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COLLEGE OF ENGINEERING
Department of Meteorology and Oceanography

Final Report

WAVE STATISTICS FOR LAKES MICHIGAN, HURON, AND SUPERIOR

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ABSTRACT

This study was conducted to produce statistics of significant wave height and period for 11 locations on Lakes Huron and Superior for which such data were not available. Wave statistics were also produced for 3 locations on Lake Michigan so that comparisons could be made with an earlier study.

The wind field used to determine the wave parameters was derived from the geostrophic wind based on a pressure analysis of synoptic weather reports taken every 6 hours. The Svendrup-Munk method of wave hindcasting as revised by Bretschneider (the SMB method) was used to hindcast the wave parameters. Data from 1965, 1966 and 1967 were used in the study.

1. INTRODUCTION

The understanding of shore erosion, the design of maritime structures and the design of Great Lakes ships require a knowledge of the statistics of wave heights and wave periods on the Great Lakes. To meet these needs a wave hindcast study for Lakes Michigan, Huron and Superior was conducted for the years 1965, 1966, and 1967. The results of this study are reported herein.

2. USE OF WAVE HINDCASTS

A statistical summarization of accurate wave height and wave period data taken over several years and at representative locations would provide excellent wave statistics. However, reliable wave data measured by accurate wave gages are much too scarce for statistical treatment and can only be used for evaluating the effectiveness of indirect analytical methods of determining wave statistics. Indirect methods require a calculation of the "surface" wind field followed by a determination of the wave field as a function of surface wind speed, fetch and duration. Cole (1967) showed that the "surface" wind at Muskegon on Lake Michigan could best be determined by use of Bretschneider's (1952) empirical relations of the ratio of surface wind to geostrophic wind as a function of surface stability (water temperature - air temperature) and isobaric curvature. With the "surface" wind established the

significant wave height and significant wave period as determined by the Sverdrup-Munk - Bretschneider (SMB) method (CERC Tech. Rpt. #4 (1966)) was shown to correlate best with data collected at Muskegon. The Bretschneider surface wind chart and the SMB wave analysis technique were used to determine the significant wave heights and significant wave periods obtained for this study.

3. LOCATION OF WAVE HINDCAST STATIONS

The stations in each of the lakes for which wave hindcasts were made are shown in Figures 1, 2, and 3 and are described as follows:

Lake Michigan

<u>Geographic Location</u>	<u>Latitude</u>	<u>Longitude</u>
Point Betsie, Michigan	44.67 N	86.33 W
Muskegon, Michigan	43.17 N	86.33 W
Burns Harbor, Indiana	41.67 N	87.17 W

These stations are representative of northern Lake Michigan, mid-lake and southern Lake Michigan respectively. Also, at each of these stations wave height and wave period data have been collected. The Muskegon, Michigan location was included in an earlier study of wave statistics on Lake Michigan Saville (1953), so comparisons can be made between this study and the older one.

Lake Huron

<u>Geographic Location</u>	<u>Latitude</u>	<u>Longitude</u>
Port Huron, Michigan	43.17 N	82.33 W
Harbor Beach, Michigan	44.17 N	82.67 W
Douglas Point, Ontario	44.33 N	81.67 W
Alpena, Michigan	45.00 N	83.17 W
Cockburn Island, Ontario	45.83 N	83.17 W

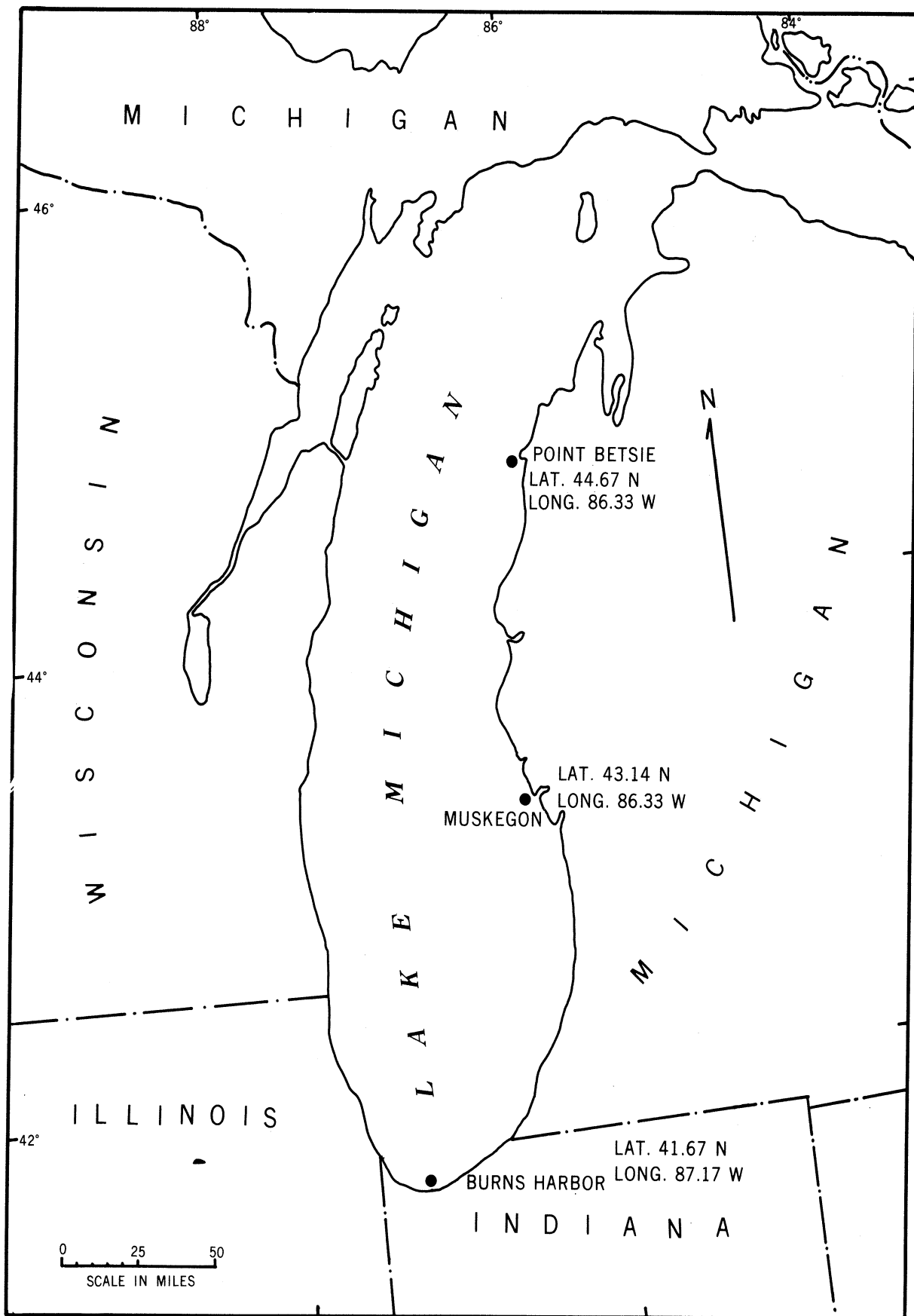


Figure 1. Wave hindcast locations in Lake Michigan.

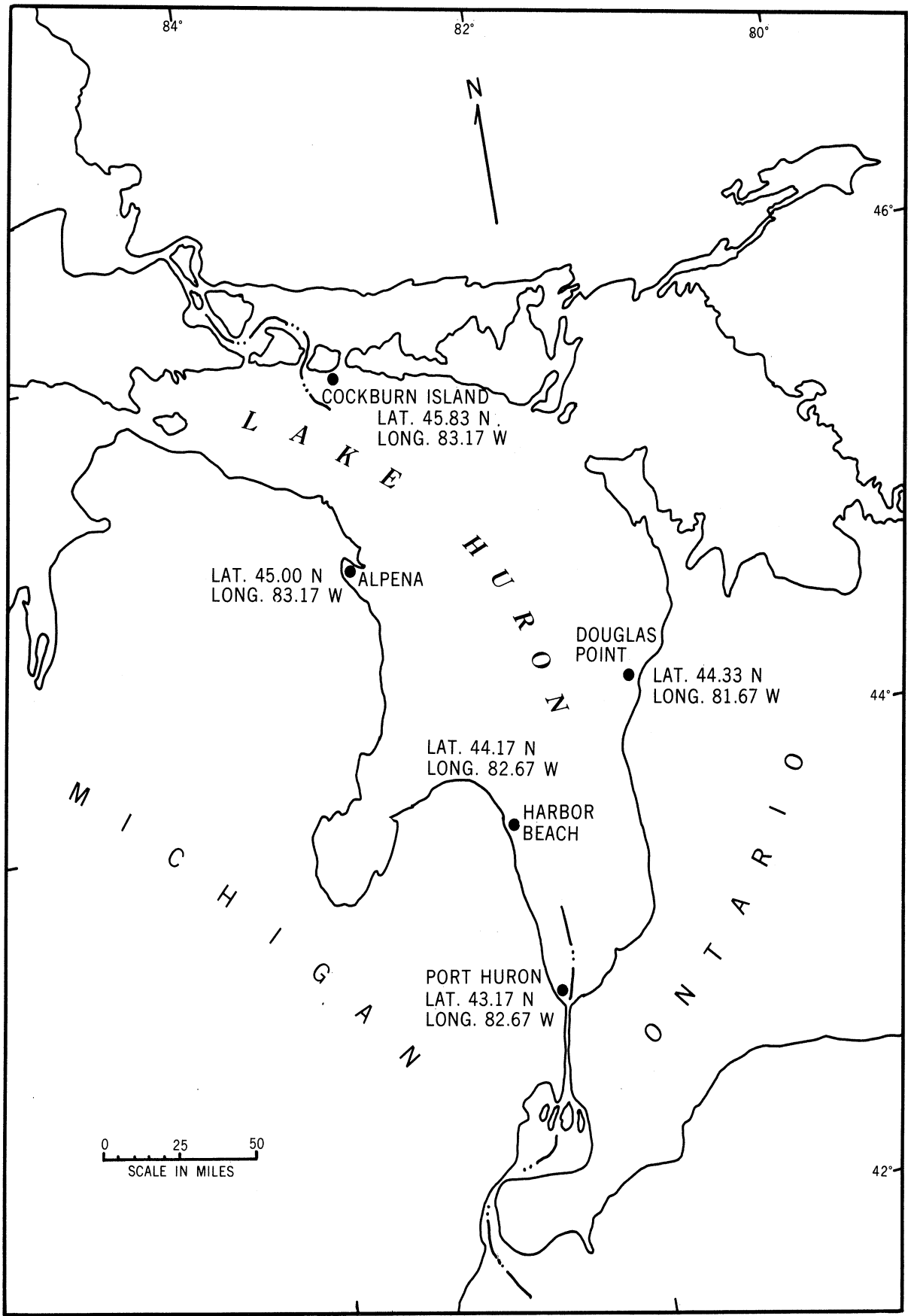


Figure 2. Wave hindcast locations in Lake Huron.

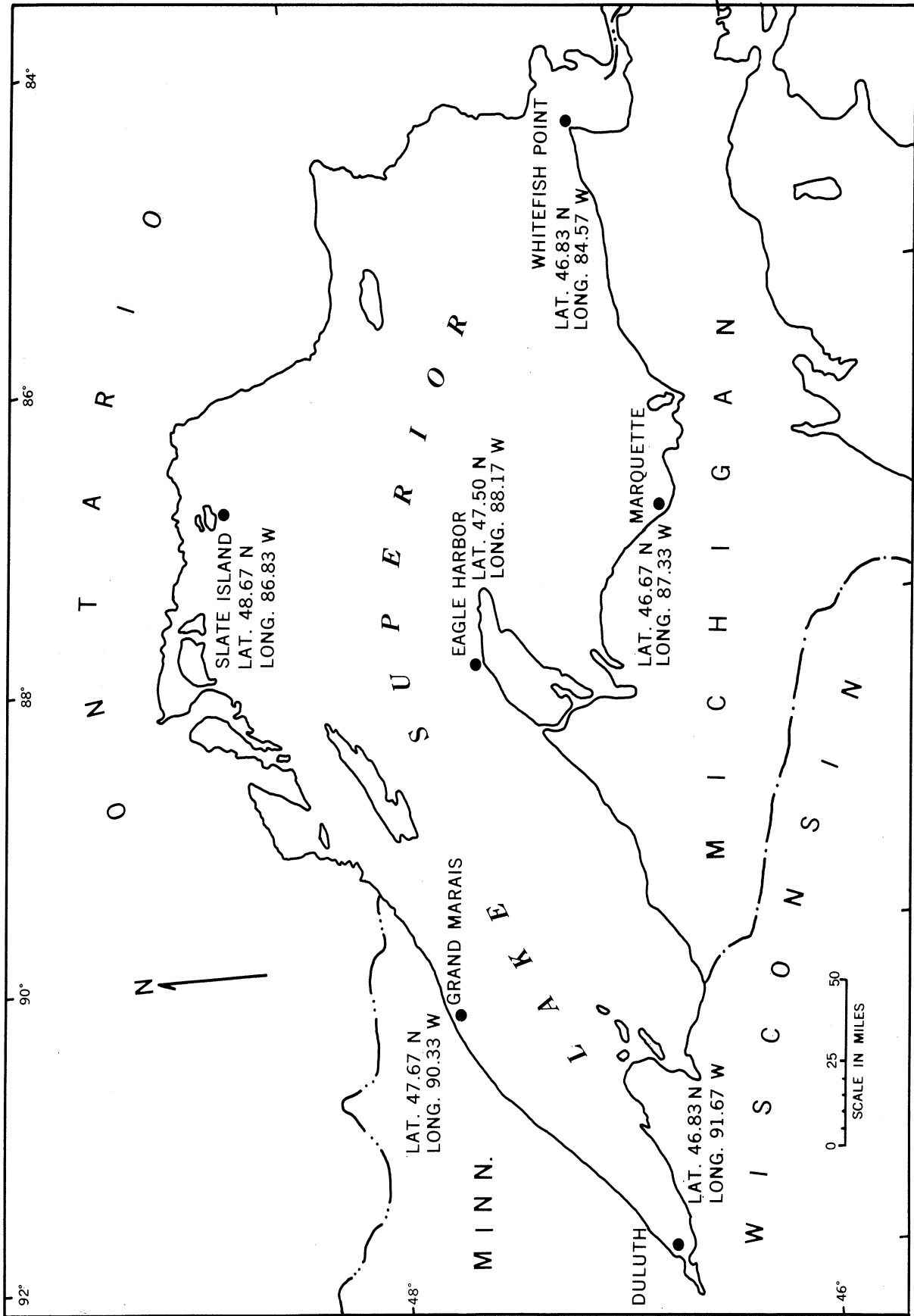


Figure 3. Wave hindcast locations in Lake Superior

Lake Superior

<u>Geographic Location</u>	<u>Latitude</u>	<u>Longitude</u>
Duluth, Minnesota	46.83 N	91.67 W
Grand Marias, Minnesota	47.67 N	90.33 W
Eagle Harbor, Michigan	47.50 N	88.17 W
Marquette, Michigan	46.67 N	87.33 W
Whitefish Point, Michigan	46.83 N	85.00 W
Slate Island, Ontario	48.67 N	86.83 W

These stations in Lake Huron and Lake Superior were chosen to be representative of significant portions of each of the lakes, with interpolation to be used between stations. Limited wind and wave data exist for some of these locations.

4. ANALYSIS TECHNIQUE

A wave hindcasting technique where the wave parameters were calculated from an analytical surface wind field based on historical pressure data was used in this study. Figure 4 shows a flow diagram of the steps involved in the analysis technique, from the reading of atmospheric pressures at weather stations over the area to a determination of significant wave height and significant wave period statistics at the 14 locations listed above. A detailed discussion follows for each step of the analysis.

Station Pressure Data and 500mb Wind Data

The majority of the pressure data were taken from weather station plots on the six-hourly synoptic weather charts for 1965, 1966 and 1967 plotted and analyzed by the ESSA forecast center at Chicago, Illinois. A printed form with stations in the proper order for punching data cards for later computer readout was used.

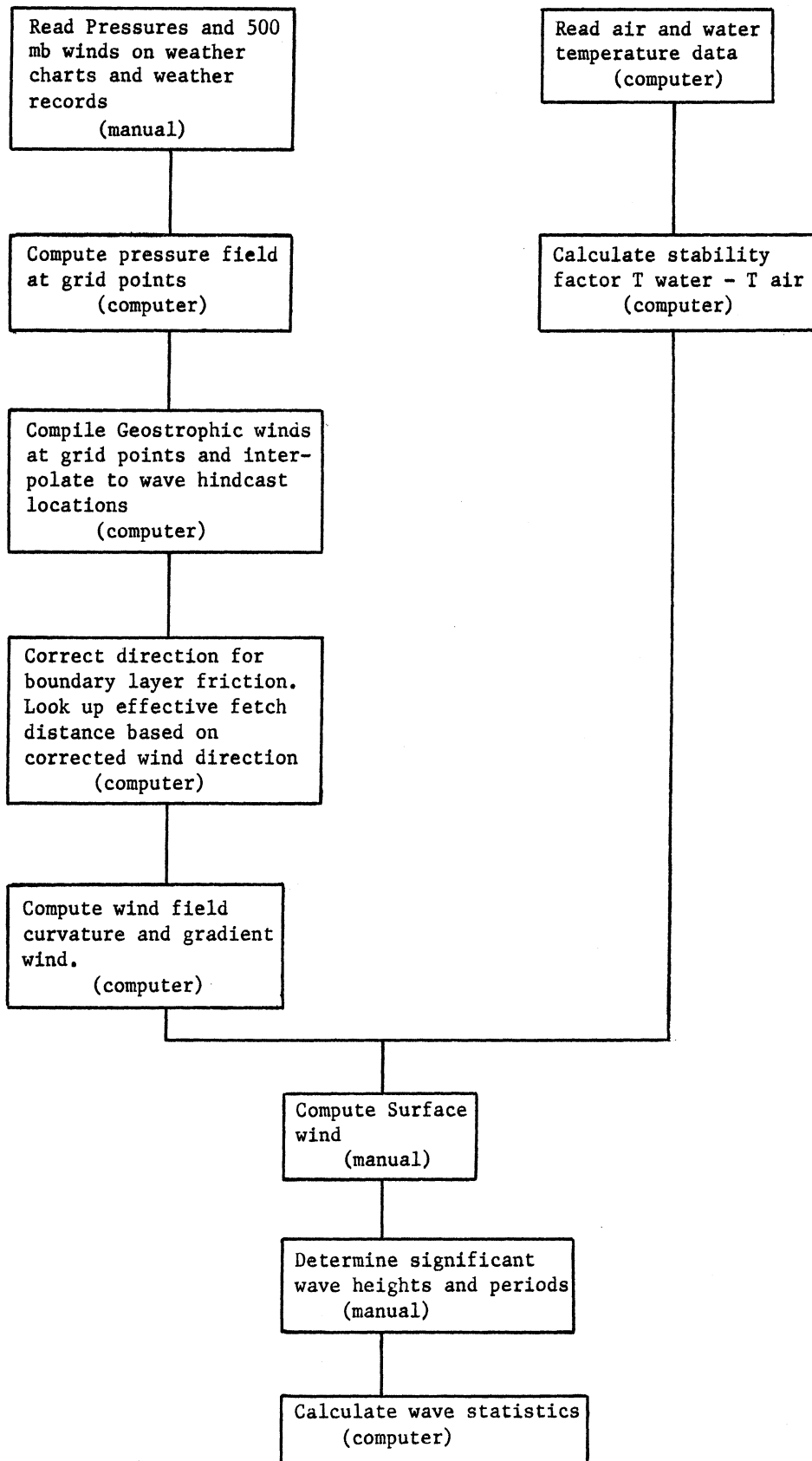


Figure 4. Flow diagram of wave hindcasting procedure and statistical calculations.

A plastic overlay with guide lines corresponding to the data sheet completed the data abstraction tools. Abstraction of data from these maps was faster than looking up pressure data on teletype weather reports and the map data had the great advantage that they had been evaluated and corrected by the Chicago analysts. Data for stations not plotted on the map were obtained from teletype data. The 500mb wind at Green Bay, Wisconsin, used in the pressure analysis scheme, was abstracted from teletype data or from the Northern Hemisphere Data Tabulations.

All pressure data and the 500mb wind data were punched for computer input. Manual checking was used to verify the accuracy of the punched data.

Air and Water Temperature Data

The air and water temperature data were obtained from Great Lakes ship reports received from the National Weather Records Center, Asheville, North Carolina. These were obtained as a series of data cards, one for each ship observation.

Calculation of the daily average of water temperature minus air temperature for sections of each lake.

The stability factor used in the Bretschneider wind determination is the water temperature minus the air temperature. Daily averages of $T_w - T_a$ were calculated from the ship reports for sections of each lake as shown below:

<u>Section of Lake</u>	<u>Geographical Location</u>
Western Lake Superior	West of Longitude 88°
Eastern Lake Superior	East of Longitude 88°
Northern Lake Huron	North of Latitude 45°
Southern Lake Huron	South of Latitude 45°
Northern Lake Michigan	North of Latitude 44°
Southern Lake Michigan	South of Latitude 44°

Whenever ship reports were not available, daily air temperatures from land stations as determined from the Chicago weather charts were subtracted from average monthly water temperatures, Richards and Irbe (1969), to provide the stability factor.

Compute pressure field at grid points

Values of the pressure field at regularly spaced grid points were calculated from the randomly located weather station data using the successive approximation technique (SAT), Cole (1967, 1968).

The Grid Used for Geostrophic Wind Calculations

Figure 5 illustrates the grid that was used in this analysis. The grid network used is a portion of the National Meteorological Center (NMC) grid system. The grid coordinate system used in the analysis is a 25 x 25 (625 gridpoints) sub network of the original NMC grid covering the area. The NMC corner gridpoints going clockwise from the SW corner are (20.6, 10.6), (20.6, 15.4), (25.4, 15.4), (25.4, 10.6). For simplicity in calculations, the gridpoints were renumbered so that the NMC coordinate (20.6, 10.6) was replaced by (1, 1), (20.6, 15.4) by (1, 25) etc. The following equations relate latitude and longitude to NMC grid coordinates, and NMC coordinates to the analysis coordinates.

Latitude and Longitude to NMC coordinate

$$A = \sin (\text{Latitude})$$

$$B = 1 - A / (1 + A)$$

$$C = 31.205 * \sqrt{B}$$

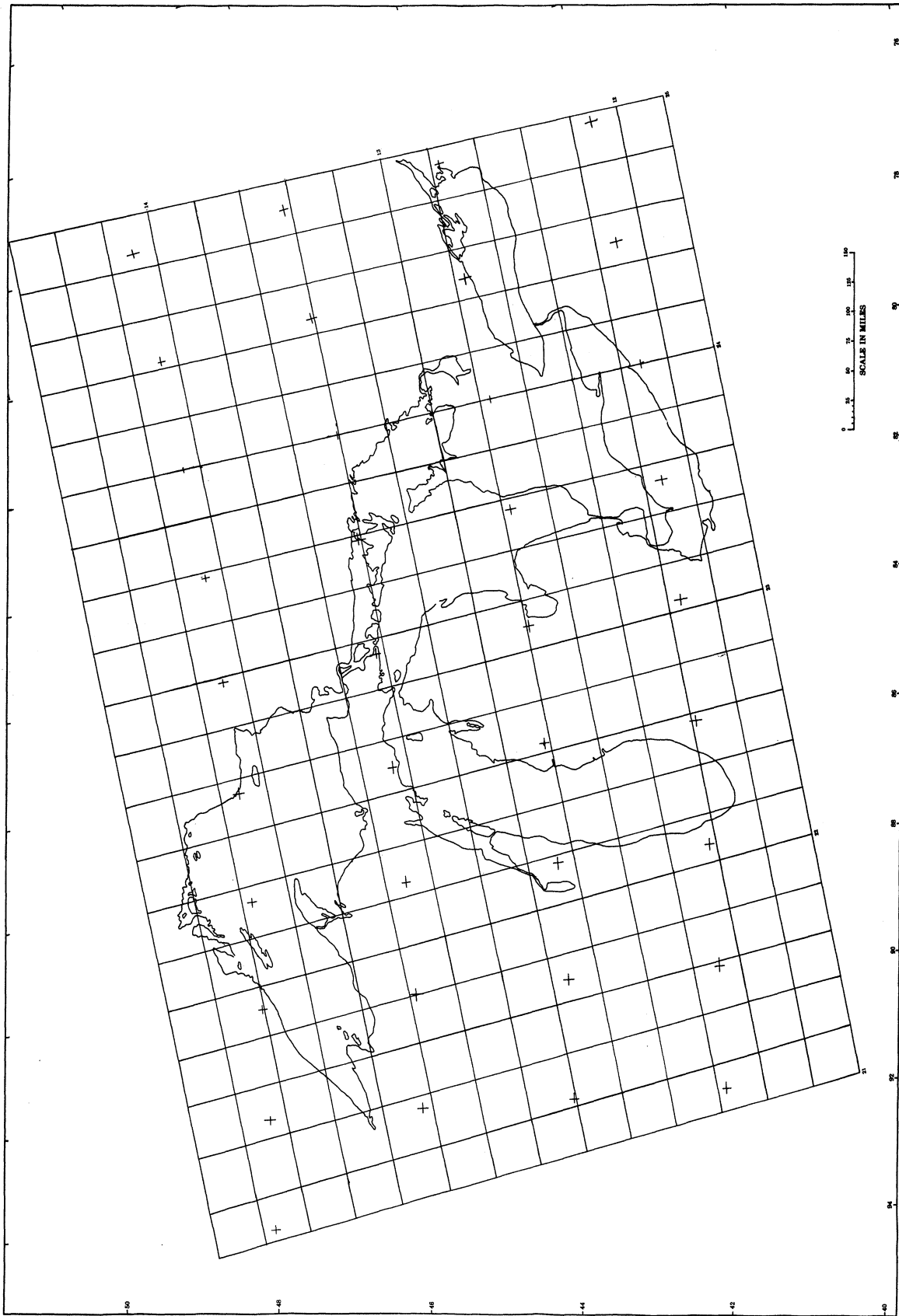


Figure 5. The grid system used in the geostrophic wind calculations.

$$D = \text{Longitude} + 10$$

$$\text{NMC } X = 24.0 + C \cdot \cos(D)$$

$$\text{NMC } Y = 26.0 - C \cdot \sin(D)$$

NMC Coordinates to Analysis Coordinates

$$\text{Analysis } X = (\text{NMC } X - 20.4) / .2$$

$$\text{Analysis } Y = (\text{NMC } Y - 10.4) / .2$$

In the calculation of the geostrophic wind, the 25 x 25 grid reduces to a 23 x 23 grid (529 gridpoints), with the curvature and subsequent gradient wind calculations further reducing the grid to 20 x 20 (400 gridpoints).

The Successive Approximation Technique

In general, the SAT is a method of successively correcting a grid point parameter using average correction factors deduced from reported data. Smoothing can also be applied to the corrected grid field to further minimize errors. The steps in the SAT applied to this pressure analysis are explained as follows:

1. FIRST GUESS PRESSURE FIELD

The input pressure field can be obtained in one of two ways. First, if an isobaric surface analysis is available for the area, a plastic grid overlay is placed on the map, and the pressure at each gridpoint is interpolated from the analysis. Secondly, if a gridpoint pressure field already exists (as is the case with all but the first time period in question), it can be advected to form the new first guess field for the succeeding time period. The latter method was used in most cases in this study.

B. THE FIRST SCAN

Once a first guess pressure field has been established, the first in the series of scans of the iterative correction process begins. In the first scan, the pressure field is corrected by considering all stations within 4.75 grid lengths of each gridpoint. The pressure at an individual gridpoint is corrected in the following manner:

- a) All synoptic stations within a radius of 4.75 grid lengths are identified. Any of these stations that did not report a pressure for the time period being considered are ignored in the remaining steps.
- b) An interpolated station pressure is obtained for each of these reporting stations using bilinear interpolation from the first guess pressure field. The difference between the interpolated station pressure and the measured station pressure is the error introduced at that station by interpolation from the first guess field.

$$\text{ERROR} = P_{\text{measured}} - P_{\text{interpolated}}$$

The entire purpose of the following steps of the SAT is to make this error as small as possible.

- c) The contribution to the correction applied at each grid point from each measured station pressure is weighted inversely to its distance from the grid point. The weighting function for each station takes the form:

$$\text{WT} = \frac{N^2 - d^2}{N^2 + d^2}$$

where

N = scanning radius (4.75 grid lengths for the first scan)

d = distance from grid point to station.

The inclusion of the scan radius in this weighting function causes WT to be unity for a station on the grid point, and zero for a station at a distance equal to or greater than the scan radius.

d) The weighted correction factor applied to the grid point becomes

$$\text{CORR} = \frac{\sum (\text{ERROR} * \text{WT})}{\sum \text{stations}}$$

where:

$\sum \text{stations}$ = the total number of stations contributing to the correction factor

This mean value of weighted errors is then used to correct the grid point pressure as follows:

$$P(I, J) = P(I, J) - \text{CORR}$$

where:

I and J define the grid point in question.

C. SCANS TWO AND THREE

The steps outlined in scan one were repeated for scans two and three with radii (N) of 3.60 and 2.25 grid lengths. The input pressure field in each case was the corrected pressure field of the previous scan. By reducing the scan radius, the stations closest to the grid point had the strongest influence on the final grid point correction.

D. THE FIRST SMOOTHING

To reduce calculation instabilities, the pressure field was smoothed between scans three and four and after scan four. The smoothing functions used in this analysis were as follows.

F. THE SECOND SMOOTHING

The corrected pressure field obtained from scan four is smoothed by the same function given in D above.

The result of the five steps above is a final grid point pressure field that has been modified by the successive approximation technique so as to agree with the pressure field generated by the input station pressures.

Advection of final pressure field for first guess field of next analysis.

As mentioned earlier, one method of obtaining a first guess field is to advect a previous field. The final pressure field obtained by the SAT, was advected to the next 6 hour time period. The initial advection was in the direction of the 500mb wind at Green Bay, Wisconsin (taken to be typical of the entire Great Lakes area), and at a speed equal to 43% of this same 500mb wind. These speeds and directions were converted into grid length distances and rounded off to an integer number of grid length displacements in the East-West and North-South directions. For example, if the advection displacements happened to be $X = 2.2$ and $Y = -3.1$, each grid point pressure would simply be transposed 2 grid lengths East and 3 grid lengths South (+ = East and North). The void created in the northwest, in this case, was filled using a mirroring technique which occasionally gave poor results. After many advectations for the same direction the pressure gradients in this void tended to get very large. This weakness in the advection scheme caused errors in the results for the western Lake Superior stations which are reflected in the "uncertain data" category in the wave summaries. Further research into this portion of the advection process should be done.

Since this method of advection was fixed for all cases, a scheme was devised to ensure the best possible advection direction and distance for the entire pressure field. After the initial advection by the parameters based on the 500mb wind, the pressures at each of 19 selected stations, each of which was very close to a grid point, were compared to the adjacent grid point pressures, and the pressure differences were calculated. These differences were summed over all of the 19 selected stations. The pressure field was then shifted 3 grid lengths in each of the 8 compass directions, and for each shift another comparison and a summation was made for the 19 selected stations. The pressure field was then shifted to the position that had the smallest error summation, or it remained stationary if the first summation was the smallest. This process was repeated for scans of 2 grid lengths and then 1 grid length in each of the 8 compass directions, finally arriving at a pressure field position that had a minimum initial error. The computer output which gives a summary of this process is shown in Table 1. Figure 6 is an illustration of this process.

As was mentioned earlier, the advected pressure field became the first guess field for the new time period. The SAT was then applied to this new first guess field with new station pressures and a final pressure field was computed for the new time. In the production of the wind fields, each computer run covered a month or about 120 iterative grid point pressure calculations.

TABLE 1

<u>XD</u>	<u>YD</u>	<u>N</u>	<u>SER 0</u>	<u>SER (1)</u>	<u>SER (2)</u>	<u>SER (3)</u>	<u>SER (4)</u>	<u>SER (5)</u>	<u>SER (6)</u>	<u>SER (7)</u>	<u>SER (8)</u>
-2	1	3	38.44	72.89	<u>27.71</u>	41.21	52.42	59.35	67.44	68.36	78.76
1	1	2	27.71	81.45	44.33	31.81	60.21	<u>25.28</u>	42.49	31.96	42.13
1	-1	1	25.28	18.10	22.88	38.09	<u>17.64</u>	41.21	25.25	32.13	47.30
1	0										

Where:

XD = Advection in the East-West Direction

YD = Advection in the North-South Direction

N = Grid length of Scan

SER 0 = error at the initial pressure field location

SER(I), I=1, 8 = error at each of the 8 compass points in the Scan

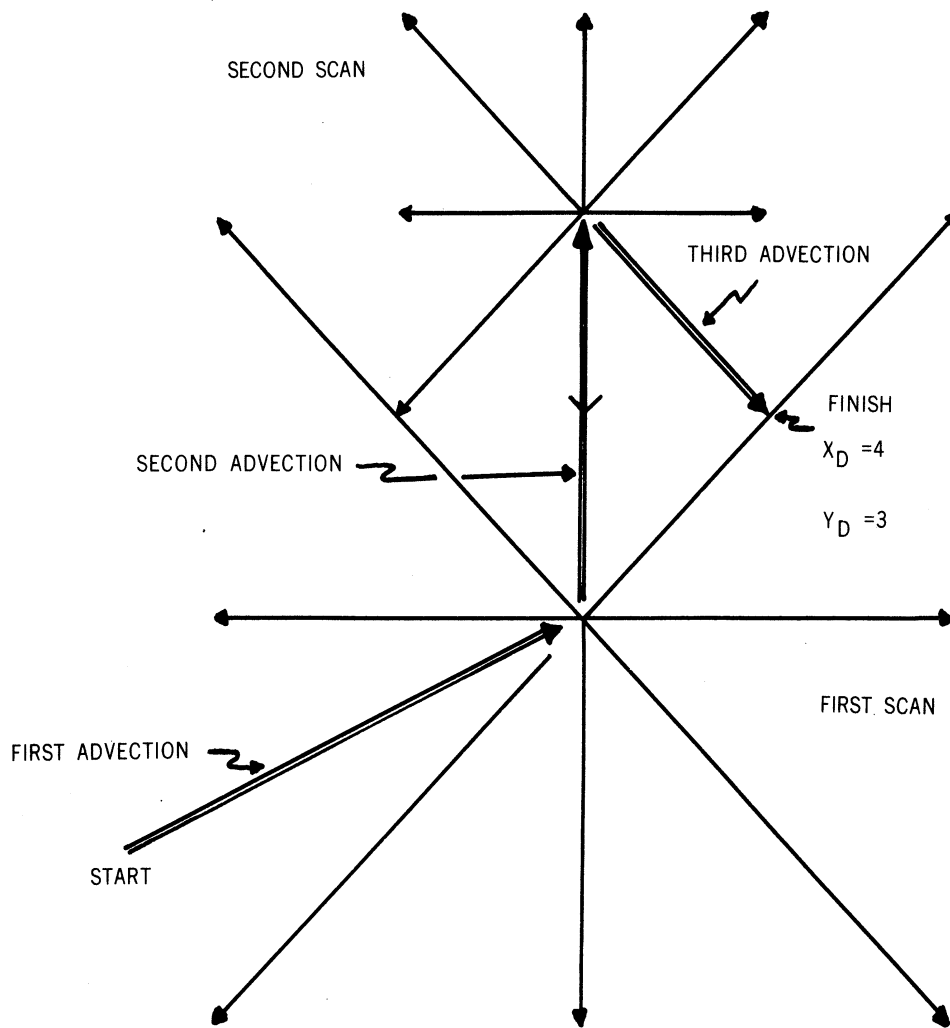


Figure 6. The advection process used to convert an old pressure pattern into a first guess field for the successive approximation technique 6 hours later

5. SURFACE WIND DETERMINATION

Computation of geostrophic winds at grid points and interpolation to station locations

The u (positive to the east) and v (positive to the north) components of the geostrophic wind at each grid point were calculated from the grid point pressure field by using standard meteorological equations in centered finite difference form.

$$u_o = \frac{-R\bar{T}}{f P_o} \frac{P_1 - P_3}{Y_1 - Y_3}$$

$$v_o = \frac{R\bar{T}}{f P_o} \frac{P_4 - P_2}{x_4 - x_2}$$

where: f = the Coriolis parameter

R = the gas constant

\bar{T} = the monthly mean atmospheric temperature in °K taken to be:

Jan. 277 °K	May 277 °K	Sept. 290 °K
Feb. 276 °K	Jun 282 °K	Oct. 283 °K
Mar. 276 °K	Jul 292 °K	Nov. 280 °K
Apr. 276 °K	Aug 292 °K	Dec. 276 °K

and $P_o, P_1, P_2, P_3,$ and P_4 are gridpoint pressures as shown below:

$$\begin{array}{ccc}
 & +P_1 & \\
 +P_2 & +P_o & +P_4 \\
 & +P_3 &
 \end{array}$$

The magnitude and direction of the geostrophic wind were calculated from the following equations:

$$\begin{aligned}v_{\text{geo}} &= \sqrt{u^2 + v^2} \\ &= \arctan u/v \\ &= \text{the meteorological definition of wind direc-}\end{aligned}$$

tion, i.e., the direction from which the wind is blowing.

The same bilinear interpolation subroutine that was used in the pressure analysis was used to obtain the geostrophic wind components, and therefore, the geostrophic wind speed and wind direction at the 14 analysis locations.

Correction for Boundary Layer Friction

It is well known that the surface wind direction varies from the geostrophic wind direction due to frictional drag in the boundary layer. A comparison was made between computed geostrophic wind directions and observed wind directions at the U.S. Lake Survey research tower one mile off shore from Muskegon, Michigan for previously calculated data. The average of the differences between observed wind directions and geostrophic wind directions was -28° . CERC Tech. Rpt #4 (1966) states; "near the surface, the angle between the gradient or geostrophic winds and the actual wind is 10 to 15 degrees over sea areas and about 40 degrees over land areas." As the Great Lakes are transition areas between continental and maritime influences, the difference between geostrophic and observed winds should be between these values. Pore and Richardson (1969) report the maximum frequency of difference between observed and primitive equation wind direction occurred for -20° . From the above considerations, a value of -20° was chosen as a correction term to be added to the geostrophic wind direction in order to obtain the surface wind direction. This was done for all data.

Determination of Effective Fetch Distances

Fetch is defined as the distance over which waves are generated by a wind. For a region the size of the Great Lakes and for meteorological conditions that generate waves greater than a few inches of height, the fetch is determined mainly by the distance to the upwind shore from the location in question. A geographical fetch distance was measured for each 10° of direction at each of the 14 wave hindcast locations. Fetch width as well as fetch length affects the development of waves with a narrow body of water having smaller waves than a wide one. Hughes (1968) states that fetch width will have no effect if it is twice the fetch length. For many of the wind directions for stations such as Duluth and Burns Harbor this criteria is never met and fetch width must be considered. In calculating the effective fetch for use in this study, the method developed by Bretschneider and reported in CERC Tech Rpt. #4 (1966) pp. 26 was used. This method computes an effective fetch as:

$$\begin{aligned} F_{\text{eff}} &= \sum X_i \cos \alpha \\ &= \sum \cos \alpha \end{aligned}$$

where: the summation occurs over 6° sectors lying on both sides of the wind direction up to a maximum of 45°.

X_i = the measured fetch for sector i .

α = the angle between the wind direction and sector i .

These effective fetch distances were tabulated in the computer so an effective fetch distance could be looked up for each calculated surface wind direction at each station.

Computation of Wind Field Curvature

The curvature of the computed wind is one of the parameters necessary for the determination of the ratio of the surface wind to the geostrophic wind according to the method of Bretschneider. A unique method of computer calculation was used to obtain the curvature using the equations for vorticity in cartesian and natural coordinates.

Vorticity in Cartesian coordinates:

$$\text{VOR} = \Delta v / \Delta y - \Delta u / \Delta x$$

Vorticity in natural coordinates:

$$\text{VOR} = kv_0 - \Delta v / \Delta n$$

Where:

VOR = Vorticity

v_0 = the magnitude of the wind at the grid point
in question

$\Delta v / \Delta x$ = the gradient of the y component of velocity in the
x direction

$\Delta u / \Delta y$ = the gradient of the x component of velocity in the
y direction

$\Delta v / \Delta n$ = the gradient of the wind speed in a direction
normal to the streamline

k = the curvature of the wind field

The velocity at each grid point is known and the gradients can be computed by finite differences, so VOR can be computed from the cartesian coordinate equation and substituted into the natural coordinate equation. The curvature k remains as the only unknown, for which a numerical value can be readily obtained. This process lends itself well to computer solution and according to Hilfiker & Cole (1970) will yield results that are comparable to manual curvature determinations, such as fitting known radii of curvature on a transparent scale.

Print Geostrophic Wind Speed, Surface Wind Direction, Streamline (Isobaric) Curvature, and Effective Fetch for the 14 Analysis Locations

The computer was programmed to print out the geostrophic wind speed, the geostrophic wind direction, the isobaric curvature and the effective fetch as shown in Figure 7. The additional column headings of $T_w - T_a$, Wind Ratio, Surface Wind, Duration, Wave Height and Wave Period were included so the print-out sheet could be used as a worksheet for the manual determination of the wave heights and periods. In addition, the grid point fields of geostrophic wind speed, geostrophic wind direction and gradient wind curvature were printed for reference if needed.

Print Air Temperature, Water Temperature and Water Temperature Minus Air Temperature for Lakes Superior, Huron and Michigan

The daily mean values of water temperature, air temperature and their difference were printed in tabular form. The eastern and western sections of Lake Superior were treated separately as were the northern and southern sections of Lake Michigan and Huron. These data with the curvature data and geostrophic wind data were combined to produce the surface wind.

Look up the ratio between surface and geostrophic wind

The computed values of $T_w - T_a$ and isobaric curvature were used as input data to look up, manually, the ratio between surface and geostrophic wind on a tabulation of the curves of Figure 8 due to Bretschneider and published in CERC Tech. Rpt #4 (1966), pp. 11. With the wind ratio and the geostrophic wind speed known, the surface wind was computed by multiplication.

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DIRECTIONS GIVEN ARE ACTUAL GEOSTROPHIC DIRECTIONS CALCULATED
 A BOUNDARY LAYER CORRECTION OF -20 DEGREES WAS APPLIED TO THE GEOSTROPHIC DIRECTIONS IN THE FETCH CALCULATIONS

STATION	LAT DEG	LONG DEG	SPEED KNOTS	DIR DEG	CURV DEG	FETCH KN.	PRESSURE MI.	MB	TW-TA RATIO	WIND KNOTS	SFC WIND KNOTS	DURATION HOURS	WAVE HT FEET	WAVE PER. SEC.
DULUTH	46.83	91.57	26.	163.	-0.9	5	1022.5		9.6	.88	22.88	9	2.7	3.5
GRAND MARIAS	47.67	90.33	27.	172.	-1.3	59	1024.7		9.6	.88	23.76	9	7.0	6.7
EAGLE HARBOR	47.50	93.17	18.	145.	-1.3	36	1026.7		9.6	.88	15.84	9	3.3	4.7
MARQUETTE	46.67	87.33	14.	170.	5.5	20	1026.8		17.5	.76	10.64	3	1.1	2.9
WHITEFISH POINT	46.83	85.00	9.	130.	0.1	20	1028.2		17.5	.73	6.57	--	SL	--
SLATE ISLAND	48.67	86.83	20.	164.	-1.3	70	1028.4		17.5	1.01	20.20	3	3.5	4.5
PORT HURON	43.17	82.33	8.	117.	4.1	15	1024.7		5.1	.62	4.96	--	SL	--
HARBOR BEACH	44.17	82.67	26.	61.	-1.0	74	1025.7		5.1	.80	20.80	3	3.7	4.6
ALPENA	45.00	83.17	13.	65.	-0.8	55	1027.6		9.1	.87	11.31	3	1.3	3.1
COCKBURN ISL.	45.83	83.17	1.	16.	0.1	0	1027.8		9.1	.63	.63	--	Fetch=0	--
DOUGLAS POINT	44.33	81.67	16.	56.	0.7	29	1025.4		5.1	.59	9.44	--	SL	--
POINT BETSIE	44.67	86.33	21.	124.	-5.9	3	1026.1		5.8	.80	16.80	3	1.3	2.7
MUSKEGON	43.17	86.33	18.	111.	2.2	6	1023.7		3.0	.57	10.26	3	.8	2.6
BURNS HARBOR	41.67	87.17	22.	106.	-0.5	18	1021.5		3.0	.78	17.16	3	2.7	4.0

Air Temperatures
 W. SUPERIOR -7.8 °C
 E. SUPERIOR -15.7 °C
 N. HURON -6.2 °C
 S. HURON -2.1 °C

GREAT LAKES DOMINATED by HIGH CENTERED 52°N 82°W
 ISOBARIC SPACING 2-3°C
 LOW CENTERED OVER NEWFOUNDLAND
 STATIONARY FRONT OVER New Jersey, VIRGINIA,
 KENTUCKY INTO LOW OVER KANSAS
 LOW OVER MANITOBA

Figure 7. Computer print-out of geostrophic wind speed, geostrophic wind direction, wind field curvature and effective fetch.

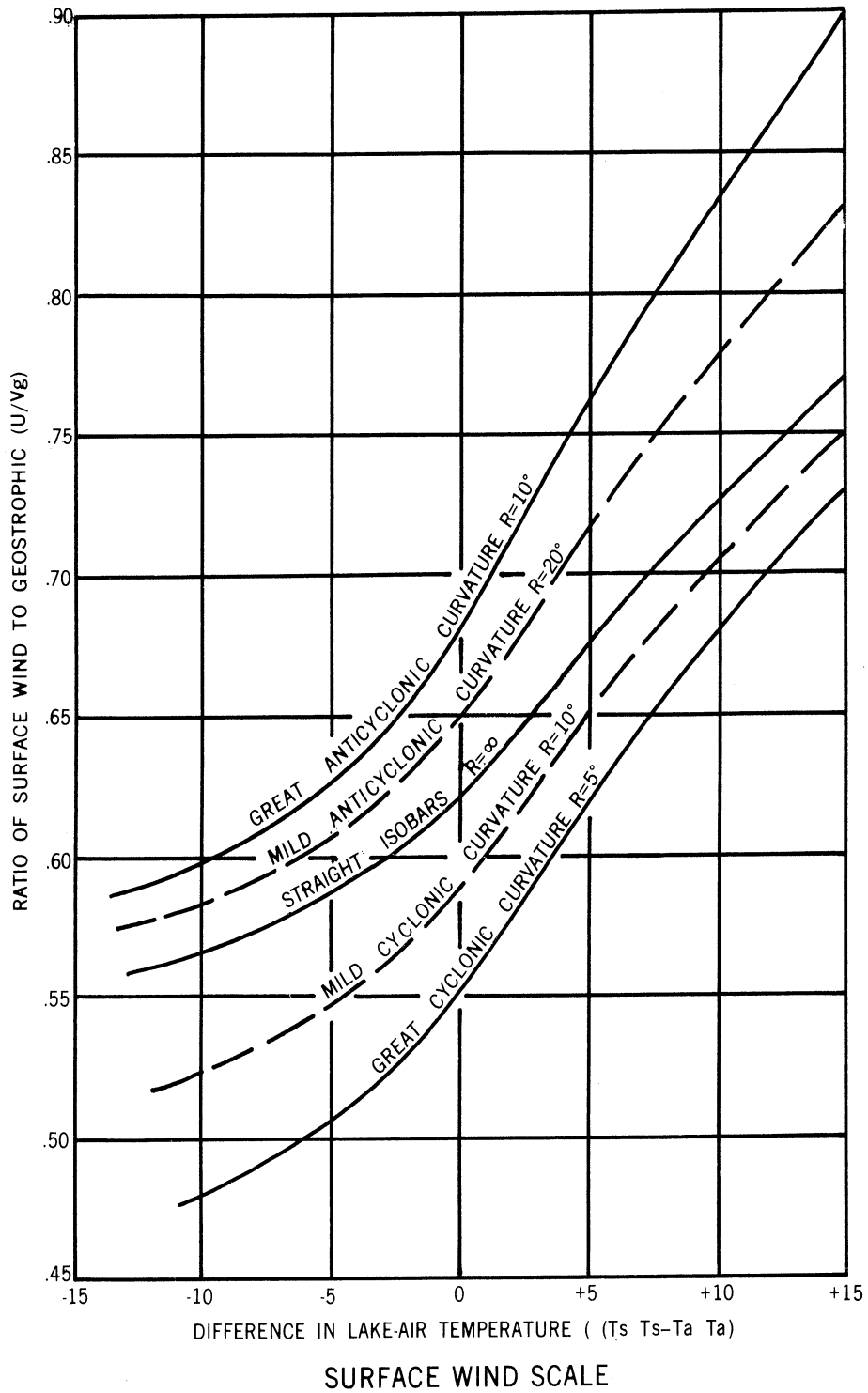


Figure 8. Bretschneider's relation between surface and geostrophic wind.

Wind Duration

The wind duration was determined subjectively by assuming that a new wave field was produced each time the surface wind had a speed of less than 10 knots, or the wind direction shifted by more than $\pm 45^\circ$ or $\pm 30^\circ$ if the absolute value of the curvature was less than 10° . In all cases, the wind was assumed to have had the calculated speed and direction for 3 hours before and after the time of calculation. It was further assumed that old wave fields died out rapidly by absorption on a nearby shore and did not affect the new ones whenever the wind shifted more than 40° .

6. SIGNIFICANT WAVE HEIGHT AND SIGNIFICANT WAVE PERIOD

Figure 9 is the SMB wave hindcasting nomogram as depicted in CERC Tech. Rpt #4 (1966), pp. 20. It was used to determine, manually, the significant wave heights and significant wave periods for the 14 locations using the SMB method as outlined in CERC Tech. Rpt #4 (1966).

The significant wave height is the average of the higher one third of the waves while the significant wave period is the period of the dominant wave. The significant wave height can be related to other wave statistics by the following ratios due to Hughes (1968):

Highest Wave	1.87 times the significant wave height	
Highest 10%	1.29	"
Average	0.64	"
Most Frequent	0.50	"

As is mentioned in H. O. Pub. No. 603 (1955) and by Hughes (1968), out-sized waves much larger than 1.87 times the significant wave will occur occasionally and they cannot be predicted nor are they considered in the summaries in the appendices. The occasional extra large wave summary shown

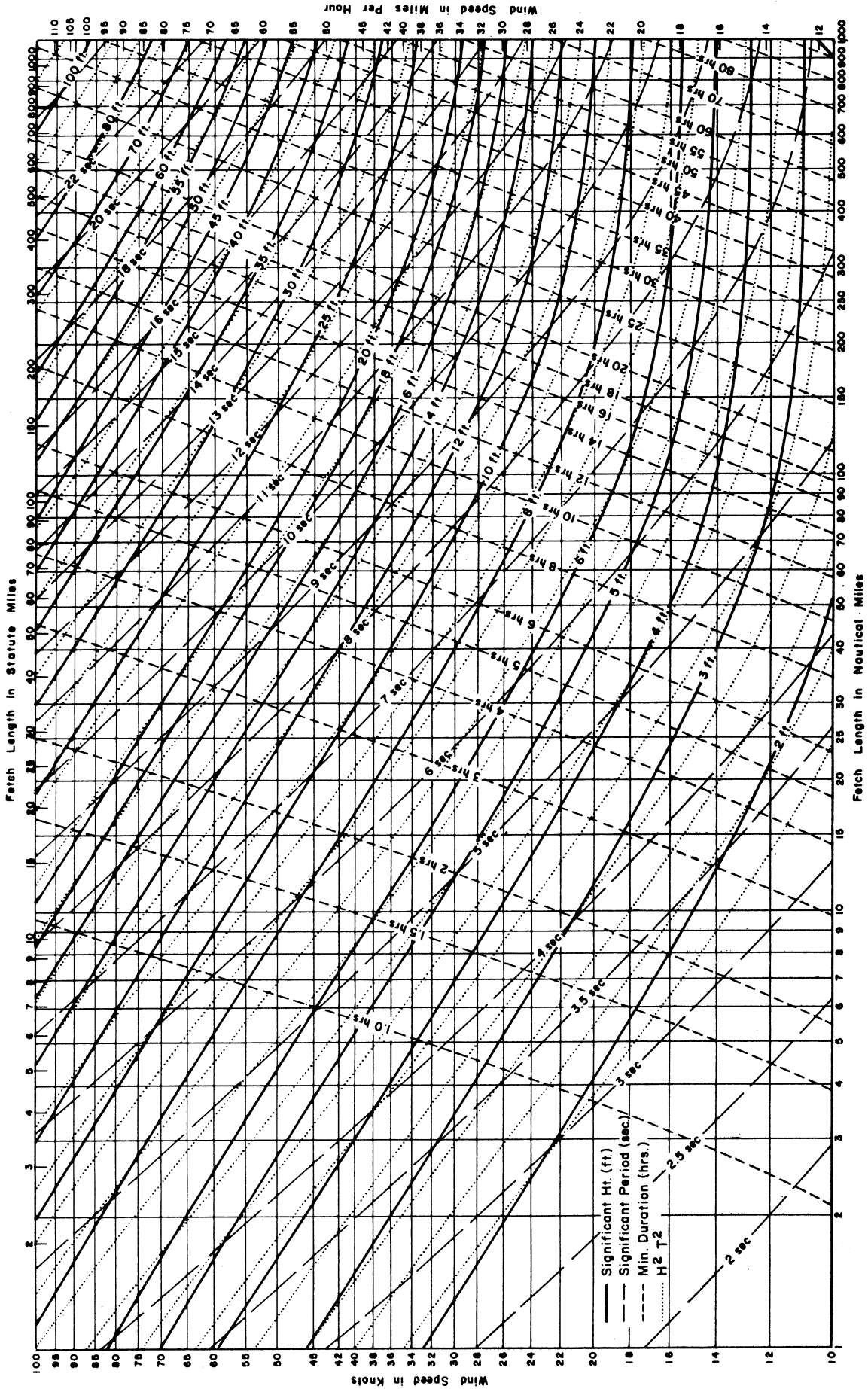


Figure 9. The SMB wave hindcasting nomogram used to determine the significant wave heights and periods. the significant wave heights and periods.

in some of the appendices is probably a mistake in the data cards fed to the statistics program and should not be construed as a result of the occasional outsized waves.

These waves are assumed to be deep water waves and no corrections for shallow water have been made, nor were they necessary for the off-shore locations for which wave hindcasts were made.

It should be noted that winds of less than 10 knots fall off of this nomogram and produce waves with negligible heights. Any surface wind conditions of less than 10 knots were classified as calm winds and were summed separately in the calculation of the wave statistics.

In all calculations the existence of ice on the lakes in winter has been ignored. Fetch lengths have not been shortened and the possibility of no waves at a location because of ice cover has not been considered. During the winter months a water temperature of 32°F has been assumed unless data to the contrary were available.

7. WAVE STATISTICS

A computer program was written to compile the wave statistics for each month at each location. Each of these compilations, as shown in the appendices is a two dimensional array of significant wave height as ordinate and significant wave period as abscissa with each entry being the number of hours of occurrence. For each significant wave height, period and wind direction, the hours of occurrence in 1965, 1966, 1967 and the total for all three years are listed. Totals for each significant wave height regardless of period or wind direction and for each significant period regardless of height and wind direction are compiled. Other sub-totals were also calculated as shown in the appendices.

In the classifications of significant wave height and significant wave period, the lower limit is included while the upper one is not.

Data for the last half of February, 1967 and the first half of May, 1965 were not available and their contributions to the wave statistics are missing.

APPENDIX A

FIGURES A-1 thru A-12

WAVE STATISTICS FOR A LOCATION IN

LAKE SUPERIOR NEAR

DULUTH, MINNESOTA

(46.83°N, 91.67°W)

LAKE SUPERIOR FEBRUARY
LATITUDE 46.83 LONGITUDE 91.67

DATE	TIME	WAVE	PERIOD (SECS)	7-8	8-9	9-10	TOTAL
1-1	N	6	6	6	6	6	18
1-2	NE	6	6	6	6	6	18
1-3	E	6	6	6	6	6	18
1-4	SE	6	6	6	6	6	18
1-5	S	6	6	6	6	6	18
1-6	SW	6	6	6	6	6	18
1-7	W	6	6	6	6	6	18
1-8	NW	6	6	6	6	6	18
1-9	N	6	6	6	6	6	18
1-10	NE	6	6	6	6	6	18
1-11	E	6	6	6	6	6	18
1-12	SE	6	6	6	6	6	18
1-13	S	6	6	6	6	6	18
1-14	SW	6	6	6	6	6	18
1-15	W	6	6	6	6	6	18
1-16	NW	6	6	6	6	6	18
1-17	N	6	6	6	6	6	18
1-18	NE	6	6	6	6	6	18
1-19	E	6	6	6	6	6	18
1-20	SE	6	6	6	6	6	18
1-21	S	6	6	6	6	6	18
1-22	SW	6	6	6	6	6	18
1-23	W	6	6	6	6	6	18
1-24	NW	6	6	6	6	6	18
1-25	N	6	6	6	6	6	18
1-26	NE	6	6	6	6	6	18
1-27	E	6	6	6	6	6	18
1-28	SE	6	6	6	6	6	18
1-29	S	6	6	6	6	6	18
1-30	SW	6	6	6	6	6	18
1-31	W	6	6	6	6	6	18
1-32	NW	6	6	6	6	6	18
1-33	N	6	6	6	6	6	18
1-34	NE	6	6	6	6	6	18
1-35	E	6	6	6	6	6	18
1-36	SE	6	6	6	6	6	18
1-37	S	6	6	6	6	6	18
1-38	SW	6	6	6	6	6	18
1-39	W	6	6	6	6	6	18
1-40	NW	6	6	6	6	6	18
1-41	N	6	6	6	6	6	18
1-42	NE	6	6	6	6	6	18
1-43	E	6	6	6	6	6	18
1-44	SE	6	6	6	6	6	18
1-45	S	6	6	6	6	6	18
1-46	SW	6	6	6	6	6	18
1-47	W	6	6	6	6	6	18
1-48	NW	6	6	6	6	6	18
1-49	N	6	6	6	6	6	18
1-50	NE	6	6	6	6	6	18
1-51	E	6	6	6	6	6	18
1-52	SE	6	6	6	6	6	18
1-53	S	6	6	6	6	6	18
1-54	SW	6	6	6	6	6	18
1-55	W	6	6	6	6	6	18
1-56	NW	6	6	6	6	6	18
1-57	N	6	6	6	6	6	18
1-58	NE	6	6	6	6	6	18
1-59	E	6	6	6	6	6	18
1-60	SE	6	6	6	6	6	18
1-61	S	6	6	6	6	6	18
1-62	SW	6	6	6	6	6	18
1-63	W	6	6	6	6	6	18
1-64	NW	6	6	6	6	6	18
1-65	N	6	6	6	6	6	18
1-66	NE	6	6	6	6	6	18
1-67	E	6	6	6	6	6	18
1-68	SE	6	6	6	6	6	18
1-69	S	6	6	6	6	6	18
1-70	SW	6	6	6	6	6	18
1-71	W	6	6	6	6	6	18
1-72	NW	6	6	6	6	6	18
1-73	N	6	6	6	6	6	18
1-74	NE	6	6	6	6	6	18
1-75	E	6	6	6	6	6	18
1-76	SE	6	6	6	6	6	18
1-77	S	6	6	6	6	6	18
1-78	SW	6	6	6	6	6	18
1-79	W	6	6	6	6	6	18
1-80	NW	6	6	6	6	6	18
1-81	N	6	6	6	6	6	18
1-82	NE	6	6	6	6	6	18
1-83	E	6	6	6	6	6	18
1-84	SE	6	6	6	6	6	18
1-85	S	6	6	6	6	6	18
1-86	SW	6	6	6	6	6	18
1-87	W	6	6	6	6	6	18
1-88	NW	6	6	6	6	6	18
1-89	N	6	6	6	6	6	18
1-90	NE	6	6	6	6	6	18
1-91	E	6	6	6	6	6	18
1-92	SE	6	6	6	6	6	18
1-93	S	6	6	6	6	6	18
1-94	SW	6	6	6	6	6	18
1-95	W	6	6	6	6	6	18
1-96	NW	6	6	6	6	6	18
1-97	N	6	6	6	6	6	18
1-98	NE	6	6	6	6	6	18
1-99	E	6	6	6	6	6	18
1-100	SE	6	6	6	6	6	18

FIGURE A-2b

DULUTH LAKE SUPERIOR FEBRUARY
 LATITUDE 46.83 LONGITUDE 93.67

CONTINUED

WEIGHT DIS	1-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(FT) DIS	05	06	07	08	09	10	11	12	
11-12	0	0	0	0	0	0	0	0	0
12-13	0	0	0	0	0	0	0	0	0
13-14	0	0	0	0	0	0	0	0	0
14-15	0	0	0	0	0	0	0	0	0
15-16	0	0	0	0	0	0	0	0	0
16-17	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0
TOTALS	342	368	344	354	368	372	372	360	3704

1967 CASE 1---ACTUAL PERIOD IS 10-6 SEC
 1967 CASE 2---ACTUAL PERIOD IS 30-9 SEC

FIGURE A-7

RAVI SURABHY
DULJITH
LATITUDE: 46.43 N, LONGITUDE: 91.67 E

LAKE SURF-TIME JULY

HEIGHT (FT) 018

<2

2-3

3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

1965

1966

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

HEIGHT (FT) 018

<2

2-3

3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

1965

1966

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

HEIGHT (FT) 018

<2

2-3

3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

1965

1966

1967

TOTAL

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1967

TOTAL

HEIGHT (FT) 018

<2

2-3

3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

1965

1966

1967

TOTAL

1967

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1967

TOTAL

HEIGHT (FT) 018

<2

2-3

3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

1965

1966

1967

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1967

TOTAL

HEIGHT (FT) 018

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3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

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1967

TOTAL

HEIGHT (FT) 018

<2

2-3

3-4

4-5

5-6

6-7

7-8

8-9

9-10

>10

TOTALS

PERIOD (SECS)

1965

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1967

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1967

TOTAL

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TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

1967

TOTAL

HEIGHT (FT) 018

<2

2-3

3-4

4-5

HEIGHT	DIR	42	2-3	2-4	4-5	5-6	7-8	8-9	9-10	10	TOTALS
(FT) DIR	42	2-3	2-4	4-5	5-6	7-8	8-9	9-10	10	TOTALS	
1-2 N		6	6	6	6	6	6	6	6	6	60
1-2 NNE			18	18	12	48					126
1-2 ENE				6	6	12					36
1-2 ESE					6	6					12
1-2 SSE		6	18	12	36						72
1-2 S					18	6	6				30
1-2 SSW		18	18	24	6	6					72
1-2 SW		6	6	6	6	6	18				54
1-2 WSW			6	12	6	6	18				54
1-2 W		6	6	12	6	6	18				54
1-2 NNW		6	12	18	6	6	18				66
1-2 NW		6	6	12	18	18	18				72
1-2 NNW		30	24	90	144	54	66	78	126		600
1-2 N				6	6	6	6	6	6		48
1-2 NNE			24	18	42						126
1-2 NE				6	6	6	6	6	6		48
1-2 E				6	6	6	6	6	6		48
1-2 SSE				6	18	24					48
1-2 SW			6	6	12						24
1-2 WSW			6	6	12						24
1-2 W			18	6	18	6					48
1-2 NNW			32	66	54	12	6	24	6		162
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	12						24
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	12						24
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6	6	6		48
1-2 NE			6	6	6	6	6	6	6		48
1-2 E			6	6	6	6	6	6	6		48
1-2 SSE			6	6	6	6	6	6	6		48
1-2 SW			6	6	6	6	6	6	6		48
1-2 WSW			6	6	6	6	6	6	6		48
1-2 W			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 NW			6	6	6	6	6	6	6		48
1-2 NNW			6	6	6	6	6	6	6		48
1-2 N			6	6	6	6	6	6	6		48
1-2 NNE			6	6	6	6	6				

APPENDIX B

FIGURES B-1 thru B-12

WAVE STATISTICS FOR A LOCATION IN

LAKE SUPERIOR NEAR

GRAND MARIAS, MINNESOTA

(47.67°N, 90.33°W)

FIGURE B-1A

GRAND HAVES SUMMARY
 MAPIAS LAKE SUPERIOR JANUARY
 LATITUDE 47.07 LONGITUDE 90.33

HEIGHT	DIR	165	166	167	TOT	165	166	167	TOT	165	166	167	TOT	165	166	167	TOT	165	166	167	TOT	165	166	167	TOT	PERIOD (SECS)	TOTALS	1965	1966	1967	TOTAL			
1-1	NE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
1-2	NE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
1-2	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
1-2	SM	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
1-2	HWY	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
1-2	TOT	24	12	6	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	
2-3	NE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
2-3	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
2-3	E	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
2-3	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
2-3	WSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
2-3	TOT	24	12	6	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	6	18	18	42	
3-4	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	E	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	S	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	SM	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	WSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
3-4	TOT	30	12	18	60	6	12	24	6	6	6	18	24	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	NE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	E	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	SSE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	SSE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	SM	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	WSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
4-5	TOT	12	12	30	54	12	12	12	36	54	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18
5-6	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
5-6	E	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
5-6	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
5-6	SE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
5-6	SM	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
5-6	WSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
5-6	TOT	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	NE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	ESE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	E	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	SSE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	SSE	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	SSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	SM	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	WSW	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	
6-7	TOT	30	6	6	36	24	18	30	72	6	6	6	18	6	6	6	18	6	6															

CONTINUED

HEIGHT	PERIOD (SECT)												TOTALS																													
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	TOTAL																														
DIR	065	066	067	067	065	066	067	067	065	066	067	067	065	066	067	1965	1967	TOTAL																								
FTI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																								
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																								
12-13													0	0	0																											
13-14													0	0	0																											
14-15													0	0	0																											
15-16													0	0	0																											
16-17													0	0	0																											
17-18													0	0	0																											
18-19													0	0	0																											
19-20													0	0	0																											
20-21													0	0	0																											
21-22													0	0	0																											
22-23													0	0	0																											
23-24													0	0	0																											
24-25													0	0	0																											
25-26													0	0	0																											
26-27													0	0	0																											
27-28													0	0	0																											
28-29													0	0	0																											
29-30													0	0	0																											
30-31													0	0	0																											
31-32													0	0	0																											
32-33													0	0	0																											
33-34													0	0	0																											
34-35													0	0	0																											
35-36													0	0	0																											
36-37													0	0	0																											
37-38													0	0	0																											
38-39													0	0	0																											
39-40													0	0	0																											
40-41													0	0	0																											
41-42													0	0	0																											
42-43													0	0	0																											
43-44													0	0	0																											
44-45													0	0	0																											
45-46													0	0	0																											
46-47													0	0	0																											
47-48													0	0	0																											
48-49													0	0	0																											
49-50													0	0	0																											
50-51													0	0	0																											
51-52													0	0	0																											
52-53													0	0	0																											
53-54													0	0	0																											
54-55													0	0	0																											
55-56													0	0	0																											
56-57													0	0	0																											
57-58													0	0	0																											
58-59													0	0	0																											
59-60													0	0	0																											
60-61													0	0	0																											
61-62													0	0	0																											
62-63													0	0	0																											
63-64													0	0	0																											
64-65													0	0	0																											
65-66													0	0	0																											
66-67													0	0	0																											
67-68													0	0	0																											
68-69													0	0	0																											
69-70													0	0	0																											
70-71													0	0	0																											
71-72													0	0	0																											
72-73													0	0	0																											
73-74													0	0	0																											
74-75													0	0	0																											
75-76													0	0	0																											
76-77													0	0	0																											
77-78													0	0	0																											
78-79													0	0	0																											
79-80													0	0	0																											
80-81													0	0	0																											
81-82													0	0	0																											
82-83													0	0	0																											
83-84													0	0	0																											
84-85													0	0	0																											
85-86													0	0	0																											
86-87													0	0	0																											
87-88													0	0	0																											
88-89													0	0	0																											
89-90													0	0	0																											
90-91													0	0	0																											
91-92													0	0	0																											
92-93													0	0	0																											
93-94													0	0	0																											
94-95													0	0	0																											
95-96													0	0	0																											
96-97													0	0	0																											
97-98													0	0	0																											
98-99													0	0	0																											
99-100													0	0	0																											
TOTAL	0	0	0	36	6	6	48	76	24	36	138	54	30	78	162	72	6	36	134	24	30	12	66	30	48	12	90	0	24	0	24	0	12	0	12	0	0	0	294	180	180	654
UNCERTAIN DATA																													294	180	180	654										
HOURS IN MONTH																													744	744	744	2232										

FIGURE B-7

GRAND MARIAS LAKE SUPPLEMENT JULY
LATITUDE 47.57 LONGITUDE 90.33

PERIOD (SECT)

>10

TOTALS

FLIGHT DIR	1-2	2-3	3-4	4-5	5-6	7-8	8-9	9-10	>10	TOTALS	
1-2 NE	6	6	6	6	6	6	6	6	6	60	
1-2 ENE	6	6	6	6	6	6	6	6	6	60	
1-2 E	12	12	6	6	6	6	6	6	6	120	
1-2 ESE	6	6	6	6	6	6	6	6	6	60	
1-2 SE	6	6	6	6	6	6	6	6	6	60	
1-2 SSE	6	6	6	6	6	6	6	6	6	60	
1-2 S	12	6	18	6	6	6	6	6	6	120	
1-2 SW	6	6	6	6	6	6	6	6	6	60	
1-2 SSW	6	6	6	6	6	6	6	6	6	60	
1-2 W	6	6	6	6	6	6	6	6	6	60	
1-2 WNW	6	6	6	6	6	6	6	6	6	60	
1-2 NW	6	6	6	6	6	6	6	6	6	60	
1-2 NNW	6	6	6	6	6	6	6	6	6	60	
1-2 N	6	6	6	6	6	6	6	6	6	60	
1-2 NNE	6	6	6	6	6	6	6	6	6	60	
1-2 NE	6	6	6	6	6	6	6	6	6	60	
TOT	36	12	6	54	12	6	54	72	6	6	
2-3 ENE	6	6	6	6	6	6	6	6	6	60	
2-3 ESE	6	6	6	6	6	6	6	6	6	60	
2-3 E	6	6	6	6	6	6	6	6	6	60	
2-3 ESE	6	6	6	6	6	6	6	6	6	60	
2-3 SE	6	6	6	6	6	6	6	6	6	60	
2-3 SSE	6	6	6	6	6	6	6	6	6	60	
2-3 S	6	6	6	6	6	6	6	6	6	60	
2-3 SSW	6	6	6	6	6	6	6	6	6	60	
2-3 SW	6	6	6	6	6	6	6	6	6	60	
2-3 SSW	6	6	6	6	6	6	6	6	6	60	
2-3 W	6	6	6	6	6	6	6	6	6	60	
2-3 WNW	6	6	6	6	6	6	6	6	6	60	
2-3 NW	6	6	6	6	6	6	6	6	6	60	
2-3 NNW	6	6	6	6	6	6	6	6	6	60	
2-3 N	6	6	6	6	6	6	6	6	6	60	
2-3 NNE	6	6	6	6	6	6	6	6	6	60	
2-3 NE	6	6	6	6	6	6	6	6	6	60	
TOT	30	30	24	84	18	18	36	6	6	6	
3-4 ENE	6	6	6	6	6	6	6	6	6	60	
3-4 ESE	6	6	6	6	6	6	6	6	6	60	
3-4 E	6	6	6	6	6	6	6	6	6	60	
3-4 ESE	6	6	6	6	6	6	6	6	6	60	
3-4 SE	6	6	6	6	6	6	6	6	6	60	
3-4 SSE	6	6	6	6	6	6	6	6	6	60	
3-4 S	6	6	6	6	6	6	6	6	6	60	
3-4 SSW	6	6	6	6	6	6	6	6	6	60	
3-4 SW	6	6	6	6	6	6	6	6	6	60	
3-4 SSW	6	6	6	6	6	6	6	6	6	60	
3-4 W	6	6	6	6	6	6	6	6	6	60	
3-4 WNW	6	6	6	6	6	6	6	6	6	60	
3-4 NW	6	6	6	6	6	6	6	6	6	60	
3-4 NNW	6	6	6	6	6	6	6	6	6	60	
3-4 N	6	6	6	6	6	6	6	6	6	60	
3-4 NNE	6	6	6	6	6	6	6	6	6	60	
3-4 NE	6	6	6	6	6	6	6	6	6	60	
TOT	12	12	6	18	6	18	6	6	6	6	
4-5 ENE	6	6	6	6	6	6	6	6	6	60	
4-5 ESE	6	6	6	6	6	6	6	6	6	60	
4-5 E	6	6	6	6	6	6	6	6	6	60	
4-5 ESE	6	6	6	6	6	6	6	6	6	60	
4-5 SE	6	6	6	6	6	6	6	6	6	60	
4-5 SSE	6	6	6	6	6	6	6	6	6	60	
4-5 S	6	6	6	6	6	6	6	6	6	60	
4-5 SSW	6	6	6	6	6	6	6	6	6	60	
4-5 SW	6	6	6	6	6	6	6	6	6	60	
4-5 SSW	6	6	6	6	6	6	6	6	6	60	
4-5 W	6	6	6	6	6	6	6	6	6	60	
4-5 WNW	6	6	6	6	6	6	6	6	6	60	
4-5 NW	6	6	6	6	6	6	6	6	6	60	
4-5 NNW	6	6	6	6	6	6	6	6	6	60	
4-5 N	6	6	6	6	6	6	6	6	6	60	
4-5 NNE	6	6	6	6	6	6	6	6	6	60	
4-5 NE	6	6	6	6	6	6	6	6	6	60	
TOT	6	6	6	6	6	6	6	6	6	6	
5-6 ENE	6	6	6	6	6	6	6	6	6	60	
5-6 ESE	6	6	6	6	6	6	6	6	6	60	
5-6 E	6	6	6	6	6	6	6	6	6	60	
5-6 ESE	6	6	6	6	6	6	6	6	6	60	
5-6 SE	6	6	6	6	6	6	6	6	6	60	
5-6 SSE	6	6	6	6	6	6	6	6	6	60	
5-6 S	6	6	6	6	6	6	6	6	6	60	
5-6 SSW	6	6	6	6	6	6	6	6	6	60	
5-6 SW	6	6	6	6	6	6	6	6	6	60	
5-6 SSW	6	6	6	6	6	6	6	6	6	60	
5-6 W	6	6	6	6	6	6	6	6	6	60	
5-6 WNW	6	6	6	6	6	6	6	6	6	60	
5-6 NW	6	6	6	6	6	6	6	6	6	60	
5-6 NNW	6	6	6	6	6	6	6	6	6	60	
5-6 N	6	6	6	6	6	6	6	6	6	60	
5-6 NNE	6	6	6	6	6	6	6	6	6	60	
5-6 NE	6	6	6	6	6	6	6	6	6	60	
TOT	6	6	6	6	6	6	6	6	6	6	
TOTAL CALM	0	0	0	42	24	12	78	48	36	79	142
UNCERTAIN DATA	0	0	0	0	0	0	0	0	0	0	0
HOURS IN MONTH	0	0	0	42	24	12	78	48	36	79	142

UNCERTAIN DATA
HOURS IN MONTH

162 74 144 384
402 282 582 1266
180 384 18 582
744 744 744 2232

FIGURE B-9

NAVE CIRCULAR
 NAVAL LAKE STATION
 LATITUDE 47.67 LONGITUDE 68.33

WEIGHT	01F	02	03	04	05	06	07	08	09	10	11	12	TOTALS
1-2	ENC	6	6	6	6	6	6	6	6	6	6	6	72
1-2	FSE	12	12	12	12	12	12	12	12	12	12	12	144
1-2	SSE	6	6	6	6	6	6	6	6	6	6	6	72
1-2	SWW	6	6	6	6	6	6	6	6	6	6	6	72
1-2	W	18	18	18	18	18	18	18	18	18	18	18	216
1-2	WNW	6	6	6	6	6	6	6	6	6	6	6	72
1-2	NW	24	24	24	24	24	24	24	24	24	24	24	288
1-2	NE	6	6	6	6	6	6	6	6	6	6	6	72
2-3	F	6	6	6	6	6	6	6	6	6	6	6	72
2-3	ESE	6	6	6	6	6	6	6	6	6	6	6	72
2-3	SE	6	6	6	6	6	6	6	6	6	6	6	72
2-3	SSE	6	6	6	6	6	6	6	6	6	6	6	72
2-3	SWW	6	6	6	6	6	6	6	6	6	6	6	72
2-3	W	18	18	18	18	18	18	18	18	18	18	18	216
2-3	WNW	6	6	6	6	6	6	6	6	6	6	6	72
2-3	NW	24	24	24	24	24	24	24	24	24	24	24	288
2-3	NE	6	6	6	6	6	6	6	6	6	6	6	72
3-4	F	6	6	6	6	6	6	6	6	6	6	6	72
3-4	ESE	6	6	6	6	6	6	6	6	6	6	6	72
3-4	SE	6	6	6	6	6	6	6	6	6	6	6	72
3-4	SSE	6	6	6	6	6	6	6	6	6	6	6	72
3-4	SWW	6	6	6	6	6	6	6	6	6	6	6	72
3-4	W	18	18	18	18	18	18	18	18	18	18	18	216
3-4	WNW	6	6	6	6	6	6	6	6	6	6	6	72
3-4	NW	24	24	24	24	24	24	24	24	24	24	24	288
3-4	NE	6	6	6	6	6	6	6	6	6	6	6	72
4-5	F	6	6	6	6	6	6	6	6	6	6	6	72
4-5	ESE	6	6	6	6	6	6	6	6	6	6	6	72
4-5	SE	6	6	6	6	6	6	6	6	6	6	6	72
4-5	SSE	6	6	6	6	6	6	6	6	6	6	6	72
4-5	SWW	6	6	6	6	6	6	6	6	6	6	6	72
4-5	W	18	18	18	18	18	18	18	18	18	18	18	216
4-5	WNW	6	6	6	6	6	6	6	6	6	6	6	72
4-5	NW	24	24	24	24	24	24	24	24	24	24	24	288
4-5	NE	6	6	6	6	6	6	6	6	6	6	6	72
5-6	F	6	6	6	6	6	6	6	6	6	6	6	72
5-6	ESE	6	6	6	6	6	6	6	6	6	6	6	72
5-6	SE	6	6	6	6	6	6	6	6	6	6	6	72
5-6	SSE	6	6	6	6	6	6	6	6	6	6	6	72
5-6	SWW	6	6	6	6	6	6	6	6	6	6	6	72
5-6	W	18	18	18	18	18	18	18	18	18	18	18	216
5-6	WNW	6	6	6	6	6	6	6	6	6	6	6	72
5-6	NW	24	24	24	24	24	24	24	24	24	24	24	288
5-6	NE	6	6	6	6	6	6	6	6	6	6	6	72
6-7	F	6	6	6	6	6	6	6	6	6	6	6	72
6-7	ESE	6	6	6	6	6	6	6	6	6	6	6	72
6-7	SE	6	6	6	6	6	6	6	6	6	6	6	72
6-7	SSE	6	6	6	6	6	6	6	6	6	6	6	72
6-7	SWW	6	6	6	6	6	6	6	6	6	6	6	72
6-7	W	18	18	18	18	18	18	18	18	18	18	18	216
6-7	WNW	6	6	6	6	6	6	6	6	6	6	6	72
6-7	NW	24	24	24	24	24	24	24	24	24	24	24	288
6-7	NE	6	6	6	6	6	6	6	6	6	6	6	72
8-9	F	6	6	6	6	6	6	6	6	6	6	6	72
8-9	ESE	6	6	6	6	6	6	6	6	6	6	6	72
8-9	SE	6	6	6	6	6	6	6	6	6	6	6	72
8-9	SSE	6	6	6	6	6	6	6	6	6	6	6	72
8-9	SWW	6	6	6	6	6	6	6	6	6	6	6	72
8-9	W	18	18	18	18	18	18	18	18	18	18	18	216
8-9	WNW	6	6	6	6	6	6	6	6	6	6	6	72
8-9	NW	24	24	24	24	24	24	24	24	24	24	24	288
8-9	NE	6	6	6	6	6	6	6	6	6	6	6	72
9-10	F	6	6	6	6	6	6	6	6	6	6	6	72
9-10	ESE	6	6	6	6	6	6	6	6	6	6	6	72
9-10	SE	6	6	6	6	6	6	6	6	6	6	6	72
9-10	SSE	6	6	6	6	6	6	6	6	6	6	6	72
9-10	SWW	6	6	6	6	6	6	6	6	6	6	6	72
9-10	W	18	18	18	18	18	18	18	18	18	18	18	216
9-10	WNW	6	6	6	6	6	6	6	6	6	6	6	72
9-10	NW	24	24	24	24	24	24	24	24	24	24	24	288
9-10	NE	6	6	6	6	6	6	6	6	6	6	6	72
TOTAL	CALL	0	0	0	24	18	0	42	72	42	60	174	34
TOTAL	CAUSE	0	0	0	24	18	0	42	72	42	60	174	34
TOTAL	MOVS IN MONTH	0	0	0	24	18	0	42	72	42	60	174	34

FIGURE B-10
 MAJIAS LAKE SUPERIOR OCTOBER
 LATITUDE 47.57 LONGITUDE 90.33

HEIGHT	DIR	165 160 167 TOT	165 160 167 0	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	165 166 167 101	TOTALS
1-2	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
1-2	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
2-3	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
2-3	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
3-4	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
3-4	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
3-4	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
3-4	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
3-4	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
3-4	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
3-4	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
4-5	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
4-5	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
4-5	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
4-5	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
4-5	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
4-5	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
4-5	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
5-6	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
5-6	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
5-6	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
5-6	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
5-6	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
5-6	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
5-6	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
6-7	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
6-7	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
6-7	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
6-7	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
6-7	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
6-7	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
6-7	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
7-8	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
7-8	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
7-8	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
7-8	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
7-8	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
7-8	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
7-8	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
8-9	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
8-9	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
8-9	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
8-9	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
8-9	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
8-9	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	396
8-9	TOT	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	396	
TOTAL	CLM	0	0	0	12	18	24	30	36	42	48	54	60	66	72	78	84	396

UNCERTAIN DATA
 MOODS IN MONTH

204 84 174 442
 354 168 374 862
 186 492 276 924
 744 744 744 2232

APPENDIX C

FIGURES C-1 thru C-12

WAVE STATISTICS FOR A LOCATION IN

LAKE SUPERIOR NEAR

EAGLE HARBOR, MICHIGAN

(47.50°N, 88.17°W)

FIGURE C-9a

WAVE SUMMARY
 MAGNITUDE 100 FT-EMPER
 LATITUDE 47.55 LONGITUDE 85.17

HEIGHT	PERIOD (SEC)	6-5	6-6	6-7	6-8	6-9	TOTAL
1-1 N	12	6	6	6	6	6	36
1-2 N	12	6	6	6	6	6	36
1-3 N	12	6	6	6	6	6	36
1-4 N	12	6	6	6	6	6	36
1-5 N	12	6	6	6	6	6	36
1-6 N	12	6	6	6	6	6	36
1-7 N	12	6	6	6	6	6	36
1-8 N	12	6	6	6	6	6	36
1-9 N	12	6	6	6	6	6	36
1-10 N	12	6	6	6	6	6	36
1-11 N	12	6	6	6	6	6	36
1-12 N	12	6	6	6	6	6	36
1-13 N	12	6	6	6	6	6	36
1-14 N	12	6	6	6	6	6	36
1-15 N	12	6	6	6	6	6	36
1-16 N	12	6	6	6	6	6	36
1-17 N	12	6	6	6	6	6	36
1-18 N	12	6	6	6	6	6	36
1-19 N	12	6	6	6	6	6	36
1-20 N	12	6	6	6	6	6	36
1-21 N	12	6	6	6	6	6	36
1-22 N	12	6	6	6	6	6	36
1-23 N	12	6	6	6	6	6	36
1-24 N	12	6	6	6	6	6	36
1-25 N	12	6	6	6	6	6	36
1-26 N	12	6	6	6	6	6	36
1-27 N	12	6	6	6	6	6	36
1-28 N	12	6	6	6	6	6	36
1-29 N	12	6	6	6	6	6	36
1-30 N	12	6	6	6	6	6	36
1-31 N	12	6	6	6	6	6	36
1-32 N	12	6	6	6	6	6	36
1-33 N	12	6	6	6	6	6	36
1-34 N	12	6	6	6	6	6	36
1-35 N	12	6	6	6	6	6	36
1-36 N	12	6	6	6	6	6	36
1-37 N	12	6	6	6	6	6	36
1-38 N	12	6	6	6	6	6	36
1-39 N	12	6	6	6	6	6	36
1-40 N	12	6	6	6	6	6	36
1-41 N	12	6	6	6	6	6	36
1-42 N	12	6	6	6	6	6	36
1-43 N	12	6	6	6	6	6	36
1-44 N	12	6	6	6	6	6	36
1-45 N	12	6	6	6	6	6	36
1-46 N	12	6	6	6	6	6	36
1-47 N	12	6	6	6	6	6	36
1-48 N	12	6	6	6	6	6	36
1-49 N	12	6	6	6	6	6	36
1-50 N	12	6	6	6	6	6	36
1-51 N	12	6	6	6	6	6	36
1-52 N	12	6	6	6	6	6	36
1-53 N	12	6	6	6	6	6	36
1-54 N	12	6	6	6	6	6	36
1-55 N	12	6	6	6	6	6	36
1-56 N	12	6	6	6	6	6	36
1-57 N	12	6	6	6	6	6	36
1-58 N	12	6	6	6	6	6	36
1-59 N	12	6	6	6	6	6	36
1-60 N	12	6	6	6	6	6	36
1-61 N	12	6	6	6	6	6	36
1-62 N	12	6	6	6	6	6	36
1-63 N	12	6	6	6	6	6	36
1-64 N	12	6	6	6	6	6	36
1-65 N	12	6	6	6	6	6	36
1-66 N	12	6	6	6	6	6	36
1-67 N	12	6	6	6	6	6	36
1-68 N	12	6	6	6	6	6	36
1-69 N	12	6	6	6	6	6	36
1-70 N	12	6	6	6	6	6	36
1-71 N	12	6	6	6	6	6	36
1-72 N	12	6	6	6	6	6	36
1-73 N	12	6	6	6	6	6	36
1-74 N	12	6	6	6	6	6	36
1-75 N	12	6	6	6	6	6	36
1-76 N	12	6	6	6	6	6	36
1-77 N	12	6	6	6	6	6	36
1-78 N	12	6	6	6	6	6	36
1-79 N	12	6	6	6	6	6	36
1-80 N	12	6	6	6	6	6	36
1-81 N	12	6	6	6	6	6	36
1-82 N	12	6	6	6	6	6	36
1-83 N	12	6	6	6	6	6	36
1-84 N	12	6	6	6	6	6	36
1-85 N	12	6	6	6	6	6	36
1-86 N	12	6	6	6	6	6	36
1-87 N	12	6	6	6	6	6	36
1-88 N	12	6	6	6	6	6	36
1-89 N	12	6	6	6	6	6	36
1-90 N	12	6	6	6	6	6	36
1-91 N	12	6	6	6	6	6	36
1-92 N	12	6	6	6	6	6	36
1-93 N	12	6	6	6	6	6	36
1-94 N	12	6	6	6	6	6	36
1-95 N	12	6	6	6	6	6	36
1-96 N	12	6	6	6	6	6	36
1-97 N	12	6	6	6	6	6	36
1-98 N	12	6	6	6	6	6	36
1-99 N	12	6	6	6	6	6	36
1-100 N	12	6	6	6	6	6	36

FIGURE C-12a

EAGLE HARBOR LAKE SUPERIOR DECEMBER
 HARBOR LAKE SUPERIOR DECEMBER
 LATITUDE 47-20' N LONGITUDE 88-17' W

FLIGHT	DIR	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	TOTALS
1-1	S	6	6	6	6	6	6	6	6	6	6
1-1	S	6	6	6	6	6	6	6	6	6	6
1-1	TOT	12	12	12	12	12	12	12	12	12	12
1-2	N	6	6	6	6	6	6	6	6	6	6
1-2	NNE	12	12	12	12	12	12	12	12	12	12
1-2	E	6	6	6	6	6	6	6	6	6	6
1-2	ESE	6	6	6	6	6	6	6	6	6	6
1-2	SE	6	6	6	6	6	6	6	6	6	6
1-2	SSE	6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6
1-2	W	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6
1-2	TOT	42	30	24	54	42	24	24	90	6	6
2-3	N	6	6	6	6	6	6	6	6	6	6
2-3	NNE	6	6	6	6	6	6	6	6	6	6
2-3	NE	6	6	6	6	6	6	6	6	6	6
2-3	ENE	6	6	6	6	6	6	6	6	6	6
2-3	E	6	6	6	6	6	6	6	6	6	6
2-3	ESE	6	6	6	6	6	6	6	6	6	6
2-3	SE	6	6	6	6	6	6	6	6	6	6
2-3	SSE	6	6	6	6	6	6	6	6	6	6
2-3	S	6	6	6	6	6	6	6	6	6	6
2-3	SSW	6	6	6	6	6	6	6	6	6	6
2-3	SW	6	6	6	6	6	6	6	6	6	6
2-3	WSW	6	6	6	6	6	6	6	6	6	6
2-3	W	6	6	6	6	6	6	6	6	6	6
2-3	WNW	6	6	6	6	6	6	6	6	6	6
2-3	TOT	42	30	42	36	24	102	6	6	6	6
3-4	N	6	6	6	6	6	6	6	6	6	6
3-4	NNE	6	6	6	6	6	6	6	6	6	6
3-4	NE	6	6	6	6	6	6	6	6	6	6
3-4	ENE	6	6	6	6	6	6	6	6	6	6
3-4	E	6	6	6	6	6	6	6	6	6	6
3-4	ESE	6	6	6	6	6	6	6	6	6	6
3-4	SE	6	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6	6
3-4	SW	6	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6	6
3-4	W	6	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6	6
3-4	TOT	42	30	42	36	24	102	6	6	6	6
4-5	N	6	6	6	6	6	6	6	6	6	6
4-5	NNE	6	6	6	6	6	6	6	6	6	6
4-5	NE	6	6	6	6	6	6	6	6	6	6
4-5	ENE	6	6	6	6	6	6	6	6	6	6
4-5	E	6	6	6	6	6	6	6	6	6	6
4-5	ESE	6	6	6	6	6	6	6	6	6	6
4-5	SE	6	6	6	6	6	6	6	6	6	6
4-5	SSE	6	6	6	6	6	6	6	6	6	6
4-5	S	6	6	6	6	6	6	6	6	6	6
4-5	SSW	6	6	6	6	6	6	6	6	6	6
4-5	SW	6	6	6	6	6	6	6	6	6	6
4-5	WSW	6	6	6	6	6	6	6	6	6	6
4-5	W	6	6	6	6	6	6	6	6	6	6
4-5	WNW	6	6	6	6	6	6	6	6	6	6
4-5	TOT	42	30	42	36	24	102	6	6	6	6
5-6	N	6	6	6	6	6	6	6	6	6	6
5-6	NNE	6	6	6	6	6	6	6	6	6	6
5-6	NE	6	6	6	6	6	6	6	6	6	6
5-6	ENE	6	6	6	6	6	6	6	6	6	6
5-6	E	6	6	6	6	6	6	6	6	6	6
5-6	ESE	6	6	6	6	6	6	6	6	6	6
5-6	SE	6	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6	6
5-6	SW	6	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6	6
5-6	W	6	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6	6
5-6	TOT	42	30	42	36	24	102	6	6	6	6
6-7	N	6	6	6	6	6	6	6	6	6	6
6-7	NNE	6	6	6	6	6	6	6	6	6	6
6-7	NE	6	6	6	6	6	6	6	6	6	6
6-7	ENE	6	6	6	6	6	6	6	6	6	6
6-7	E	6	6	6	6	6	6	6	6	6	6
6-7	ESE	6	6	6	6	6	6	6	6	6	6
6-7	SE	6	6	6	6	6	6	6	6	6	6
6-7	SSE	6	6	6	6	6	6	6	6	6	6
6-7	S	6	6	6	6	6	6	6	6	6	6
6-7	SSW	6	6	6	6	6	6	6	6	6	6
6-7	SW	6	6	6	6	6	6	6	6	6	6
6-7	WSW	6	6	6	6	6	6	6	6	6	6
6-7	W	6	6	6	6	6	6	6	6	6	6
6-7	WNW	6	6	6	6	6	6	6	6	6	6
6-7	TOT	42	30	42	36	24	102	6	6	6	6

APPENDIX D

FIGURES D-1 thru D-12
WAVE STATISTICS FOR A LOCATION IN
LAKE SUPERIOR NEAR
MARQUETTE, MICHIGAN
(46.67°N, 87.33°W)

FIGURE D-3a

MAQUETTE WAVER SUMRAY
LAKE SUPERIOR, MARCH
LA. 47.00, L. 92.07, LONGITUDE 87.33

WAVE LIGHT	2-1	2-2	2-3	3-4	4-5	5-6	PERIOD (SEC)	7-8	8-9	9-10	TOTALS			
	101	102	103	104	105	106	107	108	109	110	1965	1966	1967	TOTAL
1-1 N	6	6	6	12	6	6					0	0	0	12
1-1 NNE				12	6	6					0	0	0	12
1-1 ENE				6	6	6					0	0	0	6
1-1 E				6	6	6					0	0	0	6
1-1 ESE				6	6	6					0	0	0	6
1-1 SE				6	6	6	18				12	0	0	6
1-1 SSE				6	6	6	12				12	0	0	6
1-1 S				6	6	6	6				6	0	0	6
1-1 SSW				12	6	18	12	12	24		12	0	0	6
1-1 SW				6	6	6	6				12	0	0	6
1-1 WSW				6	6	6	6				12	0	0	6
1-1 W				6	6	6	6				0	0	0	6
1-1 WNW				6	6	6	6				0	0	0	6
1-1 NNW				6	6	6	6				0	0	0	6
1-1 NW				42	12	6	63	24	48	120	6	12	0	18
1-1 TOT				42	12	6	63	24	48	120	6	12	0	18
2-3 N				12	12	6	6				6	0	0	12
2-3 NNE				6	6	6	6				6	0	0	12
2-3 NE				6	6	6	6				6	0	0	12
2-3 ENE				6	6	6	6				6	0	0	12
2-3 E				6	6	6	6				6	0	0	12
2-3 ESE				6	6	6	6				6	0	0	12
2-3 SE				6	6	6	6				6	0	0	12
2-3 SSE				6	6	6	6				6	0	0	12
2-3 S				12	12	24	12				18	0	0	12
2-3 SSW				12	12	24	12				18	0	0	12
2-3 SW				12	12	24	12				18	0	0	12
2-3 SSW				12	12	24	12				18	0	0	12
2-3 SW				12	12	24	12				18	0	0	12
2-3 WSW				12	12	24	12				18	0	0	12
2-3 W				6	6	12	6				0	0	0	6
2-3 WNW				6	6	12	6				0	0	0	6
2-3 NNW				12	12	24	6				0	0	0	6
2-3 TOT				18	66	90	174	30	36	24	90	6	6	12
3-4 N				6	6	6	12	12			6	0	0	6
3-4 NNE				6	6	6	12	12			6	0	0	6
3-4 NE				6	6	6	12	12			6	0	0	6
3-4 ENE				6	6	6	12	12			6	0	0	6
3-4 E				6	6	6	12	12			6	0	0	6
3-4 ESE				6	6	6	12	12			6	0	0	6
3-4 SE				6	6	6	12	12			6	0	0	6
3-4 SSE				6	6	6	12	12			6	0	0	6
3-4 S				6	6	6	12	12			6	0	0	6
3-4 SSW				6	6	6	12	12			6	0	0	6
3-4 SW				6	6	6	12	12			6	0	0	6
3-4 WSW				6	6	6	12	12			6	0	0	6
3-4 W				6	6	6	12	12			6	0	0	6
3-4 WNW				6	6	6	12	12			6	0	0	6
3-4 NNW				6	6	6	12	12			6	0	0	6
3-4 NW				6	6	6	12	12			6	0	0	6
3-4 TOT				6	6	12	36	72	60	168	24	6	12	42
4-5 N				6	6	6	6	6			0	0	0	6
4-5 NNE				6	6	6	6	6			0	0	0	6
4-5 NE				6	6	6	6	6			0	0	0	6
4-5 ENE				6	6	6	6	6			0	0	0	6
4-5 E				6	6	6	6	6			0	0	0	6
4-5 ESE				6	6	6	6	6			0	0	0	6
4-5 SE				6	6	6	6	6			0	0	0	6
4-5 SSE				6	6	6	6	6			0	0	0	6
4-5 S				6	6	6	6	6			0	0	0	6
4-5 SSW				6	6	6	6	6			0	0	0	6
4-5 SW				6	6	6	6	6			0	0	0	6
4-5 WSW				6	6	6	6	6			0	0	0	6
4-5 W				6	6	6	6	6			0	0	0	6
4-5 WNW				6	6	6	6	6			0	0	0	6
4-5 NNW				6	6	6	6	6			0	0	0	6
4-5 NW				6	6	6	6	6			0	0	0	6
4-5 TOT				18	6	18	42	12	48	90	6	18	24	36
5-6 N				6	6	6	6	6			0	0	0	6
5-6 NNE				6	6	6	6	6			0	0	0	6
5-6 NE				6	6	6	6	6			0	0	0	6
5-6 ENE				6	6	6	6	6			0	0	0	6
5-6 E				6	6	6	6	6			0	0	0	6
5-6 ESE				6	6	6	6	6			0	0	0	6
5-6 SE				6	6	6	6	6			0	0	0	6
5-6 SSE				6	6	6	6	6			0	0	0	6
5-6 S				6	6	6	6	6			0	0	0	6
5-6 SSW				6	6	6	6	6			0	0	0	6
5-6 SW				6	6	6	6	6			0	0	0	6
5-6 WSW				6	6	6	6	6			0	0	0	6
5-6 W				6	6	6	6	6			0	0	0	6
5-6 WNW				6	6	6	6	6			0	0	0	6
5-6 NNW				6	6	6	6	6			0	0	0	6
5-6 NW				6	6	6	6	6			0	0	0	6
5-6 TOT				12	30	72	30	24	12	66	12	54	12	336

FIGURE D-3b

WAVE SUMMARY
LAKE SUPERIOR MARCH
MARQUETTE LATITUDE 46.87 LONGITUDE 87.33

CONTINUED

HEIGHT (FT)	DIR	1-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	TOTAL
2-3	N	6	6	6	6	6	6	6	6	6	6
3-4	N	6	6	6	6	6	6	6	6	6	6
4-5	N	6	6	6	6	6	6	6	6	6	6
5-6	N	6	6	6	6	6	6	6	6	6	6
6-7	N	6	6	6	6	6	6	6	6	6	6
7-8	N	6	6	6	6	6	6	6	6	6	6
8-9	N	6	6	6	6	6	6	6	6	6	6
9-10	N	6	6	6	6	6	6	6	6	6	6
10-11	N	6	6	6	6	6	6	6	6	6	6
11-12	N	6	6	6	6	6	6	6	6	6	6
12-13	N	6	6	6	6	6	6	6	6	6	6
13-14	N	6	6	6	6	6	6	6	6	6	6
14-15	N	6	6	6	6	6	6	6	6	6	6
15-16	N	6	6	6	6	6	6	6	6	6	6
16-17	N	6	6	6	6	6	6	6	6	6	6
17-18	N	6	6	6	6	6	6	6	6	6	6
18-19	N	6	6	6	6	6	6	6	6	6	6
19-20	N	6	6	6	6	6	6	6	6	6	6
20-21	N	6	6	6	6	6	6	6	6	6	6
21-22	N	6	6	6	6	6	6	6	6	6	6
22-23	N	6	6	6	6	6	6	6	6	6	6
23-24	N	6	6	6	6	6	6	6	6	6	6
24-25	N	6	6	6	6	6	6	6	6	6	6
TOTAL		0	0	0	0	0	0	0	0	0	0

PERIOD (H)	1-6	7-12	13-18	19-24	25-30	TOTAL
1-6	6	6	6	6	6	6
7-12	6	6	6	6	6	6
13-18	6	6	6	6	6	6
19-24	6	6	6	6	6	6
25-30	6	6	6	6	6	6
TOTAL	30	30	30	30	30	150

1966 CASE 1---ACTUAL PERIOD IS 11-0 SEC
1967 CASE 3---ACTUAL PERIOD IS 10-7 SEC

FIGURE D-5a

WAVE SIMPLIFY
LAKE SUPERIOR, MAY
LOCATION: 46.87°N 87.93°W

HEIGHT	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	TOTAL
(FT) DIR	165	166	167	168	169	170	171	172	173	174	175
5-1 SSW	12	12	6	12	6	12	6	12	6	12	120
5-1 SW	24	6	6	6	6	6	6	6	6	6	120
5-1 S	12	6	6	6	6	6	6	6	6	6	120
5-1 SE	6	6	6	6	6	6	6	6	6	6	120
5-1 E	6	6	6	6	6	6	6	6	6	6	120
5-1 NE	6	6	6	6	6	6	6	6	6	6	120
5-1 N	6	6	6	6	6	6	6	6	6	6	120
5-1 NW	6	6	6	6	6	6	6	6	6	6	120
TOT	60	74	12	6	6	6	6	6	6	6	600
1-2 N	6	6	6	6	6	6	6	6	6	6	120
1-2 NNE	12	12	6	6	6	6	6	6	6	6	120
1-2 NE	6	6	6	6	6	6	6	6	6	6	120
1-2 ENE	6	6	6	6	6	6	6	6	6	6	120
1-2 E	6	6	6	6	6	6	6	6	6	6	120
1-2 ESE	6	6	6	6	6	6	6	6	6	6	120
1-2 SE	6	6	6	6	6	6	6	6	6	6	120
1-2 SSE	6	6	6	6	6	6	6	6	6	6	120
1-2 S	6	6	6	6	6	6	6	6	6	6	120
1-2 SSW	6	6	6	6	6	6	6	6	6	6	120
1-2 SW	6	6	6	6	6	6	6	6	6	6	120
1-2 SSW	6	6	6	6	6	6	6	6	6	6	120
1-2 W	6	6	6	6	6	6	6	6	6	6	120
1-2 WNW	6	6	6	6	6	6	6	6	6	6	120
1-2 NW	6	6	6	6	6	6	6	6	6	6	120
1-2 NNW	6	6	6	6	6	6	6	6	6	6	120
TOT	24	42	42	108	36	42	54	132			600
2-3 N	6	6	6	6	6	6	6	6	6	6	120
2-3 NNE	6	6	6	6	6	6	6	6	6	6	120
2-3 NE	6	6	6	6	6	6	6	6	6	6	120
2-3 ENE	6	6	6	6	6	6	6	6	6	6	120
2-3 E	6	6	6	6	6	6	6	6	6	6	120
2-3 ESE	6	6	6	6	6	6	6	6	6	6	120
2-3 SE	6	6	6	6	6	6	6	6	6	6	120
2-3 SSE	6	6	6	6	6	6	6	6	6	6	120
2-3 S	6	6	6	6	6	6	6	6	6	6	120
2-3 SSW	6	6	6	6	6	6	6	6	6	6	120
2-3 SW	6	6	6	6	6	6	6	6	6	6	120
2-3 SSW	6	6	6	6	6	6	6	6	6	6	120
2-3 W	6	6	6	6	6	6	6	6	6	6	120
2-3 WNW	6	6	6	6	6	6	6	6	6	6	120
2-3 NW	6	6	6	6	6	6	6	6	6	6	120
2-3 NNW	6	6	6	6	6	6	6	6	6	6	120
TOT	36	66	48	180	12	12	12	12	12	12	600
3-4 N	6	6	6	6	6	6	6	6	6	6	120
3-4 NNE	6	6	6	6	6	6	6	6	6	6	120
3-4 NE	6	6	6	6	6	6	6	6	6	6	120
3-4 ENE	6	6	6	6	6	6	6	6	6	6	120
3-4 E	6	6	6	6	6	6	6	6	6	6	120
3-4 ESE	6	6	6	6	6	6	6	6	6	6	120
3-4 SE	6	6	6	6	6	6	6	6	6	6	120
3-4 SSE	6	6	6	6	6	6	6	6	6	6	120
3-4 S	6	6	6	6	6	6	6	6	6	6	120
3-4 SSW	6	6	6	6	6	6	6	6	6	6	120
3-4 SW	6	6	6	6	6	6	6	6	6	6	120
3-4 SSW	6	6	6	6	6	6	6	6	6	6	120
3-4 W	6	6	6	6	6	6	6	6	6	6	120
3-4 WNW	6	6	6	6	6	6	6	6	6	6	120
3-4 NW	6	6	6	6	6	6	6	6	6	6	120
3-4 NNW	6	6	6	6	6	6	6	6	6	6	120
TOT	12	12	24	12	36	66	12	36	54		600
4-5 N	6	6	6	6	6	6	6	6	6	6	120
4-5 NNE	6	6	6	6	6	6	6	6	6	6	120
4-5 NE	6	6	6	6	6	6	6	6	6	6	120
4-5 ENE	6	6	6	6	6	6	6	6	6	6	120
4-5 E	6	6	6	6	6	6	6	6	6	6	120
4-5 ESE	6	6	6	6	6	6	6	6	6	6	120
4-5 SE	6	6	6	6	6	6	6	6	6	6	120
4-5 SSE	6	6	6	6	6	6	6	6	6	6	120
4-5 S	6	6	6	6	6	6	6	6	6	6	120
4-5 SSW	6	6	6	6	6	6	6	6	6	6	120
4-5 SW	6	6	6	6	6	6	6	6	6	6	120
4-5 SSW	6	6	6	6	6	6	6	6	6	6	120
4-5 W	6	6	6	6	6	6	6	6	6	6	120
4-5 WNW	6	6	6	6	6	6	6	6	6	6	120
4-5 NW	6	6	6	6	6	6	6	6	6	6	120
4-5 NNW	6	6	6	6	6	6	6	6	6	6	120
TOT	12	12	24	12	36	66	12	36	54		600
5-6 N	6	6	6	6	6	6	6	6	6	6	120
5-6 NNE	6	6	6	6	6	6	6	6	6	6	120
5-6 NE	6	6	6	6	6	6	6	6	6	6	120
5-6 ENE	6	6	6	6	6	6	6	6	6	6	120
5-6 E	6	6	6	6	6	6	6	6	6	6	120
5-6 ESE	6	6	6	6	6	6	6	6	6	6	120
5-6 SE	6	6	6	6	6	6	6	6	6	6	120
5-6 SSE	6	6	6	6	6	6	6	6	6	6	120
5-6 S	6	6	6	6	6	6	6	6	6	6	120
5-6 SSW	6	6	6	6	6	6	6	6	6	6	120
5-6 SW	6	6	6	6	6	6	6	6	6	6	120
5-6 SSW	6	6	6	6	6	6	6	6	6	6	120
5-6 W	6	6	6	6	6	6	6	6	6	6	120
5-6 WNW	6	6	6	6	6	6	6	6	6	6	120
5-6 NW	6	6	6	6	6	6	6	6	6	6	120
5-6 NNW	6	6	6	6	6	6	6	6	6	6	120
TOT	12	12	24	12	36	66	12	36	54		600
6-7 N	6	6	6	6	6	6	6	6	6	6	120
6-7 NNE	6	6	6	6	6	6	6	6	6	6	120
6-7 NE	6	6	6	6	6	6	6	6	6	6	120
6-7 ENE	6	6	6	6	6	6	6	6	6	6	120
6-7 E	6	6	6	6	6	6	6	6	6	6	120
6-7 ESE	6	6	6	6	6	6	6	6	6	6	120
6-7 SE	6	6	6	6	6	6	6	6	6	6	120
6-7 SSE	6	6	6	6	6	6	6	6	6	6	120
6-7 S	6	6	6	6	6	6	6	6	6	6	120
6-7 SSW	6	6	6	6	6	6	6	6	6	6	120
6-7 SW	6	6	6	6	6	6	6	6	6	6	120
6-7 SSW	6	6	6	6	6	6	6	6	6	6	120
6-7 W	6	6	6	6	6	6	6	6	6	6	120
6-7 WNW	6	6	6	6	6	6	6	6	6	6	120
6-7 NW	6	6	6	6	6	6	6	6	6	6	120
6-7 NNW	6	6	6	6	6	6	6	6	6	6	120
TOT	12	12	24	12	36	66	12	36	54		600

FIGURE D-7

MAVLE SUPPLY MARQUETTE
LAKE SUPERIOR JULY
LATITUDE 46.67 LONGITUDE 87.31

HEIGHT	DIR	165-66	167	TOT	165-66	167	TOT	3-4	4-5	5-6	PERIOD (SEC)	7-8	8-9	9-10	TOTALS		
		17	6	18	12	6	18	6	12	6	4-7	6	6	6	165-66	167	TOT
1-2	N	6	12	18	6	6	12	6	6	6					6	18	24
1-2	NNE	6	6	12	6	6	12	6	6	6					6	6	12
1-2	NE	6	6	12	6	6	12	6	6	6					6	6	12
1-2	ENE	6	6	12	6	6	12	6	6	6					6	6	12
1-2	E	6	6	12	6	6	12	6	6	6					6	6	12
1-2	ESE	6	6	12	6	6	12	6	6	6					6	6	12
1-2	SE	6	6	12	6	6	12	6	6	6					6	6	12
1-2	SSE	6	6	12	6	6	12	6	6	6					6	6	12
1-2	SW	18	6	24	6	6	12	6	6	6					12	6	18
1-2	WSW	6	6	12	6	6	12	6	6	6					6	6	12
1-2	W	6	6	12	6	6	12	6	6	6					6	6	12
1-2	WNW	12	6	18	6	6	12	6	6	6					12	6	18
1-2	NW	6	6	12	6	6	12	6	6	6					6	6	12
1-2	NNW	6	6	12	6	6	12	6	6	6					6	6	12
1-2	TOT	66	48	114	42	34	76	42	34	42	138				108	107	215
2-3	N	6	6	12	6	6	12	6	6	6					6	6	12
2-3	NNE	6	6	12	6	6	12	6	6	6					6	6	12
2-3	NE	6	6	12	6	6	12	6	6	6					6	6	12
2-3	ENE	6	6	12	6	6	12	6	6	6					6	6	12
2-3	E	6	6	12	6	6	12	6	6	6					6	6	12
2-3	ESE	6	6	12	6	6	12	6	6	6					6	6	12
2-3	SE	6	6	12	6	6	12	6	6	6					6	6	12
2-3	SSE	6	6	12	6	6	12	6	6	6					6	6	12
2-3	SW	12	6	18	6	6	12	6	6	6					12	6	18
2-3	WSW	6	6	12	6	6	12	6	6	6					6	6	12
2-3	W	6	6	12	6	6	12	6	6	6					6	6	12
2-3	WNW	6	6	12	6	6	12	6	6	6					6	6	12
2-3	NW	6	6	12	6	6	12	6	6	6					6	6	12
2-3	NNW	6	6	12	6	6	12	6	6	6					6	6	12
2-3	TOT	66	30	96	30	12	42	34							96	42	138
3-4	N	6	6	12	6	6	12	6	6	6					6	6	12
3-4	NNE	6	6	12	6	6	12	6	6	6					6	6	12
3-4	NE	6	6	12	6	6	12	6	6	6					6	6	12
3-4	ENE	6	6	12	6	6	12	6	6	6					6	6	12
3-4	E	6	6	12	6	6	12	6	6	6					6	6	12
3-4	ESE	6	6	12	6	6	12	6	6	6					6	6	12
3-4	SE	6	6	12	6	6	12	6	6	6					6	6	12
3-4	SSE	6	6	12	6	6	12	6	6	6					6	6	12
3-4	SW	6	6	12	6	6	12	6	6	6					6	6	12
3-4	WSW	6	6	12	6	6	12	6	6	6					6	6	12
3-4	W	6	6	12	6	6	12	6	6	6					6	6	12
3-4	WNW	6	6	12	6	6	12	6	6	6					6	6	12
3-4	NW	6	6	12	6	6	12	6	6	6					6	6	12
3-4	NNW	6	6	12	6	6	12	6	6	6					6	6	12
3-4	TOT	66	30	96	30	12	42	34							96	42	138
4-5	N	6	6	12	6	6	12	6	6	6					6	6	12
4-5	NNE	6	6	12	6	6	12	6	6	6					6	6	12
4-5	NE	6	6	12	6	6	12	6	6	6					6	6	12
4-5	ENE	6	6	12	6	6	12	6	6	6					6	6	12
4-5	E	6	6	12	6	6	12	6	6	6					6	6	12
4-5	ESE	6	6	12	6	6	12	6	6	6					6	6	12
4-5	SE	6	6	12	6	6	12	6	6	6					6	6	12
4-5	SSE	6	6	12	6	6	12	6	6	6					6	6	12
4-5	SW	6	6	12	6	6	12	6	6	6					6	6	12
4-5	WSW	6	6	12	6	6	12	6	6	6					6	6	12
4-5	W	6	6	12	6	6	12	6	6	6					6	6	12
4-5	WNW	6	6	12	6	6	12	6	6	6					6	6	12
4-5	NW	6	6	12	6	6	12	6	6	6					6	6	12
4-5	NNW	6	6	12	6	6	12	6	6	6					6	6	12
4-5	TOT	66	30	96	30	12	42	34							96	42	138
5-6	N	6	6	12	6	6	12	6	6	6					6	6	12
5-6	NNE	6	6	12	6	6	12	6	6	6					6	6	12
5-6	NE	6	6	12	6	6	12	6	6	6					6	6	12
5-6	ENE	6	6	12	6	6	12	6	6	6					6	6	12
5-6	E	6	6	12	6	6	12	6	6	6					6	6	12
5-6	ESE	6	6	12	6	6	12	6	6	6					6	6	12
5-6	SE	6	6	12	6	6	12	6	6	6					6	6	12
5-6	SSE	6	6	12	6	6	12	6	6	6					6	6	12
5-6	SW	6	6	12	6	6	12	6	6	6					6	6	12
5-6	WSW	6	6	12	6	6	12	6	6	6					6	6	12
5-6	W	6	6	12	6	6	12	6	6	6					6	6	12
5-6	WNW	6	6	12	6	6	12	6	6	6					6	6	12
5-6	NW	6	6	12	6	6	12	6	6	6					6	6	12
5-6	NNW	6	6	12	6	6	12	6	6	6					6	6	12
5-6	TOT	66	30	96	30	12	42	34							96	42	138
6-7	N	6	6	12	6	6	12	6	6	6					6	6	12
6-7	NNE	6	6	12	6	6	12	6	6	6					6	6	12
6-7	NE	6	6	12	6	6	12	6	6	6					6	6	12
6-7	ENE	6	6	12	6	6	12	6	6	6					6	6	12
6-7	E	6	6	12	6	6	12	6	6	6					6	6	12
6-7	ESE	6	6	12	6	6	12	6	6	6					6	6	12
6-7	SE	6	6	12	6	6	12	6	6	6					6	6	12
6-7	SSE	6	6	12	6	6	12	6	6	6					6	6	12
6-7	SW	6	6	12	6	6	12	6	6	6					6	6	12
6-7	WSW	6	6	12	6	6	12	6	6	6					6	6	12
6-7	W	6	6	12	6	6	12	6	6	6					6	6	12
6-7	WNW	6	6	12	6	6	12	6	6	6					6	6	12
6-7	NW	6	6	12	6	6	12	6	6	6					6	6	12
6-7	NNW	6	6	12	6	6	12	6	6	6					6	6	12
6-7	TOT	66	30	96	30	12	42	34							96	42	138
7-8	N	6	6	12	6	6	12	6	6	6					6	6	12
7-8	NNE	6	6	12	6	6	12										

FIGURE D-9a

MAJORITY LAKE SUPERIOR FORTANER
 WAVE SUMMARY
 LATITUDE 46.47 LONGITUDE 87.33

HEIGHT	WAVE	PERIOD (SEC)	6-7	7-8	8-9	9-10	TOTALS
FT	DIC	105 166 167 107	105 166 167 107	105 166 167 107	105 166 167 107	105 166 167 107	105 166 167 107
5-1	SW	6	6	6	6	6	24
5-1	SW	12	6	6	6	6	24
5-1	W	18	6	6	6	6	24
5-1	W	24	6	6	6	6	24
5-1	W	30	6	6	6	6	24
TOT			30	30	30	30	120
1-2	N	6	6	6	6	6	24
1-2	NE	12	6	6	6	6	24
1-2	NE	18	6	6	6	6	24
1-2	NE	24	6	6	6	6	24
1-2	E	30	6	6	6	6	24
1-2	SE	36	6	6	6	6	24
1-2	SE	42	6	6	6	6	24
1-2	SE	48	6	6	6	6	24
1-2	SW	54	6	6	6	6	24
1-2	SW	60	6	6	6	6	24
1-2	SW	66	6	6	6	6	24
1-2	W	72	6	6	6	6	24
1-2	W	78	6	6	6	6	24
1-2	W	84	6	6	6	6	24
1-2	WNW	90	6	6	6	6	24
1-2	WNW	96	6	6	6	6	24
1-2	WNW	102	6	6	6	6	24
TOT			66	24	54	144	308
2-3	N	6	6	6	6	6	24
2-3	NNE	12	6	6	6	6	24
2-3	NNE	18	6	6	6	6	24
2-3	NNE	24	6	6	6	6	24
2-3	ENE	30	6	6	6	6	24
2-3	ENE	36	6	6	6	6	24
2-3	ENE	42	6	6	6	6	24
2-3	E	48	6	6	6	6	24
2-3	E	54	6	6	6	6	24
2-3	E	60	6	6	6	6	24
2-3	E	66	6	6	6	6	24
2-3	E	72	6	6	6	6	24
2-3	E	78	6	6	6	6	24
2-3	E	84	6	6	6	6	24
2-3	E	90	6	6	6	6	24
2-3	E	96	6	6	6	6	24
2-3	E	102	6	6	6	6	24
TOT			54	24	108	24	210
3-4	N	6	6	6	6	6	24
3-4	NNE	12	6	6	6	6	24
3-4	NNE	18	6	6	6	6	24
3-4	NNE	24	6	6	6	6	24
3-4	ENE	30	6	6	6	6	24
3-4	ENE	36	6	6	6	6	24
3-4	ENE	42	6	6	6	6	24
3-4	E	48	6	6	6	6	24
3-4	E	54	6	6	6	6	24
3-4	E	60	6	6	6	6	24
3-4	E	66	6	6	6	6	24
3-4	E	72	6	6	6	6	24
3-4	E	78	6	6	6	6	24
3-4	E	84	6	6	6	6	24
3-4	E	90	6	6	6	6	24
3-4	E	96	6	6	6	6	24
3-4	E	102	6	6	6	6	24
TOT			6	6	6	6	24
4-5	N	6	6	6	6	6	24
4-5	NNE	12	6	6	6	6	24
4-5	NNE	18	6	6	6	6	24
4-5	NNE	24	6	6	6	6	24
4-5	ENE	30	6	6	6	6	24
4-5	ENE	36	6	6	6	6	24
4-5	ENE	42	6	6	6	6	24
4-5	E	48	6	6	6	6	24
4-5	E	54	6	6	6	6	24
4-5	E	60	6	6	6	6	24
4-5	E	66	6	6	6	6	24
4-5	E	72	6	6	6	6	24
4-5	E	78	6	6	6	6	24
4-5	E	84	6	6	6	6	24
4-5	E	90	6	6	6	6	24
4-5	E	96	6	6	6	6	24
4-5	E	102	6	6	6	6	24
TOT			6	6	6	6	24
5-6	N	6	6	6	6	6	24
5-6	NNE	12	6	6	6	6	24
5-6	NNE	18	6	6	6	6	24
5-6	NNE	24	6	6	6	6	24
5-6	ENE	30	6	6	6	6	24
5-6	ENE	36	6	6	6	6	24
5-6	ENE	42	6	6	6	6	24
5-6	E	48	6	6	6	6	24
5-6	E	54	6	6	6	6	24
5-6	E	60	6	6	6	6	24
5-6	E	66	6	6	6	6	24
5-6	E	72	6	6	6	6	24
5-6	E	78	6	6	6	6	24
5-6	E	84	6	6	6	6	24
5-6	E	90	6	6	6	6	24
5-6	E	96	6	6	6	6	24
5-6	E	102	6	6	6	6	24
TOT			6	6	6	6	24
6-7	N	6	6	6	6	6	24
6-7	NNE	12	6	6	6	6	24
6-7	NNE	18	6	6	6	6	24
6-7	NNE	24	6	6	6	6	24
6-7	ENE	30	6	6	6	6	24
6-7	ENE	36	6	6	6	6	24
6-7	ENE	42	6	6	6	6	24
6-7	E	48	6	6	6	6	24
6-7	E	54	6	6	6	6	24
6-7	E	60	6	6	6	6	24
6-7	E	66	6	6	6	6	24
6-7	E	72	6	6	6	6	24
6-7	E	78	6	6	6	6	24
6-7	E	84	6	6	6	6	24
6-7	E	90	6	6	6	6	24
6-7	E	96	6	6	6	6	24
6-7	E	102	6	6	6	6	24
TOT			6	6	6	6	24
7-8	N	6	6	6	6	6	24
7-8	NNE	12	6	6	6	6	24
7-8	NNE	18	6	6	6	6	24
7-8	NNE	24	6	6	6	6	24
7-8	ENE	30	6	6	6	6	24
7-8	ENE	36	6	6	6	6	24
7-8	ENE	42	6	6	6	6	24
7-8	E	48	6	6	6	6	24
7-8	E	54	6	6	6	6	24
7-8	E	60	6	6	6	6	24
7-8	E	66	6	6	6	6	24
7-8	E	72	6	6	6	6	24
7-8	E	78	6	6	6	6	24
7-8	E	84	6	6	6	6	24
7-8	E	90	6	6	6	6	24
7-8	E	96	6	6	6	6	24
7-8	E	102	6	6	6	6	24
TOT			6	6	6	6	24
8-9	N	6	6	6	6	6	24
8-9	NNE	12	6	6	6	6	24
8-9	NNE	18	6	6	6	6	24
8-9	NNE	24	6	6	6	6	24
8-9	ENE	30	6	6	6	6	24
8-9	ENE	36	6	6	6	6	24
8-9	ENE	42	6	6	6	6	24
8-9	E	48	6	6	6	6	24
8-9	E	54	6	6	6	6	24
8-9	E	60	6	6	6	6	24
8-9	E	66	6	6	6	6	24
8-9	E	72	6	6	6	6	24
8-9	E	78	6	6	6	6	24
8-9	E	84	6	6	6	6	24
8-9	E	90	6	6	6	6	24
8-9	E	96	6	6	6	6	24
8-9	E	102	6	6	6	6	24
TOT			6	6	6	6	24
9-10	N	6	6	6	6	6	24
9-10	NNE	12	6	6	6	6	24
9-10	NNE	18	6	6	6	6	24
9-10	NNE	24	6	6	6	6	24
9-10	ENE	30	6	6	6	6	24
9-10	ENE	36	6	6	6	6	24
9-10	ENE	42	6	6	6	6	24
9-10	E	48	6	6	6	6	24
9-10	E	54	6	6	6	6	24
9-10	E	60	6	6	6	6	24
9-10	E	66	6	6	6	6	24
9-10	E	72	6	6	6	6	24
9-10	E	78	6	6	6	6	24
9-10	E	84	6	6	6	6	24
9-10	E	90	6	6	6	6	24
9-10	E	96	6	6	6	6	24
9-10	E	102	6	6	6	6	24
TOT			6	6	6	6	24

FIGURE D-11a

MARQUETTE LAKE SUPERIOR NOVEMBER
 WAVE SUMMARY
 LATITUDE 46-07 LONGITUDE 87-33

HEIGHT	DIR	'65 '66 '67 TOT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	TOTALS
(FT)		2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	
1-2	N	6	6	6	6	6	6	6	6	6	6	6
1-2	NNE	6	6	6	6	6	6	6	6	6	6	6
1-2	NE	6	6	6	6	6	6	6	6	6	6	6
1-2	ENE	6	6	6	6	6	6	6	6	6	6	6
1-2	E	6	6	6	6	6	6	6	6	6	6	6
1-2	ESE	6	6	6	6	6	6	6	6	6	6	6
1-2	SSE	6	6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6	6
1-2	W	6	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6	6
1-2	NW	6	6	6	6	6	6	6	6	6	6	6
1-2	NNW	6	6	6	6	6	6	6	6	6	6	6
1-2	N	48	30	72	150	54	42	48	144			302
2-2	N	6	6	6	6	6	6	6	6	6	6	6
2-2	NNE	6	6	6	6	6	6	6	6	6	6	6
2-2	NE	6	6	6	6	6	6	6	6	6	6	6
2-2	ENE	6	6	6	6	6	6	6	6	6	6	6
2-2	E	6	6	6	6	6	6	6	6	6	6	6
2-2	ESE	6	6	6	6	6	6	6	6	6	6	6
2-2	SSE	6	6	6	6	6	6	6	6	6	6	6
2-2	S	6	6	6	6	6	6	6	6	6	6	6
2-2	SSW	6	6	6	6	6	6	6	6	6	6	6
2-2	SW	6	6	6	6	6	6	6	6	6	6	6
2-2	WSW	6	6	6	6	6	6	6	6	6	6	6
2-2	W	6	6	6	6	6	6	6	6	6	6	6
2-2	WNW	6	6	6	6	6	6	6	6	6	6	6
2-2	NW	6	6	6	6	6	6	6	6	6	6	6
2-2	NNW	6	6	6	6	6	6	6	6	6	6	6
2-2	N	60	84	48	192	48	24	36	108	6	6	308
3-4	N	6	6	6	6	6	6	6	6	6	6	6
3-4	NNE	6	6	6	6	6	6	6	6	6	6	6
3-4	NE	6	6	6	6	6	6	6	6	6	6	6
3-4	ENE	6	6	6	6	6	6	6	6	6	6	6
3-4	E	6	6	6	6	6	6	6	6	6	6	6
3-4	ESE	6	6	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6	6	6
3-4	SW	6	6	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6	6	6
3-4	W	6	6	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6	6	6
3-4	NW	6	6	6	6	6	6	6	6	6	6	6
3-4	NNW	6	6	6	6	6	6	6	6	6	6	6
3-4	N	12	6	18	48	48	144	18	18	36		308
4-5	N	6	6	6	6	6	6	6	6	6	6	6
4-5	NNE	6	6	6	6	6	6	6	6	6	6	6
4-5	NE	6	6	6	6	6	6	6	6	6	6	6
4-5	ENE	6	6	6	6	6	6	6	6	6	6	6
4-5	E	6	6	6	6	6	6	6	6	6	6	6
4-5	ESE	6	6	6	6	6	6	6	6	6	6	6
4-5	SSE	6	6	6	6	6	6	6	6	6	6	6
4-5	S	6	6	6	6	6	6	6	6	6	6	6
4-5	SSW	6	6	6	6	6	6	6	6	6	6	6
4-5	SW	6	6	6	6	6	6	6	6	6	6	6
4-5	WSW	6	6	6	6	6	6	6	6	6	6	6
4-5	W	6	6	6	6	6	6	6	6	6	6	6
4-5	WNW	6	6	6	6	6	6	6	6	6	6	6
4-5	NW	6	6	6	6	6	6	6	6	6	6	6
4-5	NNW	6	6	6	6	6	6	6	6	6	6	6
4-5	N	6	6	6	6	6	6	6	6	6	6	6
5-6	N	6	6	6	6	6	6	6	6	6	6	6
5-6	NNE	6	6	6	6	6	6	6	6	6	6	6
5-6	NE	6	6	6	6	6	6	6	6	6	6	6
5-6	ENE	6	6	6	6	6	6	6	6	6	6	6
5-6	E	6	6	6	6	6	6	6	6	6	6	6
5-6	ESE	6	6	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6	6	6
5-6	SW	6	6	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6	6	6
5-6	W	6	6	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6	6	6
5-6	NW	6	6	6	6	6	6	6	6	6	6	6
5-6	NNW	6	6	6	6	6	6	6	6	6	6	6
5-6	N	6	6	6	6	6	6	6	6	6	6	6
6-7	N	6	6	6	6	6	6	6	6	6	6	6
6-7	NNE	6	6	6	6	6	6	6	6	6	6	6
6-7	NE	6	6	6	6	6	6	6	6	6	6	6
6-7	ENE	6	6	6	6	6	6	6	6	6	6	6
6-7	E	6	6	6	6	6	6	6	6	6	6	6
6-7	ESE	6	6	6	6	6	6	6	6	6	6	6
6-7	SSE	6	6	6	6	6	6	6	6	6	6	6
6-7	S	6	6	6	6	6	6	6	6	6	6	6
6-7	SSW	6	6	6	6	6	6	6	6	6	6	6
6-7	SW	6	6	6	6	6	6	6	6	6	6	6
6-7	WSW	6	6	6	6	6	6	6	6	6	6	6
6-7	W	6	6	6	6	6	6	6	6	6	6	6
6-7	WNW	6	6	6	6	6	6	6	6	6	6	6
6-7	NW	6	6	6	6	6	6	6	6	6	6	6
6-7	NNW	6	6	6	6	6	6	6	6	6	6	6
6-7	N	6	6	6	6	6	6	6	6	6	6	6
TOT		12	6	18	48	48	144	18	18	36		308

APPENDIX E

FIGURES E-1 thru E-12
WAVE STATISTICS FOR A LOCATION IN
LAKE SUPERIOR NEAR
WHITEFISH POINT, MICHIGAN
(46.83°N, 85.00°W)

FIGURE E-6

WHITEFISH POINT NAVAL SURVEY LAKE ERIE JUNE
 LATITUDE 46-03 LONGITUDE 85-00

HEIGHT	4-2	4-3	4-4	4-5	7-R	8-9	9-10	TOTALS				
FEET	0-1	1-2	2-3	3-4	4-5	5-6	6-7	1965	1966	1967	TOTAL	
4-1 SSW	6	6	6	6	6	6	6	6	6	6	0	12
4-2 S	18	42	24	84	6	6	6	18	42	24	6	54
4-3 W	6	6	6	6	6	6	6	6	6	6	6	12
4-4 WSW	24	54	30	108	6	6	6	24	54	30	6	103
TOT	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NNE	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NE	6	6	6	6	6	6	6	6	6	6	6	6
1-2 ENE	6	6	6	6	6	6	6	6	6	6	6	6
1-2 E	6	6	6	6	6	6	6	6	6	6	6	6
1-2 ESE	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SE	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SSE	6	6	6	6	6	6	6	6	6	6	6	6
1-2 S	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SSW	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SW	6	6	6	6	6	6	6	6	6	6	6	6
1-2 WSW	6	6	6	6	6	6	6	6	6	6	6	6
1-2 W	6	6	6	6	6	6	6	6	6	6	6	6
1-2 WNW	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NNW	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NW	6	6	6	6	6	6	6	6	6	6	6	6
TOT	54	54	42	150	84	54	48	186	138	108	90	336
2-3 N	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NNE	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NE	6	6	6	6	6	6	6	6	6	6	6	6
2-3 ENE	6	6	6	6	6	6	6	6	6	6	6	6
2-3 E	6	6	6	6	6	6	6	6	6	6	6	6
2-3 ESE	6	6	6	6	6	6	6	6	6	6	6	6
2-3 SE	6	6	6	6	6	6	6	6	6	6	6	6
2-3 SSE	6	6	6	6	6	6	6	6	6	6	6	6
2-3 S	6	6	6	6	6	6	6	6	6	6	6	6
2-3 SSW	6	6	6	6	6	6	6	6	6	6	6	6
2-3 SW	6	6	6	6	6	6	6	6	6	6	6	6
2-3 WSW	6	6	6	6	6	6	6	6	6	6	6	6
2-3 W	6	6	6	6	6	6	6	6	6	6	6	6
2-3 WNW	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NNW	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NW	6	6	6	6	6	6	6	6	6	6	6	6
TOT	90	92	36	168	48	18	72	6	6	6	6	240
3-4 N	6	6	6	6	6	6	6	6	6	6	6	6
3-4 NNE	6	6	6	6	6	6	6	6	6	6	6	6
3-4 NE	6	6	6	6	6	6	6	6	6	6	6	6
3-4 ENE	6	6	6	6	6	6	6	6	6	6	6	6
3-4 E	6	6	6	6	6	6	6	6	6	6	6	6
3-4 ESE	6	6	6	6	6	6	6	6	6	6	6	6
3-4 SE	6	6	6	6	6	6	6	6	6	6	6	6
3-4 SSE	6	6	6	6	6	6	6	6	6	6	6	6
3-4 S	6	6	6	6	6	6	6	6	6	6	6	6
3-4 SSW	6	6	6	6	6	6	6	6	6	6	6	6
3-4 SW	6	6	6	6	6	6	6	6	6	6	6	6
3-4 WSW	6	6	6	6	6	6	6	6	6	6	6	6
3-4 W	6	6	6	6	6	6	6	6	6	6	6	6
3-4 WNW	6	6	6	6	6	6	6	6	6	6	6	6
3-4 NNW	6	6	6	6	6	6	6	6	6	6	6	6
3-4 NW	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6
4-5 N	6	6	6	6	6	6	6	6	6	6	6	6
4-5 NNE	6	6	6	6	6	6	6	6	6	6	6	6
4-5 NE	6	6	6	6	6	6	6	6	6	6	6	6
4-5 ENE	6	6	6	6	6	6	6	6	6	6	6	6
4-5 E	6	6	6	6	6	6	6	6	6	6	6	6
4-5 ESE	6	6	6	6	6	6	6	6	6	6	6	6
4-5 SE	6	6	6	6	6	6	6	6	6	6	6	6
4-5 SSE	6	6	6	6	6	6	6	6	6	6	6	6
4-5 S	6	6	6	6	6	6	6	6	6	6	6	6
4-5 SSW	6	6	6	6	6	6	6	6	6	6	6	6
4-5 SW	6	6	6	6	6	6	6	6	6	6	6	6
4-5 WSW	6	6	6	6	6	6	6	6	6	6	6	6
4-5 W	6	6	6	6	6	6	6	6	6	6	6	6
4-5 WNW	6	6	6	6	6	6	6	6	6	6	6	6
4-5 NNW	6	6	6	6	6	6	6	6	6	6	6	6
4-5 NW	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6
TOTAL CALM	0	0	0	0	0	0	0	0	0	0	0	0
UNCERTAIN DATA	0	0	0	0	0	0	0	0	0	0	0	0
HOURS IN MONTH	78	114	72	264	174	102	84	360	84	18	54	216
TOTAL	396	258	216	870	324	456	504	1204	0	6	6	6
TOTAL	720	720	720	2160	720	720	720	2160	0	6	6	6

UNCERTAIN DATA
 HOURS IN MONTH

FIGURE E-11a

WHITEFISH POINT LAKE SUPERIOR NOVEMBER
 LATITUDE 46.93 LONGITUDE 89.00

HEIGHT	DIR	PERC	SEC	4-5	5-6	6-7	7-8	8-9	TOTALS
1-1	SSW	6	18	24	6	6	6	6	6
1-2	N	6	6	6	6	6	6	6	6
1-2	N	6	6	6	6	6	6	6	6
1-2	NNE	12	12						12
1-2	NE	12	12						12
1-2	ENE	6	6	12					18
1-2	E	6	6	6					12
1-2	ESE	6	6	6					12
1-2	SE	12	12	24					36
1-2	SSE	6	6	6					12
1-2	S	6	6	6					12
1-2	SSW	6	6	6					12
1-2	SSW	6	18	6	30	12	48		108
1-2	SSW	6	6	6	6	6	18		36
1-2	WSW	6	12	6	24				42
1-2	W	6	6	6					12
1-2	WNW	6	6	6					12
1-2	NW	24	78	30	132	54	78	66	150
1-2	TOT								336
2-3	N	6	6	6	12	6	6		36
2-3	NNE	6	6	6	12	6	6		36
2-3	NE	6	6	12	18	12	6		42
2-3	ENE	6	6	6	6				18
2-3	E	6	6	6	6				18
2-3	ESE	6	6	6	6				18
2-3	SE	6	6	6	6				18
2-3	SSE	6	6	6	6				18
2-3	S	18	18	18	6	6			54
2-3	SSW	18	18	36	6	6			66
2-3	SSW	18	18	18	54	6			108
2-3	WSW	12	6	6	6				24
2-3	W	12	6	6	6				24
2-3	WNW	6	6	6	6				12
2-3	NW	6	6	6	6				12
2-3	TOT	60	66	60	180	48	36	54	180
3-4	N	12	12	6	6	12			36
3-4	NNE	12	6	6	6	6			30
3-4	NE	6	6	12	6	18			36
3-4	ENE	6	12	6	18				36
3-4	E	6	6	6	6				24
3-4	ESE	6	6	6	6				24
3-4	SE	6	6	6	6				24
3-4	SSE	6	6	6	6				24
3-4	S	6	6	6	6				24
3-4	SSW	6	6	6	6				24
3-4	SSW	6	6	6	6				24
3-4	WSW	6	6	6	6				24
3-4	W	6	6	6	6				24
3-4	WNW	6	6	6	6				24
3-4	NW	6	6	6	6				24
3-4	TOT	6	6	24	42	60	126	12	240
4-5	N	6	6	6	6	6			24
4-5	NNE	6	6	6	6	6			24
4-5	NE	6	6	6	6	6			24
4-5	ENE	6	6	6	6	6			24
4-5	E	6	6	6	6	6			24
4-5	ESE	6	6	6	6	6			24
4-5	SE	6	6	6	6	6			24
4-5	SSE	6	6	6	6	6			24
4-5	S	6	6	6	6	6			24
4-5	SSW	6	6	6	6	6			24
4-5	SSW	6	6	6	6	6			24
4-5	WSW	6	6	6	6	6			24
4-5	W	6	6	6	6	6			24
4-5	WNW	6	6	6	6	6			24
4-5	NW	6	6	6	6	6			24
4-5	TOT	6	6	24	42	30	64	12	120
5-6	N	12	12	6	6				36
5-6	NNE	12	12	6	6				36
5-6	NE	12	6	6	6				30
5-6	ENE	6	6	6	6				24
5-6	E	6	6	6	6				24
5-6	ESE	6	6	6	6				24
5-6	SE	6	6	6	6				24
5-6	SSE	6	6	6	6				24
5-6	S	6	6	6	6				24
5-6	SSW	6	6	6	6				24
5-6	SSW	6	6	6	6				24
5-6	WSW	6	6	6	6				24
5-6	W	6	6	6	6				24
5-6	WNW	6	6	6	6				24
5-6	NW	6	6	6	6				24
5-6	TOT	24	18	18	60	12	6	12	120

FIGURE E-11b

WHITEFISH POINT LAKE SURVEY NOVEMBER
LATITUDE 46.83 LONGITUDE 85.00

CONTINUED

HEIGHT	DIF	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(FT)		107 TOT	107 TOT	107 TOT	107 TOT	107 TOT	107 TOT	107 TOT	107 TOT	1965 1966 1967 TOTAL
6-7 NNE										0 6 6 12
6-7 E										0 6 6 12
6-7 NNW										0 6 6 12
6-7 NW										0 6 6 12
6-7 N										0 6 6 12
6-7 NNW										0 6 6 12
6-7 TOT										0 6 6 12
7-8 NNE										0 6 6 12
7-8 E										0 6 6 12
7-8 NNW										0 6 6 12
7-8 NW										0 6 6 12
7-8 N										0 6 6 12
7-8 NNW										0 6 6 12
7-8 TOT										0 6 6 12
8-9 ENE										0 6 6 12
8-9 E										0 6 6 12
8-9 NNW										0 6 6 12
8-9 TOT										0 6 6 12
9-10 NNE										0 6 6 12
9-10 NE										0 6 6 12
9-10 NW										0 6 6 12
9-10 TOT										0 6 6 12
10-11 NNE										0 6 6 12
10-11 NE										0 6 6 12
10-11 NW										0 6 6 12
10-11 TOT										0 6 6 12
11-12 N										0 6 6 12
11-12 NE										0 6 6 12
11-12 ENE										0 6 6 12
11-12 SE										0 6 6 12
11-12 S										0 6 6 12
11-12 SW										0 6 6 12
11-12 WNW										0 6 6 12
11-12 NW										0 6 6 12
11-12 NNW										0 6 6 12
11-12 TOT										0 6 6 12
12-13 SE										0 6 6 12
13-14 W										0 6 6 12
14-15 WNW										0 6 6 12
15-16 ENE										0 6 6 12
16-17 WNW										0 6 6 12
17-18 NE										0 6 6 12
17-18 ENE										0 6 6 12
17-18 TOT										0 6 6 12
19-20 NE										0 6 6 12
23-24 ENE										0 6 6 12
TOTAL	C C C	0 24 84 48 156 114 150 126 390 76 102 120 300 66 78 90 234 42 54 72 168 42 42 6 90 42 18 C 60 12 24 0 36 C C C	0 42 552 482 3434							
UNCERTAIN DATA										300 144 234 678
REGLES IN PERM										0 24 24 48 120 120 780 2160

FIGURE E-12a

NAVE SURVIVARY
WHITEFISH POINT LAKE SUPERIOR DECEMBER
LATITUDE 46.23 LONGITUDE 85.00

HEIGHT	DIR	'65 '66 '67 TOT	2-2	3-4	5-6	PERICC (SEC)	6-7	7-8	8-9	9-10	TOTALS
(FT)		'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	'65 '66 '67 TCT	1925 1926 1967 TOTAL
1-2	ENE	24	6	12							6 24 6 36
1-2	ENE	6	6	12							6 6 6 18
1-2	E	12	12	6	18						12 12 6 30
1-2	SSE	6	6	12	18	6	24				6 6 12 24 30
1-2	S	6	12	18	6	6					6 6 12 24 30
1-2	SSW	6	12	18	6	24					6 12 18 6 30
1-2	SW	24	12	36	6	12					24 6 18 48
1-2	WSW	6	6	12	6	12					6 6 12 6 30
1-2	W	6	6	12	18	6	24				6 6 12 6 30
1-2	WNW	6	6	6	6	6					6 6 6 6 24
1-2	NNW	6	6	6	6	6					6 6 6 6 24
1-2	TOT	42	42	36	120	54	72	36	162		66 114 72 252
2-3	N		6	6	12						6 6 12 18
2-3	NNE		6	6	12						6 6 12 18
2-3	NE	6	6	6	12	12	24				6 6 6 12 24
2-3	ESE	18	6	12	12	12					12 6 12 12 30
2-3	SE	6	18	24							6 18 24 48
2-3	SSE	12	24	12	6	18					12 24 12 6 30
2-3	S	12	6	12	18	6					12 6 12 18 30
2-3	SSW	12	6	12	18	6					12 6 12 18 30
2-3	SW	12	6	12	12	24					12 6 12 12 30
2-3	WSW	12	6	12	12	12					12 6 12 12 30
2-3	W	6	6	6	6	6					6 6 6 6 24
2-3	WNW	6	6	6	6	6					6 6 6 6 24
2-3	NNW	6	6	6	6	6					6 6 6 6 24
2-3	TOT	66	42	66	174	66	48	60	174		66 48 60 174
3-4	N		6	12	18	6	6				6 18 6 24
3-4	NNE		6	12	12	6	6				6 12 12 6 24
3-4	NE	12	12	6	24	6					12 12 6 24 30
3-4	E	12	18	30							12 18 30 42
3-4	ESE	6	6	12	6	12					6 6 12 6 30
3-4	SE	12	18	30							12 18 30 42
3-4	SSE	6	6	18	30						6 6 18 30 42
3-4	S	12	6	18	30						12 6 18 30 42
3-4	SSW	12	6	18	30						12 6 18 30 42
3-4	SW	12	6	12	24						12 6 12 24 30
3-4	WSW	6	6	12	24						6 6 12 24 30
3-4	W	6	6	6	6	6					6 6 6 6 24
3-4	WNW	6	6	6	6	6					6 6 6 6 24
3-4	TOT	12	6	18	102	72	34	12	6	18	12 6 18 102 72 34
4-5	N		6	6	12						6 6 12 18
4-5	NNE		6	6	12						6 6 12 18
4-5	NE	6	6	6	6	6					6 6 6 6 24
4-5	E	6	6	6	6	6					6 6 6 6 24
4-5	ESE	6	6	6	6	6					6 6 6 6 24
4-5	SE	6	6	6	6	6					6 6 6 6 24
4-5	SSE	6	6	6	6	6					6 6 6 6 24
4-5	S	6	6	6	6	6					6 6 6 6 24
4-5	SSW	6	6	6	6	6					6 6 6 6 24
4-5	SW	6	6	6	6	6					6 6 6 6 24
4-5	WSW	6	6	6	6	6					6 6 6 6 24
4-5	W	6	6	6	6	6					6 6 6 6 24
4-5	WNW	6	6	6	6	6					6 6 6 6 24
4-5	NNW	6	6	6	6	6					6 6 6 6 24
4-5	TOT	12	24	12	48	30	24	30	84	32	12 24 30 84 32 12 24
5-6	N		6	6	6	6					6 6 6 6 24
5-6	NNE		6	6	6	6					6 6 6 6 24
5-6	NE	6	6	6	6	6					6 6 6 6 24
5-6	E	6	6	6	6	6					6 6 6 6 24
5-6	ESE	6	6	6	6	6					6 6 6 6 24
5-6	SE	6	6	6	6	6					6 6 6 6 24
5-6	SSE	6	6	6	6	6					6 6 6 6 24
5-6	S	6	6	6	6	6					6 6 6 6 24
5-6	SSW	6	6	6	6	6					6 6 6 6 24
5-6	SW	6	6	6	6	6					6 6 6 6 24
5-6	WSW	6	6	6	6	6					6 6 6 6 24
5-6	W	6	6	6	6	6					6 6 6 6 24
5-6	WNW	6	6	6	6	6					6 6 6 6 24
5-6	NNW	6	6	6	6	6					6 6 6 6 24
5-6	TOT	6	6	6	6	6					6 6 6 6 24

APPENDIX F

FIGURES F-1 thru F-12
WAVE STATISTICS FOR A LOCATION IN
LAKE SUPERIOR NEAR
SLATE ISLAND, ONTARIO
(48.67°N, 86.83°W)

FIGURE F-1b

STATE ISLAND LAKE SUPERIOR JANUARY
 LATITUDE 49.07 LONGITUDE 86.83

CONTINUED

HEIGHT (FT)	DIR	<2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOT	TOTALS
		05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	05 06 07 TOT	1967 1968 1969 TOTAL
7-8	N	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	NNE	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	ENE	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	ESE	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	E	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	SE	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	SW	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	S	6	6	6	6	6	6	6	6	6	6	0 0 0
7-8	TOT	5	12	12	10	12	14	30	6	6	6	24 12 30 66
8-9	NNE	6	6	6	6	6	6	6	6	6	6	0 0 0
8-9	E	6	6	6	6	6	6	6	6	6	6	0 0 0
8-9	SSE	6	6	6	6	6	6	6	6	6	6	0 0 0
8-9	SW	6	6	6	6	6	6	6	6	6	6	0 0 0
8-9	TOT	6	6	6	6	6	6	6	6	6	6	12 6 18 36
9-10	NE	6	6	6	6	6	6	6	6	6	6	0 0 0
9-10	E	6	6	6	6	6	6	6	6	6	6	0 0 0
9-10	ESE	6	6	6	6	6	6	6	6	6	6	0 0 0
9-10	SSE	6	6	6	6	6	6	6	6	6	6	0 0 0
9-10	SSW	6	6	6	6	6	6	6	6	6	6	0 0 0
9-10	WSW	6	6	6	6	6	6	6	6	6	6	0 0 0
9-10	TOT	6	6	6	6	6	6	6	6	6	6	6 12 12 36
10-11	NE	6	6	6	6	6	6	6	6	6	6	0 0 0
10-11	E	6	6	6	6	6	6	6	6	6	6	0 0 0
10-11	ESE	6	6	6	6	6	6	6	6	6	6	0 0 0
10-11	SSE	6	6	6	6	6	6	6	6	6	6	0 0 0
10-11	SSW	6	6	6	6	6	6	6	6	6	6	0 0 0
10-11	WSW	6	6	6	6	6	6	6	6	6	6	0 0 0
10-11	TOT	24	24	6	6	6	6	6	6	6	6	6 6 36 48
11-12	S	6	6	6	6	6	6	6	6	6	6	0 0 0
11-12	TOT	6	6	6	6	6	6	6	6	6	6	6 6 6 18
12-13	N	6	6	6	6	6	6	6	6	6	6	0 0 0
13-14	SE	6	6	6	6	6	6	6	6	6	6	0 0 0
14-15	ESE	6	6	6	6	6	6	6	6	6	6	0 0 0
14-15	WSW	6	6	6	6	6	6	6	6	6	6	0 0 0
14-15	TOT	6	6	6	6	6	6	6	6	6	6	0 0 0
15-16	ESE	6	6	6	6	6	6	6	6	6	6	0 0 0
15-16	SSW	6	6	6	6	6	6	6	6	6	6	0 0 0
15-16	TOT	6	6	6	6	6	6	6	6	6	6	0 0 0
18-19	WSW	6	6	6	6	6	6	6	6	6	6	0 0 0
>30	SW	6	6	6	6	6	6	6	6	6	6	0 0 0
TOTAL		0	6	0	5	6	6	6	6	6	6	222 408 510 1140
UNCERTAIN DATA												132 42 102 276
HOURS IN MONTH												390 282 132 804
												744 732 744 2220

1967 CASE 1---ACTUAL PERIOD IS 13.3 SEC

COUNT ENDED

HEIGHT	62	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTALS			
FILEDIP	65	66	67	68	69	70	71	72	73	74	1965	1966	1967	TOTAL
22-13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MONTH	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0

UNEMPLOYED
 MONTHS IN MONTH
 1965 CASE 1--ACTUAL PERIOD IS 10.0 SEC
 1967 CASE 1--NORMAL PERIOD IS 11.5 SEC

312 672 360 177
 672 672 360 17706

FIGURE 3

ISLAND NAME SURVEY PERIOD MARCH
 SLATE LATITUDE 48.67 LONGITUDE 88.83

HEIGHT (FT)	D14	65 166 167 TOT	2-3	3-4	4-5	5-6	6-7	7-8	8-9	TOTAL
		65 166 167 TOT	65 166 167 TOT	65 166 167 TOT	65 166 167 TOT	65 166 167 TOT	65 166 167 TOT	65 166 167 TOT	65 166 167 TOT	65 166 167 TOT
		12 6 6 24	6 6 12 12 12 24	6 6 12 12 12 24	6 6 12 12 12 24	6 6 12 12 12 24	6 6 12 12 12 24	6 6 12 12 12 24	6 6 12 12 12 24	6 6 12 12 12 24
1-2	N	6	6	6	6	6	6	6	6	6
1-2	NNE	6	6	6	6	6	6	6	6	6
1-2	ENE	6	6	6	6	6	6	6	6	6
1-2	E	18	12 12 12 24	12 24	12 24	12 24	12 24	12 24	12 24	12 24
1-2	ESE	6	6	6	6	6	6	6	6	6
1-2	SE	6	6	6	6	6	6	6	6	6
1-2	SSE	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6
1-2	W	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6
1-2	NW	6	6	6	6	6	6	6	6	6
1-2	NNW	6	6	6	6	6	6	6	6	6
1-2	TOT	42	12 24 78	36 42 78 156						
2-3	N	6	6	6	6	6	6	6	6	6
2-3	NNE	6	6	6	6	6	6	6	6	6
2-3	NE	6	6	6	6	6	6	6	6	6
2-3	ENE	6	6	6	6	6	6	6	6	6
2-3	E	18	6	6	6	6	6	6	6	6
2-3	ESE	6	6	6	6	6	6	6	6	6
2-3	SE	6	6	6	6	6	6	6	6	6
2-3	SSE	6	6	6	6	6	6	6	6	6
2-3	S	6	6	6	6	6	6	6	6	6
2-3	SSW	6	6	6	6	6	6	6	6	6
2-3	WSW	6	6	6	6	6	6	6	6	6
2-3	W	6	6	6	6	6	6	6	6	6
2-3	WNW	6	6	6	6	6	6	6	6	6
2-3	NW	6	6	6	6	6	6	6	6	6
2-3	NNW	6	6	6	6	6	6	6	6	6
2-3	TOT	60	30 72 162 24	12 24 60						
3-4	N	6	6	6	6	6	6	6	6	6
3-4	NNE	6	6	6	6	6	6	6	6	6
3-4	NE	6	6	6	6	6	6	6	6	6
3-4	ENE	6	6	6	6	6	6	6	6	6
3-4	E	18	6	6	6	6	6	6	6	6
3-4	ESE	6	6	6	6	6	6	6	6	6
3-4	SE	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6
3-4	W	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6
3-4	NW	6	6	6	6	6	6	6	6	6
3-4	NNW	6	6	6	6	6	6	6	6	6
3-4	TOT	6	6 36 30 24 90	6 6						
4-5	N	6	6	6	6	6	6	6	6	6
4-5	NNE	6	6	6	6	6	6	6	6	6
4-5	NE	6	6	6	6	6	6	6	6	6
4-5	ENE	6	6	6	6	6	6	6	6	6
4-5	E	18	6	6	6	6	6	6	6	6
4-5	ESE	6	6	6	6	6	6	6	6	6
4-5	SE	6	6	6	6	6	6	6	6	6
4-5	SSE	6	6	6	6	6	6	6	6	6
4-5	S	6	6	6	6	6	6	6	6	6
4-5	SSW	6	6	6	6	6	6	6	6	6
4-5	WSW	6	6	6	6	6	6	6	6	6
4-5	W	6	6	6	6	6	6	6	6	6
4-5	WNW	6	6	6	6	6	6	6	6	6
4-5	NW	6	6	6	6	6	6	6	6	6
4-5	NNW	6	6	6	6	6	6	6	6	6
4-5	TOT	36	6 12 54 12 12 24 48	6 6 12 12 24 48						
5-6	N	6	6	6	6	6	6	6	6	6
5-6	NNE	6	6	6	6	6	6	6	6	6
5-6	NE	6	6	6	6	6	6	6	6	6
5-6	ENE	6	6	6	6	6	6	6	6	6
5-6	E	18	6	6	6	6	6	6	6	6
5-6	ESE	6	6	6	6	6	6	6	6	6
5-6	SE	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6
5-6	W	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6
5-6	NW	6	6	6	6	6	6	6	6	6
5-6	NNW	6	6	6	6	6	6	6	6	6
5-6	TOT	12	12 24 6 24 6 24 10 18 6 24	6 6 12 12 24 48						
6-7	N	6	6	6	6	6	6	6	6	6
6-7	NNE	6	6	6	6	6	6	6	6	6
6-7	NE	6	6	6	6	6	6	6	6	6
6-7	ENE	6	6	6	6	6	6	6	6	6
6-7	E	18	6	6	6	6	6	6	6	6
6-7	ESE	6	6	6	6	6	6	6	6	6
6-7	SE	6	6	6	6	6	6	6	6	6
6-7	SSE	6	6	6	6	6	6	6	6	6
6-7	S	6	6	6	6	6	6	6	6	6
6-7	SSW	6	6	6	6	6	6	6	6	6
6-7	WSW	6	6	6	6	6	6	6	6	6
6-7	W	6	6	6	6	6	6	6	6	6
6-7	WNW	6	6	6	6	6	6	6	6	6
6-7	NW	6	6	6	6	6	6	6	6	6
6-7	NNW	6	6	6	6	6	6	6	6	6
6-7	TOT	12	12 24 6 24 6 24 10 18 6 24	6 6 12 12 24 48						
7-8	N	6	6	6	6	6	6	6	6	6
7-8	NNE	6	6	6	6	6	6	6	6	6
7-8	NE	6	6	6	6	6	6	6	6	6
7-8	ENE	6	6	6	6	6	6	6	6	6
7-8	E	18	6	6	6	6	6	6	6	6
7-8	ESE	6	6	6	6	6	6	6	6	6
7-8	SE	6	6	6	6	6	6	6	6	6
7-8	SSE	6	6	6	6	6	6	6	6	6
7-8	S	6	6	6	6	6	6	6	6	6
7-8	SSW	6	6	6	6	6	6	6	6	6
7-8	WSW	6	6	6	6	6	6	6	6	6
7-8	W	6	6	6	6	6	6	6	6	6
7-8	WNW	6	6	6	6	6	6	6	6	6
7-8	NW	6	6	6	6	6	6	6	6	6
7-8	NNW	6	6	6	6	6	6	6	6	6
7-8	TOT	12	12 24 6 24 6 24 10 18 6 24	6 6 12 12 24 48						
8-9	N	6	6	6	6	6	6	6	6	6
8-9	NNE	6	6	6	6	6	6	6	6	6
8-9	NE	6	6	6	6	6	6	6	6	6
8-9	ENE	6	6	6	6	6	6	6	6	6
8-9	E	18	6	6	6	6	6	6	6	6
8-9	ESE	6	6	6	6	6	6	6	6	6
8-9	SE	6	6	6	6	6	6	6	6	6
8-9	SSE	6	6	6	6	6	6	6	6	6
8-9	S	6	6	6	6	6	6	6	6	6
8-9	SSW	6	6	6	6	6	6	6	6	6
8-9	WSW	6	6	6	6	6	6	6	6	6
8-9	W	6	6	6	6	6	6	6	6	6
8-9	WNW	6	6	6	6	6	6	6	6	6
8-9	NW	6	6	6	6	6	6	6	6	6
8-9	NNW	6	6	6	6	6	6	6	6	6
8-9	TOT	12	12 24 6 24 6 24 10 18 6 24	6 6 12 12 24 48						

APPENDIX G

FIGURES G-1 thru G-12

WAVE STATISTICS FOR A LOCATION IN

LAKE HURON NEAR

PORT HURON, MICHIGAN

(43.17°N, 82.33°W)

HEIGHT	PERIOD (SECT)										TOTALS	
	1-1	2-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10		
1-1	6	6	6	6	6	6	6	6	6	6	6	6
1-2	6	6	6	6	6	6	6	6	6	6	6	6
1-3	6	6	6	6	6	6	6	6	6	6	6	6
1-4	6	6	6	6	6	6	6	6	6	6	6	6
1-5	6	6	6	6	6	6	6	6	6	6	6	6
1-6	6	6	6	6	6	6	6	6	6	6	6	6
1-7	6	6	6	6	6	6	6	6	6	6	6	6
1-8	6	6	6	6	6	6	6	6	6	6	6	6
1-9	6	6	6	6	6	6	6	6	6	6	6	6
1-10	6	6	6	6	6	6	6	6	6	6	6	6
1-TOT	12	24	6	42								12
2-1	6	6	6	6	6	6	6	6	6	6	6	6
2-2	6	6	6	6	6	6	6	6	6	6	6	6
2-3	6	6	6	6	6	6	6	6	6	6	6	6
2-4	6	6	6	6	6	6	6	6	6	6	6	6
2-5	6	6	6	6	6	6	6	6	6	6	6	6
2-6	6	6	6	6	6	6	6	6	6	6	6	6
2-7	6	6	6	6	6	6	6	6	6	6	6	6
2-8	6	6	6	6	6	6	6	6	6	6	6	6
2-9	6	6	6	6	6	6	6	6	6	6	6	6
2-10	6	6	6	6	6	6	6	6	6	6	6	6
2-TOT	48	36	6	90	36	24	48	6	6	6	6	12
3-1	6	6	6	6	6	6	6	6	6	6	6	6
3-2	6	6	6	6	6	6	6	6	6	6	6	6
3-3	6	6	6	6	6	6	6	6	6	6	6	6
3-4	6	6	6	6	6	6	6	6	6	6	6	6
3-5	6	6	6	6	6	6	6	6	6	6	6	6
3-6	6	6	6	6	6	6	6	6	6	6	6	6
3-7	6	6	6	6	6	6	6	6	6	6	6	6
3-8	6	6	6	6	6	6	6	6	6	6	6	6
3-9	6	6	6	6	6	6	6	6	6	6	6	6
3-10	6	6	6	6	6	6	6	6	6	6	6	6
3-TOT	48	36	6	90	36	24	48	6	6	6	6	12
4-1	6	6	6	6	6	6	6	6	6	6	6	6
4-2	6	6	6	6	6	6	6	6	6	6	6	6
4-3	6	6	6	6	6	6	6	6	6	6	6	6
4-4	6	6	6	6	6	6	6	6	6	6	6	6
4-5	6	6	6	6	6	6	6	6	6	6	6	6
4-6	6	6	6	6	6	6	6	6	6	6	6	6
4-7	6	6	6	6	6	6	6	6	6	6	6	6
4-8	6	6	6	6	6	6	6	6	6	6	6	6
4-9	6	6	6	6	6	6	6	6	6	6	6	6
4-10	6	6	6	6	6	6	6	6	6	6	6	6
4-TOT	48	36	6	90	36	24	48	6	6	6	6	12
5-1	6	6	6	6	6	6	6	6	6	6	6	6
5-2	6	6	6	6	6	6	6	6	6	6	6	6
5-3	6	6	6	6	6	6	6	6	6	6	6	6
5-4	6	6	6	6	6	6	6	6	6	6	6	6
5-5	6	6	6	6	6	6	6	6	6	6	6	6
5-6	6	6	6	6	6	6	6	6	6	6	6	6
5-7	6	6	6	6	6	6	6	6	6	6	6	6
5-8	6	6	6	6	6	6	6	6	6	6	6	6
5-9	6	6	6	6	6	6	6	6	6	6	6	6
5-10	6	6	6	6	6	6	6	6	6	6	6	6
5-TOT	48	36	6	90	36	24	48	6	6	6	6	12
TOTAL	0	0	0	60	60	12	132	42	42	24	108	0
UNCERTAIN DATA												
HOURS IN MONTH												

TOTALS
 102 15 12
 642 12 70 1
 742 742 742 2

FIGURE G-8

PRST HAVS COMPANY
MUSUN LAKE MFLTA AUGUST
LATITUDE 53.17 (LONGITUDE 82.33)

HEIGHT	DIR	'65 '66 '67 TOT	'65 '66 '67 TCT	'65 '66 '67 TOT	'65 '66 '67 TCT	'65 '66 '67 TOT	'65 '66 '67 TCT	'65 '66 '67 TOT	'65 '66 '67 TCT	'65 '66 '67 TOT	'65 '66 '67 TCT	TOTALS
(FT)												
2-3	N	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	E	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	W	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	TOT	24	66	42	122	36	90	60	186			60 156 102 318
2-3	N	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	E	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	W	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
2-3	TOT	24	66	42	122	36	90	60	186			60 156 102 318
3-4	N	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	E	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	W	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
3-4	TOT	24	66	42	122	36	90	60	186			60 156 102 318
4-5	N	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	E	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	W	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
4-5	TOT	24	66	42	122	36	90	60	186			60 156 102 318
5-6	N	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	E	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	W	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
5-6	TOT	24	66	42	122	36	90	60	186			60 156 102 318
6-7	N	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	E	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	W	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
6-7	TOT	24	66	42	122	36	90	60	186			60 156 102 318
7-8	N	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	E	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	W	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
7-8	TOT	24	66	42	122	36	90	60	186			60 156 102 318
8-9	N	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	NE	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	E	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	ESE	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	SE	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	SSE	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	SW	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	WSW	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	W	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	WNW	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	NW	6	6	6	6	6	6	6	6	6	6	6 6 6
8-9	TOT	24	66	42	122	36	90	60	186			60 156 102 318
TOTAL	CALP	0	0	0	0	0	0	0	0	0	0	0
TOTAL	UNCERTAIN DATA	0	0	0	0	0	0	0	0	0	0	0
TOTAL	HOLES IN PERCH	0	0	0	0	0	0	0	0	0	0	0

552
588
744

222
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APPENDIX H

FIGURES H-1 thru H-12
WAVE STATISTICS FOR A LOCATION IN
LAKE HURON NEAR
HARBOR BEACH, MICHIGAN
(44.17°N, 82.67°W)

FIGURE H-1b

MARCON BEACH SUMMARY
LAKE HO-ON JANUARY
LATITUDE 44.17 LONGITUDE 82.67

CONTINUED

HEIGHT	DIR	<2	2-3	3-4	4-5	5-6	PERIODS (SEC)	7-8	8-9	9-10	>10	TOTALS					
(FT)		0.65	0.66	0.67	TOT	0.65	0.66	0.67	TOT	0.65	0.66	0.67	TOT	1955	1956	1967	TOTAL
7-8	N	5	6	12	18	12	6	6	6	12	12	6	6	12	6	12	30
7-8	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	12
7-8	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	TOT	56	12	30	108	6	12	13	30	6	12	12	6	12	24	54	150
8-9	N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	12
8-9	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
8-9	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
8-9	NW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
8-9	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
8-9	TOT	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
9-10	N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	12
9-10	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	ENE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10	TOT	12	6	6	24	36	54	24	114	6	6	6	6	6	6	6	6
10-11	NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11	ENE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	ENE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
12-13	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
12-13	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
12-13	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
12-13	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
12-13	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
13-14	N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
13-14	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
13-14	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
13-14	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
14-15	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
14-15	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
14-15	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
15-16	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
15-16	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
15-16	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
16-17	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
16-17	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
16-17	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
17-18	NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
17-18	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
17-18	TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOTAL		0	0	0	24	12	42	78	54	42	114	210	180	120	120	120	120

FIGURE H-4a

MARCH DEATH LAKE FLIGN APRIL
 LATITUDE 44-17 LONGITUDE 82-67

HEIGHT	DIR	PERIOD (SECS)	5-6	6-7	7-8	8-9	9-10	TOTALS
1-2	N	12	6	6	6	6	6	36
1-2	NNE	12	6	6	6	6	6	36
1-2	NE	12	6	6	6	6	6	36
1-2	ENE	12	6	6	6	6	6	36
1-2	E	12	6	6	6	6	6	36
1-2	ESE	12	6	6	6	6	6	36
1-2	SE	12	6	6	6	6	6	36
1-2	SSE	12	6	6	6	6	6	36
1-2	S	12	6	6	6	6	6	36
1-2	SSW	12	6	6	6	6	6	36
1-2	SW	12	6	6	6	6	6	36
1-2	WSW	12	6	6	6	6	6	36
1-2	W	12	6	6	6	6	6	36
1-2	WNW	12	6	6	6	6	6	36
1-2	NW	12	6	6	6	6	6	36
1-2	NNW	12	6	6	6	6	6	36
1-2	N	12	6	6	6	6	6	36
2-3	N	12	6	6	6	6	6	36
2-3	NNE	12	6	6	6	6	6	36
2-3	NE	12	6	6	6	6	6	36
2-3	ENE	12	6	6	6	6	6	36
2-3	E	12	6	6	6	6	6	36
2-3	ESE	12	6	6	6	6	6	36
2-3	SE	12	6	6	6	6	6	36
2-3	SSE	12	6	6	6	6	6	36
2-3	S	12	6	6	6	6	6	36
2-3	SSW	12	6	6	6	6	6	36
2-3	SW	12	6	6	6	6	6	36
2-3	WSW	12	6	6	6	6	6	36
2-3	W	12	6	6	6	6	6	36
2-3	WNW	12	6	6	6	6	6	36
2-3	NW	12	6	6	6	6	6	36
2-3	NNW	12	6	6	6	6	6	36
2-3	N	12	6	6	6	6	6	36
3-4	N	12	6	6	6	6	6	36
3-4	NNE	12	6	6	6	6	6	36
3-4	NE	12	6	6	6	6	6	36
3-4	ENE	12	6	6	6	6	6	36
3-4	E	12	6	6	6	6	6	36
3-4	ESE	12	6	6	6	6	6	36
3-4	SE	12	6	6	6	6	6	36
3-4	SSE	12	6	6	6	6	6	36
3-4	S	12	6	6	6	6	6	36
3-4	SW	12	6	6	6	6	6	36
3-4	WSW	12	6	6	6	6	6	36
3-4	W	12	6	6	6	6	6	36
3-4	WNW	12	6	6	6	6	6	36
3-4	NW	12	6	6	6	6	6	36
3-4	NNW	12	6	6	6	6	6	36
3-4	N	12	6	6	6	6	6	36
4-5	N	12	6	6	6	6	6	36
4-5	NNE	12	6	6	6	6	6	36
4-5	NE	12	6	6	6	6	6	36
4-5	ENE	12	6	6	6	6	6	36
4-5	E	12	6	6	6	6	6	36
4-5	ESE	12	6	6	6	6	6	36
4-5	SE	12	6	6	6	6	6	36
4-5	SSE	12	6	6	6	6	6	36
4-5	S	12	6	6	6	6	6	36
4-5	SW	12	6	6	6	6	6	36
4-5	WSW	12	6	6	6	6	6	36
4-5	W	12	6	6	6	6	6	36
4-5	WNW	12	6	6	6	6	6	36
4-5	NW	12	6	6	6	6	6	36
4-5	NNW	12	6	6	6	6	6	36
4-5	N	12	6	6	6	6	6	36
5-6	N	12	6	6	6	6	6	36
5-6	NNE	12	6	6	6	6	6	36
5-6	NE	12	6	6	6	6	6	36
5-6	ENE	12	6	6	6	6	6	36
5-6	E	12	6	6	6	6	6	36
5-6	ESE	12	6	6	6	6	6	36
5-6	SE	12	6	6	6	6	6	36
5-6	SSE	12	6	6	6	6	6	36
5-6	S	12	6	6	6	6	6	36
5-6	SW	12	6	6	6	6	6	36
5-6	WSW	12	6	6	6	6	6	36
5-6	W	12	6	6	6	6	6	36
5-6	WNW	12	6	6	6	6	6	36
5-6	NW	12	6	6	6	6	6	36
5-6	NNW	12	6	6	6	6	6	36
5-6	N	12	6	6	6	6	6	36
TOT			108	60	66	72	78	384

FIGURE B-30

HARBOUR: BEACH LAKE HUDON APRIL
 LATITUDE 44-17 LONGITUDE 82-57

CONTINUED

HEIGHT (FT)	DIR	<2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTALS																			
		65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	1965 1966 1967 TOTAL																			
		PERIOD (SEC)																													
E-5	NNE			6	6	6	6	12	12			C 0 18 18																			
B-5	NE							6	6			C 0 6 12																			
B-5	ENE			6	6	6	6	18	18			C 0 6 6 24																			
B-5	E			6	6	6	6	18	18			C 0 6 6 24																			
B-5	SE			6	6	12	24	6	18	18	42	C 12 24 30 66																			
	TOT			6	6	12	24	6	18	18	42	C 6 6 12 18																			
5-10	ENE											C 0 6 6 12 18																			
10-11	NNE											C 0 6 6 6 6																			
10-11	ENE											C 0 6 6 6 6																			
	TOT											C 0 6 6 6 6 12																			
11-12	NNE											C 0 6 6 6 6																			
11-12	ESE											C 0 6 6 6 6																			
	TOT											C 0 6 6 6 6 12																			
TOTAL	C C C 0	42	18	18	78	72	96	102	270	102	126	150	378	64	90	114	288	36	48	36	120	18	18	36	72	C 12 12 24	C 0 C C C C C 0	354	408	486	1230
UNCERTAIN DATA																										358	312	292	900		
MGLRS IN MONTH																										480	720	780	2330		

HEIGHT	4-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTALS
1-2	12	6	6	6	6	6	6	6	6	6	12
1-2 N	6	6	6	6	6	6	6	6	6	6	6
1-2 NNE	6	6	6	6	6	6	6	6	6	6	6
1-2 NE	6	6	6	6	6	6	6	6	6	6	6
1-2 ENE	6	6	6	6	6	6	6	6	6	6	6
1-2 E	6	6	6	6	6	6	6	6	6	6	6
1-2 ESE	6	6	6	6	6	6	6	6	6	6	6
1-2 SE	6	6	6	6	6	6	6	6	6	6	6
1-2 S	6	6	6	6	6	6	6	6	6	6	6
1-2 SSE	6	6	6	6	6	6	6	6	6	6	6
1-2 SW	6	6	6	6	6	6	6	6	6	6	6
1-2 WSW	6	6	6	6	6	6	6	6	6	6	6
1-2 W	6	6	6	6	6	6	6	6	6	6	6
1-2 WNW	6	6	6	6	6	6	6	6	6	6	6
1-2 NW	6	6	6	6	6	6	6	6	6	6	6
1-2 NNW	6	6	6	6	6	6	6	6	6	6	6
1-2 TOT	12	12	36	60	36	78	60	174			48
2-3				12	12						
2-3 N				12	12						
2-3 NNE				12	12						
2-3 NE				12	12						
2-3 ENE				12	12						
2-3 E				12	12						
2-3 ESE				12	12						
2-3 SE				12	12						
2-3 SSE				12	12						
2-3 SW				12	12						
2-3 WSW				12	12						
2-3 W				12	12						
2-3 WNW				12	12						
2-3 NW				12	12						
2-3 NNW				12	12						
2-3 TOT				42	42						84
3-4				6	6	6	6	6	6	6	6
3-4 N				6	6	6	6	6	6	6	6
3-4 NNE				6	6	6	6	6	6	6	6
3-4 NE				6	6	6	6	6	6	6	6
3-4 ENE				6	6	6	6	6	6	6	6
3-4 E				6	6	6	6	6	6	6	6
3-4 ESE				6	6	6	6	6	6	6	6
3-4 SE				6	6	6	6	6	6	6	6
3-4 SSE				6	6	6	6	6	6	6	6
3-4 SW				6	6	6	6	6	6	6	6
3-4 WSW				6	6	6	6	6	6	6	6
3-4 W				6	6	6	6	6	6	6	6
3-4 WNW				6	6	6	6	6	6	6	6
3-4 NW				6	6	6	6	6	6	6	6
3-4 NNW				6	6	6	6	6	6	6	6
3-4 TOT				42	42	48	12	18	48		54
4-5				6	6	6	6	6	6	6	6
4-5 N				6	6	6	6	6	6	6	6
4-5 NNE				6	6	6	6	6	6	6	6
4-5 NE				6	6	6	6	6	6	6	6
4-5 ENE				6	6	6	6	6	6	6	6
4-5 E				6	6	6	6	6	6	6	6
4-5 ESE				6	6	6	6	6	6	6	6
4-5 SE				6	6	6	6	6	6	6	6
4-5 SSE				6	6	6	6	6	6	6	6
4-5 SW				6	6	6	6	6	6	6	6
4-5 WSW				6	6	6	6	6	6	6	6
4-5 W				6	6	6	6	6	6	6	6
4-5 WNW				6	6	6	6	6	6	6	6
4-5 NW				6	6	6	6	6	6	6	6
4-5 NNW				6	6	6	6	6	6	6	6
4-5 TOT				42	42	48	12	18	48		54
5-6				6	6	6	6	6	6	6	6
5-6 N				6	6	6	6	6	6	6	6
5-6 NNE				6	6	6	6	6	6	6	6
5-6 NE				6	6	6	6	6	6	6	6
5-6 ENE				6	6	6	6	6	6	6	6
5-6 E				6	6	6	6	6	6	6	6
5-6 ESE				6	6	6	6	6	6	6	6
5-6 SE				6	6	6	6	6	6	6	6
5-6 SSE				6	6	6	6	6	6	6	6
5-6 SW				6	6	6	6	6	6	6	6
5-6 WSW				6	6	6	6	6	6	6	6
5-6 W				6	6	6	6	6	6	6	6
5-6 WNW				6	6	6	6	6	6	6	6
5-6 NW				6	6	6	6	6	6	6	6
5-6 NNW				6	6	6	6	6	6	6	6
5-6 TOT				42	42	48	12	18	48		54
6-7				6	6	6	6	6	6	6	6
6-7 N				6	6	6	6	6	6	6	6
6-7 NNE				6	6	6	6	6	6	6	6
6-7 NE				6	6	6	6	6	6	6	6
6-7 ENE				6	6	6	6	6	6	6	6
6-7 E				6	6	6	6	6	6	6	6
6-7 ESE				6	6	6	6	6	6	6	6
6-7 SE				6	6	6	6	6	6	6	6
6-7 SSE				6	6	6	6	6	6	6	6
6-7 SW				6	6	6	6	6	6	6	6
6-7 WSW				6	6	6	6	6	6	6	6
6-7 W				6	6	6	6	6	6	6	6
6-7 WNW				6	6	6	6	6	6	6	6
6-7 NW				6	6	6	6	6	6	6	6
6-7 NNW				6	6	6	6	6	6	6	6
6-7 TOT				42	42	48	12	18	48		54
7-8				6	6	6	6	6	6	6	6
7-8 N				6	6	6	6	6	6	6	6
7-8 NNE				6	6	6	6	6	6	6	6
7-8 NE				6	6	6	6	6	6	6	6
7-8 ENE				6	6	6	6	6	6	6	6
7-8 E				6	6	6	6	6	6	6	6
7-8 ESE				6	6	6	6	6	6	6	6
7-8 SE				6	6	6	6	6	6	6	6
7-8 SSE				6	6	6	6	6	6	6	6
7-8 SW				6	6	6	6	6	6	6	6
7-8 WSW				6	6	6	6	6	6	6	6
7-8 W				6	6	6	6	6	6	6	6
7-8 WNW				6	6	6	6	6	6	6	6
7-8 NW				6	6	6	6	6	6	6	6
7-8 NNW				6	6	6	6	6	6	6	6
7-8 TOT				42	42	48	12	18	48		54
8-9				6	6	6	6	6	6	6	6
8-9 N				6	6	6	6	6	6	6	6
8-9 NNE				6	6	6	6	6	6	6	6
8-9 NE				6	6	6	6	6	6	6	6
8-9 ENE				6	6	6	6	6	6	6	6
8-9 E				6	6	6	6	6	6	6	6
8-9 ESE				6	6	6	6	6	6	6	6
8-9 SE				6	6	6	6	6	6	6	6
8-9 SSE				6	6	6	6	6	6	6	6
8-9 SW				6	6	6	6	6	6	6	6
8-9 WSW				6	6	6	6	6	6	6	6
8-9 W				6	6	6	6	6	6	6	6
8-9 WNW				6	6	6	6	6	6	6	6
8-9 NW				6	6	6	6	6	6	6	6
8-9 NNW				6	6	6	6	6	6	6	6
8-9 TOT				42	42	48	12	18	48		54
9-10				6	6	6	6	6	6	6	6
9-10 N				6	6	6	6	6	6	6	6
9-10 NNE				6	6	6	6	6	6	6	6
9-10 NE				6	6	6	6	6	6	6	6
9-10 ENE				6	6	6	6	6	6	6	6
9-10 E				6	6	6	6	6	6	6	6
9-10 ESE				6	6	6	6	6	6	6	6
9-10 SE				6	6	6	6	6	6	6	6
9-10 SSE				6	6	6	6	6	6	6	6
9-10 SW				6	6	6</					

HARBOR BEACH SURVEY LAKE HURON SEPTEMBER
 LATITUDE 44-17 LONGITUDE 82-67

CONTINUED

WEIGHT (FT)	DIS.	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
8-9	NE	65	66	67	TOT	65	66	67	TOT	1985
8-9	ENE	65	66	67	TOT	65	66	67	TOT	1966
8-9	NW	65	66	67	TOT	65	66	67	TOT	1967
8-9	TOT	65	66	67	TOT	65	66	67	TOT	1967
9-10	SW	12	12	6	30					6
9-10	WSW	6	6	6						0
9-10	TOT	6	6	6						0
10-11	NE	6	6	6						0
11-12	WNW	6	6	6						0
14-15	ENE	6	6	6						0

TOTAL	CALM	UNCERTAIN DATA	HOURS IN MONTH
0	0	0	0
16	18	10	54
120	78	60	258
120	144	84	348
108	42	258	36
168	12	18	18
48			
414	432	300	1146
306	288	420	1014
720	720	720	2160

(FT)	DIR	'65 '66 '67 TOT	'65 '66 '67 TOT	'65 '66 '67 TOT	'65 '66 '67 TOT	'65 '66 '67 TOT	'65 '66 '67 TOT	'65 '66 '67 TOT	'65 '66 '67 TOT
1-1	N	6	6	6	6	6	6	6	6
1-2	NNE	6	6	6	6	6	6	6	6
1-3	NE	6	6	6	6	6	6	6	6
1-4	E	6	6	6	6	6	6	6	6
1-5	ESE	6	6	6	6	6	6	6	6
1-6	SSE	6	6	6	6	6	6	6	6
1-7	S	6	6	6	6	6	6	6	6
1-8	SSW	6	6	6	6	6	6	6	6
1-9	SW	6	6	6	6	6	6	6	6
1-10	WSW	6	6	6	6	6	6	6	6
1-11	W	6	6	6	6	6	6	6	6
1-12	WNW	6	6	6	6	6	6	6	6
1-13	NW	6	6	6	6	6	6	6	6
1-14	NNW	6	6	6	6	6	6	6	6
1-15	TOT	12	18	12	42	36	60	138	
2-1	N	6	6	6	6	6	6	6	6
2-2	NNE	6	6	6	6	6	6	6	6
2-3	NE	6	6	6	6	6	6	6	6
2-4	E	6	6	6	6	6	6	6	6
2-5	ESE	6	6	6	6	6	6	6	6
2-6	SSE	6	6	6	6	6	6	6	6
2-7	S	6	6	6	6	6	6	6	6
2-8	SSW	6	6	6	6	6	6	6	6
2-9	SW	6	6	6	6	6	6	6	6
2-10	WSW	18	12	18	18	6	6	6	6
2-11	W	12	6	6	12	18	12	42	
2-12	WNW	6	6	6	6	6	6	6	6
2-13	NW	6	6	6	6	6	6	6	6
2-14	NNW	6	6	6	6	6	6	6	6
2-15	TOT	60	24	36	120	102	66	66	234
3-1	N	6	6	6	6	6	6	6	6
3-2	NNE	6	6	6	6	6	6	6	6
3-3	NE	6	6	6	6	6	6	6	6
3-4	E	6	6	6	6	6	6	6	6
3-5	ESE	6	6	6	6	6	6	6	6
3-6	SSE	6	6	6	6	6	6	6	6
3-7	S	6	6	6	6	6	6	6	6
3-8	SSW	6	6	6	6	6	6	6	6
3-9	SW	6	6	6	6	6	6	6	6
3-10	WSW	18	12	18	18	6	6	6	6
3-11	W	12	6	6	12	18	12	42	
3-12	WNW	6	6	6	6	6	6	6	6
3-13	NW	6	6	6	6	6	6	6	6
3-14	NNW	6	6	6	6	6	6	6	6
3-15	TOT	60	24	36	120	102	66	66	234
4-1	N	6	6	6	6	6	6	6	6
4-2	NNE	6	6	6	6	6	6	6	6
4-3	NE	6	6	6	6	6	6	6	6
4-4	E	6	6	6	6	6	6	6	6
4-5	ESE	6	6	6	6	6	6	6	6
4-6	SSE	6	6	6	6	6	6	6	6
4-7	S	6	6	6	6	6	6	6	6
4-8	SSW	6	6	6	6	6	6	6	6
4-9	SW	6	6	6	6	6	6	6	6
4-10	WSW	12	12	18	6	6	6	6	6
4-11	W	6	6	6	6	6	6	6	6
4-12	WNW	6	6	6	6	6	6	6	6
4-13	NW	6	6	6	6	6	6	6	6
4-14	NNW	6	6	6	6	6	6	6	6
4-15	TOT	12	18	6	36	72	78	54	204
5-1	N	6	6	6	6	6	6	6	6
5-2	NNE	6	6	6	6	6	6	6	6
5-3	NE	6	6	6	6	6	6	6	6
5-4	E	6	6	6	6	6	6	6	6
5-5	ESE	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6
5-7	S	6	6	6	6	6	6	6	6
5-8	SSW	6	6	6	6	6	6	6	6
5-9	SW	6	6	6	6	6	6	6	6
5-10	WSW	12	6	6	24	6	6	6	6
5-11	W	6	6	6	6	6	6	6	6
5-12	WNW	6	6	6	6	6	6	6	6
5-13	NW	6	6	6	6	6	6	6	6
5-14	NNW	6	6	6	6	6	6	6	6
5-15	TOT	12	18	6	36	72	78	54	204
6-1	N	6	6	6	6	6	6	6	6
6-2	NNE	6	6	6	6	6	6	6	6
6-3	NE	6	6	6	6	6	6	6	6
6-4	E	6	6	6	6	6	6	6	6
6-5	ESE	6	6	6	6	6	6	6	6
6-6	SSE	6	6	6	6	6	6	6	6
6-7	S	6	6	6	6	6	6	6	6
6-8	SSW	6	6	6	6	6	6	6	6
6-9	SW	6	6	6	6	6	6	6	6
6-10	WSW	12	6	6	24	6	6	6	6
6-11	W	6	6	6	6	6	6	6	6
6-12	WNW	6	6	6	6	6	6	6	6
6-13	NW	6	6	6	6	6	6	6	6
6-14	NNW	6	6	6	6	6	6	6	6
6-15	TOT	12	18	6	36	72	78	54	204
7-1	N	6	6	6	6	6	6	6	6
7-2	NNE	6	6	6	6	6	6	6	6
7-3	NE	6	6	6	6	6	6	6	6
7-4	E	6	6	6	6	6	6	6	6
7-5	ESE	6	6	6	6	6	6	6	6
7-6	SSE	6	6	6	6	6	6	6	6
7-7	S	6	6	6	6	6	6	6	6
7-8	SSW	6	6	6	6	6	6	6	6
7-9	SW	6	6	6	6	6	6	6	6
7-10	WSW	12	6	6	24	6	6	6	6
7-11	W	6	6	6	6	6	6	6	6
7-12	WNW	6	6	6	6	6	6	6	6
7-13	NW	6	6	6	6	6	6	6	6
7-14	NNW	6	6	6	6	6	6	6	6
7-15	TOT	12	18	6	36	72	78	54	204
8-1	N	6	6	6	6	6	6	6	6
8-2	NNE	6	6	6	6	6	6	6	6
8-3	NE	6	6	6	6	6	6	6	6
8-4	E	6	6	6	6	6	6	6	6
8-5	ESE	6	6	6	6	6	6	6	6
8-6	SSE	6	6	6	6	6	6	6	6
8-7	S	6	6	6	6	6	6	6	6
8-8	SSW	6	6	6	6	6	6	6	6
8-9	SW	6	6	6	6	6	6	6	6
8-10	WSW	12	6	6	24	6	6	6	6
8-11	W	6	6	6	6	6	6	6	6
8-12	WNW	6	6	6	6	6	6	6	6
8-13	NW	6	6	6	6	6	6	6	6
8-14	NNW	6	6	6	6	6	6	6	6
8-15	TOT	12	18	6	36	72	78	54	204
9-1	N	6	6	6	6	6	6	6	6
9-2	NNE	6	6	6	6	6	6	6	6
9-3	NE	6	6	6	6	6	6	6	6
9-4	E	6	6	6	6	6	6	6	6
9-5	ESE	6	6	6	6	6	6	6	6
9-6	SSE	6	6	6	6	6	6	6	6
9-7	S	6	6	6	6	6	6	6	6
9-8	SSW	6	6	6	6	6	6	6	6
9-9	SW	6	6	6	6	6	6	6	6
9-10	WSW	12	6	6	24	6	6	6	6
9-11	W	6	6	6	6	6	6	6	6
9-12	WNW	6	6	6	6	6	6	6	6
9-13	NW	6	6	6	6	6	6	6	6
9-14	NNW	6	6	6	6	6	6	6	6
9-15	TOT	12	18	6	36	72	78	54	204
10-1	N	6	6	6	6	6	6	6	6
10-2	NNE	6	6	6	6	6	6	6	6
10-3	NE	6	6	6	6	6	6	6	6
10-4	E	6	6	6	6	6	6	6	6
10-5	ESE	6	6	6	6	6	6	6	6
10-6	SSE	6	6	6	6	6	6	6	6
10-7	S	6	6	6	6	6	6	6	6
10-8	SSW	6	6	6	6	6	6	6	6
10-9	SW	6	6	6	6	6	6	6	6
10-10	WSW	12	6	6	24	6	6	6	6
10-11	W	6	6	6	6	6	6	6	6
10-12	WNW	6	6	6	6	6	6	6	6
10-13	NW	6	6	6	6	6	6	6	6
10-14	NNW	6	6	6	6	6	6	6	6
10-15	TOT	12	18	6	36	72	78	54	204
11-1	N	6	6	6	6	6	6	6	6
11-2	NNE	6	6	6	6	6	6	6	6
11-3	NE	6	6	6	6	6	6	6	6
11-4	E	6	6	6	6	6	6	6	6
11-5	ESE	6	6	6	6	6	6	6	6
11-6	SSE	6	6	6	6	6	6	6	6
11-7	S	6	6	6	6	6	6	6	6
11-8	SSW	6	6	6	6	6	6	6	6
11-9	SW	6	6	6	6	6	6	6	6
11-10	WSW	12	6	6	24	6	6	6	6
11-11	W	6	6	6	6	6	6	6	6
11-12	WNW	6	6	6	6	6	6	6	6
11-13	NW	6	6	6	6	6	6	6	6
11-14	NNW	6	6	6	6	6	6	6	6
11-15	TOT	12	18	6	36	72	78	54	204
12-1	N	6	6	6	6	6	6	6	6
12-2	NNE	6	6	6	6	6	6	6	6
12-3	NE	6	6	6	6	6	6	6	6
12-4	E	6	6	6	6	6	6	6	6
12-5	ESE	6	6	6	6	6	6	6	6
12-6	SSE	6	6	6	6	6	6	6	6
12-7	S	6	6	6	6	6	6	6	6
12-8	SSW	6	6	6	6	6	6	6	6
12-9	SW	6	6	6	6	6	6	6	6
12-10	WSW	12	6	6	24	6	6	6	6
12-11	W	6	6	6	6	6	6	6	6
12-12	WNW	6	6	6	6	6	6	6	6
12-13	NW	6	6	6	6	6	6	6	6
12-14	NNW	6	6	6</					

HEIGHT	DIR	'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT	TOTALS			
(FT)		12	12	12	36	12	12	12	36	12	12	12	36	12	12	12	36	1945	1946	1947	TOTAL
		6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18	6	6	6	18
1-2	N																	0	0	0	0
1-2	NE																	0	0	0	0
1-2	E																	0	0	0	0
1-2	ESE																	0	0	0	0
1-2	SSE																	0	0	0	0
1-2	S																	0	0	0	0
1-2	SSW																	0	0	0	0
1-2	SW																	0	0	0	0
1-2	WSW																	0	0	0	0
1-2	W																	0	0	0	0
1-2	WNW																	0	0	0	0
1-2	NW																	0	0	0	0
1-2	NNW																	0	0	0	0
1-2	TOT	12	18	18	48	72	54	66	192									84	72	84	240
2-3	N																	0	0	0	0
2-3	NNE																	0	0	0	0
2-3	NE																	0	0	0	0
2-3	ESE																	0	0	0	0
2-3	SSE																	0	0	0	0
2-3	S																	0	0	0	0
2-3	SSW																	0	0	0	0
2-3	SW																	0	0	0	0
2-3	WSW																	0	0	0	0
2-3	W																	0	0	0	0
2-3	WNW																	0	0	0	0
2-3	NW																	0	0	0	0
2-3	NNW																	0	0	0	0
2-3	TOT	30	48	12	90	60	36	90	186									50	84	102	276
3-4	N																	0	0	0	0
3-4	NNE																	0	0	0	0
3-4	NE																	0	0	0	0
3-4	ESE																	0	0	0	0
3-4	SSE																	0	0	0	0
3-4	S																	0	0	0	0
3-4	SSW																	0	0	0	0
3-4	SW																	0	0	0	0
3-4	WSW																	0	0	0	0
3-4	W																	0	0	0	0
3-4	WNW																	0	0	0	0
3-4	NW																	0	0	0	0
3-4	NNW																	0	0	0	0
3-4	TOT	66	42	12	180	18	36	12	66									84	78	84	246
4-5	N																	0	0	0	0
4-5	NNE																	0	0	0	0
4-5	NE																	0	0	0	0
4-5	ESE																	0	0	0	0
4-5	SSE																	0	0	0	0
4-5	S																	0	0	0	0
4-5	SSW																	0	0	0	0
4-5	SW																	0	0	0	0
4-5	WSW																	0	0	0	0
4-5	W																	0	0	0	0
4-5	WNW																	0	0	0	0
4-5	NW																	0	0	0	0
4-5	NNW																	0	0	0	0
4-5	TOT	12	6	18	60	54	78	192										72	60	78	210
5-6	N																	0	0	0	0
5-6	NNE																	0	0	0	0
5-6	NE																	0	0	0	0
5-6	ESE																	0	0	0	0
5-6	SSE																	0	0	0	0
5-6	S																	0	0	0	0
5-6	SSW																	0	0	0	0
5-6	SW																	0	0	0	0
5-6	WSW																	0	0	0	0
5-6	W																	0	0	0	0
5-6	WNW																	0	0	0	0
5-6	NW																	0	0	0	0
5-6	NNW																	0	0	0	0
5-6	TOT	12	6	18	60	54	78	192										72	60	78	210
6-7	N																	0	0	0	0
6-7	NNE																	0	0	0	0
6-7	NE																	0	0	0	0
6-7	ESE																	0	0	0	0
6-7	SSE																	0	0	0	0
6-7	S																	0	0	0	0
6-7	SSW																	0	0	0	0
6-7	SW																	0	0	0	0
6-7	WSW																	0	0	0	0
6-7	W																	0	0	0	0
6-7	WNW																	0	0	0	0
6-7	NW																	0	0	0	0
6-7	NNW																	0	0	0	0
6-7	TOT	18	24	42	180	18	30	24	72									36	54	24	114

APPENDIX I

FIGURES I-1 thru I-12
WAVE STATISTICS FOR A LOCATION IN
LAKE HURON NEAR
ALPENS, MICHIGAN
(45.00°N, 83.17°W)

CONTINUED

HEIGHT	42	2-3	3-4	4-5	6-7	7-8	8-9	9-10	TOTALS
DIR	DIR	DIR	DIR	DIR	DIR	DIR	DIR	DIR	DIR
165 '66	165 '66	165 '66	165 '66	165 '66	165 '66	165 '66	165 '66	165 '66	165 '66
TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
7-8 N	12	6	6	18	6	6	6	6	12
7-8 NNE	6	6	6	18	6	6	6	6	12
7-8 ENE	6	6	6	18	6	6	6	6	12
7-8 SSE	6	6	6	18	6	6	6	6	12
7-8 S	6	6	6	18	6	6	6	6	12
7-8 SW	6	6	6	18	6	6	6	6	12
7-8 WSW	6	6	6	18	6	6	6	6	12
7-8 NNW	6	6	6	18	6	6	6	6	12
7-8 NW	6	6	6	18	6	6	6	6	12
TOT	42	36	18	96	6	6	12	42	42
8-9 N	6	6	6	18	6	6	6	6	12
8-9 NNE	6	6	6	18	6	6	6	6	12
8-9 NE	6	6	6	18	6	6	6	6	12
8-9 ESE	6	6	6	18	6	6	6	6	12
8-9 SSE	6	6	6	18	6	6	6	6	12
8-9 S	6	6	6	18	6	6	6	6	12
8-9 SW	6	6	6	18	6	6	6	6	12
8-9 WSW	6	6	6	18	6	6	6	6	12
8-9 NNW	6	6	6	18	6	6	6	6	12
8-9 NW	6	6	6	18	6	6	6	6	12
TOT	6	6	6	18	6	6	12	6	18
9-10 N	6	6	6	18	6	6	6	6	12
9-10 NNE	6	6	6	18	6	6	6	6	12
9-10 NE	6	6	6	18	6	6	6	6	12
9-10 ESE	6	6	6	18	6	6	6	6	12
9-10 SSE	6	6	6	18	6	6	6	6	12
9-10 S	6	6	6	18	6	6	6	6	12
9-10 SW	6	6	6	18	6	6	6	6	12
9-10 WSW	6	6	6	18	6	6	6	6	12
9-10 NNW	6	6	6	18	6	6	6	6	12
9-10 NW	6	6	6	18	6	6	6	6	12
TOT	18	12	30	12	6	6	24	12	24
10-11 N	6	6	6	18	6	6	6	6	12
10-11 NNE	6	6	6	18	6	6	6	6	12
10-11 NE	6	6	6	18	6	6	6	6	12
10-11 ESE	6	6	6	18	6	6	6	6	12
10-11 SSE	6	6	6	18	6	6	6	6	12
10-11 S	6	6	6	18	6	6	6	6	12
10-11 SW	6	6	6	18	6	6	6	6	12
10-11 WSW	6	6	6	18	6	6	6	6	12
10-11 NNW	6	6	6	18	6	6	6	6	12
10-11 NW	6	6	6	18	6	6	6	6	12
TOT	12	12	24	6	6	6	12	18	0
11-12 N	6	6	6	18	6	6	6	6	12
11-12 NNE	6	6	6	18	6	6	6	6	12
11-12 NE	6	6	6	18	6	6	6	6	12
11-12 ESE	6	6	6	18	6	6	6	6	12
11-12 SSE	6	6	6	18	6	6	6	6	12
11-12 S	6	6	6	18	6	6	6	6	12
11-12 SW	6	6	6	18	6	6	6	6	12
11-12 WSW	6	6	6	18	6	6	6	6	12
11-12 NNW	6	6	6	18	6	6	6	6	12
11-12 NW	6	6	6	18	6	6	6	6	12
TOT	6	6	12	6	6	6	18	6	12
13-14 ESE	6	6	6	18	6	6	6	6	12
13-14 NE	6	6	6	18	6	6	6	6	12
13-14 SE	6	6	6	18	6	6	6	6	12
13-14 S	6	6	6	18	6	6	6	6	12
13-14 SW	6	6	6	18	6	6	6	6	12
13-14 WSW	6	6	6	18	6	6	6	6	12
13-14 NNW	6	6	6	18	6	6	6	6	12
13-14 NW	6	6	6	18	6	6	6	6	12
TOT	6	6	12	6	6	6	18	6	12
14-15 ENE	6	6	6	18	6	6	6	6	12
14-15 NE	6	6	6	18	6	6	6	6	12
14-15 SE	6	6	6	18	6	6	6	6	12
14-15 S	6	6	6	18	6	6	6	6	12
14-15 SW	6	6	6	18	6	6	6	6	12
14-15 WSW	6	6	6	18	6	6	6	6	12
14-15 NNW	6	6	6	18	6	6	6	6	12
14-15 NW	6	6	6	18	6	6	6	6	12
TOT	6	6	12	6	6	6	18	6	12
15-16 N	6	6	6	18	6	6	6	6	12
15-16 NNE	6	6	6	18	6	6	6	6	12
15-16 NE	6	6	6	18	6	6	6	6	12
15-16 ESE	6	6	6	18	6	6	6	6	12
15-16 SSE	6	6	6	18	6	6	6	6	12
15-16 S	6	6	6	18	6	6	6	6	12
15-16 SW	6	6	6	18	6	6	6	6	12
15-16 WSW	6	6	6	18	6	6	6	6	12
15-16 NNW	6	6	6	18	6	6	6	6	12
15-16 NW	6	6	6	18	6	6	6	6	12
TOT	6	6	12	6	6	6	18	6	12
20-21 E	6	6	6	18	6	6	6	6	12
23-24 SSE	6	6	6	18	6	6	6	6	12

1967 CASE 1---ACTUAL PERIOD IS 10.9 SIC
 1967 CASE 2---ACTUAL PERIOD IS 10.3 SEC

TOTAL 0 0 0 18 12 30 60 138 114 186 438 250 198 126 474 120 126 72 318 78 102 84 264 36 30 48 114 48 6 18 72 6 0 6 12 0 0 12 12 583 583 582 1764
 CALM 102 14 156 402
 UNCERTAIN DATA 168 0 0 0
 HOURS IN MONTH 744 732 744 2220

HEIGHT	4-2	5-6	PERIOD (SECT)	4-7	7-8	9-10	TOTALS
1-2 N	6	6	6	6	6	6	42
1-2 NNE	6	6	6	6	6	6	42
1-2 NE	6	6	6	6	6	6	42
1-2 ENE	6	6	6	6	6	6	42
1-2 E	6	6	6	6	6	6	42
1-2 SSE	6	6	6	6	6	6	42
1-2 SSW	6	6	6	6	6	6	42
1-2 SW	6	6	6	6	6	6	42
1-2 WSW	6	6	6	6	6	6	42
1-2 W	6	6	6	6	6	6	42
1-2 WNW	6	6	6	6	6	6	42
1-2 NNW	6	6	6	6	6	6	42
1-2 NW	6	6	6	6	6	6	42
2-3 NNE	6	6	6	6	6	6	42
2-3 NE	6	6	6	6	6	6	42
2-3 ENE	6	6	6	6	6	6	42
2-3 E	6	6	6	6	6	6	42
2-3 SSE	6	6	6	6	6	6	42
2-3 SSW	6	6	6	6	6	6	42
2-3 SW	6	6	6	6	6	6	42
2-3 WSW	6	6	6	6	6	6	42
2-3 W	6	6	6	6	6	6	42
2-3 WNW	6	6	6	6	6	6	42
2-3 NNW	6	6	6	6	6	6	42
2-3 NW	6	6	6	6	6	6	42
3-4 N	6	6	6	6	6	6	42
3-4 NNE	6	6	6	6	6	6	42
3-4 NE	6	6	6	6	6	6	42
3-4 ENE	6	6	6	6	6	6	42
3-4 E	6	6	6	6	6	6	42
3-4 SSE	6	6	6	6	6	6	42
3-4 SSW	6	6	6	6	6	6	42
3-4 SW	6	6	6	6	6	6	42
3-4 WSW	6	6	6	6	6	6	42
3-4 W	6	6	6	6	6	6	42
3-4 WNW	6	6	6	6	6	6	42
3-4 NNW	6	6	6	6	6	6	42
3-4 NW	6	6	6	6	6	6	42
TOT	102	102	42	246			
4-5 N	18	12	6	18			54
4-5 NNE	6	6	6	6			24
4-5 NE	6	6	6	6			24
4-5 ENE	6	6	6	6			24
4-5 E	6	6	6	6			24
4-5 SSE	6	6	6	6			24
4-5 SSW	6	6	6	6			24
4-5 SW	6	6	6	6			24
4-5 WSW	6	6	6	6			24
4-5 W	6	6	6	6			24
4-5 WNW	6	6	6	6			24
4-5 NNW	6	6	6	6			24
4-5 NW	6	6	6	6			24
TOT	84	42	66	192			
5-6 N	6	6	6	6	6	6	36
5-6 NNE	6	6	6	6	6	6	36
5-6 NE	6	6	6	6	6	6	36
5-6 ENE	6	6	6	6	6	6	36
5-6 E	6	6	6	6	6	6	36
5-6 SSE	6	6	6	6	6	6	36
5-6 SSW	6	6	6	6	6	6	36
5-6 SW	6	6	6	6	6	6	36
5-6 WSW	6	6	6	6	6	6	36
5-6 W	6	6	6	6	6	6	36
5-6 WNW	6	6	6	6	6	6	36
5-6 NNW	6	6	6	6	6	6	36
5-6 NW	6	6	6	6	6	6	36
TOT	36	36	36	144	36	36	
6-7 N	6	6	6	6	6	6	36
6-7 NNE	6	6	6	6	6	6	36
6-7 NE	6	6	6	6	6	6	36
6-7 ENE	6	6	6	6	6	6	36
6-7 E	6	6	6	6	6	6	36
6-7 SSE	6	6	6	6	6	6	36
6-7 SSW	6	6	6	6	6	6	36
6-7 SW	6	6	6	6	6	6	36
6-7 WSW	6	6	6	6	6	6	36
6-7 W	6	6	6	6	6	6	36
6-7 WNW	6	6	6	6	6	6	36
6-7 NNW	6	6	6	6	6	6	36
6-7 NW	6	6	6	6	6	6	36
TOT	36	36	36	144	36	36	

HEIGHT	DIR	'65 '66 '67 TOT	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
1-2	N	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT
1-2	NNE	6	6	6	6	6	6	6	6	6	6
1-2	E	6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6
1-2	W	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6
1-2	NW	6	6	6	6	6	6	6	6	6	6
1-2	NNW	6	6	6	6	6	6	6	6	6	6
1-2	TOT	18	18	18	18	18	18	18	18	18	18
2-3	N	6	6	6	6	6	6	6	6	6	6
2-3	NNE	6	6	6	6	6	6	6	6	6	6
2-3	ENE	6	6	6	6	6	6	6	6	6	6
2-3	E	6	6	6	6	6	6	6	6	6	6
2-3	SSE	6	6	6	6	6	6	6	6	6	6
2-3	S	6	6	6	6	6	6	6	6	6	6
2-3	SSW	6	6	6	6	6	6	6	6	6	6
2-3	SW	6	6	6	6	6	6	6	6	6	6
2-3	WSW	6	6	6	6	6	6	6	6	6	6
2-3	W	6	6	6	6	6	6	6	6	6	6
2-3	WNW	6	6	6	6	6	6	6	6	6	6
2-3	NW	6	6	6	6	6	6	6	6	6	6
2-3	NNW	6	6	6	6	6	6	6	6	6	6
2-3	TOT	6	6	6	6	6	6	6	6	6	6
3-4	N	6	6	6	6	6	6	6	6	6	6
3-4	NNE	6	6	6	6	6	6	6	6	6	6
3-4	ENE	6	6	6	6	6	6	6	6	6	6
3-4	E	6	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6	6
3-4	SW	6	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6	6
3-4	W	6	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6	6
3-4	NW	6	6	6	6	6	6	6	6	6	6
3-4	NNW	6	6	6	6	6	6	6	6	6	6
3-4	TOT	66	72	90	228	6	6	6	6	6	6
4-5	N	6	6	6	6	6	6	6	6	6	6
4-5	NNE	6	6	6	6	6	6	6	6	6	6
4-5	ENE	6	6	6	6	6	6	6	6	6	6
4-5	E	6	6	6	6	6	6	6	6	6	6
4-5	SSE	6	6	6	6	6	6	6	6	6	6
4-5	S	6	6	6	6	6	6	6	6	6	6
4-5	SSW	6	6	6	6	6	6	6	6	6	6
4-5	SW	6	6	6	6	6	6	6	6	6	6
4-5	WSW	6	6	6	6	6	6	6	6	6	6
4-5	W	6	6	6	6	6	6	6	6	6	6
4-5	WNW	6	6	6	6	6	6	6	6	6	6
4-5	NW	6	6	6	6	6	6	6	6	6	6
4-5	NNW	6	6	6	6	6	6	6	6	6	6
4-5	TOT	24	12	48	84	12	12	24	6	6	6
5-6	N	6	6	6	6	6	6	6	6	6	6
5-6	NNE	6	6	6	6	6	6	6	6	6	6
5-6	ENE	6	6	6	6	6	6	6	6	6	6
5-6	E	6	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6	6
5-6	SW	6	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6	6
5-6	W	6	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6	6
5-6	NW	6	6	6	6	6	6	6	6	6	6
5-6	NNW	6	6	6	6	6	6	6	6	6	6
5-6	TOT	6	6	6	6	6	6	6	6	6	6
6-7	N	6	6	6	6	6	6	6	6	6	6
6-7	NNE	6	6	6	6	6	6	6	6	6	6
6-7	ENE	6	6	6	6	6	6	6	6	6	6
6-7	E	6	6	6	6	6	6	6	6	6	6
6-7	SSE	6	6	6	6	6	6	6	6	6	6
6-7	S	6	6	6	6	6	6	6	6	6	6
6-7	SSW	6	6	6	6	6	6	6	6	6	6
6-7	SW	6	6	6	6	6	6	6	6	6	6
6-7	WSW	6	6	6	6	6	6	6	6	6	6
6-7	W	6	6	6	6	6	6	6	6	6	6
6-7	WNW	6	6	6	6	6	6	6	6	6	6
6-7	NW	6	6	6	6	6	6	6	6	6	6
6-7	NNW	6	6	6	6	6	6	6	6	6	6
6-7	TOT	12	24	6	30	6	6	6	6	6	6

CONTINUED

HEIGHT (FT)	DIR	<2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS						
7-8	N	65	66	67	TOT	65	66	67	TOT	65	66	67	TOT	1965	1966	1967	TOTAL
7-8	NNE													6	0	0	6
7-8	SE													6	0	0	6
7-8	NH													6	0	0	6
7-8	TOT													6	0	0	6
8-5	NNE													6	6	0	12
8-5	NE													6	6	0	12
8-5	SSW													6	6	0	12
8-5	SW													6	6	0	12
8-9	NNW													6	6	0	12
8-9	TCT													6	6	0	12
9-10	NE													12	12	0	24
10-11	N													6	6	0	12
10-11	NNE													12	12	0	24
10-11	S													6	6	0	12
10-11	TOT													6	6	0	12
11-12	NNE													6	6	0	12
11-12	NE													6	6	0	12
11-12	S													6	6	0	12
11-12	TOT													6	6	0	12
12-13	NNE													6	6	0	12
12-13	NE													6	6	0	12
12-13	TOT													6	6	0	12
14-15	ESE													6	6	0	12
14-15	NNW													6	6	0	12
14-15	TCT													6	6	0	12
15-16	NE													6	6	0	12

TOTAL	C	C	C	0	24	18	6	48	186	108	222	516	138	186	204	528	54	96	72	222	30	36	18	84	18	18	54	6	36	C	42	C	6	C	6	C	0	C	0	0	456	504	540	3500
-------	---	---	---	---	----	----	---	----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	-----	----	----	----	----	----	----	----	---	----	---	----	---	---	---	---	---	---	---	---	---	-----	-----	-----	------

UNCERTAIN DATA
HOURS IN MONTH

720	720	720	2360
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APPENDIX J

FIGURES J-1 thru J-12
WAVE STATISTICS FOR A LOCATION IN
LAKE HURON NEAR
COCKBURN ISLAND, ONTARIO
(45.83°N, 83.17°W)

FIGURE J-1b

CUCKOOEN ISL. NAVY STATION JANUARY
 LATITUDE 45.93 LONGITUDE 13.17

CONTINUED

HEIGHT	DIC	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(FT)	DIC	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	1965 1966 1967 TOTAL
8-9	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
8-9	SSW	6	6	6	6	6	6	6	6	6	6 0 0 6
8-9	NNW	6	6	6	6	6	6	6	6	6	6 0 0 6
8-9	TOT	18	18	18	18	18	18	18	18	18	18 0 0 54
9-10	E	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	SE	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	S	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	NW	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	TOT	24	24	24	24	24	24	24	24	24	0 24 0 48
10-11	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
10-11	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
10-11	SSE	6	6	6	6	6	6	6	6	6	6 0 0 6
10-11	TOT	18	18	18	18	18	18	18	18	18	18 0 0 54
11-12	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	SSE	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	NW	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	TOT	24	24	24	24	24	24	24	24	24	24 0 0 72
12-13	NW	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	SW	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	TOT	18	18	18	18	18	18	18	18	18	18 0 0 54
14-15	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
14-15	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
14-15	TOT	12	12	12	12	12	12	12	12	12	12 0 0 36
15-16	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
17-18	SSE	6	6	6	6	6	6	6	6	6	6 0 0 6
23-24	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
25-26	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
29-30	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
TOTAL	ALL	0	6	12	18	24	30	36	42	48	486 324 456 1266
UNCERTAIN DATA											
HOURS IN MONTH											
1965 CASE 1---ACTUAL PERIOD IS 35.0 SEC											
1967 CASE 1---ACTUAL PERIOD IS 30.0 SEC											
1967 CASE 2---ACTUAL PERIOD IS 31.5 SEC											
1967 CASE 3---ACTUAL PERIOD IS 31.5 SEC											
1967 CASE 4---ACTUAL PERIOD IS 30.0 SEC											

HEIGHT	DIC	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(FT)	DIC	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	1965 1966 1967 TOTAL
8-9	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
8-9	SSW	6	6	6	6	6	6	6	6	6	6 0 0 6
8-9	NNW	6	6	6	6	6	6	6	6	6	6 0 0 6
8-9	TOT	18	18	18	18	18	18	18	18	18	18 0 0 54
9-10	E	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	SE	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	S	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	NW	6	6	6	6	6	6	6	6	6	0 6 0 6
9-10	TOT	24	24	24	24	24	24	24	24	24	0 24 0 48
10-11	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
10-11	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
10-11	SSE	6	6	6	6	6	6	6	6	6	6 0 0 6
10-11	TOT	18	18	18	18	18	18	18	18	18	18 0 0 54
11-12	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	SSE	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	NW	6	6	6	6	6	6	6	6	6	6 0 0 6
11-12	TOT	24	24	24	24	24	24	24	24	24	24 0 0 72
12-13	NW	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	SW	6	6	6	6	6	6	6	6	6	6 0 0 6
13-14	TOT	18	18	18	18	18	18	18	18	18	18 0 0 54
14-15	ESE	6	6	6	6	6	6	6	6	6	6 0 0 6
14-15	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
14-15	TOT	12	12	12	12	12	12	12	12	12	12 0 0 36
15-16	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
17-18	SSE	6	6	6	6	6	6	6	6	6	6 0 0 6
23-24	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
25-26	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
29-30	SE	6	6	6	6	6	6	6	6	6	6 0 0 6
TOTAL	ALL	0	6	12	18	24	30	36	42	48	486 324 456 1266
UNCERTAIN DATA											
HOURS IN MONTH											
1965 CASE 1---ACTUAL PERIOD IS 35.0 SEC											
1967 CASE 1---ACTUAL PERIOD IS 30.0 SEC											
1967 CASE 2---ACTUAL PERIOD IS 31.5 SEC											
1967 CASE 3---ACTUAL PERIOD IS 31.5 SEC											
1967 CASE 4---ACTUAL PERIOD IS 30.0 SEC											

FIGURE J-3a

WAVE SUMMARY CASE NUMBER MARSH
COCKBURN I.L. LA. LONG. 45-03. EDDITUDE 83-17

HEIGHT	DIR	1-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOT	TOTALS
(FT)		1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67	1965 '66 '67
1-2	E	6	6	6	6	6	6	6	6	6	6
1-2	ESE	12	12	12	12	12	12	12	12	12	12
1-2	SE	6	6	6	6	6	6	6	6	6	6
1-2	SSE	6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6
1-2	W	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6
1-2	MNW	6	6	6	6	6	6	6	6	6	6
1-2	M	6	6	6	6	6	6	6	6	6	6
1-2	MNE	6	6	6	6	6	6	6	6	6	6
1-2	NNE	6	6	6	6	6	6	6	6	6	6
1-2	N	6	6	6	6	6	6	6	6	6	6
1-2	NNE	6	6	6	6	6	6	6	6	6	6
1-2	NW	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6
1-2	W	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6
1-2	SSE	6	6	6	6	6	6	6	6	6	6
1-2	SE	6	6	6	6	6	6	6	6	6	6
1-2	ESE	6	6	6	6	6	6	6	6	6	6
1-2	E	6	6	6	6	6	6	6	6	6	6
1-2	TOT	6	6	6	6	6	6	6	6	6	6
3-4	E	6	6	6	6	6	6	6	6	6	6
3-4	ESE	12	12	12	12	12	12	12	12	12	12
3-4	SE	6	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6	6
3-4	SW	6	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6	6
3-4	W	6	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6	6
3-4	MNW	6	6	6	6	6	6	6	6	6	6
3-4	M	6	6	6	6	6	6	6	6	6	6
3-4	MNE	6	6	6	6	6	6	6	6	6	6
3-4	NNE	6	6	6	6	6	6	6	6	6	6
3-4	N	6	6	6	6	6	6	6	6	6	6
3-4	NNE	6	6	6	6	6	6	6	6	6	6
3-4	NW	6	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6	6
3-4	W	6	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6	6
3-4	SW	6	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6	6
3-4	SE	6	6	6	6	6	6	6	6	6	6
3-4	ESE	6	6	6	6	6	6	6	6	6	6
3-4	E	6	6	6	6	6	6	6	6	6	6
3-4	TOT	6	6	6	6	6	6	6	6	6	6
5-6	E	6	6	6	6	6	6	6	6	6	6
5-6	ESE	12	12	12	12	12	12	12	12	12	12
5-6	SE	6	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6	6
5-6	SW	6	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6	6
5-6	W	6	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6	6
5-6	MNW	6	6	6	6	6	6	6	6	6	6
5-6	M	6	6	6	6	6	6	6	6	6	6
5-6	MNE	6	6	6	6	6	6	6	6	6	6
5-6	NNE	6	6	6	6	6	6	6	6	6	6
5-6	N	6	6	6	6	6	6	6	6	6	6
5-6	NNE	6	6	6	6	6	6	6	6	6	6
5-6	NW	6	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6	6
5-6	W	6	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6	6
5-6	SW	6	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6	6
5-6	SE	6	6	6	6	6	6	6	6	6	6
5-6	ESE	6	6	6	6	6	6	6	6	6	6
5-6	E	6	6	6	6	6	6	6	6	6	6
5-6	TOT	6	6	6	6	6	6	6	6	6	6
7-8	E	6	6	6	6	6	6	6	6	6	6
7-8	ESE	12	12	12	12	12	12	12	12	12	12
7-8	SE	6	6	6	6	6	6	6	6	6	6
7-8	SSE	6	6	6	6	6	6	6	6	6	6
7-8	S	6	6	6	6	6	6	6	6	6	6
7-8	SSW	6	6	6	6	6	6	6	6	6	6
7-8	SW	6	6	6	6	6	6	6	6	6	6
7-8	WSW	6	6	6	6	6	6	6	6	6	6
7-8	W	6	6	6	6	6	6	6	6	6	6
7-8	WNW	6	6	6	6	6	6	6	6	6	6
7-8	MNW	6	6	6	6	6	6	6	6	6	6
7-8	M	6	6	6	6	6	6	6	6	6	6
7-8	MNE	6	6	6	6	6	6	6	6	6	6
7-8	NNE	6	6	6	6	6	6	6	6	6	6
7-8	N	6	6	6	6	6	6	6	6	6	6
7-8	NNE	6	6	6	6	6	6	6	6	6	6
7-8	NW	6	6	6	6	6	6	6	6	6	6
7-8	WNW	6	6	6	6	6	6	6	6	6	6
7-8	W	6	6	6	6	6	6	6	6	6	6
7-8	WSW	6	6	6	6	6	6	6	6	6	6
7-8	SW	6	6	6	6	6	6	6	6	6	6
7-8	SSW	6	6	6	6	6	6	6	6	6	6
7-8	S	6	6	6	6	6	6	6	6	6	6
7-8	SSE	6	6	6	6	6	6	6	6	6	6
7-8	SE	6	6	6	6	6	6	6	6	6	6
7-8	ESE	6	6	6	6	6	6	6	6	6	6
7-8	E	6	6	6	6	6	6	6	6	6	6
7-8	TOT	6	6	6	6	6	6	6	6	6	6
9-10	E	6	6	6	6	6	6	6	6	6	6
9-10	ESE	12	12	12	12	12	12	12	12	12	12
9-10	SE	6	6	6	6	6	6	6	6	6	6
9-10	SSE	6	6	6	6	6	6	6	6	6	6
9-10	S	6	6	6	6	6	6	6	6	6	6
9-10	SSW	6	6	6	6	6	6	6	6	6	6
9-10	SW	6	6	6	6	6	6	6	6	6	6
9-10	WSW	6	6	6	6	6	6	6	6	6	6
9-10	W	6	6	6	6	6	6	6	6	6	6
9-10	WNW	6	6	6	6	6	6	6	6	6	6
9-10	MNW	6	6	6	6	6	6	6	6	6	6
9-10	M	6	6	6	6	6	6	6	6	6	6
9-10	MNE	6	6	6	6	6	6	6	6	6	6
9-10	NNE	6	6	6	6	6	6	6	6	6	6
9-10	N	6	6	6	6	6	6	6	6	6	6
9-10	NNE	6	6								

FIGURE J-4

CCORUNA ISL. LAKE SUPPLY
LAKE FLORON APRIL
LATITUDE 45.23 LONGITUDE 83.37

HEIGHT	DIR	2-3		3-4		4-5		5-6		6-7		7-8		8-9		9-10		TOTALS	
		TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT
42	N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
42	ENE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
42	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	WN	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2	TOT	18	6	48	12	48	12	158											
2-2	E	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-2	TOT	12	6	24	42	30	30	12	12	6	6	6	6	6	6	6	6	6	6
3-4	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	WN	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4	TOT	6	6	18	18	42	18	6	12	24	42								
4-5	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5	TOT	6	6	36	24	30	30	12	12	12	12								
5-6	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
5-6	TOT	6	6	12	12	6	6	6	6	6	6	6	6	6	6	6	6	6	6
6-7	ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8	SSE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

HEIGHT	DIR	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT	TOT	TCT
TOTAL	CALC	0	0	24	12	60	30	114	57	48	24	12	150	42	36	72	36	60	30
TOTAL	CALC	0	0	24	12	60	30	114	57	48	24	12	150	42	36	72	36	60	30
UNDETECTABLE																			
PELUS IN MENT																			

186 222 316 726
480 452 356 1368
24 6 6 36
650 720 720 2130

APPENDIX K

FIGURES K-1 thru K-12
WAVE STATISTICS FOR A LOCATION IN
LAKE HURON NEAR
DOUGLAS POINT, ONTARIO
(44.33°N, 81.67°W)

FIGURE K-3B

DOUGLAS POINT LAKE MICHIGAN JANUARY
 LATITUDE 44-33 LONGITUDE 81-67

CONTINUED

WIND DIRECTION	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(10°)	D12	D12	D12	D12	D12	D12	D12	D12	1965
	W	W	W	W	W	W	W	W	1966
	W	W	W	W	W	W	W	W	1967
	W	W	W	W	W	W	W	W	TOTAL
6-7 S	6	6	6	6	6	6	6	6	6
6-7 SW	6	6	6	6	6	6	6	6	6
6-7 WSW	6	6	6	6	6	6	6	6	6
6-7 W	6	6	6	6	6	6	6	6	6
6-7 WNW	6	6	6	6	6	6	6	6	6
6-7 NW	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
7-8 NNE	6	6	6	6	6	6	6	6	6
7-8 NE	6	6	6	6	6	6	6	6	6
7-8 ENE	6	6	6	6	6	6	6	6	6
7-8 E	6	6	6	6	6	6	6	6	6
7-8 ESE	6	6	6	6	6	6	6	6	6
7-8 SE	6	6	6	6	6	6	6	6	6
7-8 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
8-9 N	6	6	6	6	6	6	6	6	6
8-9 NNE	6	6	6	6	6	6	6	6	6
8-9 NE	6	6	6	6	6	6	6	6	6
8-9 ENE	6	6	6	6	6	6	6	6	6
8-9 E	6	6	6	6	6	6	6	6	6
8-9 ESE	6	6	6	6	6	6	6	6	6
8-9 SE	6	6	6	6	6	6	6	6	6
8-9 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
9-10 N	6	6	6	6	6	6	6	6	6
9-10 NNE	6	6	6	6	6	6	6	6	6
9-10 NE	6	6	6	6	6	6	6	6	6
9-10 ENE	6	6	6	6	6	6	6	6	6
9-10 E	6	6	6	6	6	6	6	6	6
9-10 ESE	6	6	6	6	6	6	6	6	6
9-10 SE	6	6	6	6	6	6	6	6	6
9-10 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
10-11 N	6	6	6	6	6	6	6	6	6
10-11 NNE	6	6	6	6	6	6	6	6	6
10-11 NE	6	6	6	6	6	6	6	6	6
10-11 ENE	6	6	6	6	6	6	6	6	6
10-11 E	6	6	6	6	6	6	6	6	6
10-11 ESE	6	6	6	6	6	6	6	6	6
10-11 SE	6	6	6	6	6	6	6	6	6
10-11 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
11-12 N	6	6	6	6	6	6	6	6	6
11-12 NNE	6	6	6	6	6	6	6	6	6
11-12 NE	6	6	6	6	6	6	6	6	6
11-12 ENE	6	6	6	6	6	6	6	6	6
11-12 E	6	6	6	6	6	6	6	6	6
11-12 ESE	6	6	6	6	6	6	6	6	6
11-12 SE	6	6	6	6	6	6	6	6	6
11-12 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
12-13 N	6	6	6	6	6	6	6	6	6
12-13 NNE	6	6	6	6	6	6	6	6	6
12-13 NE	6	6	6	6	6	6	6	6	6
12-13 ENE	6	6	6	6	6	6	6	6	6
12-13 E	6	6	6	6	6	6	6	6	6
12-13 ESE	6	6	6	6	6	6	6	6	6
12-13 SE	6	6	6	6	6	6	6	6	6
12-13 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
13-14 N	6	6	6	6	6	6	6	6	6
13-14 NNE	6	6	6	6	6	6	6	6	6
13-14 NE	6	6	6	6	6	6	6	6	6
13-14 ENE	6	6	6	6	6	6	6	6	6
13-14 E	6	6	6	6	6	6	6	6	6
13-14 ESE	6	6	6	6	6	6	6	6	6
13-14 SE	6	6	6	6	6	6	6	6	6
13-14 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
14-15 N	6	6	6	6	6	6	6	6	6
14-15 NNE	6	6	6	6	6	6	6	6	6
14-15 NE	6	6	6	6	6	6	6	6	6
14-15 ENE	6	6	6	6	6	6	6	6	6
14-15 E	6	6	6	6	6	6	6	6	6
14-15 ESE	6	6	6	6	6	6	6	6	6
14-15 SE	6	6	6	6	6	6	6	6	6
14-15 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
15-16 N	6	6	6	6	6	6	6	6	6
15-16 NNE	6	6	6	6	6	6	6	6	6
15-16 NE	6	6	6	6	6	6	6	6	6
15-16 ENE	6	6	6	6	6	6	6	6	6
15-16 E	6	6	6	6	6	6	6	6	6
15-16 ESE	6	6	6	6	6	6	6	6	6
15-16 SE	6	6	6	6	6	6	6	6	6
15-16 SSE	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6
21-22 N	6	6	6	6	6	6	6	6	6
23-24 N	6	6	6	6	6	6	6	6	6

TOTAL CALM 0 0 0 0 42 66 18 126 114 84 78 276 84 78 276 96 126 132 354 156 114 84 354 96 96 84 276 36 54 42 132 24 36 24 84 6 6 0 12 0 12 6 18 370 594 428 1632
 UNCERTAIN DATA 168 138 270 576 6 0 6 12 744 732 744 2720

1966 CASE 1---ACTUAL PERIOD IS 10-6 SEC
 1966 CASE 2---ACTUAL PERIOD IS 11-2 SEC
 1967 CASE 1---ACTUAL PERIOD IS 12-8 SEC

CONTINUO

WEIGHT (FT)	D18	<2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT
9-10 NNW	6	6	6	6	6	6	6	6	6	6	0 6 0 6
1-12 NE											0 0 6 6
10-17 WSW											0 0 6 6
TOTAL	0 0 0 0	66 96 60 222	84 120 96 303	60 86 114 258	66 36 42 144	36 48 12 96	18 6 6 30	0 0 0 0	6 0 0 0	6 0 0 0	6 0 0 0
CALM											336 390 330 1056
UNDEET IN DATA											402 354 472 1228
HOURS IN MONTH											6 0 12 18
											744 744 744 2232

DOUGLAS POINT LAKE MURON SEPTEMBER
 LATITUDE 44.33 LONGITUDE 81.67

CONTINUED

PERIOD (SEC)	4-7	5-6	7-8	8-9	9-10	TOTALS
HEIGHT (FT)	4-5	4-5	4-5	4-5	4-5	1965 1705 1967 TOTAL
DIR	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	0 0 12 12
10-11 NE	12 12	0 6	0 6	0 6	0 6	0 0 12 12
20-21 WSW	12 12	0 6	0 6	0 6	0 6	0 0 12 12
TOT	12 12	0 6	0 6	0 6	0 6	0 0 12 12
14-15 N	6 6	6 6	6 6	6 6	6 6	0 0 6 6
15-16 NNE	6 6	6 6	6 6	6 6	6 6	0 0 6 6

TOTAL	0	0	0	0	0	0	0	0	0	0	0	270	342	264	876
UNCERTAINTY DATA	0	0	0	0	0	0	0	0	0	0	0	45	37	40	1286
HOURS IN MONTH	0	0	0	0	0	0	0	0	0	0	0	720	720	720	2160

FIGURE K-10a

DOUGLAS POINT LAKE HUKON OCTOBER
 LA.ITUDE 44.33 LONGITUDE 81.67

HEIGHT	DIST	2-1	3-4	4-5	5-6	7-8	8-9	TOTAL
15-1	16-1	17-1	18-1	19-1	20-1	21-1	22-1	23-1
SE	SW	W	WNW	NW	NNE	ENE	E	SEE
1-2	N	6	6	6	12			6
1-2	NNE							6
1-2	ENE	6	6	12	12			36
1-2	SE	6	6					12
1-2	SSE							6
1-2	SW	6	6	12	6	6	6	36
1-2	SW							6
1-2	WSW	6	6	12	6	12	18	54
1-2	W	6	6	12	6	6	6	36
1-2	WNW	6	6	12	6	6	6	36
1-2	NW	6	6	12	6	6	6	36
1-2	TOT	18	18	54	42	36	66	330
2-3	N	6	6	6	6	6	6	36
2-3	NNE							6
2-3	ENE	6	6	6	6	6	6	36
2-3	SE	12	6	12				30
2-3	SSE							6
2-3	SW	6	6	6	6	6	6	36
2-3	SW							6
2-3	WSW	18	18	36	12	12	12	90
2-3	W	12	12	6	30			60
2-3	WNW	12	12	6	24			54
2-3	NW	12	12	6	24			54
2-3	TOT	42	30	18	90	72	42	356
3-4	N							6
3-4	NNE							6
3-4	ENE	6	6	6	6	6	6	36
3-4	E	6	6					12
3-4	SSE							6
3-4	SW	6	6	6	6	6	6	36
3-4	SW							6
3-4	WSW	12	12	6	18	12	12	72
3-4	W	12	12	6	18	12	12	72
3-4	WNW	6	6	6	6	6	6	36
3-4	NW	6	6	6	6	6	6	36
3-4	TOT	42	30	30	84	144	36	426
4-5	N							6
4-5	NNE							6
4-5	ENE	6	6	6	6	6	6	36
4-5	E	6	6					12
4-5	SSE							6
4-5	SW	6	6	6	6	6	6	36
4-5	SW							6
4-5	WSW	12	12	6	18	12	12	72
4-5	W	12	12	6	18	12	12	72
4-5	WNW	6	6	6	6	6	6	36
4-5	NW	6	6	6	6	6	6	36
4-5	TOT	42	30	30	84	144	36	426
5-6	N							6
5-6	NNE							6
5-6	ENE	6	6	6	6	6	6	36
5-6	E	6	6					12
5-6	SSE							6
5-6	SW	6	6	6	6	6	6	36
5-6	SW							6
5-6	WSW	12	12	6	18	12	12	72
5-6	W	12	12	6	18	12	12	72
5-6	WNW	6	6	6	6	6	6	36
5-6	NW	6	6	6	6	6	6	36
5-6	TOT	42	30	30	84	144	36	426
6-7	N							6
6-7	NNE							6
6-7	ENE	6	6	6	6	6	6	36
6-7	E	6	6					12
6-7	SSE							6
6-7	SW	6	6	6	6	6	6	36
6-7	SW							6
6-7	WSW	12	12	6	18	12	12	72
6-7	W	12	12	6	18	12	12	72
6-7	WNW	6	6	6	6	6	6	36
6-7	NW	6	6	6	6	6	6	36
6-7	TOT	42	30	30	84	144	36	426
7-8	N							6
7-8	NNE							6
7-8	ENE	6	6	6	6	6	6	36
7-8	E	6	6					12
7-8	SSE							6
7-8	SW	6	6	6	6	6	6	36
7-8	SW							6
7-8	WSW	12	12	6	18	12	12	72
7-8	W	12	12	6	18	12	12	72
7-8	WNW	6	6	6	6	6	6	36
7-8	NW	6	6	6	6	6	6	36
7-8	TOT	42	30	30	84	144	36	426

	2-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT
PLIGHT	62								
(17) EIC	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT	165 166 167 TOT
E-5 N	6	6	6	6	6	6	6	6	6
E-5 SSM	6	6	6	6	6	6	6	6	6
E-5 NNA	12	6	18	12	6	24	6	6	6
E-5 TOT	6	6	6	6	6	6	6	6	6
5-10 NNE									
5-10 NSE									
5-10 NNA									
5-10 TOT									
10-11 NE									
10-11 SE									
10-11 NW									
10-11 NNA									
10-11 TOT									
12-14 NNA									
15-16 NE									
15-16 SNE									
15-16 TOT									
22-23 NNA									
TOTAL	6	6	6	6	6	6	6	6	6
CALP	18	36	12	252	84	90	180	354	102
UNCERTAIN DATA	78	102	12	252	84	90	180	354	102
HELPS IN PCRT	18	36	12	252	84	90	180	354	102
TOTAL	6	6	6	6	6	6	6	6	6
CALP	18	36	12	252	84	90	180	354	102
UNCERTAIN DATA	78	102	12	252	84	90	180	354	102
HELPS IN PCRT	18	36	12	252	84	90	180	354	102

3566 CASE 3---ACTUAL PERIOD IS 10.2 SEC

APPENDIX L

FIGURES L-1 thru L-12

WAVE STATISTICS FOR A LOCATION IN

LAKE MICHIGAN NEAR

POINT BETSIE, MICHIGAN

(44.67°N, 86.33°W)

FIGURE L-1b

POINT WETSIK SUMMIT, CALIFORNIA, JANUARY
 LATITUDE 44-67 LONGITUDE 86-33

CONTINUED

HEIGHT	DIP	62	2-3	3-6	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(1-1)		62	2-3	3-6	4-5	5-6	6-7	7-8	8-9	9-10	1965 1966 1967 TOTAL
7-8	N	18	12	6	30						18 12 0 30
7-8	W	6									0 0 0 6
7-8	NNW	12	12	6	24						12 12 0 24
TOT		36	24	12	72						36 24 0 72
8-9	N			18	6	24					18 0 6 24
8-9	NE			6							0 0 0 6
8-9	W			6	6	12	18				0 0 0 18
8-9	WNW	6	6								6 6 0 12
8-9	SW	6	6								6 6 0 12
8-9	WSW	24	12	24	6	36	36				36 12 36 42
TOT				66	24	96	66				66 24 96 42
9-10	N										0 0 0 0
9-10	NNE			6							0 0 6 6
9-10	SW			6							0 0 6 6
9-10	WNW			6							0 0 6 6
9-10	SW			6							0 0 6 6
9-10	WSW			6							0 0 6 6
TOT				24							0 0 24 24
10-11	NNE										0 0 0 0
10-11	E										0 0 0 0
10-11	NNE			6	12	6	12				6 0 6 12
10-11	SW			6	12	6	12				6 0 6 12
TOT				12	24	12	24				12 0 24 42
11-12	N							6	6		0 0 6 6
11-12	SW							6	6		0 0 6 6
11-12	N							6	6		0 0 6 6
11-12	WNW							6	6		0 0 6 6
11-12	SW							6	6		0 0 6 6
11-12	WSW							6	6		0 0 6 6
TOT								24	24		0 0 24 24
12-13	NNE							6	6		0 0 6 6
12-13	SW							6	6		0 0 6 6
12-13	WNW							6	6		0 0 6 6
12-13	SW							6	6		0 0 6 6
12-13	WSW							6	6		0 0 6 6
TOT								24	24		0 0 24 24
13-14	N							6	6		0 0 6 6
13-14	WNW							6	6		0 0 6 6
13-14	SW							6	6		0 0 6 6
13-14	WSW							6	6		0 0 6 6
TOT								24	24		0 0 24 24
14-15	N							6	6		0 0 6 6
14-15	WNW							6	6		0 0 6 6
14-15	SW							6	6		0 0 6 6
14-15	WSW							6	6		0 0 6 6
TOT								24	24		0 0 24 24
16-17	NW							6	6		0 0 6 6
17-18	SW							6	6		0 0 6 6
21-22	NE							6	6		0 0 6 6
TOTAL		0	0	42	66	336	322	25	112	270	57 96 96 282 144 96 330 108 120 30 258 48 42 84 174 24 42 12 78 6 0 6 12 0 0 12 12 56 516 477 372
UNCERTAIN DATA											
HOURS IN MONTH											
1967 CASE 1-----ACTUAL PERIOD IS 12.1 SEC											
1967 CASE 2-----ACTUAL PERIOD IS 10.2 SEC											

FIGURE L-2b

POINT MIKISIE LAKE MICHIGAN FEBRUARY
LATITUDE 44.567 LONGITUDE 86.33

CONTINUED

FLIGHT (FT)	DIP	1-3	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
		101	101	101	101	101	101	101	101	101	1965 1966 1967 TOTAL
7-8 N											6 0 0 6
7-8 W											6 0 0 6
7-8 NW											0 6 0 6
8-0 SW											18 24 6 48
8-0 W											6 6 0 6
8-0 NW											0 6 0 6
8-0 W											12 0 0 12
8-10 N											12 6 6 24
8-10 W											6 6 6 6
8-10 NW											0 6 6 6
9-10 W											6 6 6 6
9-10 NW											6 6 6 6
10-11 SW											12 12 12 36
10-11 SW											6 6 6 6
10-11 W											6 6 6 6
10-11 W											0 6 6 6
10-11 W											6 6 6 6
11-12 W											17 17 17 51
12-13 NW											6 6 6 6
13-14 NW											6 6 6 6
14-15 NW											6 6 6 6
15-17 W											6 6 6 6
17-18 NW											6 6 6 6
19-20 NW											6 6 6 6
20-23 W											6 6 6 6

TOTAL	CALL	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A	6A
		120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
UNOBSERVED																		
HOUR IN MONTH																		
TOTAL		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
UNOBSERVED																		
HOUR IN MONTH																		
TOTAL		672	672	672	672	672	672	672	672	672	672	672	672	672	672	672	672	672

1965 CASE 1---ACTUAL DESIGN IS 10.2 SEC
1965 CASE 2---ACTUAL DESIGN IS 10.0 SEC

FIGURE 1-36

SHIP NAME
 OFFICE NAME
 LATITUDE
 LONGITUDE

CONTINUED

PERIOD	DIR	'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT	TOTALS			
(LEFT)		4-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	'65	'66	'67	TOT	1965	1966	1967	TOTAL			
7-8 SW																		0	6	0	6
7-8 MSW																		0	0	0	0
7-8 W																		0	0	0	0
7-8 NW																		0	0	0	0
TOT																		0	6	0	6
8-9 NNE																		0	0	0	0
8-9 MSN																		0	0	0	0
8-9 MNW																		0	0	0	0
TOT																		0	0	0	0
9-10 N																		0	0	0	0
9-10 MSW																		0	0	0	0
9-10 W																		0	0	0	0
TOT																		0	0	0	0
10-11 MNW																		0	12	0	12
11-12 E																		0	24	0	24
13-14 MSW																		0	0	0	0
TOT																		0	6	0	6
TOTAL CALM																		0	0	0	0
UNCERTAIN DATA																		384	444	390	1218
HOURS IN MONTH																		354	300	354	1008
TOTAL																		744	744	744	2232

FIGURE I-6

WAVE STATISTICS
LAKE MICHIGAN, MAY
LATITUDE 44-07 LONGITUDE 86-34

HEIGHT*	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTAL
(FT)	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101	165 186 167 101
	6 18 6 30	6 6 6 12 6 12	6 6 6 6 6 6 6 6	6 6 6 6 12 18 34	6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6 6 6 6 6 6 6 6 6	6 6 6 6 6 6 6 6 6 6 6 6
	18 18 12 48	12	32 6 6	12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6	12 6 12 6 12 6 12 6 12 6 12 6 12 6 12 6
3-2 N		6 6									6 6 6
3-2 NE			6 6	6 12							6 6 6
3-2 ENE			6 6	6 12	6 12						6 6 6 6 6 6 6
3-2 E											6 6 6 6 6 6 6
3-2 ESE			12 6	6							6 6 6 6 6 6 6
3-2 SE											6 6 6 6 6 6 6
3-2 SSE											6 6 6 6 6 6 6
3-2 S		6									6 6 6 6 6 6 6
3-2 SSW			6 6 6 6	6 12 18 34							6 6 6 6 6 6 6
3-2 SW				14 6 24							6 6 6 6 6 6 6
3-2 SSW				18 6 18							6 6 6 6 6 6 6
3-2 W			6 6	6 6 6 18							6 6 6 6 6 6 6
3-2 WNW			6 6	6 6 6 18							6 6 6 6 6 6 6
3-2 NW			6 6	12 12 6 30							6 6 6 6 6 6 6
3-2 NNW			6 6	12 6 6							6 6 6 6 6 6 6
TOT		6 12 42 60	48 90 48 180 6	6							60 102 90 252
2-3 NE					6						6 6 6
2-3 ENE				6 12	18						6 6 6 6 6 6 6
2-3 E				12 12							6 6 6 6 6 6 6
2-3 ESE				12 6 12							6 6 6 6 6 6 6
2-3 SE				12 6 12							6 6 6 6 6 6 6
2-3 SSE				12 6 12							6 6 6 6 6 6 6
2-3 S				12 6 12							6 6 6 6 6 6 6
2-3 SSW				24 24							6 6 6 6 6 6 6
2-3 SW				6 6							6 6 6 6 6 6 6
2-3 SSW				12 12							6 6 6 6 6 6 6
2-3 W				12 12 30							6 6 6 6 6 6 6
2-3 WNW				12 6 18							6 6 6 6 6 6 6
2-3 NW				18 24 12 54 30 60 36 176							48 84 48 180
TOT		6 12 42 60	48 90 48 180 6	6							60 102 90 252
3-4 NE					6 6						6 6 6
3-4 ENE				6 6							6 6 6 6 6 6 6
3-4 E				6 6							6 6 6 6 6 6 6
3-4 ESE				6 6							6 6 6 6 6 6 6
3-4 SE				6 6							6 6 6 6 6 6 6
3-4 SSE				6 6							6 6 6 6 6 6 6
3-4 S				6 6							6 6 6 6 6 6 6
3-4 SSW				6 6							6 6 6 6 6 6 6
3-4 SW				6 6							6 6 6 6 6 6 6
3-4 SSW				6 6							6 6 6 6 6 6 6
3-4 W				6 6							6 6 6 6 6 6 6
3-4 WNW				6 6							6 6 6 6 6 6 6
3-4 NW				6 6							6 6 6 6 6 6 6
3-4 NNW				6 6							6 6 6 6 6 6 6
TOT				18 42 18 78 6 12 18							24 42 30 96
4-5 NE					6 6 6						6 6 6
4-5 ENE				6 6 6							6 6 6 6 6 6 6
4-5 E				6 6 6							6 6 6 6 6 6 6
4-5 ESE				6 6 6							6 6 6 6 6 6 6
4-5 SE				6 6 6							6 6 6 6 6 6 6
4-5 SSE				6 6 6							6 6 6 6 6 6 6
4-5 S				6 6 6							6 6 6 6 6 6 6
4-5 SSW				6 6 6							6 6 6 6 6 6 6
4-5 SW				6 6 6							6 6 6 6 6 6 6
4-5 SSW				6 6 6							6 6 6 6 6 6 6
4-5 W				6 6 6							6 6 6 6 6 6 6
4-5 WNW				6 6 6							6 6 6 6 6 6 6
4-5 NW				6 6 6							6 6 6 6 6 6 6
4-5 NNW				6 6 6							6 6 6 6 6 6 6
TOT				6 12 18 18 30 24 72							18 36 36 90
5-6 NE					6 6 6						6 6 6
5-6 ENE				6 6 6							6 6 6 6 6 6 6
5-6 E				6 6 6							6 6 6 6 6 6 6
5-6 ESE				6 6 6							6 6 6 6 6 6 6
5-6 SE				6 6 6							6 6 6 6 6 6 6
5-6 SSE				6 6 6							6 6 6 6 6 6 6
5-6 S				6 6 6							6 6 6 6 6 6 6
5-6 SSW				6 6 6							6 6 6 6 6 6 6
5-6 SW				6 6 6							6 6 6 6 6 6 6
5-6 SSW				6 6 6							6 6 6 6 6 6 6
5-6 W				6 6 6							6 6 6 6 6 6 6
5-6 WNW				6 6 6							6 6 6 6 6 6 6
5-6 NW				6 6 6							6 6 6 6 6 6 6
5-6 NNW				6 6 6							6 6 6 6 6 6 6
TOT				6 12 18 18 30 24 72							18 36 36 90
6-7 NE					6 6 6						6 6 6
6-7 ENE				6 6 6							6 6 6 6 6 6 6
6-7 E				6 6 6							6 6 6 6 6 6 6
6-7 ESE				6 6 6							6 6 6 6 6 6 6
6-7 SE				6 6 6							6 6 6 6 6 6 6
6-7 SSE				6 6 6							6 6 6 6 6 6 6
6-7 S				6 6 6							6 6 6 6 6 6 6
6-7 SSW				6 6 6							6 6 6 6 6 6 6
6-7 SW				6 6 6							6 6 6 6 6 6 6
6-7 SSW				6 6 6							6 6 6 6 6 6 6
6-7 W				6 6 6							6 6 6 6 6 6 6
6-7 WNW				6 6 6							6 6 6 6 6 6 6
6-7 NW				6 6 6							6 6 6 6 6 6 6
6-7 NNW				6 6 6							6 6 6 6 6 6 6
TOT				6 12 18 18 30 24 72							18 36 36 90
UNEXPECTED DATA											
TOTAL	0 0 0 0 24 30 54 108	66 114 60 240	54 108 162 720 90 42 36 108	6 0 6 12 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	180 234 222 696	210 450 322 1382	12 14 12 44	402 744 744 1890	
RECAP	0 0 0 0 24 30 54 108	66 114 60 240	54 108 162 720 90 42 36 108	6 0 6 12 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	180 234 222 696	210 450 322 1382	12 14 12 44	402 744 744 1890	

FIGURE L-6

NAVF SURF DIVISION
 OFFICE OF NAVAL OPERATIONS
 WASHINGTON, D.C. 20340
 REPORT NUMBER: 66-23

HEIGHT	DIR	1-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	TOTAL
1-2	ENE	6	6	6	6	6	6	6	6	6	6	6	60
1-2	ESE	6	6	6	6	6	6	6	6	6	6	6	60
1-2	TOT	12	12	12	12	12	12	12	12	12	12	12	120
2-3	ENE	6	6	6	6	6	6	6	6	6	6	6	60
2-3	ESE	6	6	6	6	6	6	6	6	6	6	6	60
2-3	TOT	12	12	12	12	12	12	12	12	12	12	12	120
3-4	ENE	6	6	6	6	6	6	6	6	6	6	6	60
3-4	ESE	6	6	6	6	6	6	6	6	6	6	6	60
3-4	TOT	12	12	12	12	12	12	12	12	12	12	12	120
4-5	ENE	6	6	6	6	6	6	6	6	6	6	6	60
4-5	ESE	6	6	6	6	6	6	6	6	6	6	6	60
4-5	TOT	12	12	12	12	12	12	12	12	12	12	12	120
5-6	ENE	6	6	6	6	6	6	6	6	6	6	6	60
5-6	ESE	6	6	6	6	6	6	6	6	6	6	6	60
5-6	TOT	12	12	12	12	12	12	12	12	12	12	12	120
6-7	ENE	6	6	6	6	6	6	6	6	6	6	6	60
6-7	ESE	6	6	6	6	6	6	6	6	6	6	6	60
6-7	TOT	12	12	12	12	12	12	12	12	12	12	12	120
7-8	ENE	6	6	6	6	6	6	6	6	6	6	6	60
7-8	ESE	6	6	6	6	6	6	6	6	6	6	6	60
7-8	TOT	12	12	12	12	12	12	12	12	12	12	12	120
8-9	ENE	6	6	6	6	6	6	6	6	6	6	6	60
8-9	ESE	6	6	6	6	6	6	6	6	6	6	6	60
8-9	TOT	12	12	12	12	12	12	12	12	12	12	12	120
9-10	ENE	6	6	6	6	6	6	6	6	6	6	6	60
9-10	ESE	6	6	6	6	6	6	6	6	6	6	6	60
9-10	TOT	12	12	12	12	12	12	12	12	12	12	12	120
10-11	ENE	6	6	6	6	6	6	6	6	6	6	6	60
10-11	ESE	6	6	6	6	6	6	6	6	6	6	6	60
10-11	TOT	12	12	12	12	12	12	12	12	12	12	12	120
11-12	ENE	6	6	6	6	6	6	6	6	6	6	6	60
11-12	ESE	6	6	6	6	6	6	6	6	6	6	6	60
11-12	TOT	12	12	12	12	12	12	12	12	12	12	12	120
12-1	ENE	6	6	6	6	6	6	6	6	6	6	6	60
12-1	ESE	6	6	6	6	6	6	6	6	6	6	6	60
12-1	TOT	12	12	12	12	12	12	12	12	12	12	12	120
TOTAL	CALC	120	120	120	120	120	120	120	120	120	120	120	1440
UNCERTAIN DATA													
HOURS IN MONTH													

FIGURE L-7

POINT DEFSIF LAKE MICHIGAN JULY
LATITUDE 44-57 LONGITUDE 86-33

HEIGHT (FT)	DTP	1-1	2-2	3-3	4-4	5-5	6-6	7-7	8-8	9-9	10-10	TOTALS
1-2	N		6	6	6	6	6	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6	6	6	6
1-2	SSW	6	6	6	6	6	6	6	6	6	6	6
1-2	SW	6	6	6	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6	6	6	6
1-2	WN	6	6	6	6	6	6	6	6	6	6	6
1-2	TOT	18	6	24	48	24	36	30	90	6	6	144
2-3	F				6	6	6	6	6	6	6	6
2-3	S				6	6	6	6	6	6	6	6
2-3	SSW				6	6	6	6	6	6	6	6
2-3	SW				6	6	6	6	6	6	6	6
2-3	WSW				6	6	6	6	6	6	6	6
2-3	WNW				6	6	6	6	6	6	6	6
2-3	WN				6	6	6	6	6	6	6	6
2-3	TOT				12	30	18	60	24	60	78	162
3-4	SW					6	6	6	6	6	6	6
3-4	WSW					6	6	6	6	6	6	6
3-4	WNW					6	6	6	6	6	6	6
3-4	TOT					6	6	6	6	6	6	6
4-5	SW							12	6	6	12	6
4-5	WSW							12	6	6	12	6
4-5	WNW							12	6	6	12	6
4-5	TOT							24	24	12	60	6
5-6	SW								6	6	12	6
7-8	M									6	6	6
TOTAL	CALM	0	0	0	18	12	24	54	36	66	48	150
	UNCERTAINTY	0	0	0	0	0	0	0	0	0	0	0
	HOURS IN MONTH	0	0	0	18	12	24	54	36	66	48	150

CONTINUED

HEIGHT (FT)	DIF	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
		*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	1965 1966 1967 TOTAL
8-9	SSW				6	12	18			0 0 6
8-9	WSW				6	6	6			0 6 12
8-9	W				6	6	6			0 6 12
8-9	WNW				6	12	18	36		6 24 48
	TOT				6	36	54	90		6 30 48
9-10	N				6	6	6			6 0 6
9-10	SW				6	6	6			6 0 6
9-10	WSW				6	6	6			6 0 6
9-10	W				18	6	24			0 18 24
9-10	WNW				6	30	48			6 30 48
	TOT				36	66	126	180		12 66 180
10-11	SSW				12	6	24			12 0 6
10-11	SW				12	6	12	30		12 6 24
10-11	W				12	6	12	30		12 6 24
	TOT				36	18	66	90		36 18 90
11-12	W				6	6	6			6 0 6
11-12	WNW				6	6	12			6 6 12
	TOT				12	12	18			12 6 18
12-13	WSW				6	6	6			6 0 6
	TOT				6	6	6			6 0 6
28-29	NE				6	6	6			6 0 6

TOTAL CALM	0	C	0	12	6	66	84	66	90	72	228	156	84	96	336	344	90	120	354	54	108	84	246	24	36	114	TOTALS			
																											462	438	486	1386
																											282	234	258	774
																											0	72	0	72
																											744	744	744	2232

UNCERTAIN DATA HOURS IN MONTH

FIGURE L-11a

NAVE SUMMARY
 BETSIE LAKE MICHIGAN NOVEMBER
 LATITUDE 44.57 LONGITUDE 86.33

HEIGHT	DIR	42	2-3	4-5	5-6	7-8	8-9	10-11	TOTALS
		62	65	66	67	68	69	70	
		TOT	TOT	TOT	TOT	TOT	TOT	TOT	TOT
1-1	ENE	6	6	6	6	6	6	6	6
1-1	SSE	6	6	6	6	6	6	6	6
1-1	TOT	18	18	18	18	18	18	18	18
1-2	N	6	6	6	6	6	6	6	6
1-2	ENE	6	6	6	6	6	6	6	6
1-2	E	6	6	6	6	6	6	6	6
1-2	ESE	12	6	18	6	6	6	6	6
1-2	S	6	6	6	6	6	6	6	6
1-2	SSW	6	6	12	12	12	36	36	36
1-2	SW	6	6	6	6	6	6	6	6
1-2	WSW	6	6	6	6	6	6	6	6
1-2	WNW	6	6	6	6	6	6	6	6
1-2	NW	6	6	6	6	6	6	6	6
1-2	NNW	6	6	6	6	6	6	6	6
1-2	TOT	6	24	6	36	42	108	108	108
2-2	N	6	6	6	6	6	6	6	6
2-2	ENE	6	6	6	6	6	6	6	6
2-2	E	6	6	6	6	6	6	6	6
2-2	ESE	6	6	6	6	6	6	6	6
2-2	SSE	6	6	6	6	6	6	6	6
2-2	S	6	6	6	6	6	6	6	6
2-2	SSW	6	6	6	6	6	6	6	6
2-2	SW	6	6	6	6	6	6	6	6
2-2	WSW	6	6	6	6	6	6	6	6
2-2	WNW	6	6	6	6	6	6	6	6
2-2	NW	6	6	6	6	6	6	6	6
2-2	NNW	6	6	6	6	6	6	6	6
2-2	TOT	6	24	6	36	42	108	108	108
3-2	N	6	6	6	6	6	6	6	6
3-2	ENE	6	6	6	6	6	6	6	6
3-2	E	6	6	6	6	6	6	6	6
3-2	ESE	6	6	6	6	6	6	6	6
3-2	SSE	6	6	6	6	6	6	6	6
3-2	S	6	6	6	6	6	6	6	6
3-2	SSW	6	6	6	6	6	6	6	6
3-2	SW	6	6	6	6	6	6	6	6
3-2	WSW	6	6	6	6	6	6	6	6
3-2	WNW	6	6	6	6	6	6	6	6
3-2	NW	6	6	6	6	6	6	6	6
3-2	NNW	6	6	6	6	6	6	6	6
3-2	TOT	6	24	6	36	42	108	108	108
4-2	N	6	6	6	6	6	6	6	6
4-2	ENE	6	6	6	6	6	6	6	6
4-2	E	6	6	6	6	6	6	6	6
4-2	ESE	6	6	6	6	6	6	6	6
4-2	SSE	6	6	6	6	6	6	6	6
4-2	S	6	6	6	6	6	6	6	6
4-2	SSW	6	6	6	6	6	6	6	6
4-2	SW	6	6	6	6	6	6	6	6
4-2	WSW	6	6	6	6	6	6	6	6
4-2	WNW	6	6	6	6	6	6	6	6
4-2	NW	6	6	6	6	6	6	6	6
4-2	NNW	6	6	6	6	6	6	6	6
4-2	TOT	6	24	6	36	42	108	108	108
5-2	N	6	6	6	6	6	6	6	6
5-2	ENE	6	6	6	6	6	6	6	6
5-2	E	6	6	6	6	6	6	6	6
5-2	ESE	6	6	6	6	6	6	6	6
5-2	SSE	6	6	6	6	6	6	6	6
5-2	S	6	6	6	6	6	6	6	6
5-2	SSW	6	6	6	6	6	6	6	6
5-2	SW	6	6	6	6	6	6	6	6
5-2	WSW	6	6	6	6	6	6	6	6
5-2	WNW	6	6	6	6	6	6	6	6
5-2	NW	6	6	6	6	6	6	6	6
5-2	NNW	6	6	6	6	6	6	6	6
5-2	TOT	6	24	6	36	42	108	108	108
6-2	N	6	6	6	6	6	6	6	6
6-2	ENE	6	6	6	6	6	6	6	6
6-2	E	6	6	6	6	6	6	6	6
6-2	ESE	6	6	6	6	6	6	6	6
6-2	SSE	6	6	6	6	6	6	6	6
6-2	S	6	6	6	6	6	6	6	6
6-2	SSW	6	6	6	6	6	6	6	6
6-2	SW	6	6	6	6	6	6	6	6
6-2	WSW	6	6	6	6	6	6	6	6
6-2	WNW	6	6	6	6	6	6	6	6
6-2	NW	6	6	6	6	6	6	6	6
6-2	NNW	6	6	6	6	6	6	6	6
6-2	TOT	6	24	6	36	42	108	108	108

FIGURE L-11b

POINT: MICHIGAN NOVEMBER
 LATITUDE 44.67 LONGITUDE 86.33

(CONTINUED)

HEIGHT (FT)	DIC	<2	2-3	3-4	4-5	5-9	7-8	9-9	2-10	2-10	TOTALS
		65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	65°66'67" TOT	1965 1966 1967 TOTAL
		12 6	12 6	12 6	12 6	12 6	12 6	12 6	12 6	12 6	0 12 0
7-8	SM	6	6	6	6	6	6	6	6	6	0 0 0
7-8	M	6	6	6	6	6	6	6	6	6	0 0 0
7-8	MW	12	12	12	12	12	12	12	12	12	12 0 12
7-8	AN	24	24	24	24	24	24	24	24	24	24 24 24
	TOT										0 0 0
8-9	SM	6	6	6	6	6	6	6	6	6	12 0 6
8-9	M	6	6	6	6	6	6	6	6	6	12 0 6
8-9	MW	12	12	12	12	12	12	12	12	12	12 0 12
8-9	AN	24	24	24	24	24	24	24	24	24	24 0 24
	TOT										0 0 0
5-10	NE										0 0 0
5-10	SM										0 0 0
5-10	M										0 0 0
5-10	MW										0 0 0
5-10	AN										0 0 0
	TOT										0 0 0
10-11	NNE										0 0 0
10-11	ENE										0 0 0
10-11	AN										0 0 0
	TOT										0 0 0
11-12	NNE										12 0 0
12-12	N										0 0 0
14-15	NE										0 0 0
14-15	M										0 0 0
14-15	MW										0 12 0
14-15	AN										0 0 0
	TOT										0 12 0
15-16	N										0 0 0
15-16	NNE										0 0 0
15-16	NE										0 12 0
	TOT										0 12 0
16-17	N										0 0 0
16-17	NE										0 0 0
16-17	M										0 0 0
16-17	MW										0 12 0
16-17	AN										0 0 0
	TOT										0 12 0
18-20	NNE										0 0 0
18-20	NE										0 0 0
18-20	M										0 0 0
18-20	MW										0 0 0
18-20	AN										0 0 0
	TOT										0 0 0
21-22	NNE										0 0 0
23-24	NNE										0 12 0
TOTAL		0	0	0	0	0	0	0	0	0	226 492 414
UNCERTAIN DATA											384 228 306
RULES IN EFFECT											720 720 720

1965 CASE 1---ACTUAL PERIOD IS 10-6 SEC
 1966 CASE 1---ACTUAL PERIOD IS 10-3 SEC
 1966 CASE 2---ACTUAL PERIOD IS 10-3 SEC
 1966 CASE 3---ACTUAL PERIOD IS 10-8 SEC
 1966 CASE 4---ACTUAL PERIOD IS 10-6 SEC

FIGURE L-12b

POINT BEISEL LAKE MICHIGAN DECEMBER
 LATITUDE 44-57 LONGITUDE 86-33

CONTINUED

HEIGHT (FT)	DIR	2-3		3-4		4-5		5-6		6-7		7-8		8-9		9-10		TOTALS			
		'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT	'65	'66	'67	TOT
7-6	N																				
7-6	E																				
7-6	SSA																				
7-8	NW																				
7-8	NW																				
7-8	NNW																				
7-8	ICT																				
8-5	NNE																				
8-5	ESE																				
8-5	NNW																				
8-5	ICT																				
9-10	N																				
9-10	NW																				
9-10	NNW																				
9-10	ICT																				
10-11	N																				
12-13	N																				

TOTAL C C C 0 60 36 76 374 66 66 102 234 156 168 96 420 102 150 120 372 54 84 54 162 12 6 12 30 12 C C C 0 C 0 0 462 510 462 1137
 UNCERTAIN DATA 282 366 282 180
 WELLS IN MONTH C C C 48 C 48 744 744 2732

APPENDIX M

FIGURES M-1 thru M-12
WAVE STATISTICS FOR A LOCATION IN
LAKE MICHIGAN NEAR
MUSKEGON, MICHIGAN
(43.17°N, 86.33°W)

HEIGHT	2-1	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	TOTALS
1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11
5-1 ENE	6	6	6	6	6	6	6	6	6	6
5-1 E	6	6	6	6	6	6	6	6	6	6
5-1 ESE	6	6	6	6	6	6	6	6	6	6
5-1 TOT	6	6	6	6	6	6	6	6	6	6
3-2 N	6	6	6	6	6	6	6	6	6	6
3-2 NNE	6	6	6	6	6	6	6	6	6	6
3-2 NE	6	6	6	6	6	6	6	6	6	6
3-2 ENE	6	6	6	6	6	6	6	6	6	6
3-2 E	6	6	6	6	6	6	6	6	6	6
3-2 ESE	6	6	6	6	6	6	6	6	6	6
3-2 SSE	6	6	6	6	6	6	6	6	6	6
3-2 S	6	6	6	6	6	6	6	6	6	6
3-2 SSW	6	6	6	6	6	6	6	6	6	6
3-2 SW	6	6	6	6	6	6	6	6	6	6
3-2 WSW	6	6	6	6	6	6	6	6	6	6
3-2 W	6	6	6	6	6	6	6	6	6	6
3-2 WNW	6	6	6	6	6	6	6	6	6	6
3-2 NNW	6	6	6	6	6	6	6	6	6	6
3-2 NW	6	6	6	6	6	6	6	6	6	6
3-2 NNW	6	6	6	6	6	6	6	6	6	6
3-2 TOT	6	6	6	6	6	6	6	6	6	6
2-3 N	12	12	12	12	12	12	12	12	12	12
2-3 NNE	12	12	12	12	12	12	12	12	12	12
2-3 NE	12	12	12	12	12	12	12	12	12	12
2-3 ENE	12	12	12	12	12	12	12	12	12	12
2-3 E	12	12	12	12	12	12	12	12	12	12
2-3 ESE	12	12	12	12	12	12	12	12	12	12
2-3 SSE	12	12	12	12	12	12	12	12	12	12
2-3 S	12	12	12	12	12	12	12	12	12	12
2-3 SSW	12	12	12	12	12	12	12	12	12	12
2-3 SW	12	12	12	12	12	12	12	12	12	12
2-3 WSW	12	12	12	12	12	12	12	12	12	12
2-3 W	12	12	12	12	12	12	12	12	12	12
2-3 WNW	12	12	12	12	12	12	12	12	12	12
2-3 NNW	12	12	12	12	12	12	12	12	12	12
2-3 NW	12	12	12	12	12	12	12	12	12	12
2-3 NNW	12	12	12	12	12	12	12	12	12	12
2-3 TOT	12	12	12	12	12	12	12	12	12	12
1-4 WNE	6	6	6	6	6	6	6	6	6	6
1-4 ESE	6	6	6	6	6	6	6	6	6	6
1-4 S	6	6	6	6	6	6	6	6	6	6
1-4 SW	6	6	6	6	6	6	6	6	6	6
1-4 WSW	6	6	6	6	6	6	6	6	6	6
1-4 W	6	6	6	6	6	6	6	6	6	6
1-4 WNW	6	6	6	6	6	6	6	6	6	6
1-4 NNW	6	6	6	6	6	6	6	6	6	6
1-4 NW	6	6	6	6	6	6	6	6	6	6
1-4 NNW	6	6	6	6	6	6	6	6	6	6
1-4 TOT	6	6	6	6	6	6	6	6	6	6
4-5 N	6	6	6	6	6	6	6	6	6	6
4-5 NNE	6	6	6	6	6	6	6	6	6	6
4-5 NE	6	6	6	6	6	6	6	6	6	6
4-5 ENE	6	6	6	6	6	6	6	6	6	6
4-5 E	6	6	6	6	6	6	6	6	6	6
4-5 ESE	6	6	6	6	6	6	6	6	6	6
4-5 SSE	6	6	6	6	6	6	6	6	6	6
4-5 S	6	6	6	6	6	6	6	6	6	6
4-5 SSW	6	6	6	6	6	6	6	6	6	6
4-5 SW	6	6	6	6	6	6	6	6	6	6
4-5 WSW	6	6	6	6	6	6	6	6	6	6
4-5 W	6	6	6	6	6	6	6	6	6	6
4-5 WNW	6	6	6	6	6	6	6	6	6	6
4-5 NNW	6	6	6	6	6	6	6	6	6	6
4-5 NW	6	6	6	6	6	6	6	6	6	6
4-5 NNW	6	6	6	6	6	6	6	6	6	6
4-5 TOT	6	6	6	6	6	6	6	6	6	6
5-6 N	6	6	6	6	6	6	6	6	6	6
5-6 NNE	6	6	6	6	6	6	6	6	6	6
5-6 NE	6	6	6	6	6	6	6	6	6	6
5-6 ENE	6	6	6	6	6	6	6	6	6	6
5-6 E	6	6	6	6	6	6	6	6	6	6
5-6 ESE	6	6	6	6	6	6	6	6	6	6
5-6 SSE	6	6	6	6	6	6	6	6	6	6
5-6 S	6	6	6	6	6	6	6	6	6	6
5-6 SSW	6	6	6	6	6	6	6	6	6	6
5-6 SW	6	6	6	6	6	6	6	6	6	6
5-6 WSW	6	6	6	6	6	6	6	6	6	6
5-6 W	6	6	6	6	6	6	6	6	6	6
5-6 WNW	6	6	6	6	6	6	6	6	6	6
5-6 NNW	6	6	6	6	6	6	6	6	6	6
5-6 NW	6	6	6	6	6	6	6	6	6	6
5-6 NNW	6	6	6	6	6	6	6	6	6	6
5-6 TOT	6	6	6	6	6	6	6	6	6	6

12 17 13 36 18 72 30 24 24 78

FIGURE M-1b

MUSKEGON, MISSOURI, MICHIGAN, JANUARY
 LATITUDE 43-17 LONGITUDE 86-33

CONTINUED

HEIGHT	2-3		3-6		4-5		4-7		5-9		7-8		9-10		TOTALS	
	N	TOT	N	TOT	N	TOT	N	TOT	N	TOT	N	TOT	N	TOT	N	TOT
6-7 NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
6-7 SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
6-7 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
6-7 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
6-7 WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
7-8 N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-8 NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8 SE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8 WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8 NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
8-9 N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
8-9 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
8-9 WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
8-9 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
8-9 NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
9-10 N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
9-10 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10 NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
10-11 N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11 NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
10-11 NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
11-12 N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11-12 NW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
12-13 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
13-14 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
15-16 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

TOTAL	0	0	0	0	18	36	126	150	72	108	330	138	102	96	336	96	126	108	330	96	84	96	264	36	54	48	138	18	30	6	54	0	0	0	0	0	0	0	0	0	540	546	898	1384	180	186	234	600	72	0	12	36	744	732	744	2420
UNCERTAIN DATA HOURS IN MONTH																										744	732	744	2420																											

FIGURE M-2b

WAVE SUPPLY
LAKE MICHIGAN FEBRUARY
MUSKEGON LATITUDE 43.17 LONGITUDE 86.33

CONTINUED

HEIGHT	DIR	<2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
FEET	DIR	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	*65 *66 *67 TOT	1965 1966 1967 TOTAL
6-7	N	6	6	6	6	6	6	6	6	6	6 0 0
6-7	SSW	6	6	6	6	6	6	6	6	6	6 0 0
6-7	N	6	6	6	6	6	6	6	6	6	6 0 0
6-7	NNW	6	6	6	6	6	6	6	6	6	6 0 0
6-7	SW	6	6	6	6	6	6	6	6	6	6 0 0
7-8	N	6	6	6	6	6	6	6	6	6	6 0 0
7-8	SW	6	6	6	6	6	6	6	6	6	6 0 0
7-8	NNW	6	6	6	6	6	6	6	6	6	6 0 0
7-8	SW	6	6	6	6	6	6	6	6	6	6 0 0
8-9	N	6	6	6	6	6	6	6	6	6	6 0 0
8-9	NNW	6	6	6	6	6	6	6	6	6	6 0 0
9-10	NE	6	6	6	6	6	6	6	6	6	6 0 0
9-10	SSW	6	6	6	6	6	6	6	6	6	6 0 0
9-10	NNW	6	6	6	6	6	6	6	6	6	6 0 0
9-10	SW	6	6	6	6	6	6	6	6	6	6 0 0
10-11	NW	6	6	6	6	6	6	6	6	6	6 0 0
10-11	SW	6	6	6	6	6	6	6	6	6	6 0 0
11-12	NW	6	6	6	6	6	6	6	6	6	6 0 0
11-12	NNW	6	6	6	6	6	6	6	6	6	6 0 0
12-13	NW	6	6	6	6	6	6	6	6	6	6 0 0
12-13	NNW	6	6	6	6	6	6	6	6	6	6 0 0
TOTAL		9	0	0	0	24	24	30	30	24	24 22 22 70
CALM											
UNCERTAIN DATA											
WINDS IN MONTH											
672 672 300 1704											

FIGURE M-36

MAJ-NELSON
LA 1:11:16 43:17 (LONGITUDE 80-33)

MAJ-NELSON
LA 1:11:16 43:17 (LONGITUDE 80-33)

HEIGHT	1-4	5-6	7-8	9-10	TOTAL
1-1	6	6	6	6	24
1-2	6	6	6	6	24
1-3	6	6	6	6	24
1-4	6	6	6	6	24
1-5	6	6	6	6	24
1-6	6	6	6	6	24
1-7	6	6	6	6	24
1-8	6	6	6	6	24
1-9	6	6	6	6	24
1-10	6	6	6	6	24
1-11	6	6	6	6	24
1-12	6	6	6	6	24
1-13	6	6	6	6	24
1-14	6	6	6	6	24
1-15	6	6	6	6	24
1-16	6	6	6	6	24
1-17	6	6	6	6	24
1-18	6	6	6	6	24
1-19	6	6	6	6	24
1-20	6	6	6	6	24
1-21	6	6	6	6	24
1-22	6	6	6	6	24
1-23	6	6	6	6	24
1-24	6	6	6	6	24
1-25	6	6	6	6	24
1-26	6	6	6	6	24
1-27	6	6	6	6	24
1-28	6	6	6	6	24
1-29	6	6	6	6	24
1-30	6	6	6	6	24
1-31	6	6	6	6	24
1-32	6	6	6	6	24
1-33	6	6	6	6	24
1-34	6	6	6	6	24
1-35	6	6	6	6	24
1-36	6	6	6	6	24
1-37	6	6	6	6	24
1-38	6	6	6	6	24
1-39	6	6	6	6	24
1-40	6	6	6	6	24
1-41	6	6	6	6	24
1-42	6	6	6	6	24
1-43	6	6	6	6	24
1-44	6	6	6	6	24
1-45	6	6	6	6	24
1-46	6	6	6	6	24
1-47	6	6	6	6	24
1-48	6	6	6	6	24
1-49	6	6	6	6	24
1-50	6	6	6	6	24
1-51	6	6	6	6	24
1-52	6	6	6	6	24
1-53	6	6	6	6	24
1-54	6	6	6	6	24
1-55	6	6	6	6	24
1-56	6	6	6	6	24
1-57	6	6	6	6	24
1-58	6	6	6	6	24
1-59	6	6	6	6	24
1-60	6	6	6	6	24
1-61	6	6	6	6	24
1-62	6	6	6	6	24
1-63	6	6	6	6	24
1-64	6	6	6	6	24
1-65	6	6	6	6	24
1-66	6	6	6	6	24
1-67	6	6	6	6	24
1-68	6	6	6	6	24
1-69	6	6	6	6	24
1-70	6	6	6	6	24
1-71	6	6	6	6	24
1-72	6	6	6	6	24
1-73	6	6	6	6	24
1-74	6	6	6	6	24
1-75	6	6	6	6	24
1-76	6	6	6	6	24
1-77	6	6	6	6	24
1-78	6	6	6	6	24
1-79	6	6	6	6	24
1-80	6	6	6	6	24
1-81	6	6	6	6	24
1-82	6	6	6	6	24
1-83	6	6	6	6	24
1-84	6	6	6	6	24
1-85	6	6	6	6	24
1-86	6	6	6	6	24
1-87	6	6	6	6	24
1-88	6	6	6	6	24
1-89	6	6	6	6	24
1-90	6	6	6	6	24
1-91	6	6	6	6	24
1-92	6	6	6	6	24
1-93	6	6	6	6	24
1-94	6	6	6	6	24
1-95	6	6	6	6	24
1-96	6	6	6	6	24
1-97	6	6	6	6	24
1-98	6	6	6	6	24
1-99	6	6	6	6	24
1-100	6	6	6	6	24

FIGURE M-4

MUSKEGON LAKE SUPPLY LAKE PICHEON APRIL
LATITUDE 49.17 LONGITUDE 26.33

DEPTH	DIR	VEG	60	67	TCT	4-5	6-7	8-9	10-11	TOTALS
2-3	3-4	4-5	6-7	7-8	8-9	10-11	12-13	14-15	16-17	TOTAL
4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	TOTAL
1-1	N	6	6	12	12					36
1-2	N	6	6	12	12					36
1-3	N	6	6	12	12					36
2-1	E	6	6	12	12					36
2-2	E	6	6	12	12					36
2-3	E	6	6	12	12					36
3-1	N	6	6	12	12					36
3-2	N	6	6	12	12					36
3-3	N	6	6	12	12					36
4-1	N	6	6	12	12					36
4-2	N	6	6	12	12					36
4-3	N	6	6	12	12					36
5-1	S	6	6	12	12					36
5-2	S	6	6	12	12					36
5-3	S	6	6	12	12					36
TOT		36	36	72	72					216
6-1	N	6	6	12	12					36
6-2	N	6	6	12	12					36
6-3	N	6	6	12	12					36
7-1	N	6	6	12	12					36
7-2	N	6	6	12	12					36
7-3	N	6	6	12	12					36
8-1	N	6	6	12	12					36
8-2	N	6	6	12	12					36
8-3	N	6	6	12	12					36
9-1	N	6	6	12	12					36
9-2	N	6	6	12	12					36
9-3	N	6	6	12	12					36
TOT		36	36	72	72					216
10-1	N	6	6	12	12					36
10-2	N	6	6	12	12					36
10-3	N	6	6	12	12					36
TOT		36	36	72	72					216
11-1	N	6	6	12	12					36
11-2	N	6	6	12	12					36
11-3	N	6	6	12	12					36
TOT		36	36	72	72					216
12-1	N	6	6	12	12					36
12-2	N	6	6	12	12					36
12-3	N	6	6	12	12					36
TOT		36	36	72	72					216
13-1	N	6	6	12	12					36
13-2	N	6	6	12	12					36
13-3	N	6	6	12	12					36
TOT		36	36	72	72					216
14-1	N	6	6	12	12					36
14-2	N	6	6	12	12					36
14-3	N	6	6	12	12					36
TOT		36	36	72	72					216
15-1	N	6	6	12	12					36
15-2	N	6	6	12	12					36
15-3	N	6	6	12	12					36
TOT		36	36	72	72					216
16-1	N	6	6	12	12					36
16-2	N	6	6	12	12					36
16-3	N	6	6	12	12					36
TOT		36	36	72	72					216
17-1	N	6	6	12	12					36
17-2	N	6	6	12	12					36
17-3	N	6	6	12	12					36
TOT		36	36	72	72					216
18-1	N	6	6	12	12					36
18-2	N	6	6	12	12					36
18-3	N	6	6	12	12					36
TOT		36	36	72	72					216
19-1	N	6	6	12	12					36
19-2	N	6	6	12	12					36
19-3	N	6	6	12	12					36
TOT		36	36	72	72					216
20-1	N	6	6	12	12					36
20-2	N	6	6	12	12					36
20-3	N	6	6	12	12					36
TOT		36	36	72	72					216
21-1	N	6	6	12	12					36
21-2	N	6	6	12	12					36
21-3	N	6	6	12	12					36
TOT		36	36	72	72					216
22-1	N	6	6	12	12					36
22-2	N	6	6	12	12					36
22-3	N	6	6	12	12					36
TOT		36	36	72	72					216
23-1	N	6	6	12	12					36
23-2	N	6	6	12	12					36
23-3	N	6	6	12	12					36
TOT		36	36	72	72					216
24-1	N	6	6	12	12					36
24-2	N	6	6	12	12					36
24-3	N	6	6	12	12					36
TOT		36	36	72	72					216
25-1	N	6	6	12	12					36
25-2	N	6	6	12	12					36
25-3	N	6	6	12	12					36
TOT		36	36	72	72					216
26-1	N	6	6	12	12					36
26-2	N	6	6	12	12					36
26-3	N	6	6	12	12					36
TOT		36	36	72	72					216
27-1	N	6	6	12	12					36
27-2	N	6	6	12	12					36
27-3	N	6	6	12	12					36
TOT		36	36	72	72					216
28-1	N	6	6	12	12					36
28-2	N	6	6	12	12					36
28-3	N	6	6	12	12					36
TOT		36	36	72	72					216
29-1	N	6	6	12	12					36
29-2	N	6	6	12	12					36
29-3	N	6	6	12	12					36
TOT		36	36	72	72					216
30-1	N	6	6	12	12					36
30-2	N	6	6	12	12					36
30-3	N	6	6	12	12					36
TOT		36	36	72	72					216
31-1	N	6	6	12	12					36
31-2	N	6	6	12	12					36
31-3	N	6	6	12	12					36
TOT		36	36	72	72					216
32-1	N	6	6	12	12					36
32-2	N	6	6	12	12					36
32-3	N	6	6	12	12					36
TOT		36	36	72	72					216
33-1	N	6	6	12	12					36
33-2	N	6	6	12	12					36
33-3	N	6	6	12	12					36
TOT		36	36	72	72					216
34-1	N	6	6	12	12					36
34-2	N	6	6	12	12					36
34-3	N	6	6	12	12					36
TOT		36	36	72	72					216
35-1	N	6	6	12	12					36
35-2	N	6	6	12	12					36
35-3	N	6	6	12	12					36
TOT		36	36	72	72					216
36-1	N	6	6	12	12					36
36-2	N	6	6	12	12					36
36-3	N	6	6	12	12					36
TOT		36	36	72	72					216
37-1	N	6	6	12	12					36
37-2	N	6	6	12	12					36
37-3	N	6	6	12	12					36
TOT		36	36	72	72					216
38-1	N	6	6	12	12					36
38-2	N	6	6	12	12					36
38-3	N	6	6	12	12					36
TOT		36	36	72	72					216
39-1	N	6	6	12	12					36
39-2	N	6	6	12	12					36
39-3	N	6	6	12	12					36
TOT		36	36	72	72					216
40-1	N	6	6	12	12					36
40-2	N	6	6	12	12					36
40-3	N	6	6	12	12					36
TOT		36	36	72	72					216
41-1	N	6	6	12	12					36
41-2	N	6	6	12	12					36
41-3	N	6	6	12	12					36
TOT		36	36	72	72					216
42-1	N	6	6	12	12					36
42-2	N	6	6	12	12					36
42-3	N	6	6	12	12					36
TOT		36	36	72	72					216
43-1	N	6	6	12	12					36
43-2	N	6	6	12	12					36
43-3	N	6	6	12	12					36
TOT		36	36	72	72					216
44-1	N	6	6	12	12					36
44-2	N	6	6	12	12					36
44-3	N	6	6	12	12					36
TOT		36	36	72	72					216
45-1	N	6	6	12	12					36
45-2	N	6	6	12	12					36
45-3	N	6	6	12	12					36
TOT		36	36	72	72					216
46-1	N	6	6	12	12					36
46-2	N	6	6	12	12					36
46-3	N	6	6	12	12					36

FIGURE M-7

MUSKEGON LAKE MICHIGAN JULY
NAVI SURVEY
LATITUDE 43.17 LONGITUDE 86.33

WEIGHT	42	2-2	3-4	4-5	5-6	7-8	8-9	9-10	TOTALS								
LEVI	018	165	166	167	101	165	166	167	101	165	166	167	101	1965	1966	1967	TOTAL
9-1 NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-1 ENE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 ESE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 WNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1-2 N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	24	30	30	64	18	30	18	66	6	6	6	6	6	48	60	48	156
2-3 N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-3 SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-3 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-3 W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2-3 NNW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4 NNE	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3-4 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
4-5 SSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7-8 W	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9-10 WSW	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
27-28 N	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
TOT	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

TOTAL CALM UNCERTAIN DATA HOURS IN MONTH

1967 CASE 1---ACTUAL PERIOD IS 48.0 SEC

TOTAL CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UNCERTAIN DATA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HOURS IN MONTH	30	36	30	46	24	36	74	86	24	30	18	72	12	0	0	0	6
TOTAL	30	36	30	46	24	36	74	86	24	30	18	72	12	0	0	0	6
TOTALS	654	612	666	1932	654	612	666	1932	654	612	666	1932	654	612	666	1932	654
TOTALS	744	744	744	2232	744	744	744	2232	744	744	744	2232	744	744	744	2232	744

FIGURE M-10a

NAVAL SUMMARY
LAKE MICHIGAN OCTOBER
LATITUDE 43-17 LONGITUDE 86-33

HEIGHT	DIR	6-7	8-9	9-10	TOTALS
(FT)		65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT
5-1	E	6	6	6	6
5-2	E	6	6	6	6
5-3	E	6	6	6	6
TOT		6	6	6	6
3-2	N	6	6	6	6
3-2	NNE	6	6	6	6
3-2	NE	6	6	6	6
3-2	ENE	6	6	6	6
3-2	E	6	6	6	6
3-2	ESE	6	6	6	6
3-2	SE	6	6	6	6
3-2	SSE	6	6	6	6
3-2	S	6	6	6	6
3-2	SSW	6	6	6	6
3-2	SW	6	6	6	6
3-2	WSW	6	6	6	6
3-2	W	6	6	6	6
3-2	WNW	6	6	6	6
3-2	NW	6	6	6	6
3-2	NNW	6	6	6	6
TOT		30	36	24	90
2-3	N	6	6	6	6
2-3	NNE	6	6	6	6
2-3	NE	6	6	6	6
2-3	ENE	6	6	6	6
2-3	E	6	6	6	6
2-3	ESE	6	6	6	6
2-3	SE	6	6	6	6
2-3	SSE	6	6	6	6
2-3	S	6	6	6	6
2-3	SSW	6	6	6	6
2-3	SW	6	6	6	6
2-3	WSW	6	6	6	6
2-3	W	6	6	6	6
2-3	WNW	6	6	6	6
2-3	NW	6	6	6	6
2-3	NNW	6	6	6	6
TOT		42	6	42	90
3-4	N	6	6	6	6
3-4	NNE	6	6	6	6
3-4	NE	6	6	6	6
3-4	ENE	6	6	6	6
3-4	E	6	6	6	6
3-4	ESE	6	6	6	6
3-4	SE	6	6	6	6
3-4	SSE	6	6	6	6
3-4	S	6	6	6	6
3-4	SSW	6	6	6	6
3-4	SW	6	6	6	6
3-4	WSW	6	6	6	6
3-4	W	6	6	6	6
3-4	WNW	6	6	6	6
3-4	NW	6	6	6	6
3-4	NNW	6	6	6	6
TOT		42	24	54	120
4-5	N	6	6	6	6
4-5	NNE	6	6	6	6
4-5	NE	6	6	6	6
4-5	ENE	6	6	6	6
4-5	E	6	6	6	6
4-5	ESE	6	6	6	6
4-5	SE	6	6	6	6
4-5	SSE	6	6	6	6
4-5	S	6	6	6	6
4-5	SSW	6	6	6	6
4-5	SW	6	6	6	6
4-5	WSW	6	6	6	6
4-5	W	6	6	6	6
4-5	WNW	6	6	6	6
4-5	NW	6	6	6	6
4-5	NNW	6	6	6	6
TOT		6	6	6	6
5-6	N	6	6	6	6
5-6	NNE	6	6	6	6
5-6	NE	6	6	6	6
5-6	ENE	6	6	6	6
5-6	E	6	6	6	6
5-6	ESE	6	6	6	6
5-6	SE	6	6	6	6
5-6	SSE	6	6	6	6
5-6	S	6	6	6	6
5-6	SSW	6	6	6	6
5-6	SW	6	6	6	6
5-6	WSW	6	6	6	6
5-6	W	6	6	6	6
5-6	WNW	6	6	6	6
5-6	NW	6	6	6	6
5-6	NNW	6	6	6	6
TOT		12	12	12	36
6-7	N	6	6	6	6
6-7	NNE	6	6	6	6
6-7	NE	6	6	6	6
6-7	ENE	6	6	6	6
6-7	E	6	6	6	6
6-7	ESE	6	6	6	6
6-7	SE	6	6	6	6
6-7	SSE	6	6	6	6
6-7	S	6	6	6	6
6-7	SSW	6	6	6	6
6-7	SW	6	6	6	6
6-7	WSW	6	6	6	6
6-7	W	6	6	6	6
6-7	WNW	6	6	6	6
6-7	NW	6	6	6	6
6-7	NNW	6	6	6	6
TOT		12	12	12	36

FIGURE M-10b

MUSKOGON LAKE MICHIGAN OCTONEK
 LATITUDE 43.17 LONGITUDE 86.33

CONTINUED

HEIGHT (FT)	DIR	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOT	TOTALS
		165 66 67 TOT	165 68 67 TOT	165 68 67 TOT	165 66 67 TOT	165 66 67 TOT	165 66 67 TOT	165 66 67 TOT	165 66 67 TOT	1965 1966 1967 TOT	1965 1966 1967 TOTAL
7-8	SW	6	6	6	6	6	6	6	6	6	6
7-8	M	6	6	6	6	6	6	6	6	6	6
7-8	WNW	6	6	6	6	6	6	6	6	6	6
7-8	W	6	6	6	6	6	6	6	6	6	6
7-8	WNW	6	24	12	62	6	6	6	6	6	30 12 48
TOT											6 0 0 0 6
8-9	N				6	6	6	6			6 0 0 0 6
8-9	S				6	6	6	6			6 0 0 0 6
8-9	WSW				6	6	22	6			12 6 0 6 24
8-9	TOT										12 6 0 6 24
>30	NE				6	6					0 0 0 6 6
<p>TOTAL CALC UNCERTAIN DATA POINTS TO NORTH</p>											
<p>TOTAL CALC UNCERTAIN DATA POINTS TO NORTH</p>											

FIGURE M-11a

MUSKOGEE WAVE SURF MICHIGAN NOVEMBER
 LATITUDE 43.17 L. (LATITUDE 86.33)

HEIGHT	1-1	2-1	3-1	4-1	5-1	6-1	7-1	8-1	9-1	10-1	TOTALS			
	DIR	PERI	PERI	PERI	PERI	PERI	PERI	PERI	PERI	PERI	C			
	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT			
	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT			
	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT	65 16 67 TOT			
1-2	N	6	6	12	6	6	12				6	12	12	24
1-2	NNE			12	12	12					0	36	0	36
1-2	E	6	6	6	6	6	6				6	36	0	42
1-2	ESE													
1-2	SE	6	6	12	12	12					0	36	0	36
1-2	SSE													
1-2	S	6	6	12	12	12					0	36	0	36
1-2	SSW													
1-2	SW	6	6	12	12	12					0	36	0	36
1-2	WSW													
1-2	W	6	6	12	12	12					0	36	0	36
1-2	WNW													
1-2	NW	6	6	12	12	12					0	36	0	36
1-2	NNW													
1-2	TOT	36	60	24	162	48	36	60	144		12	12	6	30
2-3	N				12	18	6	36			12	18	6	36
2-3	NNE				6	12	6	6			6	12	6	30
2-3	E													
2-3	ESE													
2-3	SE													
2-3	SSE													
2-3	S													
2-3	SSW													
2-3	SW													
2-3	WSW													
2-3	W													
2-3	WNW													
2-3	NW													
2-3	NNW													
2-3	TOT	24	48	24	96	48	78	42	168		72	120	60	258
3-4	N													
3-4	NNE													
3-4	E													
3-4	ESE													
3-4	SE													
3-4	SSE													
3-4	S													
3-4	SSW													
3-4	SW													
3-4	WSW													
3-4	W													
3-4	WNW													
3-4	NW													
3-4	NNW													
3-4	TOT	36	36	54	126	24	12	66	102		60	48	120	228
4-5	N													
4-5	NNE													
4-5	E													
4-5	ESE													
4-5	SE													
4-5	SSE													
4-5	S													
4-5	SSW													
4-5	SW													
4-5	WSW													
4-5	W													
4-5	WNW													
4-5	NW													
4-5	NNW													
4-5	TOT	42	48	48	138						42	48	48	138
5-6	N													
5-6	NNE													
5-6	E													
5-6	ESE													
5-6	SE													
5-6	SSE													
5-6	S													
5-6	SSW													
5-6	SW													
5-6	WSW													
5-6	W													
5-6	WNW													
5-6	NW													
5-6	NNW													
5-6	TOT	18	18	12	48	18	12	12	42		28	30	24	90
6-7	NE													
6-7	SSE													
6-7	SE													
6-7	SSE													
6-7	S													
6-7	SSW													
6-7	SW													
6-7	WSW													
6-7	W													
6-7	WNW													
6-7	NW													
6-7	NNW													
6-7	TOT	6	6	6	6	6	6	6	6		6	6	6	6
7-8	NE													
7-8	SSE													
7-8	SE													
7-8	SSE													
7-8	S													
7-8	SSW													
7-8	SW													
7-8	WSW													
7-8	W													
7-8	WNW													
7-8	NW													
7-8	NNW													
7-8	TOT	6	6	6	6	6	6	6	6		6	6	6	6

LATITUDE 43.17 LONGITUDE 86.33

CONTINUED

WEIGHT	PERIOD (SECT)	4-5	5-6	6-7	7-8	8-9	TOTALS
2-3							
3-4							
4-5							
5-6							
6-7							
7-8							
8-9							
9-10							
10-11							
11-12							
12-13							
13-14							
14-15							
15-16							
16-17							
17-18							
18-19							
19-20							
20-21							
21-22							
22-23							
23-24							
24-25							
25-26							
26-27							
27-28							
28-29							
29-30							
30-31							
31-32							
32-33							
33-34							
34-35							
35-36							
36-37							
37-38							
38-39							
39-40							
40-41							
41-42							
42-43							
43-44							
44-45							
45-46							
46-47							
47-48							
48-49							
49-50							
50-51							
51-52							
52-53							
53-54							
54-55							
55-56							
56-57							
57-58							
58-59							
59-60							
60-61							
61-62							
62-63							
63-64							
64-65							
65-66							
66-67							
67-68							
68-69							
69-70							
70-71							
71-72							
72-73							
73-74							
74-75							
75-76							
76-77							
77-78							
78-79							
79-80							
80-81							
81-82							
82-83							
83-84							
84-85							
85-86							
86-87							
87-88							
88-89							
89-90							
90-91							
91-92							
92-93							
93-94							
94-95							
95-96							
96-97							
97-98							
98-99							
99-100							

UNCERTAIN DATA
HIGHER IN PERCENT

1566 CASE 1---ACTUAL PERIOD IS 30-2 SEC
1566 CASE 2---ACTUAL PERIOD IS 31-3 SEC
1566 CASE 3---ACTUAL PERIOD IS 30-0 SEC

HEIGHT	4-1	4-2	4-3	4-4	4-5	5-6	7-8	8-9	9-10	TOTALS
	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT	*45 *66 *67 TCT
1-1	6	6	6	6	6	6	6	6	6	6
1-2	12	12	12	6	6	6	6	6	6	6
1-3	6	6	6	18	12	6	6	6	6	6
1-4	6	6	6	6	6	6	6	6	6	6
1-5	6	6	6	6	6	6	6	6	6	6
1-6	18	6	6	6	6	6	6	6	6	6
1-7	6	6	6	6	6	6	6	6	6	6
1-8	6	6	6	6	6	6	6	6	6	6
1-9	6	6	6	6	6	6	6	6	6	6
1-10	6	6	6	6	6	6	6	6	6	6
1-TCT	42	24	36	162	42	60	60	60	60	216
2-1	6	6	6	6	6	6	6	6	6	6
2-2	6	6	6	6	6	6	6	6	6	6
2-3	6	6	6	6	6	6	6	6	6	6
2-4	6	6	6	6	6	6	6	6	6	6
2-5	6	6	6	6	6	6	6	6	6	6
2-6	6	6	6	6	6	6	6	6	6	6
2-7	6	6	6	6	6	6	6	6	6	6
2-8	6	6	6	6	6	6	6	6	6	6
2-9	6	6	6	6	6	6	6	6	6	6
2-10	6	6	6	6	6	6	6	6	6	6
2-TCT	42	24	36	162	42	60	60	60	60	216
3-1	6	6	6	6	6	6	6	6	6	6
3-2	6	6	6	6	6	6	6	6	6	6
3-3	6	6	6	6	6	6	6	6	6	6
3-4	6	6	6	6	6	6	6	6	6	6
3-5	6	6	6	6	6	6	6	6	6	6
3-6	6	6	6	6	6	6	6	6	6	6
3-7	6	6	6	6	6	6	6	6	6	6
3-8	6	6	6	6	6	6	6	6	6	6
3-9	6	6	6	6	6	6	6	6	6	6
3-10	6	6	6	6	6	6	6	6	6	6
3-TCT	42	24	36	162	42	60	60	60	60	216
4-1	6	6	6	6	6	6	6	6	6	6
4-2	6	6	6	6	6	6	6	6	6	6
4-3	6	6	6	6	6	6	6	6	6	6
4-4	6	6	6	6	6	6	6	6	6	6
4-5	6	6	6	6	6	6	6	6	6	6
4-6	6	6	6	6	6	6	6	6	6	6
4-7	6	6	6	6	6	6	6	6	6	6
4-8	6	6	6	6	6	6	6	6	6	6
4-9	6	6	6	6	6	6	6	6	6	6
4-10	6	6	6	6	6	6	6	6	6	6
4-TCT	42	24	36	162	42	60	60	60	60	216
5-1	6	6	6	6	6	6	6	6	6	6
5-2	6	6	6	6	6	6	6	6	6	6
5-3	6	6	6	6	6	6	6	6	6	6
5-4	6	6	6	6	6	6	6	6	6	6
5-5	6	6	6	6	6	6	6	6	6	6
5-6	6	6	6	6	6	6	6	6	6	6
5-7	6	6	6	6	6	6	6	6	6	6
5-8	6	6	6	6	6	6	6	6	6	6
5-9	6	6	6	6	6	6	6	6	6	6
5-10	6	6	6	6	6	6	6	6	6	6
5-TCT	42	24	36	162	42	60	60	60	60	216
TOT	420	240	360	1620	420	600	600	600	600	2160

FIGURE M-2b

MUSKOGON LAKE MICHIGAN DECEMBER
 LATITUDE 43.17 LONGITUDE 86.33

CONTINUED

HEIGHT	1-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS	
PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	PERIOD (MTC)	
177.0	015-016-017-018-019-020-021-022-023-024-025-026-027-028-029-030-031-032-033-034-035-036-037-038-039-040-041-042-043-044-045-046-047-048-049-050-051-052-053-054-055-056-057-058-059-060-061-062-063-064-065-066-067-068-069-070-071-072-073-074-075-076-077-078-079-080-081-082-083-084-085-086-087-088-089-090-091-092-093-094-095-096-097-098-099-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000	0	0	0	0	0	0	0	0	0
7-8 A	6	6	6	6	6	6	6	6	6	
7-8 S	6	6	6	6	6	6	6	6	6	
7-8 M	6	6	6	6	6	6	6	6	6	
7-8 TOT	12	12	12	12	12	12	12	12	12	
8-9 A	6	6	6	6	6	6	6	6	6	
8-9 S	6	6	6	6	6	6	6	6	6	
8-9 M	6	6	6	6	6	6	6	6	6	
8-9 TOT	12	12	12	12	12	12	12	12	12	
9-10 A	6	6	6	6	6	6	6	6	6	
9-10 S	6	6	6	6	6	6	6	6	6	
9-10 M	6	6	6	6	6	6	6	6	6	
9-10 TOT	12	12	12	12	12	12	12	12	12	
10-11 A	6	6	6	6	6	6	6	6	6	
10-11 S	6	6	6	6	6	6	6	6	6	
10-11 M	6	6	6	6	6	6	6	6	6	
10-11 TOT	12	12	12	12	12	12	12	12	12	

TOTALS
 288 252 300 840
 144 744 744 2232

UNCERTAIN DATA
 UNLESS INDICATED

APPENDIX N

FIGURES N-1 thru N-12
WAVE STATISTICS FOR A LOCATION IN
LAKE MICHIGAN NEAR
BURUS HARBOR, INDIANA
(41.67°N, 87.17°W)

PASUND N-10

HA BUFB LAKE MICHIGAN JANUARY

LATITUDE 41.67 LONGITUDE 87.17

PASUND N-10

HA BUFB LAKE MICHIGAN JANUARY

LATITUDE 41.67 LONGITUDE 87.17

HEIGHT	DIR	PERIOD (SEC)					TOT
		2-3	3-4	4-5	5-6	6-7	
1-1	SE	6	12	6	6	6	36
1-1	SSE	6	6	6	6	6	30
1-1	S	6	6	6	6	6	30
1-1	SSW	12	6	6	6	6	36
1-1	SW	6	6	6	6	6	30
1-1	WSW	6	6	6	6	6	30
1-1	W	36	12	48	18	6	120
1-1	TOT	66	66	66	66	66	330
2-1	N	6	6	6	6	6	30
2-1	NNE	6	6	6	6	6	30
2-1	NE	12	12	12	12	12	60
2-1	ENE	6	6	6	6	6	30
2-1	E	6	6	6	6	6	30
2-1	ESE	6	6	6	6	6	30
2-1	SE	12	6	6	6	6	36
2-1	SSE	12	6	6	6	6	36
2-1	S	12	18	30	6	6	72
2-1	SSW	24	6	12	42	6	90
2-1	SW	18	6	18	6	6	60
2-1	WSW	6	6	12	6	6	36
2-1	W	6	6	12	6	6	36
2-1	WSW	6	6	12	6	6	36
2-1	W	6	6	12	6	6	36
2-1	NW	18	6	12	6	6	60
2-1	NNE	72	30	72	174	66	540
2-1	TOT	48	66	120	234	24	720
3-1	N	6	6	6	6	6	30
3-1	NE	6	6	6	6	6	30
3-1	ENE	6	6	6	6	6	30
3-1	E	12	12	12	6	6	60
3-1	ESE	6	6	6	6	6	30
3-1	S	12	12	12	6	6	60
3-1	SSW	6	6	6	6	6	30
3-1	SW	12	12	30	54	6	114
3-1	WSW	6	12	24	42	6	90
3-1	W	6	6	24	36	6	78
3-1	NW	6	6	12	18	6	48
3-1	NNW	6	6	12	18	6	48
3-1	TOT	48	66	120	234	24	720
4-1	N	6	6	6	6	6	30
4-1	NE	6	6	6	6	6	30
4-1	E	24	6	30	6	6	66
4-1	ESE	6	6	6	6	6	30
4-1	SSE	6	6	6	6	6	30
4-1	SSW	6	6	6	6	6	30
4-1	SW	6	6	12	12	6	42
4-1	WSW	6	6	6	6	6	30
4-1	W	6	6	6	6	6	30
4-1	NW	6	6	12	12	6	42
4-1	NNW	6	6	12	12	6	42
4-1	TOT	6	6	12	12	6	42
5-1	N	6	6	6	6	6	30
5-1	NE	6	6	6	6	6	30
5-1	E	12	12	24	6	6	60
5-1	S	6	6	6	6	6	30
5-1	SSW	6	6	6	6	6	30
5-1	SW	6	6	6	6	6	30
5-1	WSW	6	6	6	6	6	30
5-1	W	6	6	6	6	6	30
5-1	NW	6	6	6	6	6	30
5-1	NNW	6	6	6	6	6	30
5-1	TOT	6	6	6	6	6	30
6-1	N	6	6	6	6	6	30
6-1	NE	6	6	6	6	6	30
6-1	E	12	12	24	6	6	60
6-1	S	6	6	6	6	6	30
6-1	SSW	6	6	6	6	6	30
6-1	SW	6	6	6	6	6	30
6-1	WSW	6	6	6	6	6	30
6-1	W	6	6	6	6	6	30
6-1	NW	6	6	6	6	6	30
6-1	NNW	6	6	6	6	6	30
6-1	TOT	6	6	6	6	6	30
7-1	N	6	6	6	6	6	30
7-1	NE	6	6	6	6	6	30
7-1	E	12	12	24	6	6	60
7-1	S	6	6	6	6	6	30
7-1	SSW	6	6	6	6	6	30
7-1	SW	6	6	6	6	6	30
7-1	WSW	6	6	6	6	6	30
7-1	W	6	6	6	6	6	30
7-1	NW	6	6	6	6	6	30
7-1	NNW	6	6	6	6	6	30
7-1	TOT	6	6	6	6	6	30
8-1	N	6	6	6	6	6	30
8-1	NE	6	6	6	6	6	30
8-1	E	12	12	24	6	6	60
8-1	S	6	6	6	6	6	30
8-1	SSW	6	6	6	6	6	30
8-1	SW	6	6	6	6	6	30
8-1	WSW	6	6	6	6	6	30
8-1	W	6	6	6	6	6	30
8-1	NW	6	6	6	6	6	30
8-1	NNW	6	6	6	6	6	30
8-1	TOT	6	6	6	6	6	30
9-1	N	6	6	6	6	6	30
9-1	NE	6	6	6	6	6	30
9-1	E	12	12	24	6	6	60
9-1	S	6	6	6	6	6	30
9-1	SSW	6	6	6	6	6	30
9-1	SW	6	6	6	6	6	30
9-1	WSW	6	6	6	6	6	30
9-1	W	6	6	6	6	6	30
9-1	NW	6	6	6	6	6	30
9-1	NNW	6	6	6	6	6	30
9-1	TOT	6	6	6	6	6	30

CONTINUED

HEIGHT (FT)	DIR	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	TOT
7-8	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-8	NNE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-8	NW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-8	NNW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
8-9	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
8-9	NNE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
8-9	NW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
8-9	NNW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
9-10	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
9-10	NE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
9-10	NNW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
10-11	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
11-12	ENE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
11-12	NNW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
12-13	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
12-13	ENE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
12-13	NNW	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
13-14	N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
15-16	ENE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-18	NE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-18	ENE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
7-18	ENE	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
TOTAL	CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	CERTAIN DATA	126	138	264	528	108	126	96	330	78	138	36	252	102	66	18
TOTAL	UPS IN MONTH	126	138	264	528	108	126	96	330	78	138	36	252	102	66	18

PERIOD (SEC)	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	TOT
6-7	12	12	12	12	12	12	12	12	12	12
7-8	12	12	12	12	12	12	12	12	12	12
8-9	12	12	12	12	12	12	12	12	12	12
9-10	12	12	12	12	12	12	12	12	12	12
10-11	12	12	12	12	12	12	12	12	12	12
11-12	12	12	12	12	12	12	12	12	12	12
12-13	12	12	12	12	12	12	12	12	12	12
13-14	12	12	12	12	12	12	12	12	12	12
14-15	12	12	12	12	12	12	12	12	12	12
TOT	12	12	12	12	12	12	12	12	12	12

57 CASE 1---ACTUAL PERIOD IS 10.2 SEC
 57 CASE 2---ACTUAL PERIOD IS 10.3 SEC

CONTINUED

HEIGHT	02	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
(FT) DIP	65 166 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT
R-0	6	6	6	6	6	6	6	6	6	6
R-9	6	6	6	6	6	6	6	6	6	6
9-10										
0-0										
12-13										
25-26										

PERIOD (SEC)	6-7	7-8	8-9	9-10	TOTALS											
PREFIOD (SEC)	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT	65 66 67 TOT											
TOTAL	0 0 0 54 48 36 138 174 150 102 425 96 42 48 186 77 90 30 192 18 42 12 72 18 0 12 30	0 0 12 12	0 0	438 372 252 1042	167 288 102 552	672 672 360 1704										
PRECIPITATION DATA											72 17 6 90	6 0 12 14	6 0 6 6	6 0 6 6	0 0 6 6	0 0 6 6
OURS IN MONTH											672 672 360 1704	6 0 6 6	6 0 6 6	0 0 6 6	0 0 6 6	0 0 6 6

965 CASE 1---ACTUAL PERIOD IS 11.0 SEC

HEIGHT	<2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	TOTALS
1-1 SSE	12	12	6	6	12	6	6	6	6	6	108
1-1 SW	6	6	6	6	6	6	6	6	6	6	72
1-1 SW	24	18	42								90
1-1 SW	6	18	54	24	96						288
1-1 TOT	18	54	24	96							288
1-2 N	6	6	6	6	6	6	6	6	6	6	72
1-2 NNE	6	6	6	6	6	6	6	6	6	6	72
1-2 NE	6	6	6	6	6	6	6	6	6	6	72
1-2 ENE	6	6	6	6	6	6	6	6	6	6	72
1-2 E	6	6	6	6	6	6	6	6	6	6	72
1-2 ESE	6	6	6	6	6	6	6	6	6	6	72
1-2 SSE	6	6	6	6	6	6	6	6	6	6	72
1-2 S	6	6	6	6	6	6	6	6	6	6	72
1-2 SW	6	6	6	6	6	6	6	6	6	6	72
1-2 W	6	6	6	6	6	6	6	6	6	6	72
1-2 WNW	6	6	6	6	6	6	6	6	6	6	72
1-2 NNW	6	6	6	6	6	6	6	6	6	6	72
1-2 N	6	6	6	6	6	6	6	6	6	6	72
1-2 TOT	48	114	90	252	66	54	66	186			1134
2-3 N	6	6	6	6	6	6	6	6	6	6	72
2-3 NNE	6	6	6	6	6	6	6	6	6	6	72
2-3 NE	6	6	6	6	6	6	6	6	6	6	72
2-3 ENE	6	6	6	6	6	6	6	6	6	6	72
2-3 E	6	6	6	6	6	6	6	6	6	6	72
2-3 ESE	6	6	6	6	6	6	6	6	6	6	72
2-3 SSE	6	6	6	6	6	6	6	6	6	6	72
2-3 S	6	6	6	6	6	6	6	6	6	6	72
2-3 SW	6	6	6	6	6	6	6	6	6	6	72
2-3 W	6	6	6	6	6	6	6	6	6	6	72
2-3 WNW	6	6	6	6	6	6	6	6	6	6	72
2-3 NNW	6	6	6	6	6	6	6	6	6	6	72
2-3 N	6	6	6	6	6	6	6	6	6	6	72
2-3 TOT	48	114	90	252	66	54	66	186			1134
3-4 NNE	6	6	6	6	6	6	6	6	6	6	72
3-4 NE	6	6	6	6	6	6	6	6	6	6	72
3-4 ENE	6	6	6	6	6	6	6	6	6	6	72
3-4 E	6	6	6	6	6	6	6	6	6	6	72
3-4 ESE	6	6	6	6	6	6	6	6	6	6	72
3-4 SSE	6	6	6	6	6	6	6	6	6	6	72
3-4 S	6	6	6	6	6	6	6	6	6	6	72
3-4 SW	6	6	6	6	6	6	6	6	6	6	72
3-4 W	6	6	6	6	6	6	6	6	6	6	72
3-4 WNW	6	6	6	6	6	6	6	6	6	6	72
3-4 NNW	6	6	6	6	6	6	6	6	6	6	72
3-4 N	6	6	6	6	6	6	6	6	6	6	72
3-4 TOT	48	114	90	252	66	54	66	186			1134
4-5 NNE	6	6	6	6	6	6	6	6	6	6	72
4-5 NE	6	6	6	6	6	6	6	6	6	6	72
4-5 ENE	6	6	6	6	6	6	6	6	6	6	72
4-5 E	6	6	6	6	6	6	6	6	6	6	72
4-5 ESE	6	6	6	6	6	6	6	6	6	6	72
4-5 SSE	6	6	6	6	6	6	6	6	6	6	72
4-5 S	6	6	6	6	6	6	6	6	6	6	72
4-5 SW	6	6	6	6	6	6	6	6	6	6	72
4-5 W	6	6	6	6	6	6	6	6	6	6	72
4-5 WNW	6	6	6	6	6	6	6	6	6	6	72
4-5 NNW	6	6	6	6	6	6	6	6	6	6	72
4-5 N	6	6	6	6	6	6	6	6	6	6	72
4-5 TOT	48	114	90	252	66	54	66	186			1134
5-6 NNE	6	6	6	6	6	6	6	6	6	6	72
5-6 NE	6	6	6	6	6	6	6	6	6	6	72
5-6 ENE	6	6	6	6	6	6	6	6	6	6	72
5-6 E	6	6	6	6	6	6	6	6	6	6	72
5-6 ESE	6	6	6	6	6	6	6	6	6	6	72
5-6 SSE	6	6	6	6	6	6	6	6	6	6	72
5-6 S	6	6	6	6	6	6	6	6	6	6	72
5-6 SW	6	6	6	6	6	6	6	6	6	6	72
5-6 W	6	6	6	6	6	6	6	6	6	6	72
5-6 WNW	6	6	6	6	6	6	6	6	6	6	72
5-6 NNW	6	6	6	6	6	6	6	6	6	6	72
5-6 N	6	6	6	6	6	6	6	6	6	6	72
5-6 TOT	48	114	90	252	66	54	66	186			1134
6-7 NNE	6	6	6	6	6	6	6	6	6	6	72
6-7 NE	6	6	6	6	6	6	6	6	6	6	72
6-7 ENE	6	6	6	6	6	6	6	6	6	6	72
6-7 E	6	6	6	6	6	6	6	6	6	6	72
6-7 ESE	6	6	6	6	6	6	6	6	6	6	72
6-7 SSE	6	6	6	6	6	6	6	6	6	6	72
6-7 S	6	6	6	6	6	6	6	6	6	6	72
6-7 SW	6	6	6	6	6	6	6	6	6	6	72
6-7 W	6	6	6	6	6	6	6	6	6	6	72
6-7 WNW	6	6	6	6	6	6	6	6	6	6	72
6-7 NNW	6	6	6	6	6	6	6	6	6	6	72
6-7 N	6	6	6	6	6	6	6	6	6	6	72
6-7 TOT	48	114	90	252	66	54	66	186			1134
7-8 NNE	6	6	6	6	6	6	6	6	6	6	72
7-8 NE	6	6	6	6	6	6	6	6	6	6	72
7-8 ENE	6	6	6	6	6	6	6	6	6	6	72
7-8 E	6	6	6	6	6	6	6	6	6	6	72
7-8 ESE	6	6	6	6	6	6	6	6	6	6	72
7-8 SSE	6	6	6	6	6	6	6	6	6	6	72
7-8 S	6	6	6	6	6	6	6	6	6	6	72
7-8 SW	6	6	6	6	6	6	6	6	6	6	72
7-8 W	6	6	6	6	6	6	6	6	6	6	72
7-8 WNW	6	6	6	6	6	6	6	6	6	6	72
7-8 NNW	6	6	6	6	6	6	6	6	6	6	72
7-8 N	6	6	6	6	6	6	6	6	6	6	72
7-8 TOT	48	114	90	252	66	54	66	186			1134
8-9 NNE	6	6	6	6	6	6	6	6	6	6	72
8-9 NE	6	6	6	6	6	6	6	6	6	6	72
8-9 ENE	6	6	6	6	6	6	6	6	6	6	72
8-9 E	6	6	6	6	6	6	6	6	6	6	72
8-9 ESE	6	6	6	6	6	6	6	6	6	6	72
8-9 SSE	6	6	6	6	6	6	6	6	6	6	72
8-9 S	6	6	6	6	6	6	6	6	6	6	72
8-9 SW	6	6	6	6	6	6	6	6	6	6	72
8-9 W	6	6	6	6	6	6	6	6	6	6	72
8-9 WNW	6	6	6	6	6	6	6	6	6	6	72
8-9 NNW	6	6	6	6	6	6	6	6	6	6	72
8-9 N	6	6	6	6	6	6	6	6	6	6	72
8-9 TOT	48	114	90	252	66	54	66	186			1134
9-10 NNE	6	6	6	6	6	6	6	6	6	6	72
9-10 NE	6	6	6	6	6	6	6	6	6	6	72
9-10 ENE	6	6	6	6	6	6	6	6	6	6	72
9-10 E	6	6	6	6	6	6	6	6	6	6	72
9-10 ESE	6	6	6	6	6	6	6	6	6	6	72
9-10 SSE	6	6	6	6	6	6	6	6	6	6	72
9-10 S	6	6	6	6	6	6	6	6	6	6	72
9-10 SW	6	6	6	6	6	6	6	6	6	6	72
9-10 W	6	6	6	6	6	6	6	6	6	6	72
9-10 WNW	6	6	6	6	6	6	6	6	6	6	72
9-10 NNW	6	6	6	6	6	6	6	6	6	6	72
9-10 N	6	6	6	6	6	6	6	6	6	6	72
9-10 TOT	48	114	90	252	66	54	66	186			1134
11-12 N	6	6	6	6	6	6	6	6	6	6	72
11-12 NNE	6	6	6	6	6	6	6	6	6	6	72
11-12 NE	6	6	6	6	6	6	6	6	6	6	72
11-12 ENE	6	6	6								

FIGURE N-6

HAZARD DATA
LAKE MICHIGAN MAY
LATITUDE 41.67 LONGITUDE 87.17

HEIGHT	<2	2-3	3-4	5-5	6-7	7-9	8-9	TOTALS
1-1	65	66	67	68	69	70	71	1965 1966 1967
1-2	6	12	6	6	6	6	6	6 12 0
1-3	6	12	6	6	6	6	6	6 12 0
1-4	6	12	6	6	6	6	6	6 12 0
1-5	6	12	6	6	6	6	6	6 12 0
1-6	6	12	6	6	6	6	6	6 12 0
1-7	6	12	6	6	6	6	6	6 12 0
1-8	6	12	6	6	6	6	6	6 12 0
1-9	6	12	6	6	6	6	6	6 12 0
1-10	6	12	6	6	6	6	6	6 12 0
1-11	6	12	6	6	6	6	6	6 12 0
1-12	6	12	6	6	6	6	6	6 12 0
1-13	6	12	6	6	6	6	6	6 12 0
1-14	6	12	6	6	6	6	6	6 12 0
1-15	6	12	6	6	6	6	6	6 12 0
1-16	6	12	6	6	6	6	6	6 12 0
1-17	6	12	6	6	6	6	6	6 12 0
1-18	6	12	6	6	6	6	6	6 12 0
1-19	6	12	6	6	6	6	6	6 12 0
1-20	6	12	6	6	6	6	6	6 12 0
1-21	6	12	6	6	6	6	6	6 12 0
1-22	6	12	6	6	6	6	6	6 12 0
1-23	6	12	6	6	6	6	6	6 12 0
1-24	6	12	6	6	6	6	6	6 12 0
1-25	6	12	6	6	6	6	6	6 12 0
1-26	6	12	6	6	6	6	6	6 12 0
1-27	6	12	6	6	6	6	6	6 12 0
1-28	6	12	6	6	6	6	6	6 12 0
1-29	6	12	6	6	6	6	6	6 12 0
1-30	6	12	6	6	6	6	6	6 12 0
1-TOT	36	72	132	18	60	72	150	54 84 144 292
2-3	6	6	6	6	6	6	6	6 6 6
2-4	6	6	6	6	6	6	6	6 6 6
2-5	6	6	6	6	6	6	6	6 6 6
2-6	6	6	6	6	6	6	6	6 6 6
2-7	6	6	6	6	6	6	6	6 6 6
2-8	6	6	6	6	6	6	6	6 6 6
2-9	6	6	6	6	6	6	6	6 6 6
2-10	6	6	6	6	6	6	6	6 6 6
2-11	6	6	6	6	6	6	6	6 6 6
2-12	6	6	6	6	6	6	6	6 6 6
2-13	6	6	6	6	6	6	6	6 6 6
2-14	6	6	6	6	6	6	6	6 6 6
2-15	6	6	6	6	6	6	6	6 6 6
2-16	6	6	6	6	6	6	6	6 6 6
2-17	6	6	6	6	6	6	6	6 6 6
2-18	6	6	6	6	6	6	6	6 6 6
2-19	6	6	6	6	6	6	6	6 6 6
2-20	6	6	6	6	6	6	6	6 6 6
2-21	6	6	6	6	6	6	6	6 6 6
2-22	6	6	6	6	6	6	6	6 6 6
2-23	6	6	6	6	6	6	6	6 6 6
2-24	6	6	6	6	6	6	6	6 6 6
2-25	6	6	6	6	6	6	6	6 6 6
2-26	6	6	6	6	6	6	6	6 6 6
2-27	6	6	6	6	6	6	6	6 6 6
2-28	6	6	6	6	6	6	6	6 6 6
2-29	6	6	6	6	6	6	6	6 6 6
2-30	6	6	6	6	6	6	6	6 6 6
2-TOT	6	6	6	6	6	6	6	6 6 6
3-4	6	6	6	6	6	6	6	6 6 6
3-5	6	6	6	6	6	6	6	6 6 6
3-6	6	6	6	6	6	6	6	6 6 6
3-7	6	6	6	6	6	6	6	6 6 6
3-8	6	6	6	6	6	6	6	6 6 6
3-9	6	6	6	6	6	6	6	6 6 6
3-10	6	6	6	6	6	6	6	6 6 6
3-11	6	6	6	6	6	6	6	6 6 6
3-12	6	6	6	6	6	6	6	6 6 6
3-13	6	6	6	6	6	6	6	6 6 6
3-14	6	6	6	6	6	6	6	6 6 6
3-15	6	6	6	6	6	6	6	6 6 6
3-16	6	6	6	6	6	6	6	6 6 6
3-17	6	6	6	6	6	6	6	6 6 6
3-18	6	6	6	6	6	6	6	6 6 6
3-19	6	6	6	6	6	6	6	6 6 6
3-20	6	6	6	6	6	6	6	6 6 6
3-21	6	6	6	6	6	6	6	6 6 6
3-22	6	6	6	6	6	6	6	6 6 6
3-23	6	6	6	6	6	6	6	6 6 6
3-24	6	6	6	6	6	6	6	6 6 6
3-25	6	6	6	6	6	6	6	6 6 6
3-26	6	6	6	6	6	6	6	6 6 6
3-27	6	6	6	6	6	6	6	6 6 6
3-28	6	6	6	6	6	6	6	6 6 6
3-29	6	6	6	6	6	6	6	6 6 6
3-30	6	6	6	6	6	6	6	6 6 6
3-TOT	6	6	6	6	6	6	6	6 6 6
4-5	6	6	6	6	6	6	6	6 6 6
4-6	6	6	6	6	6	6	6	6 6 6
4-7	6	6	6	6	6	6	6	6 6 6
4-8	6	6	6	6	6	6	6	6 6 6
4-9	6	6	6	6	6	6	6	6 6 6
4-10	6	6	6	6	6	6	6	6 6 6
4-11	6	6	6	6	6	6	6	6 6 6
4-12	6	6	6	6	6	6	6	6 6 6
4-13	6	6	6	6	6	6	6	6 6 6
4-14	6	6	6	6	6	6	6	6 6 6
4-15	6	6	6	6	6	6	6	6 6 6
4-16	6	6	6	6	6	6	6	6 6 6
4-17	6	6	6	6	6	6	6	6 6 6
4-18	6	6	6	6	6	6	6	6 6 6
4-19	6	6	6	6	6	6	6	6 6 6
4-20	6	6	6	6	6	6	6	6 6 6
4-21	6	6	6	6	6	6	6	6 6 6
4-22	6	6	6	6	6	6	6	6 6 6
4-23	6	6	6	6	6	6	6	6 6 6
4-24	6	6	6	6	6	6	6	6 6 6
4-25	6	6	6	6	6	6	6	6 6 6
4-26	6	6	6	6	6	6	6	6 6 6
4-27	6	6	6	6	6	6	6	6 6 6
4-28	6	6	6	6	6	6	6	6 6 6
4-29	6	6	6	6	6	6	6	6 6 6
4-30	6	6	6	6	6	6	6	6 6 6
4-TOT	6	6	6	6	6	6	6	6 6 6
5-6	6	6	6	6	6	6	6	6 6 6
5-7	6	6	6	6	6	6	6	6 6 6
5-8	6	6	6	6	6	6	6	6 6 6
5-9	6	6	6	6	6	6	6	6 6 6
5-10	6	6	6	6	6	6	6	6 6 6
5-11	6	6	6	6	6	6	6	6 6 6
5-12	6	6	6	6	6	6	6	6 6 6
5-13	6	6	6	6	6	6	6	6 6 6
5-14	6	6	6	6	6	6	6	6 6 6
5-15	6	6	6	6	6	6	6	6 6 6
5-16	6	6	6	6	6	6	6	6 6 6
5-17	6	6	6	6	6	6	6	6 6 6
5-18	6	6	6	6	6	6	6	6 6 6
5-19	6	6	6	6	6	6	6	6 6 6
5-20	6	6	6	6	6	6	6	6 6 6
5-21	6	6	6	6	6	6	6	6 6 6
5-22	6	6	6	6	6	6	6	6 6 6
5-23	6	6	6	6	6	6	6	6 6 6
5-24	6	6	6	6	6	6	6	6 6 6
5-25	6	6	6	6	6	6	6	6 6 6
5-26	6	6	6	6	6	6	6	6 6 6
5-27	6	6	6	6	6	6	6	6 6 6
5-28	6	6	6	6	6	6	6	6 6 6
5-29	6	6	6	6	6	6	6	6 6 6
5-30	6	6	6	6	6	6	6	6 6 6
5-TOT	6	6	6	6	6	6	6	6 6 6
6-7	6	6	6	6	6	6	6	6 6 6
6-8	6	6	6	6	6	6	6	6 6 6
6-9	6	6	6	6	6	6	6	6 6 6
6-10	6	6	6	6	6	6	6	6 6 6
6-11	6	6	6	6	6	6	6	6 6 6
6-12	6	6	6	6	6	6	6	6 6 6
6-13	6	6	6	6	6	6	6	6 6 6
6-14	6	6	6	6	6	6	6	6 6 6
6-15	6	6	6	6	6	6	6	6 6 6
6-16	6	6	6	6	6	6	6	6 6 6
6-17	6	6	6	6	6	6	6	6 6 6
6-18	6	6	6	6	6	6	6	6 6 6
6-19	6	6	6	6	6	6	6	6 6 6
6-20	6	6	6	6	6	6	6	6 6 6
6-21	6	6	6	6	6	6	6	6 6 6
6-22	6	6	6	6	6	6	6	6 6 6

FAVORABLE-N-7

BYFANS HANDBS LAKE MICHIGAN JULY
LATITUDE 41.67 LONGITUDE 87.17

HEIGHT	4-2	5-6	6-7	7-8	8-9	9-10	>10	TOTALS
WIND DIR	65° 66' 67' TOT	65° 66' 67' TOT	65° 66' 67' TOT	65° 66' 67' TOT	65° 66' 67' TOT	65° 66' 67' TOT	65° 66' 67' TOT	1965 1966 1967 TOTAL
1-1	6	6	6	6	6	6	6	0 0 0
1-2	38	6	24					6 0 0
1-3	6	6	10					6 6 6
1-4	42	18	12					42 18 12
TOT	92	36	50					92 36 50
2-1	6	6	6					0 0 0
2-2	6	6	6					0 0 0
2-3	6	6	6					0 0 0
2-4	6	6	6					0 0 0
TOT	24	24	24					24 24 24
3-1	6	6	6					0 0 0
3-2	6	6	6					0 0 0
3-3	6	6	6					0 0 0
3-4	6	6	6					0 0 0
TOT	24	24	24					24 24 24
4-1	6	6	6					0 0 0
4-2	6	6	6					0 0 0
4-3	6	6	6					0 0 0
4-4	6	6	6					0 0 0
4-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
5-1	6	6	6					0 0 0
5-2	6	6	6					0 0 0
5-3	6	6	6					0 0 0
5-4	6	6	6					0 0 0
5-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
6-1	6	6	6					0 0 0
6-2	6	6	6					0 0 0
6-3	6	6	6					0 0 0
6-4	6	6	6					0 0 0
6-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
7-1	6	6	6					0 0 0
7-2	6	6	6					0 0 0
7-3	6	6	6					0 0 0
7-4	6	6	6					0 0 0
7-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
8-1	6	6	6					0 0 0
8-2	6	6	6					0 0 0
8-3	6	6	6					0 0 0
8-4	6	6	6					0 0 0
8-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
9-1	6	6	6					0 0 0
9-2	6	6	6					0 0 0
9-3	6	6	6					0 0 0
9-4	6	6	6					0 0 0
9-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
10-1	6	6	6					0 0 0
10-2	6	6	6					0 0 0
10-3	6	6	6					0 0 0
10-4	6	6	6					0 0 0
10-5	6	6	6					0 0 0
TOT	24	24	24					24 24 24
TOTAL	0	0	0	0	0	0	0	0 0 0
UNCERTAIN DATA	0	0	0	0	0	0	0	0 0 0
HOURS IN MONTH	0	0	0	0	0	0	0	0 0 0

1967 CASE 3---ACTUAL PERIOD IS 54.0 SEC

STATION NAME: LAKE MICHIGAN (SEPTEMBER) DATE: 9-10-67
 LOCATION: 43.67° N, 85.67° W
 OBSERVER: [Name obscured]

WIND DIRECTION	1-1	2-3	4-5	6-7	8-9	9-10	TOTALS
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252
N	6	6	6	6	6	6	42
NE	6	6	6	6	6	6	42
E	6	6	6	6	6	6	42
SE	6	6	6	6	6	6	42
S	6	6	6	6	6	6	42
SW	6	6	6	6	6	6	42
W	6	6	6	6	6	6	42
NW	6	6	6	6	6	6	42
WIND TOTAL	42	42	42	42	42	42	252

TOTAL CALN UNCEPAIN DATA
 MONTHS IN MONTH

FIGURE N-11b

BUFAS HAFAGT LAKU MICHIGAN, NOVEMBER
 LATITUDE 41-07 LONGITUDE 87-17

CONTINUED

HEIGHT (FT)	2-2	3-4	4-5	5-6	6-7	7-8	8-9	9-10	TOTALS
42	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
18-39 N	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
35-20 N	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
TOTAL	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
UNCERTAIN DATA	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
MOUSE IN MOUTH	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
1566 CASE 1	ACTUAL PERIOD IS 10.2 SEC								
1566 CASE 2	ACTUAL PERIOD IS 10.3 SEC								
1566 CASE 3	ACTUAL PERIOD IS 10.6 SEC								

PERIOD (SEC)	6-7	7-8	8-9	9-10	TOTALS
PERIOD (SEC)	6-7	7-8	8-9	9-10	TOTALS
6-7	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
7-8	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
8-9	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
9-10	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
TOTALS	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
PERIOD (SEC)	6-7	7-8	8-9	9-10	TOTALS
6-7	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
7-8	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
8-9	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
9-10	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT
TOTALS	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT	05 06 167 TOT

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