

BROAD BEACH REVETMENT
Design Water Depths

Surge Event		Sea Level Rise Over Next 25 Years (Feet)		25-Year Design Water Level / Still Water Elevation (Feet, MLLW)		Scour Depth (Feet, MLLW)	25-Year Design Water Depth (Feet)	
Recurrence Interval (Years)	Extreme Still Water Elevation (Feet, MLLW)	Low/Historic Rate	High Rate	With Low/Historic SLR	With High SLR		With Low/Historic SLR	With High SLR
5	7.4	0.1	0.8	7.5	8.2	0.0	7.5	8.2
10	7.6	0.1	0.8	7.7	8.4	0.0	7.7	8.4
25	7.7	0.1	0.8	7.8	8.5	0.0	7.8	8.5
50	7.9	0.1	0.8	8.0	8.7	0.0	8.0	8.7
100	8.0	0.1	0.8	8.1	8.8	0.0	8.1	8.8

BROAD BEACH REVETMENT
Design Breaking Wave Height

CHECK FOR DEPTH LIMITED BREAKING WAVE HEIGHT CONDITION AT TOE OF REVETMENT

100-Year Recurrence Interval Water Level

Nearshore Slope, $m = 0.03$

25-Year Predictions

Scour Elevation = 0' MLLW

SLR	T (sec)	d_s (ft)	d_s/gT^2	H_b/d_s *	H_b (ft)	H_b/gT^2	H_b/H'_o **	H'_o (ft)
Low	16	8.1	0.0010	1.09	8.85	0.0011	2.12	4.2
Low	20	8.1	0.0006	1.11	9.01	0.0007	2.55	3.5
High	16	8.8	0.0011	1.09	9.56	0.0012	2.05	4.7
High	20	8.8	0.0007	1.10	9.65	0.0007	2.55	3.8

d_s = depth at toe of structure

H_b = breaking wave height in design water depth.

Waves larger than this are already broken offshore.

H'_o = unrefracted deep water wave.

m = nearshore slope

* H_b/d_s from SPM Figure 7-4, $m=0.03$

** H_b/H'_o from SPM Figure 7-5, $m=0.03$

BROAD BEACH REVETMENT
Estimated Wave Runup Elevations

WAVE RUNUP ESTIMATES BASED ON SPM METHODOLOGY

100-Year Recurrence Interval

Nearshore Slope, $m = 0.03$

Revetment Slope, 1.5:1, i.e. $\cot\theta=1.5$

25-Year Predictions

Scour Elevation = 0' MLLW

SLR	T (sec)	d_s (ft)	H'_o (ft)	H'_o/gT^2	d_s/H'_o	R/H'_o (smooth slope) *	R/H'_o (riprap slope) **	Riprap / Smooth Correction Factor	Model Scale Correction Factor, K ***	Total Corrected Runup (ft) above design water level	Run-up Elevation (ft, MLLW)
Low	16	8.1	4.2	0.0005	1.94	4.0	2.9	0.73	1.205	14.6	22.7
Low	20	8.1	3.5	0.0003	2.30	4.2	3.5	0.83	1.205	14.9	23.0
High	16	8.8	4.7	0.0006	1.88	3.9	2.8	0.72	1.205	15.7	24.5
High	20	8.8	3.8	0.0003	2.32	4.2	3.5	0.83	1.205	16.0	24.7

* R/H'_o (smooth slope) from Figure 7-11

** R/H'_o (riprap slope) from Figure 7-15

*** Model Scale Correction, K, from Figure 7-13

CALCULATION SHEET

Project:
Broad Beach
Subject: Wave Runup

A code for dike height design and examination
EurOtop / J.W. Van der Meer (2002)

Wave Overtopping - Deterministic Methodology

Crest Elevation: +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW

Input Parameters		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Nearshore Slope	S_b (m)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Toe Level	h_t (m MLLW)	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Wave Height	H_s (m)	3.39	3.39	3.39	3.39	3.39	3.39	3.39
Wave Period (Zero-crossing)	T_z (s)	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Still Water Level	SWL (m MLLW)	2.47	2.47	2.47	2.47	2.47	2.47	2.47
Crest Level	h_c (m MLLW)	3.96	3.96	3.96	3.96	3.96	3.96	3.96
Slope	s_u (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Wave Angle	β (°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roughness reduction factor	Y_r	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Crest Width	C_w (m)	0.00	5.00	10.00	15.00	20.00	25.00	30.00
Crest Width (in feet)	C_w (ft)	0.00	16.40	32.81	49.21	65.62	82.02	98.42

Calculations								
Depth of water at Toe	d (m)	3.08	3.08	3.08	3.08	3.08	3.08	3.08
Wavelength	L (m)	100.54	100.54	0.00	0.00	0.00	0.00	100.54
Depth/Wavelength	d/L	0.03	0.03	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.03
Shoaling Coefficient	K_s	1.63	1.63	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.63
Peak Wave Period	T_p (s)	25.40	25.40	25.40	25.40	25.40	25.40	25.40
Average Slope Angle	α (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Berm reduction factor	Y_b	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wave Angle reduction factor	Y_{β}	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Combination of all reduction factors	Y_{s1}	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Iribarren No.	ξ_{op}	11.49	11.49	11.49	11.49	11.49	11.49	11.49
Wave Steepness	S_{op}	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03
Crest Freeboard	R_c (m)	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Dimensionless crest height (broken)	R_b	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Dimensionless crest height (unbroken)	R_n	0.80	0.80	0.80	0.80	0.80	0.80	0.80
	$T_{m-1.0}$ (s)	23.09	23.09	23.09	23.09	23.09	23.09	23.09
	$L_{m-1.0}$	832.48	832.48	832.48	832.48	832.48	832.48	832.48
Breaker Parameter ($\tan\alpha(H_{s0}/L_0)^{0.5}$)	$\xi_{m-1.0}$	10.45	10.45	10.45	10.45	10.45	10.45	10.45
Wave Steepness	$S_{m-1.0}$	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194
Mean Discharge Q	Q_{mean} (m ³ /s/m)	12.05490059	12.05490059	12.05490059	12.05490059	12.05490059	12.05490059	12.05490059
Maximum Discharge Q	Q_{max} (m ³ /s/m)	0.620308595	0.620308595	0.620308595	0.620308595	0.620308595	0.620308595	0.620308595
Crest Reduction factor	Cr	1	0.334882865	0.036649194	0.004010845	0.000438942	4.80373E-05	5.25715E-06
Results		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Wave Type		NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK
Discharge Rate	Q (l/s/m)	620.31	207.73	22.73	2.49	0.27	0.03	0.00

CALCULATION SHEET

Project:

Broad Beach

Subject: Wave Runup

A code for dike height design and examination

EurOtop / J.W. Van der Meer (2002)

Wave Overtopping - Deterministic Methodology

Crest Elevation: +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW

Input Parameters		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Nearshore Slope	S_b (m)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Toe Level	h_t (m MLLW)	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Wave Height	H_s (m)	3.39	3.39	3.39	3.39	3.39	3.39	3.39
Wave Period (Zero-crossing)	T_z (s)	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Still Water Level	SWL (m MLLW)	2.47	2.47	2.47	2.47	2.47	2.47	2.47
Crest Level	h_c (m MLLW)	4.57	4.57	4.57	4.57	4.57	4.57	4.57
Slope	s_u (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Wave Angle	β (°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roughness reduction factor	Y_r	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Crest Width	C_w (m)	0.00	5.00	10.00	15.00	20.00	25.00	30.00
Crest Width (in feet)	C_w (ft)	0.00	16.40	32.81	49.21	65.62	82.02	98.42

Calculations								
Depth of water at Toe	d (m)	3.08	3.08	3.08	3.08	3.08	3.08	3.08
Wavelength	L (m)	100.54	100.54	0.00	0.00	0.00	0.00	100.54
Depth/Wavelength	d/L	0.03	0.03	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.03
Shoaling Coefficient	K_s	1.63	1.63	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.63
Peak Wave Period	T_p (s)	25.40	25.40	25.40	25.40	25.40	25.40	25.40
Average Slope Angle	α (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Berm reduction factor	Y_b	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wave Angle reduction factor	Y_{β}	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Combination of all reduction factors	Y_{s1}	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Iribarren No.	ξ_{op}	11.49	11.49	11.49	11.49	11.49	11.49	11.49
Wave Steepness	S_{op}	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03
Crest Freeboard	R_c (m)	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Dimensionless crest height (broken)	R_b	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Dimensionless crest height (unbroken)	R_n	1.13	1.13	1.13	1.13	1.13	1.13	1.13
	$T_{m-1.0}$ (s)	23.09	23.09	23.09	23.09	23.09	23.09	23.09
	$L_{m-1.0}$	832.48	832.48	832.48	832.48	832.48	832.48	832.48
Breaker Parameter ($\tan\alpha(H_{s0}/L)^{0.5}$)	$\xi_{m-1.0}$	10.45	10.45	10.45	10.45	10.45	10.45	10.45
Wave Steepness	$S_{m-1.0}$	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194
Mean Discharge Q	Q_{mean} (m ³ /s/m)	10.53704415	10.53704415	10.53704415	10.53704415	10.53704415	10.53704415	10.53704415
Maximum Discharge Q	Q_{max} (m ³ /s/m)	0.292428682	0.292428682	0.292428682	0.292428682	0.292428682	0.292428682	0.292428682
Crest Reduction factor	Cr	1	0.334882865	0.036649194	0.004010845	0.000438942	4.80373E-05	5.25715E-06
Results		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Wave Type		NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK
Discharge Rate	Q (l/s/m)	292.43	97.93	10.72	1.17	0.13	0.01	0.00

CALCULATION SHEET

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Wave Overtopping - Deterministic Methodology

Crest Elevation: +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW

Input Parameters		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Nearshore Slope	S_b (m)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Toe Level	h_t (m MLLW)	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Wave Height	H_s (m)	3.39	3.39	3.39	3.39	3.39	3.39	3.39
Wave Period (Zero-crossing)	T_z (s)	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Still Water Level	SWL (m MLLW)	2.47	2.47	2.47	2.47	2.47	2.47	2.47
Crest Level	h_c (m MLLW)	6.10	6.10	6.10	6.10	6.10	6.10	6.10
Slope	s_u (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Wave Angle	β (°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roughness reduction factor	Y_r	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Crest Width	C_w (m)	0.00	5.00	10.00	15.00	20.00	25.00	28.00
Crest Width (in feet)	C_w (ft)	0.00	16.40	32.81	49.21	65.62	82.02	91.86

Calculations								
Depth of water at Toe	d (m)	3.08	3.08	3.08	3.08	3.08	3.08	3.08
Wavelength	L (m)	100.54	100.54	0.00	0.00	0.00	0.00	100.54
Depth/Wavelength	d/L	0.03	0.03	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.03
Shoaling Coefficient	K_s	1.63	1.63	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.63
Peak Wave Period	T_p (s)	25.40	25.40	25.40	25.40	25.40	25.40	25.40
Average Slope Angle	α (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Berm reduction factor	Y_b	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wave Angle reduction factor	Y_{β}	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Combination of all reduction factors	Y_{s1}	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Iribarren No.	ξ_{op}	11.49	11.49	11.49	11.49	11.49	11.49	11.49
Wave Steepness	S_{op}	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03
Crest Freeboard	R_c (m)	3.63	3.63	3.63	3.63	3.63	3.63	3.63
Dimensionless crest height (broken)	R_b	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Dimensionless crest height (unbroken)	R_n	1.94	1.94	1.94	1.94	1.94	1.94	1.94
	$T_{m-1.0}$ (s)	23.09	23.09	23.09	23.09	23.09	23.09	23.09
	$L_{m-1.0}$	832.48	832.48	832.48	832.48	832.48	832.48	832.48
Breaker Parameter ($\tan\alpha(H_{s0}/L)^{0.5}$)	$\xi_{m-1.0}$	10.45	10.45	10.45	10.45	10.45	10.45	10.45
Wave Steepness	$S_{m-1.0}$	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194
Mean Discharge Q	Q_{mean} (m ³ /s/m)	7.526736565	7.526736565	7.526736565	7.526736565	7.526736565	7.526736565	7.526736565
Maximum Discharge Q	Q_{max} (m ³ /s/m)	0.044622139	0.044622139	0.044622139	0.044622139	0.044622139	0.044622139	0.044622139
Crest Reduction factor	Cr	1	0.334882865	0.036649194	0.004010845	0.000438942	4.80373E-05	1.27374E-05
Results		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Wave Type		NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK
Discharge Rate	Q (l/s/m)	44.62	14.94	1.64	0.18	0.02	0.00	0.00

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Wave Overtopping - Deterministic Methodology

Crest Elevation: +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW +13 ft MLLW

Input Parameters			100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)
Nearshore Slope	S_b	(m)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Toe Level	h_t	(m MLLW)	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Wave Height	H_s	(m)	3.61	3.39	3.39	3.39	3.39	3.39	3.39
Wave Period (Zero-crossing)	T_z	(s)	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Still Water Level	SWL	(m MLLW)	2.67	2.67	2.67	2.67	2.67	2.67	2.67
Crest Level	h_c	(m MLLW)	3.96	3.96	3.96	3.96	3.96	3.96	3.96
Slope	s_u	(1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Wave Angle	β	(°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roughness reduction factor	Y_r		0.55	0.55	0.55	0.55	0.55	0.55	0.55
Crest Width	C_w	(m)	0.00	5.00	10.00	15.00	20.00	25.00	30.00
Crest Width (in feet)	C_w	(ft)	0.00	16.40	32.81	49.21	65.62	82.02	98.42

Calculations									
Depth of water at Toe	d	(m)	3.28	3.28	3.28	3.28	3.28	3.28	3.28
Wavelength	L	(m)	105.60	105.60	0.00	0.00	0.00	0.00	105.60
Depth/Wavelength	d/L		0.03	0.03	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.03
Shoaling Coefficient	K_s		1.62	1.62	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.62
Peak Wave Period	T_p	(s)	25.40	25.40	25.40	25.40	25.40	25.40	25.40
Average Slope Angle	α	(1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Berm reduction factor	Y_b		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wave Angle reduction factor	Y_{β}		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Combination of all reduction factors	Y_{s1}		0.55	0.55	0.55	0.55	0.55	0.55	0.55
Iribarren No.	ξ_{op}		11.14	11.49	11.49	11.49	11.49	11.49	11.49
Wave Steepness	S_{op}		3.58E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03
Crest Freeboard	R_c	(m)	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Dimensionless crest height (broken)	R_b		0.06	0.06	0.06	0.06	0.06	0.06	0.06
Dimensionless crest height (unbroken)	R_n		0.65	0.69	0.69	0.69	0.69	0.69	0.69
	$T_{m-1.0}$	(s)	23.09	23.09	23.09	23.09	23.09	23.09	23.09
	$L_{m-1.0}$		832.48	832.48	832.48	832.48	832.48	832.48	832.48
Breaker Parameter ($\tan\alpha(H_{s0}/L_0)^{0.5}$)	$\xi_{m-1.0}$		10.12	10.45	10.45	10.45	10.45	10.45	10.45
Wave Steepness	$S_{m-1.0}$		0.004336467	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194
Mean Discharge Q	Q_{mean}	(m ³ /s/m)	13.53570058	12.59906203	12.59906203	12.59906203	12.59906203	12.59906203	12.59906203
Maximum Discharge Q	Q_{max}	(m ³ /s/m)	0.961418953	0.793879769	0.793879769	0.793879769	0.793879769	0.793879769	0.793879769
Crest Reduction factor	Cr		1	0.334882865	0.036649194	0.004010845	0.000438942	4.80373E-05	5.25715E-06
Results			100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)
Wave Type			NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK
Discharge Rate	Q	(l/s/m)	961.42	265.86	29.10	3.18	0.35	0.04	0.00

CALCULATION SHEET

Project:
Broad Beach
Subject: Wave Runup

A code for dike height design and examination
EurOtop / J.W. Van der Meer (2002)

Wave Overtopping - Deterministic Methodology

Crest Elevation: +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW +15 ft MLLW

Input Parameters		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Nearshore Slope	S_b (m)	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Toe Level	h_t (m MLLW)	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Wave Height	H_s (m)	3.39	3.39	3.39	3.39	3.39	3.39	3.39
Wave Period (Zero-crossing)	T_z (s)	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Still Water Level	SWL (m MLLW)	2.67	2.67	2.67	2.67	2.67	2.67	2.67
Crest Level	h_c (m MLLW)	4.57	4.57	4.57	4.57	4.57	4.57	4.57
Slope	s_u (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Wave Angle	β (°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roughness reduction factor	Y_r	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Crest Width	C_w (m)	0.00	5.00	10.00	15.00	20.00	25.00	30.00
Crest Width (in feet)	C_w (ft)	0.00	16.40	32.81	49.21	65.62	82.02	98.42

Calculations								
Depth of water at Toe	d (m)	3.28	3.28	3.28	3.28	3.28	3.28	3.28
Wavelength	L (m)	105.60	105.60	0.00	0.00	0.00	0.00	105.60
Depth/Wavelength	d/L	0.03	0.03	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.03
Shoaling Coefficient	K_s	1.62	1.62	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.62
Peak Wave Period	T_p (s)	25.40	25.40	25.40	25.40	25.40	25.40	25.40
Average Slope Angle	α (1:?)	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Berm reduction factor	Y_b	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wave Angle reduction factor	Y_{β}	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Combination of all reduction factors	Y_{s1}	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Iribarren No.	ξ_{op}	11.49	11.49	11.49	11.49	11.49	11.49	11.49
Wave Steepness	S_{op}	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03
Crest Freeboard	R_c (m)	1.90	1.90	1.90	1.90	1.90	1.90	1.90
Dimensionless crest height (broken)	R_b	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Dimensionless crest height (unbroken)	R_n	1.02	1.02	1.02	1.02	1.02	1.02	1.02
	$T_{m-1.0}$ (s)	23.09	23.09	23.09	23.09	23.09	23.09	23.09
	$L_{m-1.0}$	832.48	832.48	832.48	832.48	832.48	832.48	832.48
Breaker Parameter ($\tan\alpha(H_{10}/L_0)^{0.5}$)	$\xi_{m-1.0}$	10.45	10.45	10.45	10.45	10.45	10.45	10.45
Wave Steepness	$S_{m-1.0}$	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194
Mean Discharge Q	Q_{mean} (m ³ /s/m)	11.01268915	11.01268915	11.01268915	11.01268915	11.01268915	11.01268915	11.01268915
Maximum Discharge Q	Q_{max} (m ³ /s/m)	0.37425439	0.37425439	0.37425439	0.37425439	0.37425439	0.37425439	0.37425439
Crest Reduction factor	Cr	1	0.334882865	0.036649194	0.004010845	0.000438942	4.80373E-05	5.25715E-06
Results		100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)	100-year, Low SLR (25 yr SLR)
Wave Type		NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK
Discharge Rate	Q (l/s/m)	374.25	125.33	13.72	1.50	0.16	0.02	0.00

CALCULATION SHEET

Project:
Broad Beach
Subject: Wave Runup

A code for dike height design and examination
EurOtop / J.W. Van der Meer (2002)

Wave Overtopping - Deterministic Methodology

Crest Elevation: +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW +20 ft MLLW

Input Parameters			100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)
Nearshore Slope	S_b (m)		0.03	0.03	0.03	0.03	0.03	0.03	0.03
Toe Level	h_t (m MLLW)		-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Wave Height	H_s (m)		3.39	3.39	3.39	3.39	3.39	3.39	3.39
Wave Period (Zero-crossing)	T_z (s)		20.00	20.00	20.00	20.00	20.00	20.00	20.00
Still Water Level	SWL (m MLLW)		2.67	2.67	2.67	2.67	2.67	2.67	2.67
Crest Level	h_c (m MLLW)		6.10	6.10	6.10	6.10	6.10	6.10	6.10
Slope	s_u (1:?)		1.50	1.50	1.50	1.50	1.50	1.50	1.50
Wave Angle	β (°)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Roughness reduction factor	Y_r		0.55	0.55	0.55	0.55	0.55	0.55	0.55
Crest Width	C_w (m)		0.00	5.00	10.00	15.00	20.00	25.00	28.00
Crest Width (in feet)	C_w (ft)		0.00	16.40	32.81	49.21	65.62	82.02	91.86

Calculations									
Depth of water at Toe	d (m)		3.28	3.28	3.28	3.28	3.28	3.28	3.28
Wavelength	L (m)		105.60	105.60	0.00	0.00	0.00	0.00	105.60
Depth/Wavelength	d/L		0.03	0.03	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.03
Shoaling Coefficient	K_s		1.62	1.62	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.62
Peak Wave Period	T_p (s)		25.40	25.40	25.40	25.40	25.40	25.40	25.40
Average Slope Angle	α (1:?)		1.50	1.50	1.50	1.50	1.50	1.50	1.50
Berm reduction factor	Y_b		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wave Angle reduction factor	Y_{β}		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Combination of all reduction factors	Y_{s1}		0.55	0.55	0.55	0.55	0.55	0.55	0.55
Iribarren No.	ξ_{op}		11.49	11.49	11.49	11.49	11.49	11.49	11.49
Wave Steepness	S_{op}		3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03	3.37E-03
Crest Freeboard	R_c (m)		3.43	3.43	3.43	3.43	3.43	3.43	3.43
Dimensionless crest height (broken)	R_b		0.16	0.16	0.16	0.16	0.16	0.16	0.16
Dimensionless crest height (unbroken)	R_n		1.84	1.84	1.84	1.84	1.84	1.84	1.84
	$T_{m-1.0}$ (s)		23.09	23.09	23.09	23.09	23.09	23.09	23.09
	$L_{m-1.0}$		832.48	832.48	832.48	832.48	832.48	832.48	832.48
Breaker Parameter ($\tan\alpha(H_{s0}/L_0)^{0.5}$)	$\xi_{m-1.0}$		10.45	10.45	10.45	10.45	10.45	10.45	10.45
Wave Steepness	$S_{m-1.0}$		0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194	0.004072194
Mean Discharge Q	Q_{mean} (m ³ /s/m)		7.866495472	7.866495472	7.866495472	7.866495472	7.866495472	7.866495472	7.866495472
Maximum Discharge Q	Q_{max} (m ³ /s/m)		0.057108049	0.057108049	0.057108049	0.057108049	0.057108049	0.057108049	0.057108049
Crest Reduction factor	Cr		1	0.334882865	0.036649194	0.004010845	0.000438942	4.80373E-05	1.27374E-05
Results			100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)	100-year, HighSLR (25 yr)
Wave Type			NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK	NOT BREAK
Discharge Rate	Q (l/s/m)		57.11	19.12	2.09	0.23	0.03	0.00	0.00

