APPENDIX H

SURF OBSERVATION REPORT (SUROB)

SURF OBSERVATION REPORT (SUROB) AND INSTRUCTIONS

1. Line Alpha. Line Alpha is the significant breaker height, or the average height of the highest one-third of all the waves observed during the report. Only the thirty-three (33) highest waves will be used to determine the significant breaker height. The significant wave height is recorded to the nearest one-half foot.

2. Line Bravo. The maximum breaker height, or highest recorded breaker, recorded to the nearest one-half foot.

3. Line Charlie. The breaker period, or average time interval in seconds between breakers observed in Line Alpha. Done by recording time began, to the last breaker counted, and dividing by one-hundred (100), or number of breakers recorded.

4. Line Delta. The percentage of various breaker types. Recorded using the worksheet circling "S" for spilling, "P" for plunging, or "X" for surging, the divided by one-hundred (100) to determine percentage for each.

a. Spilling Breakers. Characterized by the top portion of the breaker becoming unstable at various points and forming foam, which then spills and expands down the front of the breaker in a mild action.

b. Plunging Breakers. Characterized by the top portion of the breaker becoming unstable along the entire frontage very quickly, crashing over itself with a violent release of energy.

c. Surging Breakers. Characterized by appearing as a combination of spilling and plunging breakers. Initially the breaker takes on the characteristics of a plunging breaker, and suddenly changes to appear as a spilling breaker. These occur mostly on steep gradients.

5. Line Echo. The breaker angle, or the orientation of the breaker frontage in relation to shore. Done by calculating the acute angle formed between the breaker lines and the shoreline, and expressed in five (5) degree increments towards either right (R) or left (L) flank as the observer faces towards land from the seaward.

6. Line Foxtrot. The littoral current, or speed in knots of the water flowing parallel to the shore just inside the main line of breakers. Calculated by throwing an object into the surf zone as far as possible, and observing the distance (in feet) to which the object travels for one (1) minute. The number of feet travelled is then divided one-hundred (100) to determine speed in knots. Recorded to the nearest tenth of a knot and towards which flank (R or L) the object travelled.

7. Line Golf. Concerns two pieces of information; the Depth of the Surf Zone, and Lines of Breakers present therein. The lines of breakers are determined by counting the number of well-defined breaker lines. Depth (distance) is conducted by estimating the distance from the outermost breaker line to the furthest limit of the up-rush of water on shore.

8. Line Hotel. Covers several miscellaneous items of information, to be passed in plain text:

SURF OBSERVATION REPORT (SUROB) FORMAT

NAME & RANK OF OBSERVER: _____ DATE:_____TIME:_____ BEACH:_____ UNIT:_____

NOTE: BEFORE YOU START RECORDING WAVES YOU MUST REFER TO THE SUROB WORKSHEET PROVIDED. BEGIN BY STARTING YOUR STOPWATCH. WHILE OBSERVING EACH OF THE 100 WAVES, MAKE NOTE OF THE TYPE (P=PLUNGING, S=SPILLING OR X=SURGING) OF WAVES AND RECORD IT AS APPROPRIATE. ONCE THE 100TH WAVE IS OBSERVED, STOP THE STOPWATCH

LINE	INFORMATION	SUROB DATA	MSI	NOTES:
A	**SIGNIFICANT BREAKER HEIGHT IN FEET.**	_____FEET=	_____._____	OBSERVE 100 WAVES. ONLY THE HIGHEST 33 WAVES WILL BE ADDED TOGETHER AND THEN DIVIDED BY 33 FOR THE SIGNIFICANT BREAKER HEIGHT. THE MSI FACTOR WILL ALWAYS BE THE SAME AS THE BREAKER HEIGHT WITH A DECIMAL POINT ADDED. EXAMPLE: 3 FEET = 3.0 MSI
B	**MAXIMUM BREAKER HEIGHT IN FEET.**	_____FEET	**N/A**	THIS IS THE SINGLE HIGHEST WAVE OBSERVED DURING THE 100 WAVE COUNT. MSI IS NOT COMPUTED IN THIS LINE.
C	**BREAKER PERIOD IN SECONDS**.	_____ SEC	_____._____	THIS IS COMPUTED BY TAKING THE TOTAL TIME IN SECONDS THAT WAS RECORDED BY YOUR STOPWATCH AND DIVIDING IT BY 100 WAVES. EXAMPLE: 22 MIN = 1320 SECONDS AND 1320 SECONDS DIVIDED BY 100 WAVES = 13.2 SECONDS. USE THE CHART BELOW TO FIND THE MSI FACTOR.

BREAKER PERIOD MODIFICATION TABLE

BREAKER PERIOD IN SECONDS									
17	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.8	-1.0
16	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.5	-0.8
15	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3
12	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.7
11	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0
10	0.1	0.1	0.2	0.3	0.5	0.7	0.9	1.1	1.3
9	0.1	0.1	0.3	0.3	0.6	0.8	1.1	1.3	1.7
8	0.1	0.2	0.3	0.3	0.7	1.0	1.3	1.6	2.0
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
	SIGNIFICANT BREAKER HEIGHT IN FEET								

LINE	INFORMATION	SUROB DATA	MSI	NOTES:
D	**BREAKER TYPES**: PLUNGING, SPILLING OR SURGING	____%PLUNGING ____% SPILLING ____% SURGING	_____._____	AS EACH WAVE IS OBSERVED IT IS RECORDED ON THE SUROB WORKSHEET. P=PLUNGING S=SPILLING X=SURGING DIVIDE THE NUMBER OF EACH BREAKER TYPE BY 100. THIS WILL GIVE YOU PERCENTAGE OF EACH BREAKER TYPE. REFER TO THE CHART BELOW TO GET THE MSI VALUE. THERE IS NO MSI TABLE FOR PLUNGING WAVES. **YOU WILL ONLY RECORD THE LOWEST MSI VALUE FROM EITHER SPILLING OR SURGING.**

SPILLING BREAKER MODIFICATION TABLE

PERCENT SPILLING BREAKERS											
100	-0.1	-0.2	-0.5	-0.8	-1.3	-1.8	-2.5	-3.2	-4.1	-5.0
90	0.0	-0.2	-0.4	-0.7	-1.1	-1.6	-2.2	-2.9	-3.6	-4.5
80	0.0	-0.2	-0.4	-0.6	-1.0	-1.4	-2.0	-2.6	-3.2	-4.0
70	0.0	-0.1	-0.3	-0.6	-0.9	-1.3	-1.7	-2.2	-2.8	-3.5
60	0.0	-0.1	-0.2	-0.5	-0.8	-1.1	-1.5	-1.9	-2.4	-3.0
50	0.0	-0.1	-0.2	-0.4	-0.6	-0.9	-1.2	-1.6	-2.0	-2.5
40	0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-1.0	-1.3	-1.6	-2.0
30	0.0	-0.1	-0.1	-0.2	-0.4	-0.5	-0.7	-1.0	-1.2	-1.5
20	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.8	-1.0
10	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.5
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
	SIGNIFICANT BREAKER HEIGHT IN FEET									

SURGING BREAKER MODIFICATION TABLE

PERCENT SURGING BREAKERS											
100	0.1	0.2	0.5	0.8	1.3	1.8	2.5	3.2	4.1	5.0
90	0.0	0.2	0.4	0.8	1.2	1.7	2.3	3.0	3.8	4.7
80	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.9	3.6	4.5
70	0.0	0.2	0.4	0.6	1.0	1.5	2.0	2.7	3.4	4.2
60	0.0	0.2	0.3	0.6	1.0	1.4	1.9	2.5	3.1	3.9
50	0.0	0.1	0.3	0.6	0.9	1.3	1.7	2.3	2.9	3.5
40	0.0	0.1	0.3	0.5	0.8	1.1	1.5	2.0	2.6	3.2
30	0.0	0.1	0.2	0.4	0.7	1.0	1.3	1.8	2.2	2.7
20	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.2
10	0.0	0.1	0.1	0.3	0.4	0.6	0.7	1.0	1.3	1.6
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
	SIGNIFICANT BREAKER HEIGHT IN FEET									

LINE	INFORMATION	SUROB DATA	MSI	NOTES:
E	**BREAKER ANGLE**: IN DEGREES TOWARD THE RIGHT OR LEFT FLANK.	_____° RIGHT/LEFT FLANK	_____._____	THIS IS THE ANGLE WAVES BREAK ON THE SHORE. AND IT IS MEASURED IN DEGREES. IN MOST CASES IT WILL NOT EXCEED 5 DEGREES. USE THE MODIFICATION TABLE BELOW FOR THE MSI FACTOR. RIGHT OF LEFT FLANK IS DETERMINED AS IF YOU WERE LANDING ON THE BEACH.

WAVE ANGLE MODIFICATION TABLE

WAVE ANGLE IN DEGREES	0.1	0.3	0.7	1.3	2.0	2.9	3.9	5.1	6.5	8.0
40	0.1	0.3	0.7	1.3	2.0	2.9	3.9	5.1	6.5	8.0
35	0.1	0.3	0.6	1.1	1.8	2.5	3.4	4.5	5.7	7.0
30	0.1	0.2	0.5	1.0	1.5	2.2	2.9	3.8	4.9	6.0
25	0.1	0.2	0.5	0.8	1.3	1.8	2.5	3.2	4.1	5.0
20	0.0	0.2	0.4	0.6	1.0	1.4	2.0	2.6	3.2	4.0
15	0.0	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	3.0
10	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.3	1.6	2.0
5	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
	SIGNIFICANT BREAKER HEIGHT IN FEET									

LITTORAL CURRENT MODIFICATION TABLE

KNOTS	MSI MOD	KNOTS	MSI MOD	KNOTS	MSI MOD
0.0=	0.0	1.0=	3.0	2.0=	6.0
0.1=	0.3	1.1=	3.3	2.1=	6.3
0.2=	0.6	1.2=	3.6	2.2=	6.6
0.3=	0.9	1.3=	3.9	2.3=	6.9
0.4=	1.2	1.4=	4.2	2.4=	7.2
0.5=	1.5	1.5=	4.5	2.5=	7.5
0.6=	1.8	1.6=	4.8	2.6=	7.8
0.7=	2.1	1.7=	5.1	2.7=	8.1
0.8=	2.4	1.8=	5.4	2.8=	8.4
0.9=	2.7	1.9=	5.7	2.9=	8.7

F	**LITTORAL CURRENT**: IN KNOTS TOWARD THE RIGHT OR LEFT FLANK	_____ KNOTS RIGHT/LEFT FLANK	_____._____	THROW A BUOYANT OBJECT INTO THE WATER AND BEGIN TIMING ONE MINUTE. PACE OFF THE DISTANCE THE OBJECT TRAVELED IN FEET OVER THE PERIOD OF ONE MINUTE. NOW DIVIDE THE DISTANCE THE OBJECT TRAVELED BY 100. EXAMPLE: 80 FEET TRAVELED = 0.8 KNOTS USE TABLE ABOVE FOR MSI FACTOR.
G	**SURF ZONE**: LINES OF BREAKERS & DEPTH OF SURF ZONE IN FEET	_____LINES _____FEET	**N/A**	COUNT THE NUMBER OF SWELLS & BREAKERS WITHIN YOUR SPLASH AREA, THIS IS THE NUMBER FOR "LINES OF BREAKERS". DEPTH IS MEASURED FROM THE CLOSEST BREAKING WAVE TO THE FURTHEST APPROACHING SWELL & IS DONE SO IN FEET. NO MSI FACTOR IS USED.
H	**ADDITIONAL REMARKS**: WIND SPEED/DIRECTION: IN KNOTS/DEGREES TOWARDS THE RIGHT/LEFT FLANK WIND: ONSHORE OR OFFSHORE(CIRCLE ONE)	_____KNOTS _____° RIGHT/LEFT FLANK	_____._____	WIND SPEED IS MEASURED IN KNOTS USING THE RANGE FLAG METHOD. WIND DIRECTION IS MEASURED IN DEGREES TOWARD THE RIGHT OR LEFT FLANK TO THE BEACH. IF THE WIND IS BLOWING ONTO THE BEACH IT IS "ONSHORE" WIND. IF THE WIND IS BLOWING ONTO THE OCEAN IT IS "OFFSHORE" WIND.

WIND MODIFICATION TABLE

WIND SPEED IN KNOTS	ONSHORE WIND				OFFSHORE WIND		
36-40	2.0	3.0	4.0		1.5	2.0	4.0
31-35	1.5	2.0	3.0		1.0	1.5	3.0
26-30	1.0	1.5	2.0		0.5	1.0	2.0
21-25	0.5	1.0	1.5		0.0	0.5	1.5
16-20	0.0	0.5	1.0		0.0	0.0	1.0
11-15	0.0	0.0	0.5		0.0	0.0	1.0
6-10	0.0	0.0	0.5		0.0	0.0	0.5
0-5	0.0	0.0	0.0		0.0	0.0	0.0
	0-30	30-60	60-90		0-30	30-60	60-90
	WIND ANGLE RELATIVE TO THE BEACH						

H (CONT)	SECONDARY WAVE HEIGHT: IN FEET	_____FEET	_____._____	SECONDARY WAVE HEIGHT REFERS TO AN ADDITIONAL SURF ZONE BEYOND THE INITIAL SURF ZONE OR ONE APPROACHING A DIFFERENT ANGLE. THIS WILL USUALLY OCCUR ONLY ON BEACHES WITH A REEF EXTENDING BEYOND THE INITIAL SURF ZONE AND IS RARELY ENCOUNTERED. THE MSI IS CALCULATED THE SAME AS LINE "A".
	DEBRIS IN SURF ZONE: GENERAL DESCRIPTION OF OBJECTS.		**N/A**	GENERAL DESCRIPTION OF ANY OBJECTS IN THE SURF ZONE. EXAMPLE: LOGS, FISHING NETS
	SEE STATE: CALM / MODERATE /ROUGH (CIRCLE ONE)		**N/A**	

TIME BEGAN: _____MIN. _____SEC.										
	1	2	3	4	5	6	7	8	9	10
1	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
2	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
3	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
4	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
5	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
6	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
7	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
8	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
9	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
10	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X	_____ P S X
TIME ENDED: _____MIN _____ SEC.										

TOTAL NUMBER OF PLUNGING= ____÷ 100= %

TOTAL NUMBER OF SPILLING=_____÷ 100= %

TOTAL NUMBER OF SURGING=_____÷ 100= %

TOTAL TIME IN SECONDS TO OBSERVE 100 WAVES=____÷ 100 WAVES= BREAKER PERIOD

SIGNIFICANT BREAKER HEIGHT COMPUTATION (HIGHEST 33 WAVES OBSERVED)			
WAVE HEIGHT	X	OCCURRENCE	=PRODUCT
	X		
	X		
	X		
	X		
	X		
	X		
TOTAL PRODUCT ÷ 33 = SIGNIFICANT WAVE HEIGHT			

SUROB LINE	**MSI FACTOR**	**INSTRUCTIONS**
A		ADD SUROB LINES A, C, & D TOGETHER. NOW YOU WILL DETERMINE WHICH OF THE TWO LINES E OR F HAS **THE LARGER** MSI VALUE AND ADD IT. NOW FINALLY ADD LINES F AND H AND YOU WILL HAVE YOUR TOTAL MSI FACTOR. A+C+D+**E OR F**+H= MSI TOTAL
B	N/A	
C		
D		
E OR F		
G	N/A	
H		
TOTAL		

SEA STATE	CONDITIONS
1	WIND SPEEDS BETWEEN 5 TO 9 MILES PER HOUR (5 TO 8 KNOTS). WAVE HEIGHTS CONSIDERED SMALL WAVELETS BETWEEN 0.5 AND 1 FEET (0.6093 TO 0.304 METERS. SMALL WAVELETS WITH GLASSY-APPEARING CRESTS AND NO BREAKING.
2	WIND SPEEDS BETWEEN 10 TO 11 MILES PER HOURS (9 TO 10 KNOTS). WAVE HEIGHTS CONSIDERED LARGE WAVELETS, BETWEEN 1.5 AND 2 FEET (0.456 TO 0.609 METERS). LARGE WAVELETS, CRESTS BEGIN TO BREAK AND WHITECAPS ARE SCATTERED
3	WIND SPEEDS BETWEEN 16 TO 17 MILES PER HOUR (14 TO 15 KNOTS). WAVE HEIGHTS CONSIDERED SMALL, BETWEEN 3.5 AND 4 FEET (1.06 TO 1.21 METERS). SMALL WAVES BECOMING LONGER AND WHITECAPS ARE NUMEROUS
4	WIND SPEEDS BETWEEN 19 TO 24 MILES PER HOUR (17 TO 21 KNOTS). WAVE HEIGHTS CONSIDERED MODERATE, BETWEEN 4 AND 7.5 FEET (1.24-2.5 METERS). MODERATE WAVES FORMING NUMEROUS WHITE CAPS AND SOME SPRAY
5	WIND SPEEDS BETWEEN 24 TO 28 MILES PER HOUR (21 TO 25 KNOTS). WAVE HEIGHTS CONSIDERED LARGE, BETWEEN 8 AND 12 FEET (2.43 TO 3.65 METERS). LARGE WAVES FORM AND WHITECAPS ARE COMMON, ALONG WITH MORE SPRAY.

APPENDIX I

MODIFIED SURF INDEX (MSI) INSTRUCTIONS

1. Modified Surf Index (MSI). The MSI is a single dimensionless number which provides a relative measure of the conditions likely to be encountered in the surf zone. It provides a guide for judging the feasibility of conducting landing operations for each type of landing craft. It is a guide, not definite go or no go criteria. When applied to a known or forecasted surf condition, the MSI calculation provides the commander with an objective method of arriving at a safe and reasonable decision with respect to committing landing craft and amphibious vehicles.

a. Line Alpha (Significant Breaker Height). Refers to Line A of the SUROB and determines the significant breaker height factor. This number is transferred directly over from the SUROB, and is not modified by any table. (A significant breaker height of 3.0 feet converts to a MSI factor of 3.0)

b. Line Charlie (Breaker Period). Refers to Line C of the SUROB. Determined by using the "Breaker Period Modification Table".

c. Line Delta (Breaker Types). Refers to Line D of the SUROB. Record the percentages of the types of breakers that occur rounded to the nearest tenth. There is no modification table for plunging breakers. Record the lower of the two numbers under the MSI factor column.

d. Line Echo (Breaker Angle). Refers to Line E of the SUROB, and determines the breaker angle or the angle of breaker makes with the shoreline. To calculate, transfer data from the SUROB, rounding to the nearest fifth, using the "Wave Angle Modification Table" to determine the MSI factor.

e. Line Foxtrot (Littoral Current). Refers to Line F of the SUROB. Littoral current is one of the most crucial factors in conducting the MSI, because it can severely elevate the overall MSI factor if inaccurate data is submitted. Determine MSI factor by converting data from "Littoral Current Modification Table".

f. Line Hotel (General Data). Refers to Line H of SUROB.

(1) Relative Wind. Transfer respective data from SUROB and use "Wind Modification Table" to determine MSI factor.

(2) Secondary Wave Height. If another series of breakers exists further out past the main series of breakers, then the maximum

height for that system is recorded. The SUROB data is transferred directly to the MSI factor.

g. Total MSI. To get the total MSI factor add lines A through D, the highest of Line E or F, and Line H. The maximum safe MSI as per COMNAVSURFPACINST/COMNAVSURFLANTINST 3840.1B Joint Surf Manual is 6.0.

2. Problems with MSI. Relatively minimal surf conditions can combine to make landing conditions unfeasible. It is important to remember that the MSI is a guide for judging the feasibility of landing operations. MSI tables often do not go high or low enough to calculate some wave conditions, additionally; tables were designed with conventional landing craft in mind. AAVs do not have the exact characteristics as conventional landing craft and often have traction well out in the surf zone. As such, AAVs are not as affected by littoral current and can often negotiate such conditions. Vehicle mechanical factors should be seriously considered, however, the final judgment should come from the AA Unit Commander with eyes on the actual surf conditions. In the absence of direct observation, all factors should be considered when planning a landing with a high MSI.