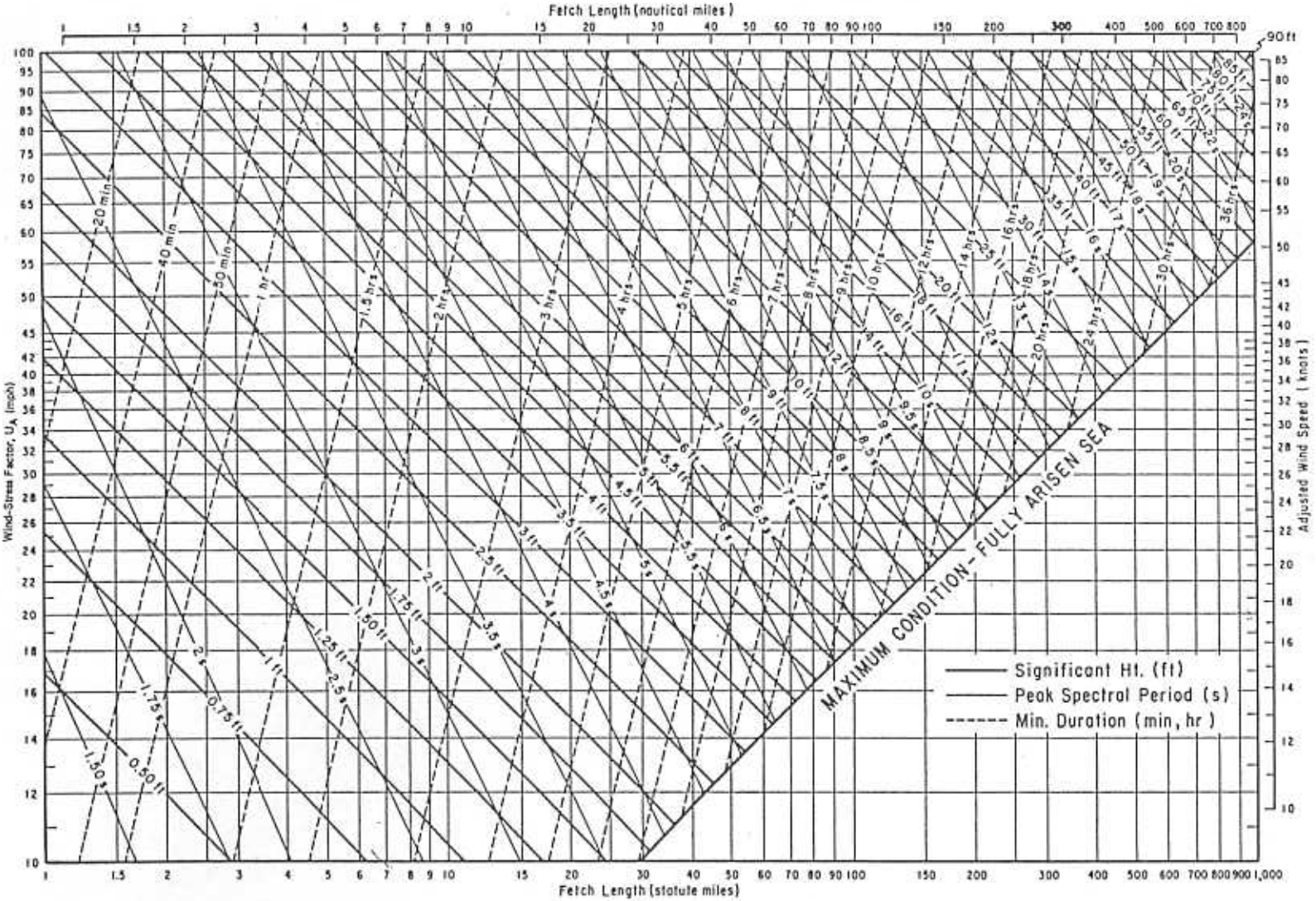


Figure 3-24. Nomograms of deepwater significant wave prediction curves as functions of windspeed, fetch length, and wind duration (English units).