

**Alaska Department of Transportation and Public Facilities
Juneau Access Improvements SEIS**

**Lynn Canal Wind and Wave Climatology Study for
Vessel Operations**

Prepared for
HDR Alaska, Inc.
Anchorage, Alaska

File No. 11163.03
4 June 2013
Rev. B

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Appendix A – Eldred Rock Wind Statistics

Appendix B – Skagway Wind Statistics

Appendix C – Point Retreat Wind Statistics

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Revision History

Section	Rev	Description	Date	Approved
All	—	Rev. — was stamped and signed by K.V. Sultani-Wright, PE, Washinton Registration No. 44822, on 15 May 2013.	15 May 2013	BLH
2.1	A	Added comment on data completeness.	28 May 2013	DWL
3.2.1	A	Added Table 12, Figure 15, 16, and 17.		
4	A	Added Conclusion section.		
4	B	Note added explanation of why effects of currents on wave generation are not accounted for.	4 June 2013	DWL
References	B	Reference 19 added.		

The stamp and signature above applies only to the content of the current revision.

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Executive Summary

This report describes the wind and wave environment appropriate to Alaska Marine Highway System (AMHS) vessel operations in Lynn Canal.

Monthly and annual wave statistics were estimated using a modern, third-generation prediction model, Simulating Waves Nearshore (SWAN, Reference 15). All waves in the SWAN domain were assumed to be wind-generated. The wind distribution over the domain was estimated using historical data from Skagway Airport, Eldred Rock, Point Retreat, and Cape Decision. The wind data at each location was correlated with the data from Eldred Rock, and the resulting correlation relationships were used to assign wind speeds to their associated regions of the SWAN domain.

Figure 1 shows the statistics of significant wave height in the worst month at the selected field points in the area of interest. Significant wave height, H_s , is defined as the average of the highest one-third of all waves in the sea state.

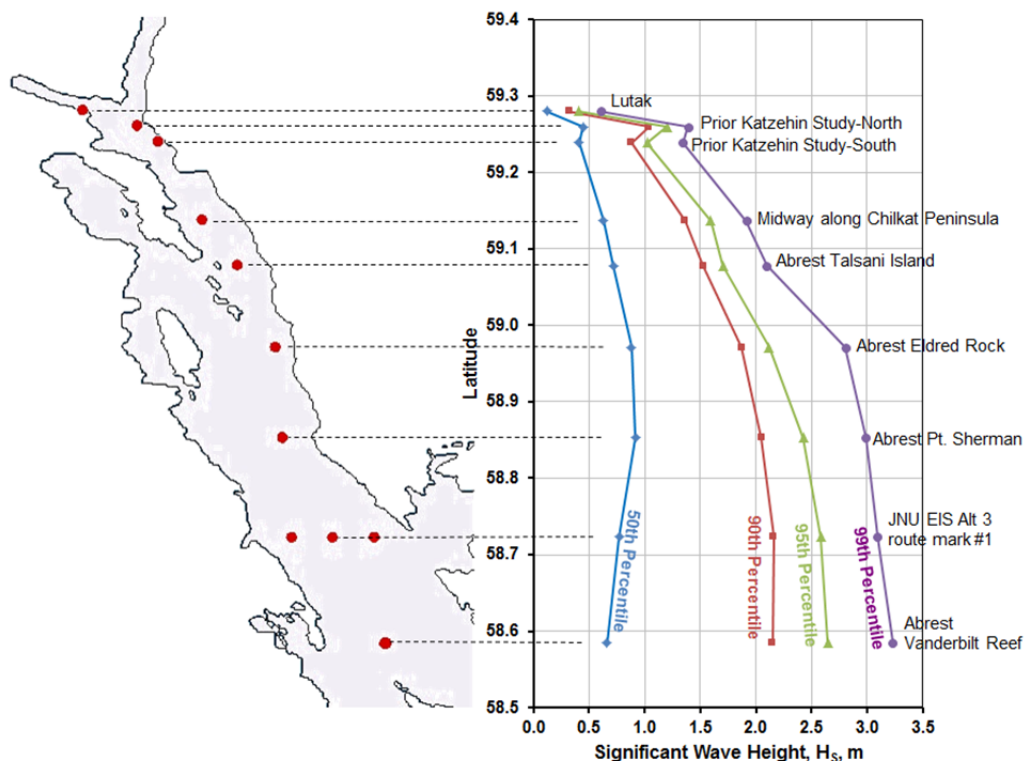


Figure 1 Maximum of monthly wave height statistics at selected points

For the purposes of a seakeeping analysis, the three southernmost field points, representative of the highest waves, were used to determine a design sea state. A route of approximately 38 nautical miles was assumed to extend from Aaron Island to midway between Eldred Rock and Point Sherman, in which a transit at 15 knots would take 2.5 hours. The average 95th percentile wave height in the worst month, weighted by the distance associated with each of the three southernmost field points, was assumed as the sea state for seakeeping analysis. The design sea state for seakeeping consists of a significant wave height of 2.6 m and a peak wave period of 6.3 seconds.

Section 1 Introduction

This report describes the wind and wave environment appropriate to AMHS vessel operations in Lynn Canal.

Monthly and annual wave statistics were estimated using a modern, third-generation prediction model, Simulating WAVes Nearshore (SWAN, Reference 15).

Sea states in this report are defined by the significant wave height and the peak wave period. Significant wave height, H_S , is defined as the average of the highest one-third of all waves in the sea state. Peak wave period, T_P , is defined as the wave period at the peak of the frequency spectrum. H_S and T_P are statistical parameters of an irregular sea condition composed of a range of wave heights and wave periods. Most probable extreme wave heights in a 2-hour storm are expected to be about twice the significant wave height.

Monthly and annual statistics in this report are presented as percentiles; the 50th, 90th, 95th, and 99th percentiles are given. The 95th percentile H_S , for example, is the significant wave height that is met or exceeded 5% of the time. In one month, this would be $(365/12 \text{ days/month} * 24 \text{ hours/day} * 0.05)$, equal to 36 hours. Table 1 shows the amount of time that each percentile condition is met or exceeded in one month and one year.

Table 1 Monthly and annual time at or above Nth percentile conditions

Percentile	“Monthly”	“Annual”
	Time at or above Nth percentile condition in one month (30.4 days)	Time at or above Nth percentile condition in one year (365 days)
50 th	365.0 hrs (15 days)	4380 hrs (182.5 days)
90 th	73.0 hrs (3 days)	876 hrs (36.5 days)
95 th	36.5 hrs (1.5 days)	438 hrs (18.25 days)
99 th	7.3 hrs	87.6 hrs (3.65 days)

Section 2 Wind Climatology

Details of the wind anemometer stations and data used in this study are shown in Table 2. The location of each of the observation stations is shown in Figure 2. Where there is data available from two different time periods, the more recent data only is used for this analysis. Certain details of the older data collection procedures, such as averaging duration for observations, and at Point Retreat and Cape Decision, the anemometer height above local ground, could not be located.

Table 2 Wind station details

Station	ID	Location	Elevation	Height above Local Ground	Period of Record	Data Source
Skagway Airport	PAGY	59.456° N, 135.324° W	18.1 m	8.0 m (Ref. 17)	1973-2012	Ref. 6
Eldred Rock	ERO	58.967° N, 135.217° W	10 m	10 m	1985-1989	Ref. 1
	EROA2	58.971° N, 135.220° W	17 m	6.1 m	10/2006- 2012	Ref. 10
Point Retreat	PRT	58.40° N, 134.95° W	15 m	not known	1973, 1985-1989	Ref. 1
	PRTA2	58.412° N, 134.953° W	30 m	6.1 m	10/2006- 2012	Ref. 11
Cape Decision	CDE	56.000° N, 134.133° W	15 m	not known	1973, 1985-1989	Ref. 1
	CDEA2	56.002° N, 134.133° W	15 m	10 m	10/2006- 2012	Ref. 9

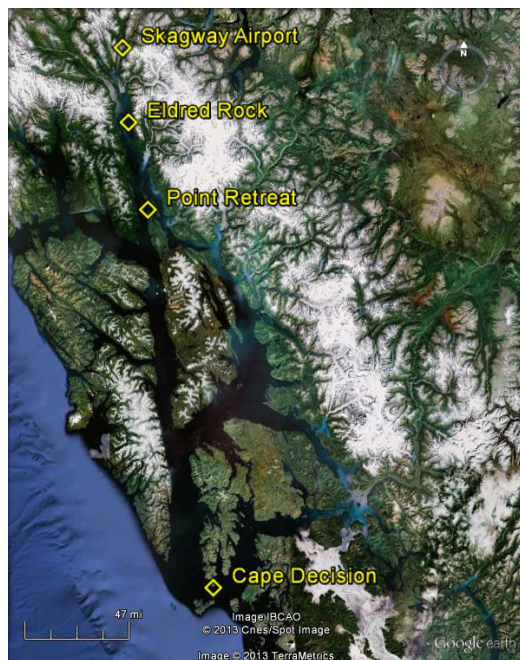


Figure 2 Wind station locations (Google Earth, Reference 8)

2.1 Eldred Rock, Alaska

Wind speed and direction data was available from Eldred Rock for the years 1985-1989 and 10/2006-2012. The more recent data is the basis for the wind-driven wave predictions. Metadata details of the dataset are shown in Table 2. Annual wind speed and direction statistics were calculated using the most recent set of data only. Both sets of data were compared, and the more recent data appeared to be a more conservative wind record. Additionally, the site conditions for observation were better documented for the recent data set than for the older data. The data completeness is shown in Table 3 as a monthly and annual percentage of theoretically possible measurements over the time period 10/2006-2012 for which valid data exists. It is unknown whether the lower data completeness in December, January, and February affects the statistics of wind speed at Eldred Rock.

Table 3 Data inventory for wind record from Eldred Rock, 10/2006-2012

Month	% Complete	Month	% Complete	Month	% Complete
January	54.5%	May	76.7%	September	92.1%
February	52.5%	June	92.2%	October	83.9%
March	62.9%	July	94.8%	November	81.4%
April	66.4%	August	83.3%	December	64.5%
Annual					75.6%

Wind speed was adjusted to a 10 m elevation using the $1/7^{\text{th}}$ power law. The full set of monthly and annual joint probability distributions between wind speed and direction are included as Appendix A. Table 4 shows monthly and annual 50th, 90th, 95th, and 99th percentile wind speeds based on the Eldred Rock data.

Table 4 Monthly and annual wind speed statistics at Eldred Rock

Month	Percentile Wind Speed, knots (2-min average at 10 m)			
	50 th	90 th	95 th	99 th
January	20	41	45	54
February	19	37	41	47
March	17	34	40	47
April	12	24	26	31
May	11	24	27	33
June	13	24	26	30
July	12	26	27	30
August	14	27	29	35
September	18	29	32	39
October	19	35	40	48
November	24	42	46	54
December	23	44	48	55
Annual	16	32	39	49

Figure 3 shows the annual joint probability of wind speed and wind direction.

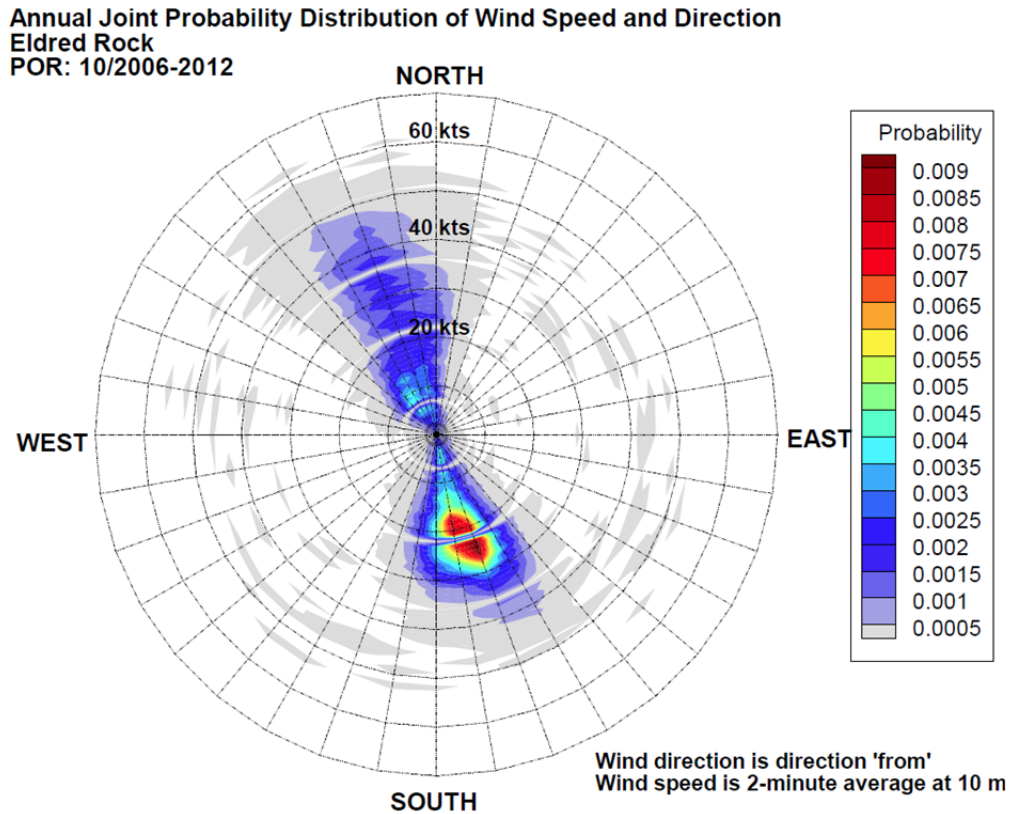


Figure 3 Annual joint probability distribution of wind speed and direction at Eldred Rock

2.2 Skagway, Alaska

Wind speed and direction data was available from the Skagway Airport for the years 1973-2012. Metadata details of the dataset are shown in Table 2. The data completeness is shown in Table 5 as a monthly and annual percentage of theoretically possible measurements over the time period for which valid data exists.

Table 5 Data inventory for wind record from Skagway, 1973-2012

Month	% Complete	Month	% Complete	Month	% Complete
January	72.4%	May	61.6%	September	67.7%
February	70.2%	June	62.7%	October	68.4%
March	67.1%	July	65.8%	November	69.9%
April	63.3%	August	68.9%	December	74.2%
Annual			67.7%		

Wind speed was adjusted to a 10 m elevation using the 1/7th power law. The full set of monthly and annual joint probability distributions between wind speed and direction are included as Appendix B. Table 6 shows monthly and annual 50th, 90th, 95th, and 99th percentile wind speeds based on the Skagway data.

Table 6 Monthly and annual wind speed statistics at Skagway

Month	Percentile Wind Speed, knots (2-min average at 10 m)			
	50 th	90 th	95 th	99 th
January	12	25	28	33
February	10	22	25	30
March	10	20	23	29
April	7	17	20	25
May	8	16	20	25
June	8	16	19	23
July	6	16	19	22
August	4	15	19	23
September	4	18	21	26
October	5	19	22	29
November	7	20	24	31
December	9	23	26	33
Annual	7	20	23	29

Figure 4 shows the annual joint probability of wind speed and wind direction.

**Annual Joint Probability Distribution of Wind Speed and Direction
Skagway Airport
POR: 1973 - 2012**

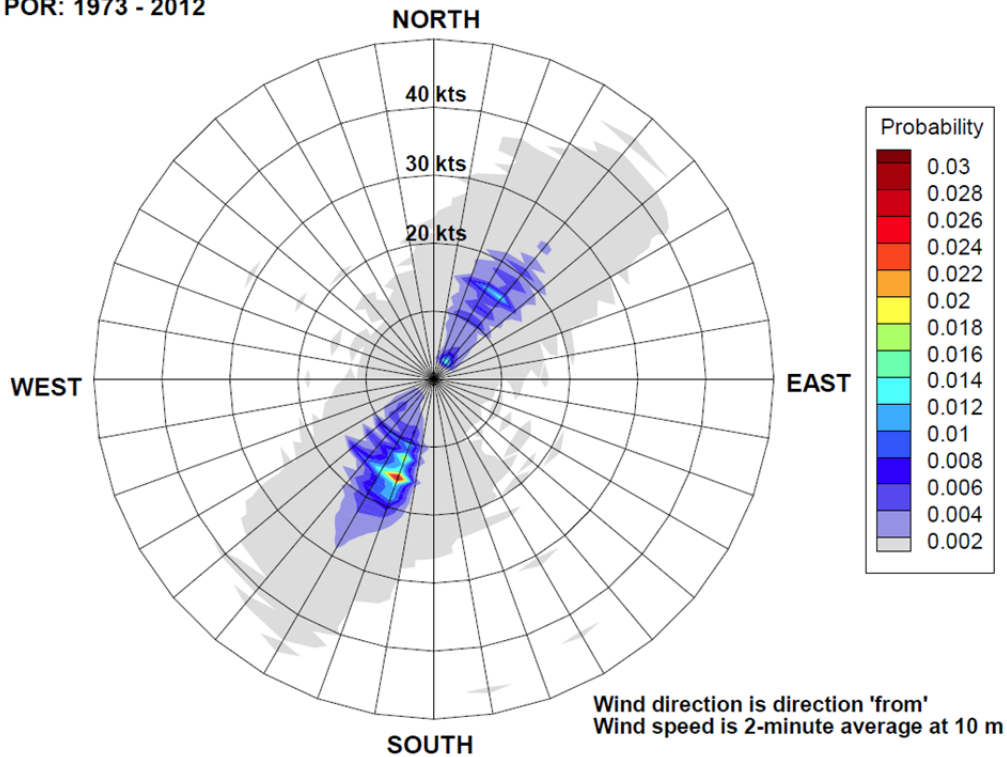


Figure 4 Annual joint probability of wind speed and direction at Skagway

2.3 Point Retreat, Alaska

Wind speed and direction data was available from Point Retreat for the years 1985-1989 and 10/2006-2012. The older data was not considered in this analysis because information about the wind anemometer height and averaging period could not be located. Metadata details of the dataset are shown in Table 2. The data completeness is shown in Table 7 as a monthly and annual percentage of theoretically possible measurements over the time period 10/2006-2012 for which valid data exists.

Table 7 Data inventory for wind record from Point Retreat, 10/2006-2012

Month	% Complete	Month	% Complete	Month	% Complete
January	89.8%	May	96.7%	September	95.0%
February	86.7%	June	97.2%	October	90.9%
March	84.5%	July	96.0%	November	91.7%
April	96.6%	August	90.6%	December	89.6%
Annual					91.2%

Wind speed was adjusted to a 10 m elevation using the $1/7^{\text{th}}$ power law. The full set of monthly and annual joint probability distributions between wind speed and direction are included as Appendix C.

During the period of record, two outlier high wind events were recorded. One event was recorded on 25 November 2006, and the other on 28 February 2007. In each case, the recorded two-minute average wind speed exceeded 100 knots, followed by an extended period without any data. Since the two wind events were extreme outliers, they were further investigated.

The wind speed records at Point Retreat were originally obtained from the National Data Buoy Center (NDBC), but they were also available from the National Climatic Data Center (NCDC, Reference 6) for 2007 and later. The records from the two sources were compared, and the high wind event recorded on 28 February 2007 did not appear in the data obtained from the NCDC. The 2006 wind event could not be compared with an alternate source. The Juneau Forecasting Office of the National Weather Service was contacted, and it was confirmed that the high wind events recorded at Point Retreat were most likely erroneous data. Therefore, the two anomalous wind speed events were excluded from the dataset.

2.4 Cape Decision, Alaska

Wind speed and direction data was available from Cape Decision for the years 1985-1989 and 10/2006-2012. The older data was not considered in this analysis because information about the wind anemometer height and averaging period could not be located. Metadata details of the dataset are shown in Table 2. The data completeness is shown in Table 8 as a monthly and annual percentage of theoretically possible measurements over the time period 10/2006-2012 for which valid data exists.

Table 8 Data inventory for wind record from Cape Decision, 10/2006-2012

Month	% Complete	Month	% Complete	Month	% Complete
January	63.5%	May	64.5%	September	79.7%
February	64.4%	June	64.9%	October	82.1%
March	62.1%	July	80.1%	November	76.9%
April	63.9%	August	79.5%	December	67.3%
Annual					71.0%

2.5 Wind Association over Lynn Canal and Chatham Strait

In consideration of its central and exposed location in Lynn Canal, Eldred Rock is treated as the master wind station for this wind and wave climate study. Wind records are also available for Skagway, Point Retreat, and Cape Decision. In order to make use of the wind information from Skagway, Point Retreat, and Cape Decision without creating a need for an impractical number of cases, it is necessary to determine winds at Skagway, Point Retreat, and Cape Decision that are likely to be associated with winds at Eldred Rock.

Initially, this was approached as a classical correlation problem. Historical records during the period October 2006 through 2012 were time-aligned. The number of aligned records and (linear) correlation coefficients are summarized in Table 9.

Table 9 Number of aligned records and correlation with winds at Eldred Rock, Oct 2006-2012

Wind Station	North Winds at Eldred Rock		South Winds at Eldred Rock	
	# of Aligned Records	Correlation	# of Aligned Records	Correlation
Skagway	8,859	0.534	15,777	0.538
Point Retreat	17,448	0.770	21,784	0.373
Cape Decision	Not needed for this study		17,074	0.103

The low values of the correlation coefficients indicate that the winds between these stations are not tightly correlated on a strict time-aligned basis. The spatial scale of winter lows leads to the expectation that there will be some correlation between high wind events, especially between Skagway and Eldred Rock, and between Point Retreat and Eldred Rock. However, the expected correlation is that each of the three locations is likely to experience elevated winds from the passage of the same low, but not necessarily at the same time. Such correlations will not be revealed by ordinary analysis of time-aligned records, though, conceivably they might be revealed through autocorrelation analysis (or some other more advanced method) not applied in this study.

Another potential shortcoming of classical (linear) correlation was that it did not lead to a simple model that visited all of the expected wind states at Skagway, Point Retreat, and Cape Decision. Particularly troubling was that the simple correlation models did not result in model inclusion of the higher winds at Skagway, Point Retreat, and Cape Decision.

To overcome these shortcomings, an alternative model was implemented that associates the n^{th} percentile wind at Skagway, Point Retreat, and Cape Decision, with the n^{th} percentile wind at Eldred Rock. Two association relationships were determined at Skagway and Point Retreat;

one for south winds at Eldred Rock, and one for north winds at Eldred Rock. For Cape Decision, an association model was developed using only the case of south winds, as only south winds acting over Chatham Strait result in waves that cross the southern boundary of the SWAN wave hindcasting model into the Lynn Canal domain.

Figure 5 shows the association relationship between winds at Eldred Rock and those acting over Taiya Inlet, as determined from the Skagway anemometer. In the model, winds from the north at Eldred Rock always result in winds from 32.9° true acting over Taiya Inlet. In addition, winds from the south at Eldred Rock always result in winds from 206.6° true acting over Taiya Inlet. The scatter plots in the background of Figure 5 provide an indication of the actual correlation field. The extensions of the association lines beyond the correlation fields indicate the way that high percentile (i.e., relatively rare) wind events at Skagway were incorporated into the hindcasting model.

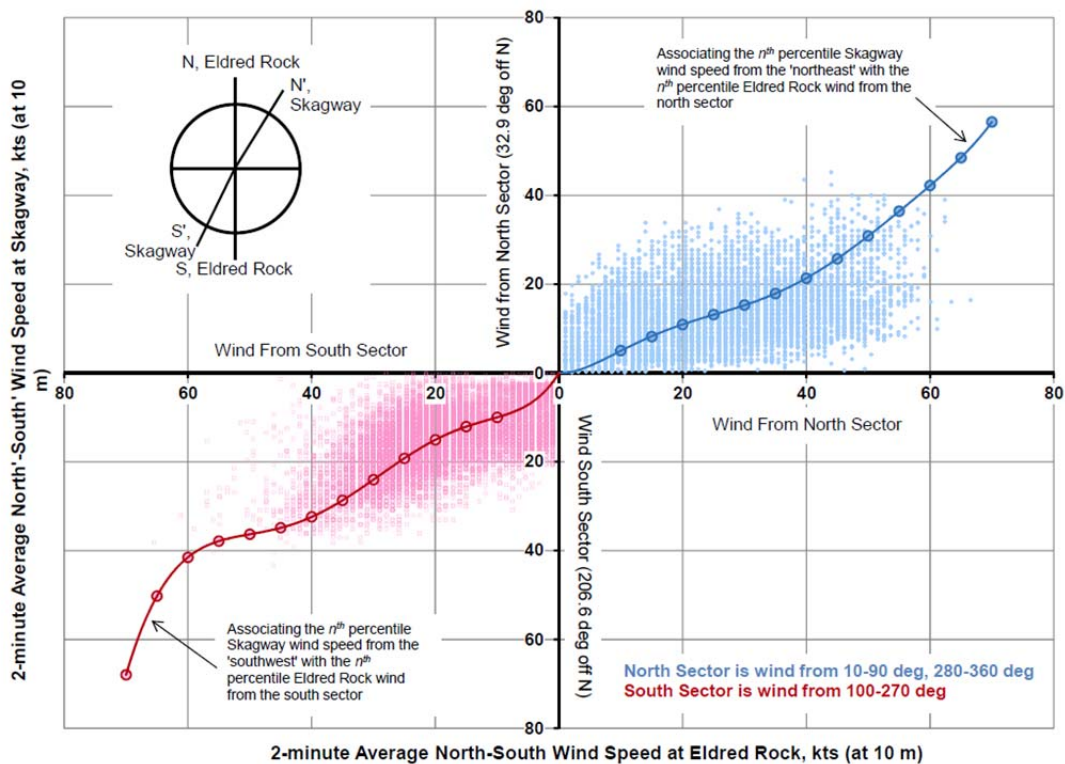


Figure 5 Wind association between Eldred Rock and Skagway

Figure 6 shows a similar association diagram for winds at Point Retreat based on winds at Eldred Rock. In the hindcasting model, the wind direction at Point Retreat was always assigned the same direction as the wind at Eldred Rock.

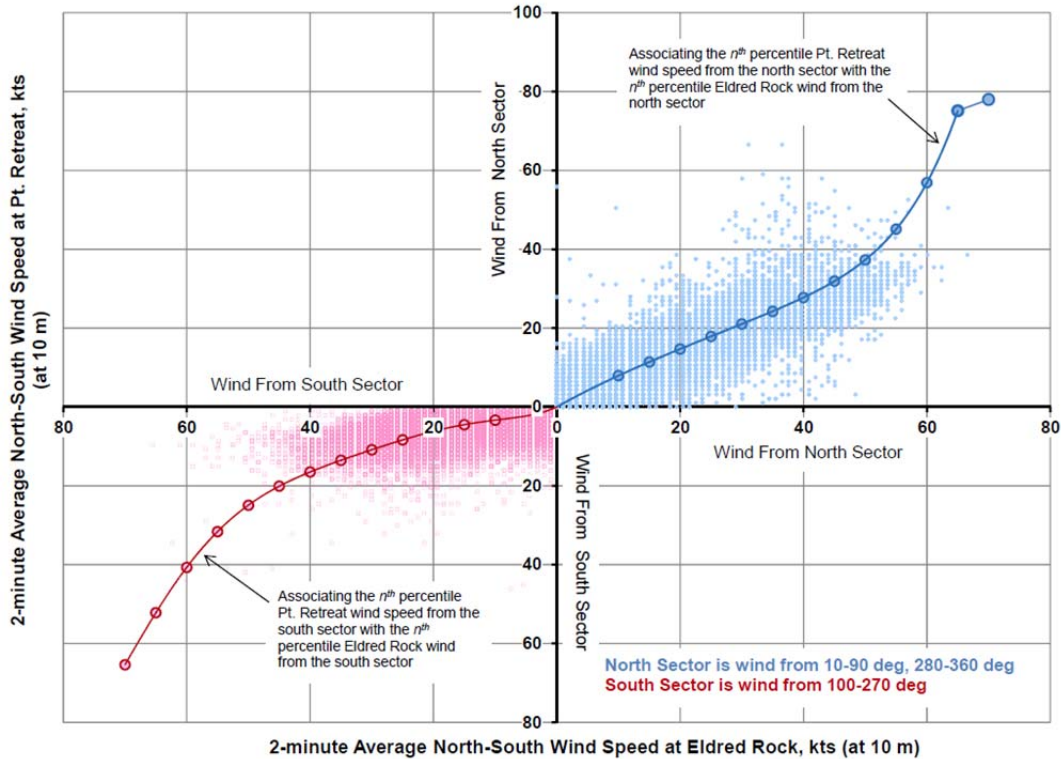


Figure 6 Wind association between Eldred Rock and Point Retreat

Figure 6 shows that the wind speeds at Point Retreat from the north sector were capped at the extrapolated 100-year return period wind speed (Reference 18).

Figure 7 shows an association diagram for winds at Cape Decision for the case of winds from the south at Eldred Rock. The wind direction given to Cape Decision in the model is the same as the wind direction at Eldred Rock. An association relationship for the case of north winds was not developed for Cape Decision, as only south winds acting over Chatham Strait result in waves that cross the southern boundary of the SWAN wave hindcasting model into the Lynn Canal domain.

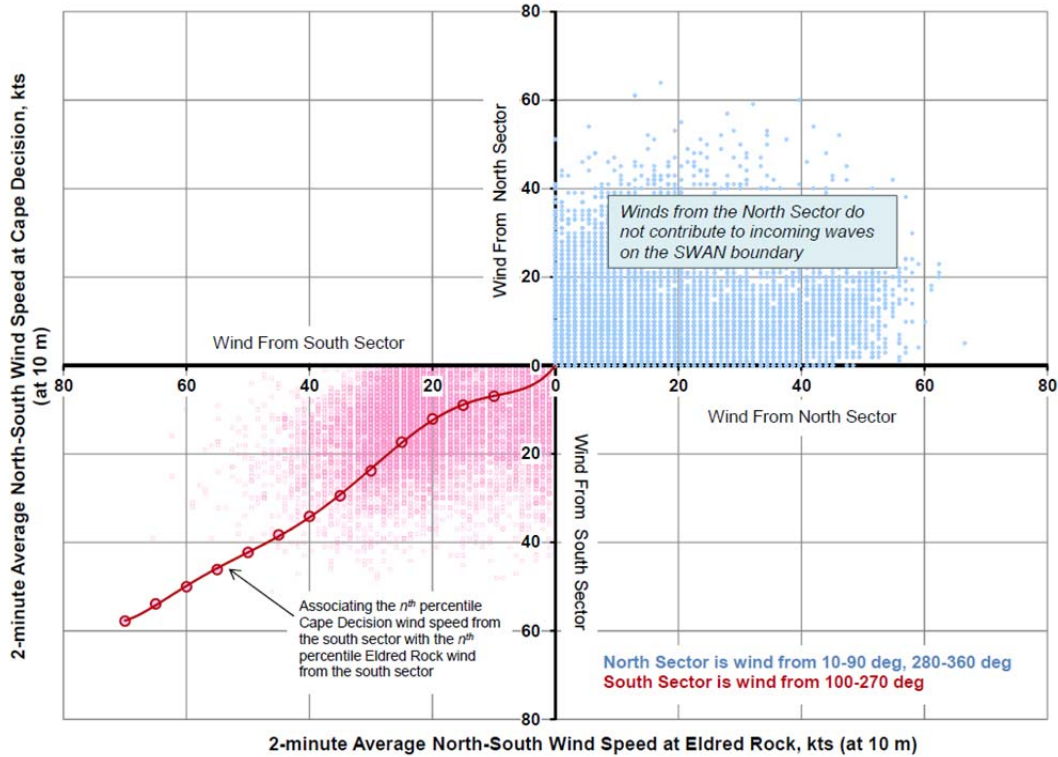


Figure 7 Wind association between Eldred Rock and Cape Decision

The winds acting at Cape Decision were only used in the hindcast of Chatham Strait waves crossing into the SWAN model domain at the southern boundary of the SWAN model. The wave hindcasting model for waves at the southern boundary of the SWAN model is further discussed in Section 3.1.2 of this report. In the hindcast of Chatham Strait waves, an average (homogeneous and uniform) wind speed was applied over the entirety of Chatham Strait, and that average was determined as the average of the wind at Cape Decision and Point Retreat.

The wind fields over the SWAN hindcasting model for Lynn Canal were modeled using four wind domains, with ordinal continuity of wind magnitude imposed at the juncture of domains. This is illustrated in Figure 8. Taiya Inlet and Lutak Inlet were both assigned the wind speed and direction as determined by the association model for Skagway. That wind domain extends to the juncture of Lutak and Taiya Inlets with Lynn Canal. From that juncture to Eldred Rock, the wind speed is linearly interpolated in space such that it achieves the Eldred Rock magnitude at Eldred Rock. The direction over this northern Eldred Rock wind domain is the wind direction at Eldred Rock. From Eldred Rock to Point Retreat, the wind is again linearly interpolated such that it assumes the Point Retreat magnitude at Point Retreat. Again, the direction is that of Eldred Rock. Finally, the Point Retreat wind domain extends south from Point Retreat to the southern boundary of the SWAN model. In this southern Point Retreat domain, the wind magnitude is constant at the Point Retreat value, and the wind direction is that of Eldred Rock.

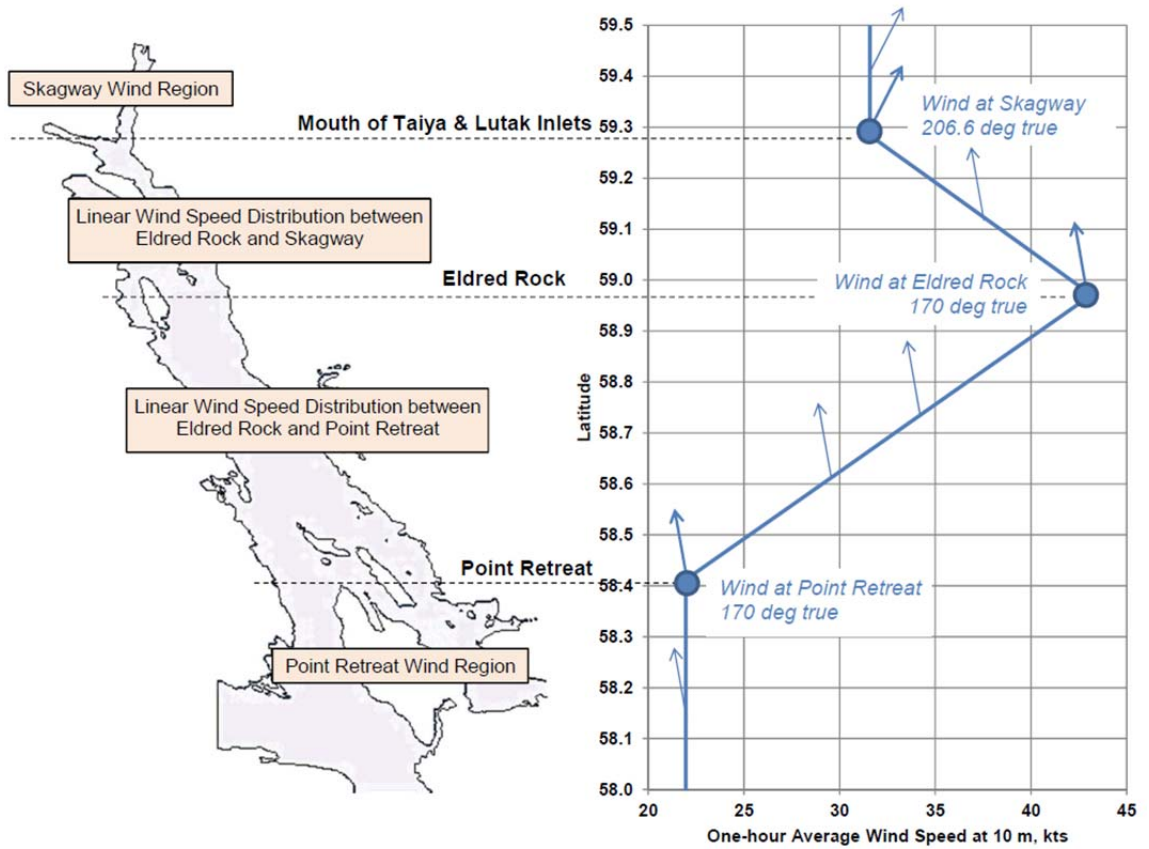


Figure 8 Example wind speed distribution over SWAN domain

Section 3 Wave Climatology

3.1 SWAN Model

SWAN is a third-generation wave model for the simulation of waves in waters of deep, intermediate, and finite depth. It is also suitable for use as a wave hindcast model (Reference 16).

SWAN simulates the following physical phenomena:

- Wave propagation in time and space, shoaling, refraction due to current and depth, and frequency shifting due to currents and nonstationary depth.
- Wave generation by wind.
- Nonlinear wave-wave interactions (both quadruplets and triads).
- Whitecapping, bottom friction, and depth-induced breaking.
- Blocking of waves by current.

Several different formulations of the various physical phenomena are included in the SWAN software. Typically, model calibration with site measured wave data is used to select the appropriate theoretical formulation for the numerical model. However, site measured wave data is not available for any site in Chatham Strait or Lynn Canal. The accuracy of the wave predictions presented herein cannot be verified without measured data.

Of greatest importance is selection of the wind-generated wave growth model and whitecapping dissipation model, because the different models implemented in SWAN can produce very different results. The saturation-based model, rather than the default pulse-based model of whitecapping, was selected for this analysis because it has been shown to produce steeper waves. Anecdotal evidence suggests that waves in Lynn Canal are quite steep. Other than the choice of a whitecapping model, the default settings for triads, quadruplets, bottom friction, and depth-induced breaking were assumed due to the lack of measured data for calibration.

3.1.1 Bathymetry

The bathymetry of the area was obtained from Reference 2. The source geographical data has a spatial resolution of 8/3 arc-seconds (7.41×10^{-4} degrees) in latitude and longitude. This was sub-sampled to a spatial resolution of 40/3 arc-seconds (3.7×10^{-3} degrees) for numeric computations.

The bathymetry of the area of interest is shown in Figure 9. The latitudinal and longitudinal coordinates are based on the WGS84 spheroid. The vertical measurements are based on the mean higher-high water (MHHW) tidal level for a number of vertical datums in the Southeast Alaska region, transformed to MHHW for modeling maximum flooding. The relationships that exist between water levels and the Juneau station datum are shown in Table 10 (Reference 4).

Table 10 Relationship between MHHW and vertical datums for Juneau, Alaska (Station ID 9452210)

Datum	Value	Description
STND	0.000 m	Station Datum
MLLW	1.102 m	Mean Lower-Low Water
MSL	3.712 m	Mean Sea Level
MHHW	6.073 m	Mean Higher-High Water

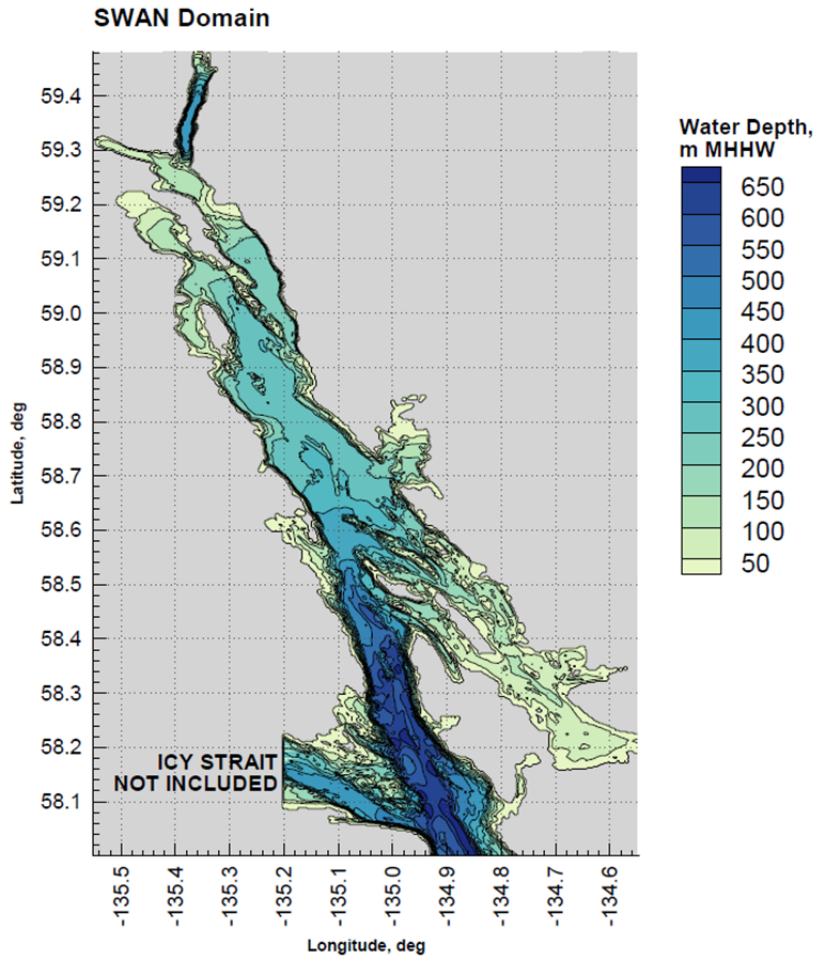


Figure 9 Bathymetry of the SWAN computational domain

3.1.2 Boundary Conditions

It may be possible for wind-driven waves to enter the SWAN domain from the south. To capture these in the SWAN wave hindcast, a wave spectrum representing the incoming waves is applied to the southern border of the computational domain.

In order to characterize these waves, a restricted fetch wave hindcast was performed for a location on the southern SWAN domain border using the fetch-limited wave growth equations in the Automated Coastal Engineering System (ACES, Reference 3). The ACES model is a deep water model that does not capture refraction, shoaling, or wave breaking effects over the wave generating fetch domain. The boundary location and its fetch radials every one degree is shown in Figure 10.

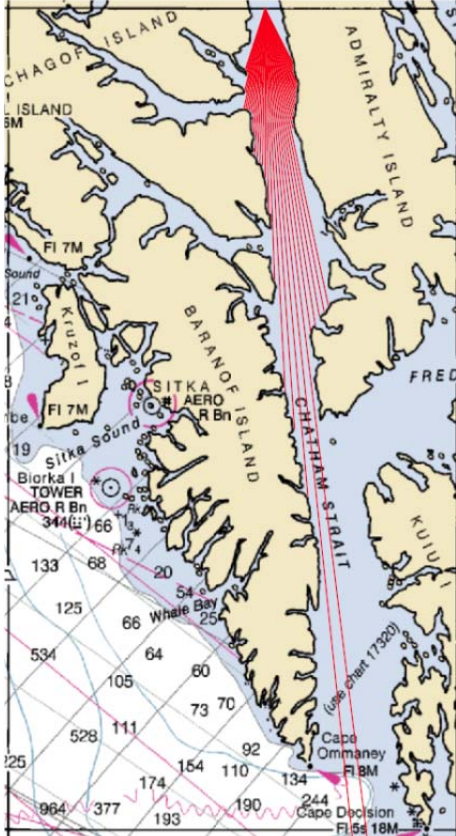


Figure 10 Fetch radials for point along SWAN southern boundary

Chatham Strait is open to the Gulf of Alaska at its southern terminus. However, the entrance is assumed to be sufficiently narrow and far from the area of interest that the wind-generating wave fetch was considered only to Cape Decision. The longest fetch radials are 140 miles long.

The thermal gradient between the air and water affects wind-generated wave growth. When the air is colder than the water, more energy is transferred from the wind to the waves, and the wave height is higher than it would be under neutral stability conditions. Hourly air and water temperature data was available for year 2010 for Juneau, Alaska (Reference 12). This was used as an approximation to the conditions at the wave hindcast site. In winter, the average air-water temperature difference was -4°C . This was conservatively assumed for all wave hindcasts, regardless of season.

Wind speeds over Chatham Strait for the purposes of the fetch-limited wave hindcast were assumed as the average between the wind speed at Point Retreat and at Cape Decision, each determined using the methods presented in Section 2.5 for each wind condition from the south at Eldred Rock with non-zero probability.

3.1.3 Wind Speed

The two-minute average wind speeds were adjusted to one-hour wind speeds using Reference 3. The temperature difference between air and water was assumed to be -4°C , as was the case for the waves on the southern boundary of the SWAN domain. The one-hour wind speeds over the SWAN domain were applied according to Section 2.5.

3.1.4 Points of Interest

Several field points were selected for presentation of wave parameters. These points are shown in Figure 11 and described in Table 111110.

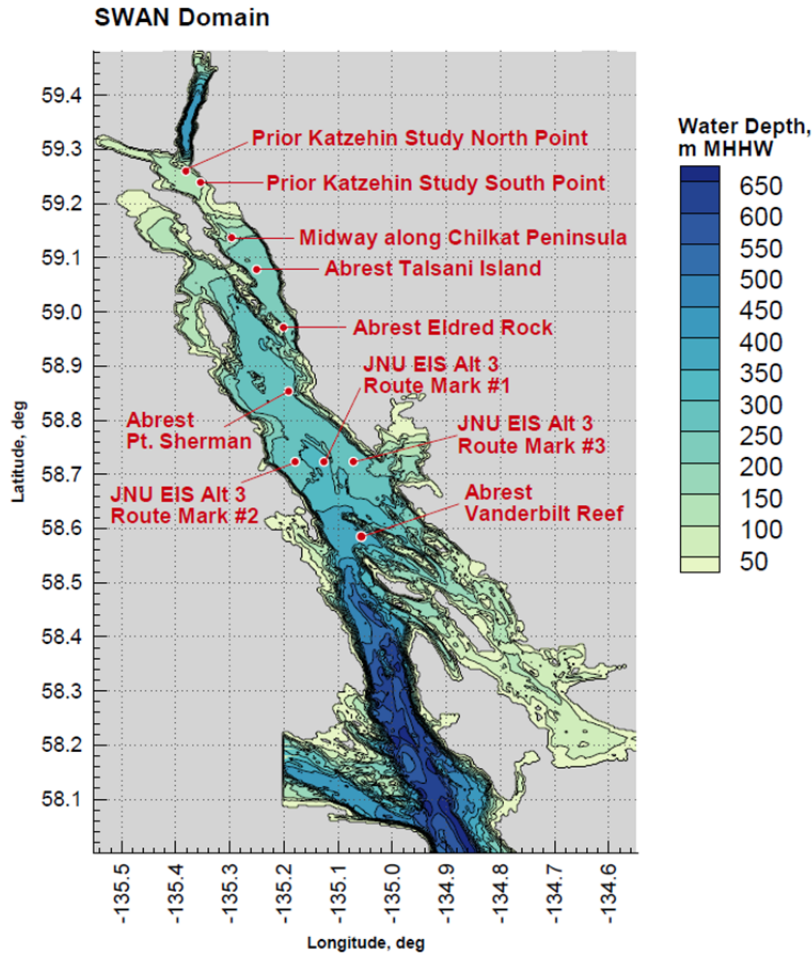


Figure 11 SWAN domain with field points of interest shown

The field points “Prior Katzeihin Study North Point” and “Prior Katzeihin Study South Point” are the two points on which the fetch-limited wave hindcast presented in Reference 12 is based.

Table 11 Field points of interest

Field Point Name	Latitude, N		Longitude, W		Water
	degrees	minutes	degrees	minutes	Depth, m
Prior Katzehin Study North	59	15.576	135	22.884	111.4
Prior Katzehin Study South	59	14.337	135	21.250	109.4
Midway along Chilkat Peninsula	59	8.212	135	17.811	178.2
Abrest Talsani Island	59	4.689	135	15.038	244.2
Abrest Eldred Rock	58	58.259	135	12.065	213.6
Abrest Pt. Sherman	58	51.194	135	11.498	295.3
JNU EIS Alt 3 route mark #1	58	43.385	135	7.576	310.2
JNU EIS Alt 3 route mark #2	58	43.393	135	10.770	290.0
JNU EIS Alt 3 route mark #3	58	43.400	135	4.310	271.6
Abrest Vanderbilt Reef	58	35.105	135	3.433	379.9

3.2 SWAN Results

3.2.1 Monthly Climatology

A SWAN case was run for each wind speed and direction combination at Eldred Rock for which there was non-zero probability. Monthly and annual statistics of significant wave height were calculated.

Each wave height can be associated with a range of wave periods, so assigning a single period to a given significant wave height requires some analysis. It was postulated that for a given wind direction, the relationship between significant wave height and peak wave period could be well-characterized by a power function. Since the north-south direction produced the highest waves, two wind directional sectors were defined. Based on the wind rose for Eldred Rock, “south” was defined as wind at Eldred Rock from 150° to 180° true and “north” was defined as wind at Eldred Rock from 330° to 360° true.

For each field point, for each of the two wind direction sectors, a curve of the form was fit to the H_S and T_P predicted by SWAN:

$$T_P = \alpha(H_S)^{1/\beta}$$

The parameters α and β were determined using a least squares fit to the data. An example of this process is shown in Figure 12 for point “Abrest Vanderbilt Reef.” The parameters for other field points and goodness of fit parameter, R^2 , are shown in Table 12. An R^2 value of one indicates a curve that passes exactly through every data point.

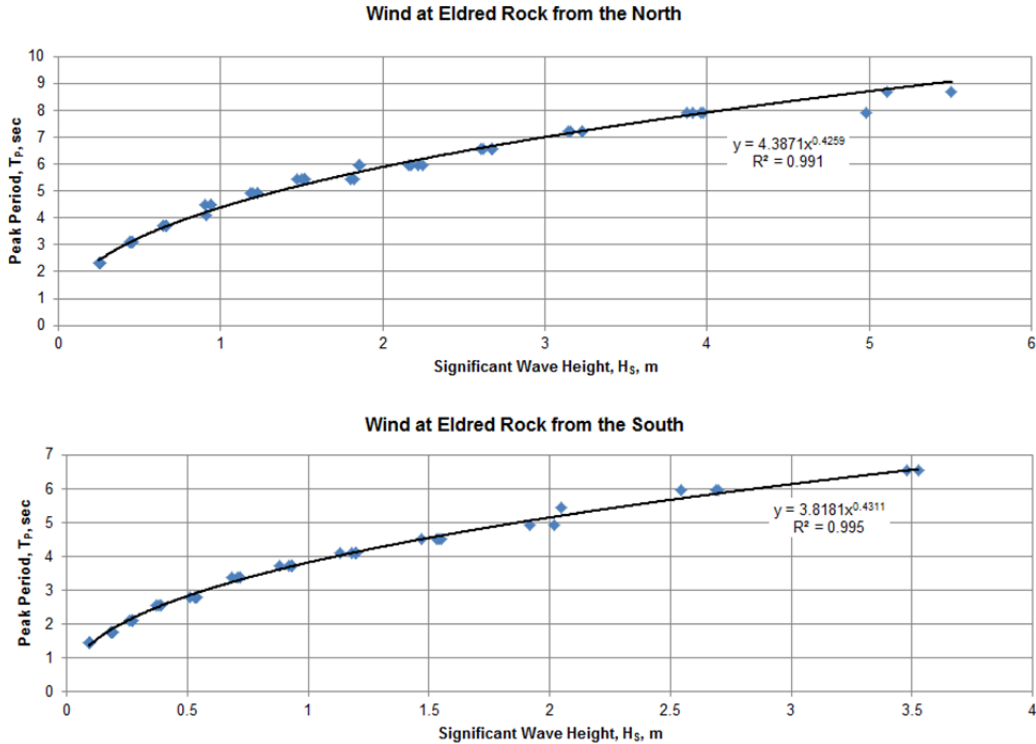


Figure 12 Example relationship between H_S and T_P at point “Abrest Vanderbilt Reef”

Table 12 H_S - T_P relationship curve fit parameters

Field Point Name	From the North			From the South		
	α	$1/\beta$	R^2	α	$1/\beta$	R^2
Abrest Talsani Island	3.8178	0.4290	0.990	4.2866	0.4598	0.993
Abrest Eldred Rock	3.7995	0.4328	0.994	4.2081	0.4687	0.995
Abrest Pt. Sherman	4.0778	0.4135	0.992	4.0397	0.4378	0.997
JNU EIS Alt 3 route mark #1	4.2003	0.4184	0.995	3.9994	0.4470	0.996
Abrest Vanderbilt Reef	4.3871	0.4259	0.991	3.8181	0.4311	0.995

For points north of Point Sherman, the peak period based on winds from the south was selected, as winds from the south generally produced the highest wave heights at these points. For points south of Point Sherman, the peak period based on winds from the north was selected for the same reason. This trend is shown in Figure 13, example cases of wind from the north and south. The example of winds from the south approximates the condition corresponding to the 95th percentile wave height in the worst month at Eldred Rock. The example of winds from the north approximates the condition corresponding to the 95th percentile wave height in the worst month at Vanderbilt Reef.

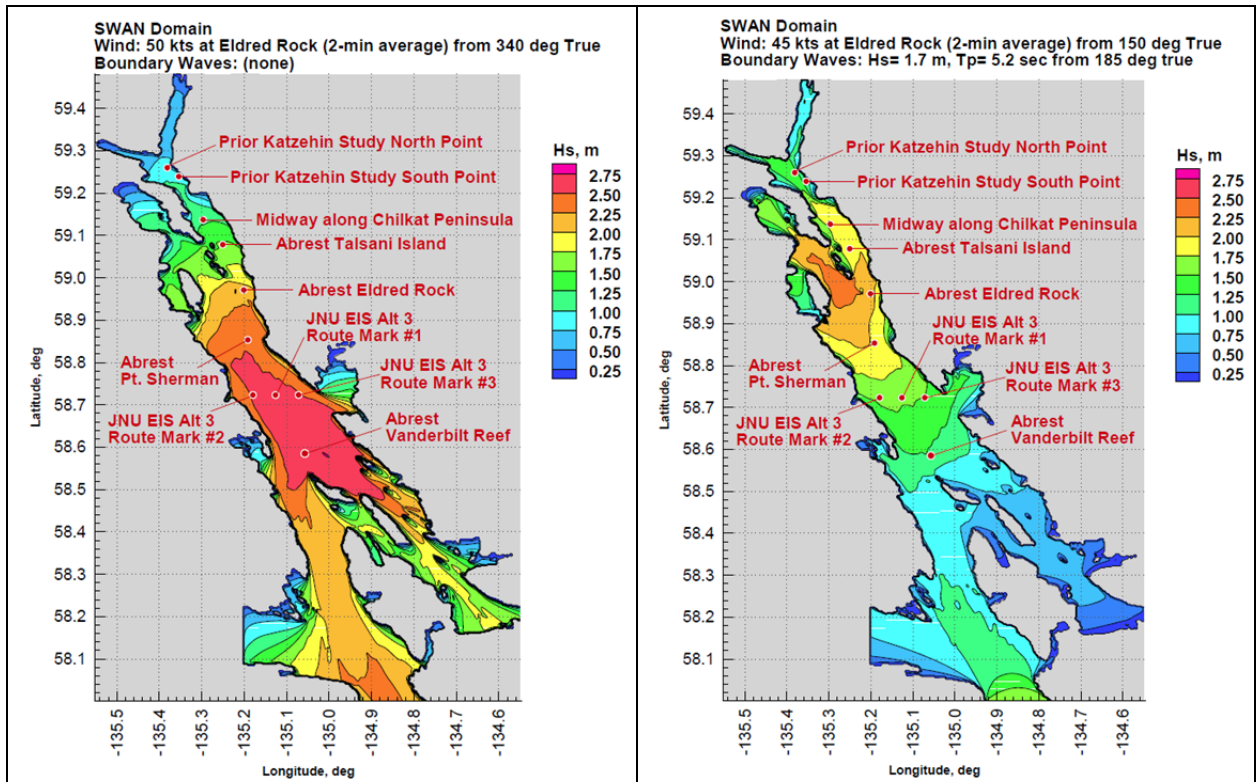


Figure 13 Example cases of wave height contours

The relationship between wind direction and wave direction is nearly linear; e.g., the waves are generally travelling in the same direction as the wind is blowing. Figure 14 shows the wind and wave directions at field point “Abrest Vanderbilt Reef,” Figure 15 shows the wind and wave directions at field point “JNU EIS Alt 3 route mark #1,” Figure 16 shows the wind and wave directions at field point “Abrest Pt. Sherman,” Figure 171715 shows the wind and wave directions at field point “Abrest Eldred Rock,” and Figure 18 shows the wind and wave directions at field point “Abrest Talsani Island.” The average wave direction corresponds to the mean wave direction over all wave frequencies, and the peak wave direction corresponds to the peak of the directional wave spectrum occurring at a single wave frequency. The lines of best fit are based on the average wave direction. A slope of one and a y-intercept of zero would represent an exact correlation between wind direction and wave direction.

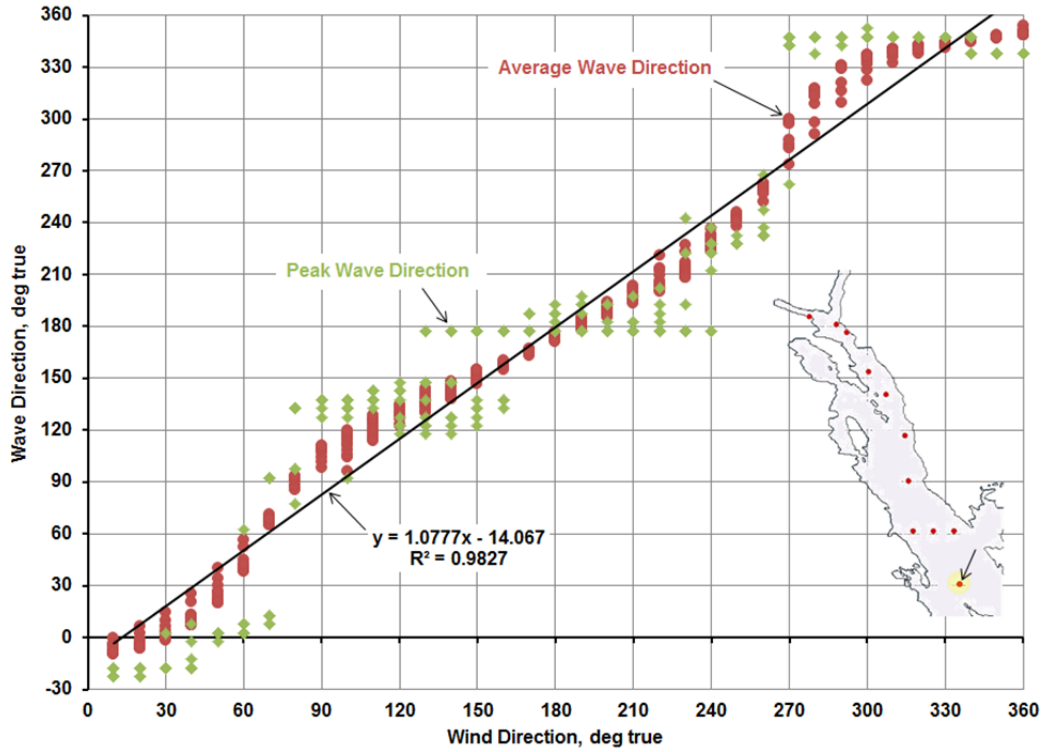


Figure 14 Relationship between wind direction and wave direction at field point “Abrest Vanderbilt Reef”

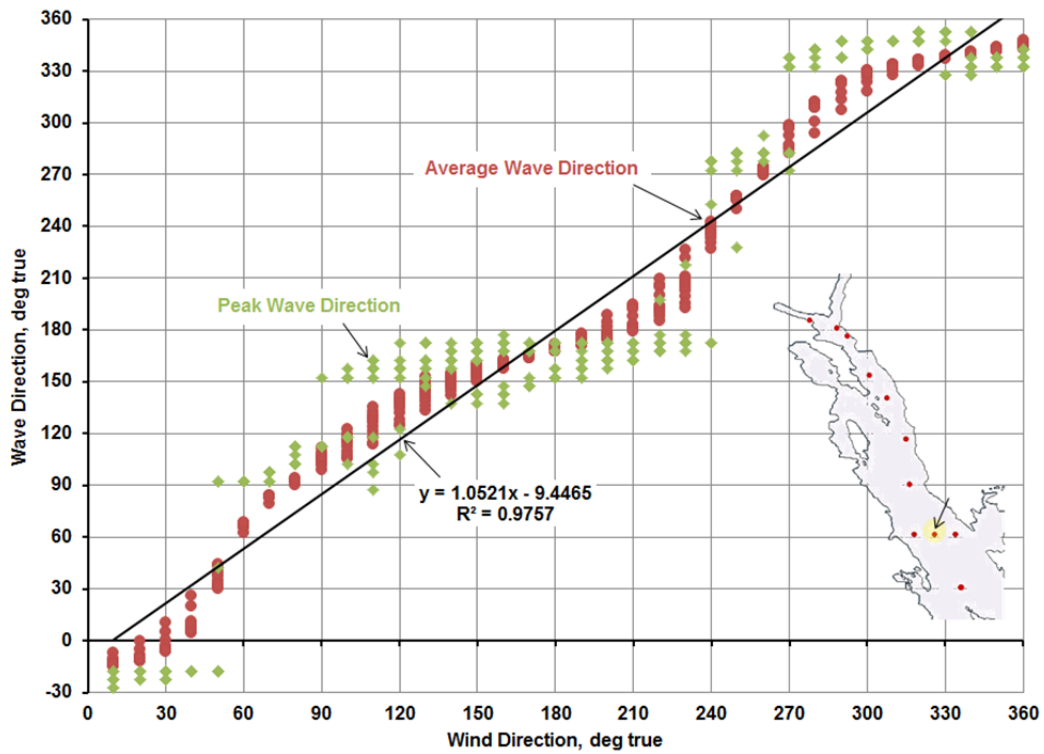


Figure 15 Relationship between wind direction and wave direction at field point “JNU EIS Alt 3 route mark #1”

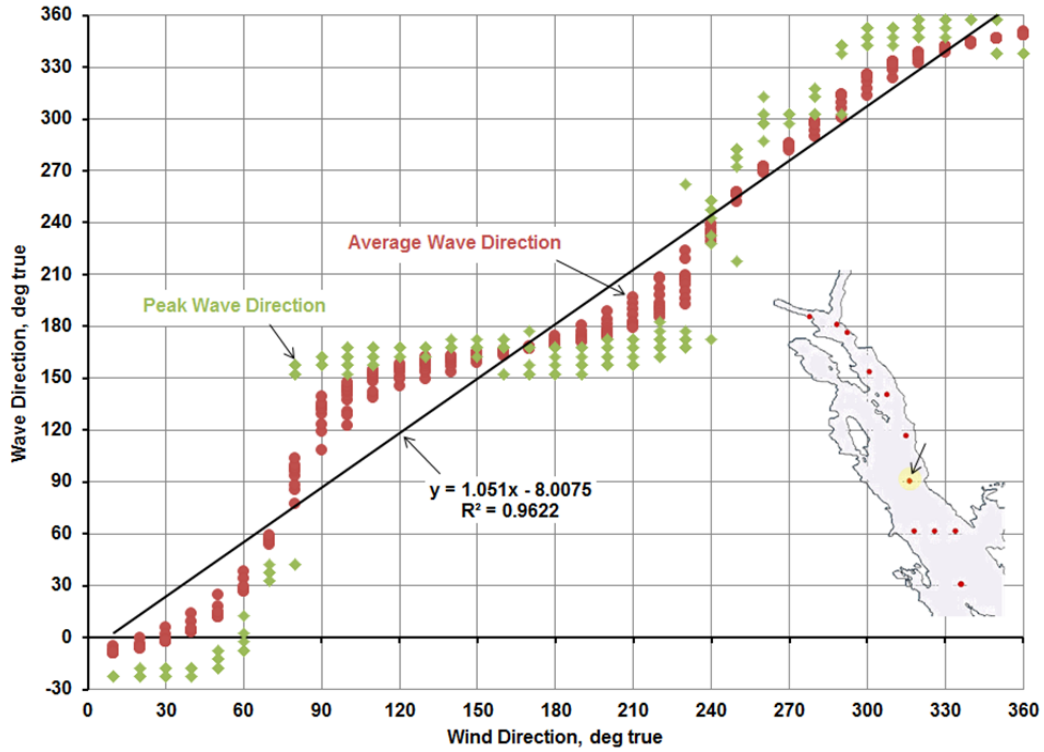


Figure 16 Relationship between wind direction and wave direction at field point "Abrest Pt. Sherman"

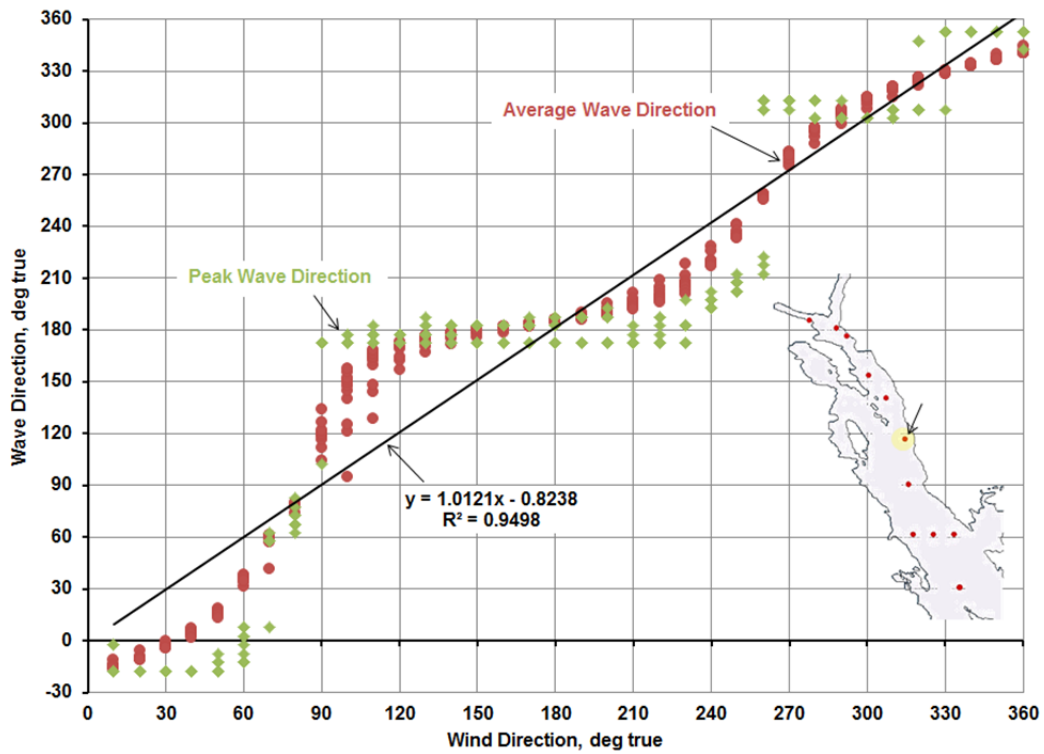


Figure 17 Relationship between wind direction and wave direction at field point "Abrest Eldred Rock"

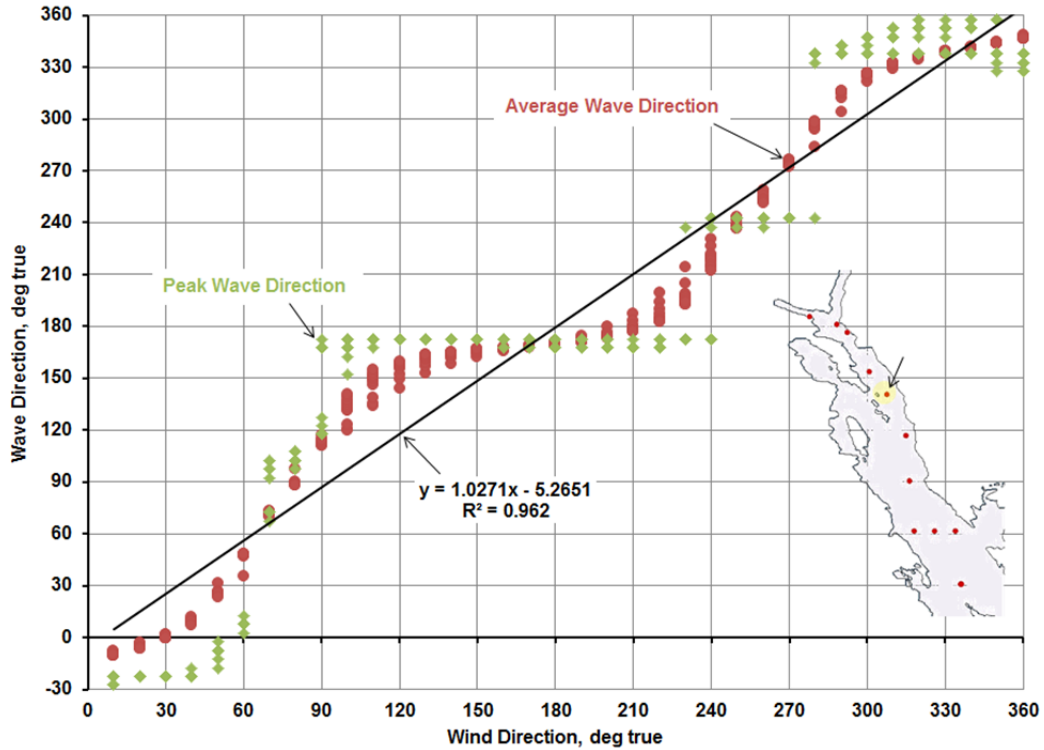


Figure 18 Relationship between wind direction and wave direction at field point “Abrest Talsani Island”
 Monthly wave statistics at field point “Abrest Vanderbilt Reef,” where the highest wave heights are predicted, are shown in Figure 19. Similar trends appear at the other field points. Monthly wave height and period statistics for other field points are given in Appendix D.

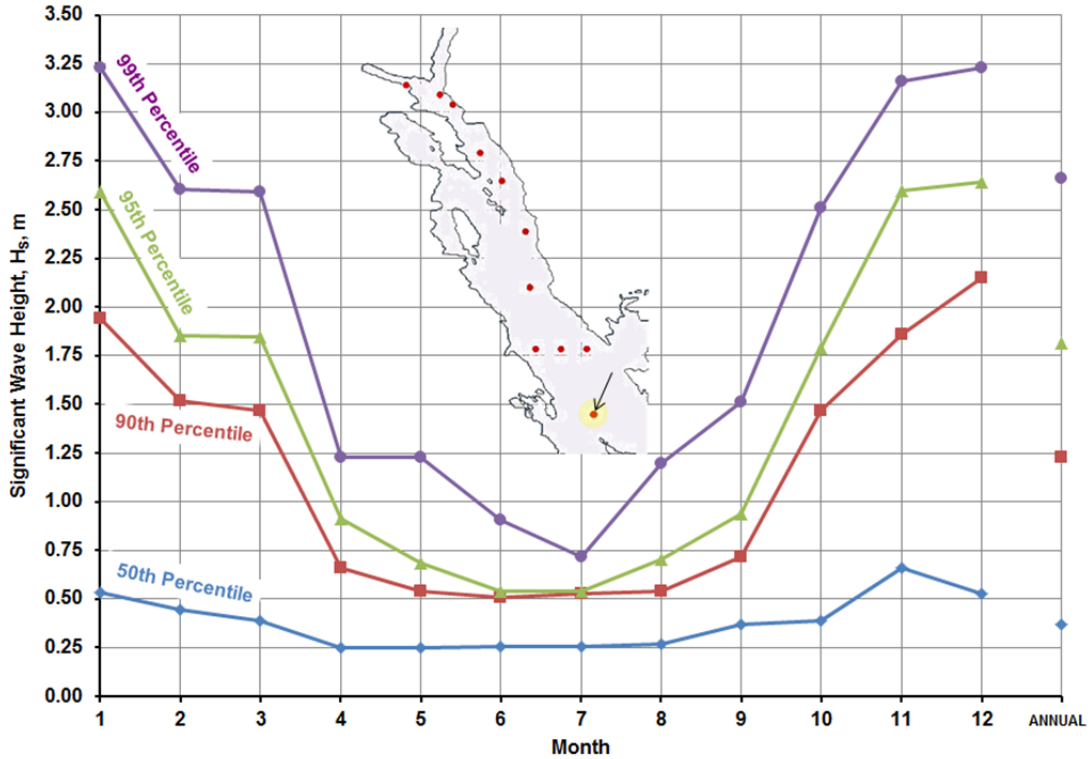


Figure 19 Monthly and annual statistics of significant wave height at field point "Abrest Vanderbilt Reef"

3.2.1.1 Worst Month

Statistics of significant wave height in the worst month at selected field points are shown in Figure 20. The worst month for each point is not necessarily the same month for all points. Additionally, the wave heights shown in Figure 20 are independent of wind direction, meaning that some points will be worse for winds from the south and some will be worse for winds from the north. In general, the worst case for field points south of Point Sherman is associated with winds from the north, and the worst case for field points north of Point Sherman are associated with winds from the south.

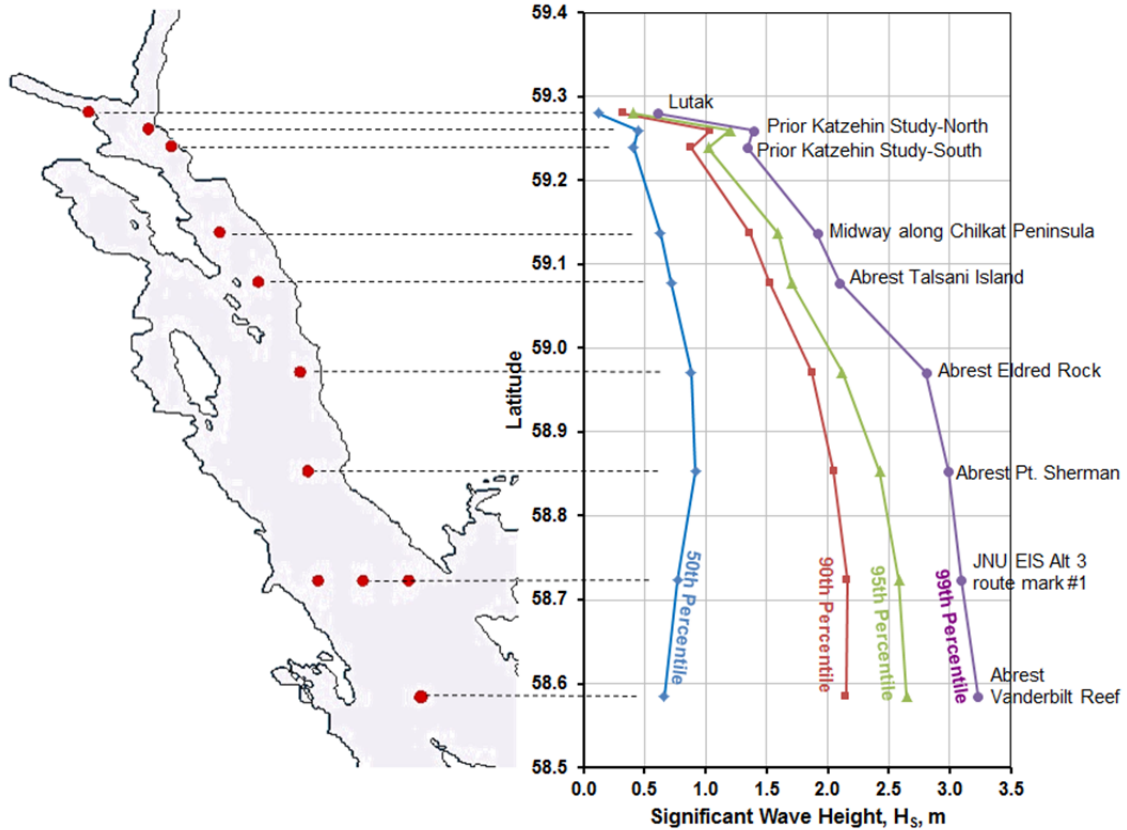


Figure 20 Maximum of monthly wave height statistics at selected points

Table 13 shows the significant wave height and peak period statistics for selected field points in the worst month.

Table 13 Statistics of sea states at five worst field points

Field Point Name		Percentile in Worst Month			
		50th	90th	95th	99th
Abrest Talsani Island	H_S , m	0.7	1.5	1.7	2.1
	T_P , sec	3.7	5.2	5.5	6.0
Abrest Eldred Rock	H_S , m	0.9	1.9	2.1	2.8
	T_P , sec	4.0	5.6	6.0	6.8
Abrest Pt. Sherman	H_S , m	0.9	2.0	2.4	3.0
	T_P , sec	3.9	5.5	5.9	6.4
JNU EIS Alt 3 route mark #1	H_S , m	0.8	2.2	2.6	3.1
	T_P , sec	3.8	5.8	6.3	6.7
Abrest Vanderbilt Reef	H_S , m	0.7	2.2	2.6	3.2
	T_P , sec	3.7	6.1	6.6	7.2

3.2.2 Design Waves for Seakeeping

A route segment of 38 nautical miles in length was selected as the design route, beginning at about Eagle Reef (north of Aaron Island) and extending northward to a point halfway between Point Sherman and Eldred rock. Between Point Retreat and Lutak, waves over this segment are predicted to be highest. Motion sickness incidence (MSI) is typically presented as an amount experienced in 2 hours of exposure. At 15 knots, transit over the 38 nautical mile route segment would take 2.5 hours.

This route includes field points “Abrest Vanderbilt Reef,” “JNU EIS Alt 3 route mark #1,” and “Abrest Pt. Sherman.” For any given statistical level, the weighted average significant wave height, weighted according to the distance along the route associated with each field point, was calculated. The peak wave period was determined in a similar manner. The design sea state for seakeeping was assumed to be the 95th percentile weighted average in the worst month, and is shown in Table 14. Monthly weighted average wave height statistics are shown in Figure 21.

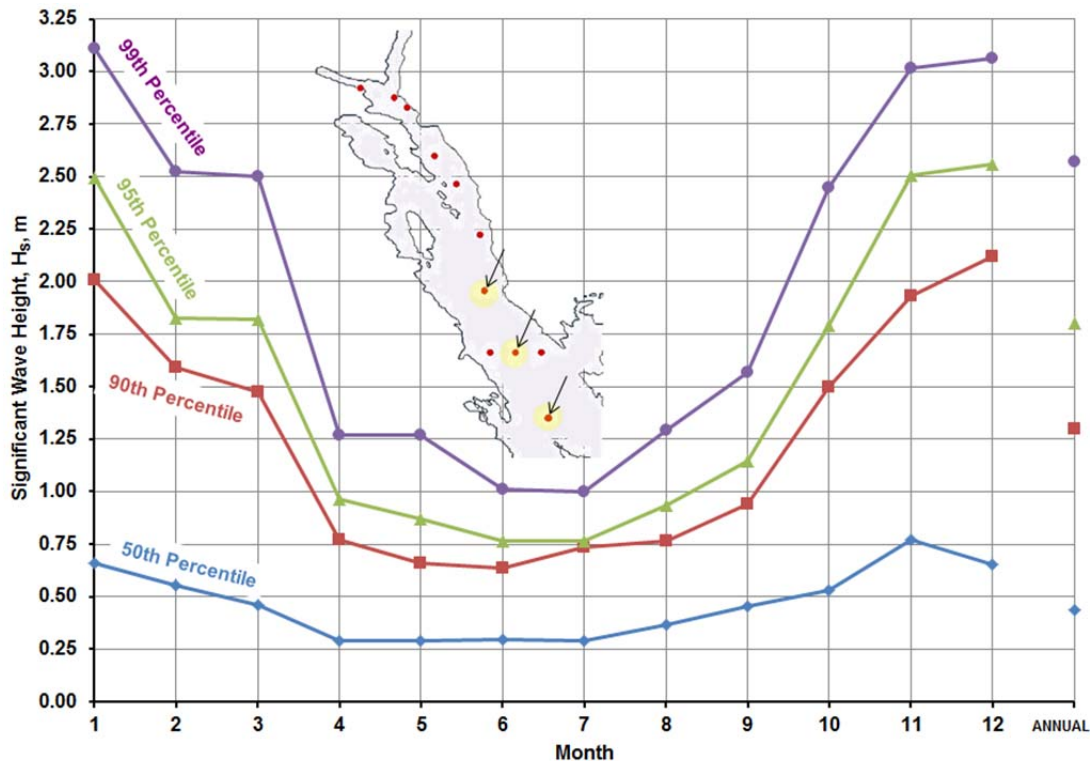


Figure 21 Monthly and annual weighted average wave height statistics

Table 14 Design sea state for seakeeping analysis

Sea State for Seakeeping		Percentile in Worst Month			
		50th	90th	95th	99th
Weighted Average	H_s , m	0.8	2.1	2.6	3.1
	T_p , sec	3.8	5.8	6.3	6.8

The spectral shape of the sea state was best fit by a JONSWAP spectrum with a peak enhancement factor (γ , gamma) equal to two. The JONSWAP spectrum is defined as:

$$S(f) = \frac{5}{16} \frac{H_s^2 T_p}{(T_p f)^5} \exp\left(\frac{-5}{4(T_p f)^4}\right) \gamma^{-1/3} \gamma \exp\left(\frac{-(T_p f - 1)^2}{2\sigma^2}\right)$$

where

σ is 0.07 for $1/f \geq T_p$ and 0.09 for $1/f < T_p$

Sample spectra for the approximate 95th percentile sea state in the worst month for points “Abrest Vanderbilt Reef” and “Abrest Point Sherman” are shown in Figure 22 and Figure 23. A Bretschneider spectrum is shown for comparison.

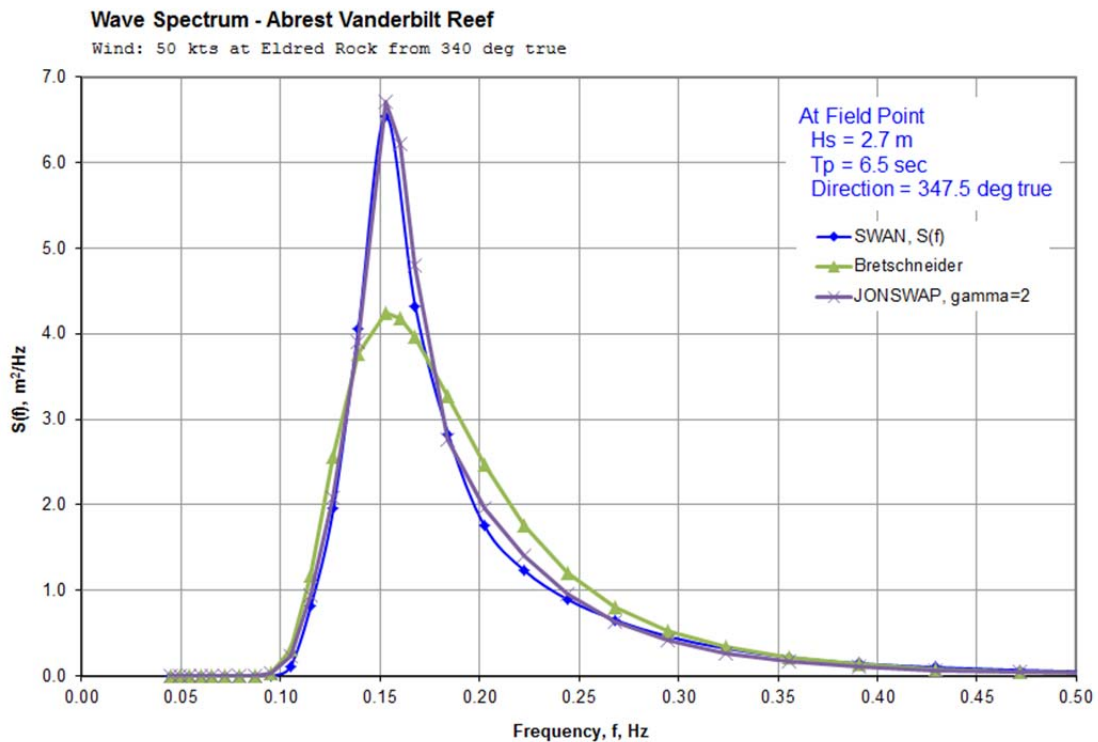


Figure 22 Wave spectrum predicted by SWAN for field point “Abrest Vanderbilt Reef”

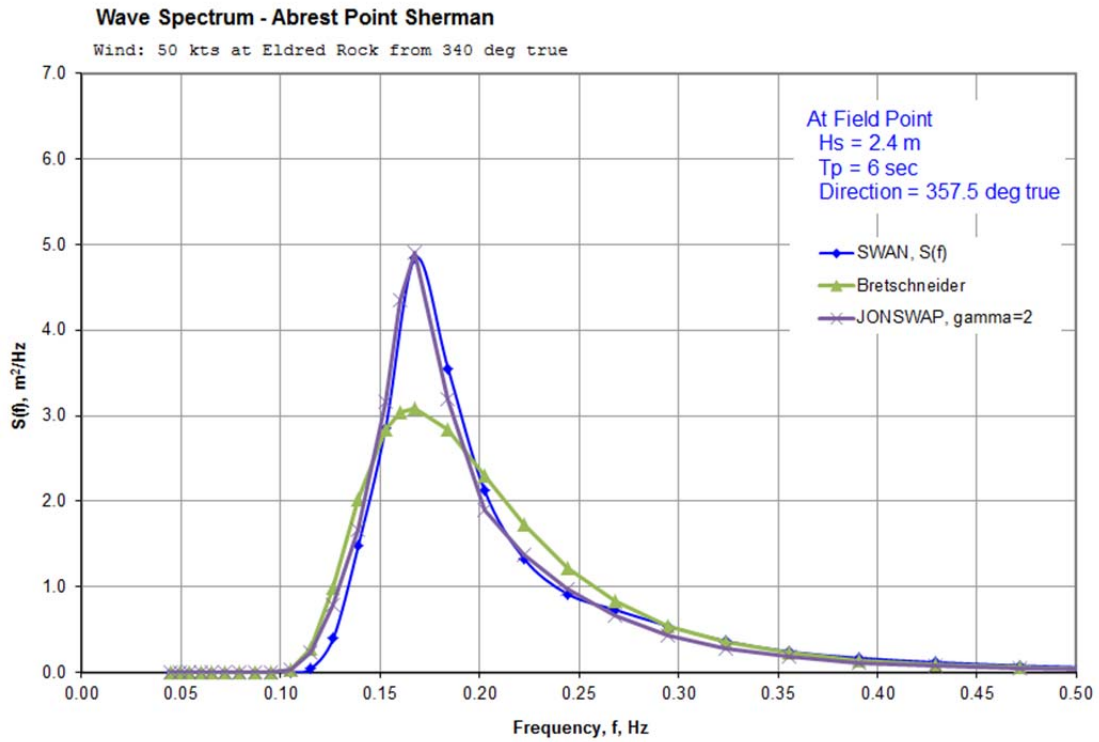


Figure 23 Wave spectrum predicted by SWAN for field point “Abrest Point Sherman”

Section 4 Conclusion

Monthly and annual wave statistics were estimated using a modern, third-generation prediction model, Simulating WAVes Nearshore (SWAN, Reference 15). The accuracy of the wave predictions presented herein cannot be verified without measured data. All waves in the SWAN domain were assumed to be wind-generated. The wind distribution over the domain was estimated using historical data from Skagway Airport, Eldred Rock, Point Retreat, and Cape Decision. The wind data at each location was correlated with the data from Eldred Rock, and the resulting correlation relationships were used to assign wind speeds to their associated regions of the SWAN domain.

Wave height statistics at several field points within the SWAN domain were calculated. For the purposes of a seakeeping analysis, the three southernmost field points, representative of the highest waves, were used to determine a design sea state. A route of approximately 38 nautical miles was assumed to extend from Aaron Island to midway between Eldred Rock and Point Sherman, in which a transit at 15 knots would take 2.5 hours. The average 95th percentile wave height in the worst month, weighted by the distance associated with each of the three southernmost field points, was assumed as the sea state for seakeeping analysis. The design sea state for seakeeping consists of a significant wave height of 2.6 m and a peak wave period of 6.3 seconds.

The effect of tidal currents on wave generation has been neglected. The links in Reference 19 give daily predictions of tidal current for various points in Lynn Canal for 2013. The maximum predicted flood current is 0.2 knot. The maximum predicted ebb current is 0.3 knot, except for a station two miles west of Vanderbilt Reef where it is 0.6 knot. The current will be less than these flood and ebb levels most of the time. Therefore, the joint occurrence of an extreme wind event and a high current will be rare. Hence for the present analysis, omission of current effects on the wave generation process is justified.

Appendix A Eldred Rock Wind Statistics

January

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	3	-	4	-	1	-	-	-	1	-	-	-	-
20	7	-	-	-	-	-	1	1	-	-	-	-	-
30	3	-	-	-	-	1	1	-	-	-	-	-	-
40	4	-	-	-	-	-	-	-	-	-	-	-	-
50	2	-	1	1	-	1	-	-	-	1	-	-	-
60	2	-	-	-	-	-	-	-	-	-	-	-	-
70	3	-	-	-	-	-	1	-	-	1	-	-	-
80	5	-	-	-	-	-	-	1	1	-	-	-	-
90	4	-	-	-	-	-	-	-	-	-	-	-	-
100	4	1	-	-	-	-	-	-	2	-	1	-	-
110	9	-	-	1	-	-	1	1	-	1	-	-	-
120	8	-	-	-	-	-	-	-	1	1	-	-	-
130	10	-	-	3	-	1	-	1	-	1	-	1	-
140	17	5	2	18	14	13	3	1	-	-	-	-	-
150	17	11	20	49	32	45	21	18	2	-	-	-	-
160	22	16	50	39	44	32	16	6	-	1	-	-	-
170	16	20	45	29	34	20	2	2	-	-	-	-	-
180	4	10	43	40	28	21	2	2	-	-	-	-	-
190	7	13	34	22	11	2	-	-	-	1	-	-	-
200	2	6	7	4	-	1	-	-	-	-	-	-	-
210	1	1	-	-	-	1	-	1	2	2	-	-	-
220	3	-	-	-	-	-	-	-	1	-	1	-	-
230	4	-	-	-	-	1	-	-	3	-	-	-	-
240	1	-	-	-	-	-	1	1	-	-	-	-	-
250	1	-	-	-	-	-	-	-	-	1	-	-	-
260	4	1	-	-	-	1	-	-	-	-	-	-	-
270	5	-	-	1	-	1	-	1	1	1	-	-	-
280	2	-	-	-	-	1	-	-	-	2	-	-	-
290	11	-	-	-	-	-	-	2	2	-	-	-	-
300	28	5	1	-	-	-	-	-	1	-	-	-	-
310	80	19	4	1	-	-	1	-	-	-	-	-	-
320	123	38	22	6	2	2	3	3	4	3	1	1	-
330	85	38	32	27	13	23	44	33	24	11	13	3	-
340	32	25	24	30	21	10	41	38	25	12	-	-	-
350	31	22	23	26	24	34	25	14	7	2	-	-	-
360	6	5	8	18	25	22	8	4	3	-	-	-	-

SUB TOTAL: 2362
 CALM: 71
 TOTAL: 2433

February

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	3	1	3	2	4	3	1	-	1	-	-	-	-
20	4	-	-	-	-	-	-	-	-	-	-	-	-
30	5	1	-	1	-	-	-	-	1	-	-	-	-
40	3	-	-	2	-	1	-	-	1	-	-	-	1
50	4	-	-	-	-	-	-	-	-	-	-	-	-
60	3	-	-	-	-	-	1	-	-	-	-	-	-
70	-	-	-	1	-	-	-	-	1	-	-	-	-
80	3	-	-	1	-	-	-	1	-	-	-	-	-
90	3	-	-	-	-	1	-	-	-	-	-	-	-
100	1	-	-	-	1	-	-	-	-	-	-	-	-
110	2	-	-	-	-	-	-	-	-	-	-	-	-
120	4	-	-	-	-	-	-	1	1	-	-	-	-
130	5	-	2	3	2	-	-	1	-	-	-	-	-
140	7	-	-	2	1	4	-	2	1	-	-	-	-
150	7	5	7	18	18	14	17	6	2	-	-	-	-
160	11	4	14	27	45	16	14	7	1	1	1	-	-
170	9	9	30	37	21	30	6	4	-	-	-	-	-
180	7	5	22	30	17	18	4	-	1	-	1	-	-
190	9	2	7	9	4	1	1	-	1	-	-	-	-
200	4	-	1	1	-	-	-	-	1	-	-	-	-
210	2	-	-	-	-	-	-	-	1	-	-	-	-
220	4	-	-	-	-	-	2	-	-	-	-	-	-
230	2	-	-	-	-	-	-	-	-	1	-	-	-
240	2	-	-	-	-	-	-	-	-	-	1	-	-
250	1	-	-	-	-	2	-	-	1	-	-	-	-
260	1	-	-	-	-	1	-	1	-	-	-	-	-
270	3	-	-	-	-	-	-	-	1	-	-	-	-
280	32	3	-	-	-	-	-	-	-	-	-	-	-
290	55	8	-	-	-	-	-	-	-	-	-	-	-
300	66	7	-	-	-	-	-	-	-	-	-	-	-
310	68	33	8	2	-	-	-	-	-	1	-	-	-
320	94	43	17	6	1	-	5	-	-	1	-	-	-
330	80	47	23	13	26	29	34	13	7	-	-	-	-
340	33	31	17	34	48	73	57	21	7	1	-	-	-
350	26	27	25	27	51	52	25	6	6	-	-	-	-
360	16	11	9	20	20	30	4	1	2	-	-	-	-

SUB TOTAL: 2052
 CALM: 89
 TOTAL: 2141

March

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	12	6	6	6	2	1	1	1	-	2	-	-	-
20	11	1	1	-	-	-	1	1	1	-	1	-	-
30	8	-	-	-	-	-	-	-	1	-	-	-	-
40	5	1	-	-	1	-	1	-	-	-	-	-	-
50	9	-	-	-	-	3	1	-	-	-	-	-	-
60	4	-	-	-	-	-	-	1	-	-	-	-	-
70	4	1	-	-	-	1	-	1	-	-	-	-	-
80	3	-	1	-	-	-	-	-	1	1	1	-	-
90	2	-	2	-	-	-	1	1	-	2	-	-	-
100	5	-	-	-	-	-	1	-	-	-	-	-	-
110	3	-	1	-	-	1	-	1	-	-	-	-	-
120	7	1	-	-	-	-	-	1	2	-	-	-	-
130	7	1	-	-	-	1	-	-	-	-	-	-	-
140	12	5	8	7	5	4	1	-	-	1	-	-	-
150	20	8	38	43	26	30	7	5	2	-	-	-	-
160	27	29	75	92	43	36	19	5	-	-	-	-	-
170	25	39	56	34	26	16	1	-	-	-	-	-	-
180	24	36	53	26	11	2	1	-	-	1	-	-	-
190	15	20	22	14	4	-	2	1	-	-	-	-	-
200	15	9	8	-	-	1	-	1	-	-	1	-	-
210	10	3	1	1	-	-	-	1	-	-	-	-	-
220	6	-	1	-	-	-	-	1	-	1	-	-	-
230	3	-	1	-	-	-	-	-	1	-	-	-	-
240	3	-	-	-	-	1	1	1	-	-	-	-	-
250	3	1	1	-	-	-	-	-	1	1	-	-	-
260	6	-	2	-	-	-	-	-	1	1	-	-	-
270	7	1	-	-	-	-	1	-	-	-	-	-	-
280	8	-	-	1	-	1	-	1	-	1	-	-	-
290	15	1	3	-	-	-	-	-	-	-	-	-	-
300	31	6	-	-	-	1	1	-	-	1	-	-	-
310	46	13	1	-	-	-	-	1	-	-	-	-	-
320	82	33	11	8	3	2	1	1	-	-	-	-	-
330	102	64	33	49	37	30	24	20	10	3	-	-	-
340	65	45	44	54	36	56	54	22	9	-	-	-	-
350	52	52	71	46	21	22	9	6	3	-	-	-	-
360	36	17	51	39	17	5	-	-	1	-	-	-	-

SUB TOTAL: 2696
 CALM: 113
 TOTAL: 2809

April

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	46	11	4	4	3	-	1	-	-	-	-	-	-
20	20	1	-	-	-	-	-	-	-	-	-	-	-
30	15	1	-	-	-	-	-	-	-	-	-	-	-
40	11	2	-	-	-	1	-	-	-	-	-	-	-
50	12	1	-	-	-	1	-	-	-	-	-	-	-
60	6	2	-	-	-	-	-	-	-	-	-	-	-
70	8	4	-	-	-	-	1	-	-	-	-	-	-
80	5	1	-	-	-	-	-	-	-	-	-	-	-
90	7	1	-	-	-	1	1	-	-	-	-	-	-
100	9	2	1	-	-	-	-	-	-	-	-	-	-
110	11	2	-	-	-	-	-	-	-	-	-	-	-
120	14	2	-	-	-	-	-	-	-	-	-	-	-
130	18	3	1	-	-	-	-	1	-	-	-	-	-
140	47	15	3	-	1	-	-	-	-	-	-	-	-
150	38	29	21	10	6	3	-	-	-	-	-	-	-
160	74	62	73	62	31	7	1	-	-	-	-	-	-
170	91	71	105	71	18	5	-	-	-	-	-	-	-
180	79	71	64	32	6	2	1	-	-	-	-	-	-
190	35	24	29	12	9	1	-	-	-	-	-	-	-
200	22	6	7	2	2	-	-	-	-	-	-	-	-
210	11	4	1	-	-	1	-	-	-	-	-	-	-
220	12	4	-	-	-	-	-	-	-	-	-	-	-
230	5	-	-	-	-	-	-	-	1	-	-	-	-
240	12	-	-	-	-	-	-	-	-	-	-	-	-
250	3	-	-	-	-	-	-	-	-	-	-	-	-
260	3	1	-	-	-	-	-	1	-	-	-	-	-
270	8	1	1	-	-	-	-	-	-	-	-	-	-
280	13	2	-	-	-	1	-	-	-	-	-	-	-
290	19	2	-	-	-	-	-	-	-	-	-	-	-
300	18	4	2	-	-	-	-	-	-	-	-	-	-
310	41	8	6	2	-	-	1	-	-	-	-	-	-
320	76	23	15	3	4	6	-	-	-	-	-	-	-
330	105	46	37	27	1	4	-	-	-	-	-	-	-
340	92	46	45	34	5	3	-	-	1	-	-	-	-
350	95	67	29	31	19	3	1	-	-	-	-	-	-
360	80	44	28	47	14	2	-	-	-	-	-	-	-

SUB TOTAL: 2704
 CALM: 165
 TOTAL: 2869

May

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	29	8	6	3	7	1	-	1	-	-	-	-	-
20	32	-	-	-	-	-	-	-	-	-	-	-	-
30	19	2	-	-	-	-	-	-	-	-	-	-	-
40	14	1	-	-	-	-	1	-	-	-	-	-	-
50	9	-	-	-	-	-	-	-	-	-	-	-	-
60	10	-	-	-	-	-	-	-	-	-	-	-	-
70	5	-	-	-	-	-	-	1	-	-	-	-	-
80	8	-	-	-	-	-	-	-	-	-	-	-	-
90	11	-	-	-	-	-	-	-	-	-	-	-	-
100	13	-	-	-	-	-	1	-	-	-	-	-	-
110	16	-	-	-	-	-	-	-	-	-	-	-	-
120	23	-	-	-	1	1	-	-	-	-	-	-	-
130	23	2	1	1	1	-	-	-	-	-	-	-	-
140	47	9	7	8	4	2	-	-	-	-	-	-	-
150	86	25	37	50	25	10	3	-	-	-	-	-	-
160	136	80	126	140	53	19	-	1	-	-	-	-	-
170	215	117	143	105	16	6	2	1	-	-	-	-	-
180	180	103	86	46	14	16	-	-	-	-	-	-	-
190	55	20	25	23	7	-	-	-	-	-	-	-	-
200	40	6	5	7	1	-	-	-	-	-	-	-	-
210	30	-	-	-	-	-	-	-	-	-	-	-	-
220	11	1	-	1	-	-	-	-	-	-	-	-	-
230	7	-	-	-	-	1	-	-	-	-	-	-	-
240	4	-	-	-	-	-	-	-	2	-	-	-	-
250	5	-	-	-	-	1	-	-	-	-	-	-	-
260	4	-	-	-	-	-	-	-	-	-	-	-	-
270	5	-	-	-	-	-	-	-	-	-	-	-	-
280	6	-	-	-	1	-	1	-	-	-	-	-	-
290	11	1	-	-	-	-	-	-	-	-	-	-	-
300	12	-	2	1	-	-	-	-	-	-	-	-	-
310	20	2	6	2	1	-	-	-	-	-	-	-	-
320	38	13	15	3	1	1	-	-	-	-	-	-	-
330	60	19	22	10	4	6	4	-	-	-	-	-	-
340	75	25	30	12	5	4	2	1	-	-	-	-	-
350	131	43	33	10	10	2	1	-	-	-	-	-	-
360	98	29	19	14	10	3	-	-	-	-	-	-	-

SUB TOTAL: 3249
 CALM: 176
 TOTAL: 3425

June

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	42	3	6	2	3	-	-	-	-	-	-	-	-
20	27	-	-	-	-	-	-	-	-	-	-	-	-
30	17	-	-	-	-	-	-	-	-	-	-	-	-
40	10	-	-	-	-	-	-	-	-	-	-	-	-
50	8	-	-	-	-	-	-	-	-	-	-	-	-
60	4	-	-	-	-	-	-	-	-	-	-	-	-
70	3	-	-	-	-	-	-	-	-	-	-	-	-
80	5	-	-	-	-	-	-	-	-	-	-	-	-
90	7	-	-	-	-	-	-	-	-	-	-	-	-
100	21	-	-	-	-	-	-	-	-	-	-	-	-
110	10	-	-	-	-	-	-	-	-	-	-	-	-
120	15	-	-	-	-	-	-	-	-	-	-	-	-
130	22	1	2	-	-	-	-	-	-	-	-	-	-
140	40	16	11	12	3	-	-	-	-	-	-	-	-
150	86	39	49	77	29	2	-	-	-	-	-	-	-
160	204	89	186	265	86	10	3	-	-	-	-	-	-
170	267	176	266	271	73	10	3	-	-	-	-	-	-
180	224	102	76	82	35	7	1	-	-	-	-	-	-
190	63	27	22	13	-	-	-	-	-	-	-	-	-
200	25	1	6	-	-	-	-	-	-	-	-	-	-
210	20	2	-	-	-	-	-	-	-	-	-	-	-
220	11	-	-	-	-	1	-	-	-	-	-	-	-
230	6	-	-	-	-	-	-	-	-	-	-	-	-
240	8	-	-	-	-	1	-	-	-	-	-	-	-
250	8	-	-	-	-	-	-	-	-	-	-	-	-
260	7	-	-	-	-	-	-	-	-	-	-	-	-
270	3	-	-	-	-	-	-	-	-	-	-	-	-
280	6	-	-	-	-	-	-	-	-	-	-	-	-
290	6	-	-	-	-	-	-	-	-	-	-	-	-
300	9	-	-	-	-	-	-	-	-	-	-	-	-
310	5	3	4	1	-	-	-	-	-	-	-	-	-
320	27	9	3	2	-	-	-	-	-	-	-	-	-
330	31	17	11	1	-	-	-	-	-	-	-	-	-
340	61	25	20	2	-	-	-	-	-	-	-	-	-
350	114	32	41	11	1	1	1	-	-	-	-	-	-
360	106	14	20	14	2	-	-	-	-	-	-	-	-

SUB TOTAL: 3832
 CALM: 152
 TOTAL: 3984

July

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	49	4	2	-	-	-	-	-	-	-	-	-	-
20	20	1	-	-	-	-	-	-	-	-	-	-	-
30	21	-	-	-	-	-	-	-	-	-	-	-	-
40	14	-	-	-	-	-	-	-	-	-	-	-	-
50	7	-	-	-	-	-	-	-	-	-	-	-	-
60	6	-	-	-	-	-	-	-	-	-	-	-	-
70	2	-	-	-	-	-	-	-	-	-	-	-	-
80	4	-	-	-	-	-	-	-	-	-	-	-	-
90	10	-	-	-	-	-	-	-	-	-	-	-	-
100	6	-	-	-	-	-	-	-	-	-	-	-	-
110	19	-	-	-	-	-	-	-	-	-	-	-	-
120	13	-	-	-	-	-	-	-	-	-	-	-	-
130	19	1	-	-	-	-	-	-	-	-	-	-	-
140	47	10	10	5	2	1	-	-	-	-	-	-	-
150	105	25	51	45	30	3	-	-	-	-	-	-	-
160	244	106	190	272	170	40	3	-	-	-	-	-	-
170	327	118	237	287	115	15	-	-	-	-	-	-	-
180	171	59	98	94	45	4	-	-	-	-	-	-	-
190	73	13	19	21	-	-	-	-	-	-	-	-	-
200	44	7	4	-	-	-	-	-	-	-	-	-	-
210	18	-	-	-	-	-	-	-	-	-	-	-	-
220	14	-	-	-	-	-	-	-	-	-	-	-	-
230	13	-	-	-	-	-	-	-	-	-	-	-	-
240	4	-	-	-	-	-	-	-	-	-	-	-	-
250	5	-	-	-	-	-	-	-	-	-	-	-	-
260	3	-	-	-	-	-	-	-	-	-	-	-	-
270	6	-	-	-	-	-	-	-	-	-	-	-	-
280	7	-	-	-	-	-	-	-	-	-	-	-	-
290	5	-	-	-	-	-	-	-	-	-	-	-	-
300	16	-	1	-	-	-	-	-	-	-	-	-	-
310	11	2	7	-	-	-	-	-	-	-	-	-	-
320	34	4	5	4	-	-	-	-	-	-	-	-	-
330	53	11	6	1	2	2	1	-	-	-	-	-	-
340	96	23	20	10	2	2	-	-	-	-	-	-	-
350	166	27	7	1	-	-	-	-	-	-	-	-	-
360	139	15	4	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 4055
 CALM: 176
 TOTAL: 4231

August

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	63	7	3	1	2	11	1	-	-	-	-	-	-
20	32	5	-	-	-	-	-	-	-	-	-	-	-
30	25	1	-	-	-	-	-	-	-	-	-	-	-
40	18	-	-	-	-	-	-	-	-	-	-	-	-
50	10	-	-	-	-	-	-	-	-	-	-	-	-
60	7	-	-	-	-	-	1	-	-	-	-	-	-
70	6	-	-	-	-	-	-	-	-	-	-	-	-
80	9	-	-	-	-	-	-	-	1	-	-	-	-
90	9	-	-	-	-	-	-	-	-	-	-	-	-
100	10	-	-	-	-	-	-	-	-	-	-	-	-
110	16	-	-	-	-	-	-	-	-	-	-	-	-
120	28	-	-	-	-	-	-	-	-	-	-	-	-
130	29	1	1	1	-	-	1	-	-	-	-	-	-
140	48	14	13	10	5	4	1	-	-	-	-	-	-
150	75	30	33	54	36	23	5	1	-	-	-	-	-
160	107	60	146	263	178	45	8	-	-	-	-	-	-
170	138	64	212	229	100	32	11	1	-	-	-	-	-
180	89	21	70	84	53	18	3	-	-	-	-	-	-
190	57	8	22	20	10	-	-	-	-	-	-	-	-
200	40	7	2	1	1	-	-	-	-	-	-	-	-
210	20	2	2	-	-	-	-	-	-	-	-	-	-
220	17	-	-	-	-	-	-	1	-	-	-	-	-
230	10	-	-	-	-	-	-	-	-	-	-	-	-
240	7	-	-	-	-	-	-	-	-	-	-	-	-
250	6	-	-	-	-	-	-	-	-	-	-	-	-
260	3	-	-	-	-	-	-	-	-	-	-	-	-
270	8	-	-	-	-	-	-	-	-	-	-	-	-
280	8	-	-	-	-	-	-	-	-	-	-	-	-
290	6	-	-	-	-	-	-	-	-	-	-	-	-
300	6	1	2	-	-	-	-	-	-	-	-	-	-
310	22	4	4	-	1	-	-	-	-	-	-	-	-
320	40	12	4	1	-	-	-	-	-	-	-	-	-
330	66	25	7	6	3	-	-	-	-	-	-	-	-
340	105	33	14	12	5	1	-	-	-	-	-	-	-
350	135	34	14	8	-	7	-	-	-	-	-	-	-
360	144	23	8	5	3	4	4	-	-	-	-	-	-

SUB TOTAL: 3604
 CALM: 116
 TOTAL: 3720

September

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	54	3	6	11	2	4	-	-	1	-	-	-	-
20	38	-	1	-	-	-	-	-	-	-	-	-	-
30	26	-	-	-	-	-	-	1	-	-	-	-	-
40	22	-	-	-	-	2	1	-	1	-	-	-	-
50	14	-	-	-	-	-	-	-	-	-	-	-	-
60	12	-	-	-	-	-	-	-	-	-	-	-	-
70	9	-	-	-	-	-	-	-	-	-	-	-	-
80	5	-	-	-	-	-	-	1	-	-	-	-	-
90	8	-	-	-	-	-	-	-	-	-	-	-	-
100	7	-	-	-	-	-	-	-	-	-	-	-	-
110	18	-	-	-	-	-	1	-	1	-	-	-	-
120	12	2	1	-	-	1	-	-	-	-	-	-	-
130	25	2	3	1	1	-	1	-	-	-	-	-	-
140	49	7	10	17	6	6	4	1	-	-	-	-	-
150	56	22	37	60	62	34	26	6	1	-	-	-	-
160	87	38	84	221	169	71	18	5	-	1	-	-	-
170	66	43	110	206	112	46	10	1	-	-	-	-	-
180	57	22	79	173	82	52	9	1	-	1	-	-	-
190	32	10	30	65	33	13	-	-	-	-	-	-	-
200	18	9	4	10	3	-	1	-	-	-	-	-	-
210	20	2	2	-	-	-	-	-	-	-	-	-	-
220	8	-	1	-	-	1	1	-	-	-	-	-	-
230	8	-	-	-	-	-	-	-	-	-	-	-	-
240	6	1	-	-	-	-	-	-	-	1	-	-	-
250	3	-	-	-	-	-	-	-	-	-	-	-	-
260	10	-	-	-	-	-	2	-	-	-	-	-	-
270	9	-	-	-	-	1	-	-	-	-	-	-	-
280	9	-	-	-	-	-	2	-	-	-	-	-	-
290	15	1	-	-	-	-	-	-	-	-	-	-	-
300	25	5	5	-	-	-	-	-	-	-	-	-	-
310	22	12	5	1	1	-	-	1	-	-	-	-	-
320	78	33	26	7	-	2	1	-	-	-	-	-	-
330	90	48	32	14	4	8	1	-	-	-	-	-	-
340	104	45	41	25	13	15	3	-	-	-	-	-	-
350	112	42	33	24	18	10	3	3	1	1	-	-	-
360	103	20	23	21	21	11	-	1	-	-	-	-	-

SUB TOTAL: 3911
 CALM: 68
 TOTAL: 3979

October

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	38	6	7	12	6	6	1	-	2	-	1	-	-
20	25	-	1	-	1	1	1	-	-	-	-	-	-
30	14	-	-	2	-	-	1	2	1	1	-	-	-
40	26	-	-	-	-	1	1	-	-	1	-	-	-
50	14	-	-	-	2	-	-	-	1	-	-	-	-
60	11	-	-	1	-	2	1	-	-	-	-	-	-
70	9	-	-	1	-	-	-	1	-	-	-	-	-
80	4	-	-	-	-	-	-	-	-	-	-	-	-
90	4	-	-	-	-	-	-	2	-	-	-	-	-
100	9	-	-	-	-	2	-	1	-	1	-	-	-
110	13	-	-	-	-	-	-	1	-	-	-	-	-
120	14	-	1	-	-	-	4	-	-	1	-	-	-
130	13	1	2	4	2	-	1	-	2	1	-	1	-
140	33	8	10	12	17	15	5	2	4	1	-	-	-
150	49	10	33	89	107	80	35	7	10	-	1	-	-
160	46	23	70	219	148	82	34	6	5	-	-	-	-
170	50	21	90	120	66	27	15	2	-	-	-	-	-
180	46	30	73	84	42	25	7	1	1	1	-	-	-
190	20	14	51	40	11	5	2	-	1	1	-	-	-
200	25	11	18	8	2	1	-	1	1	1	-	-	-
210	21	3	3	-	-	-	1	-	3	2	-	-	-
220	14	1	1	-	-	-	-	-	1	-	-	-	-
230	2	-	-	-	-	-	-	-	-	1	-	-	-
240	3	-	-	-	-	-	-	-	1	-	-	-	-
250	6	-	-	-	1	2	-	-	-	-	-	-	-
260	13	-	-	-	-	1	-	1	-	-	-	-	-
270	13	-	-	-	-	-	1	-	-	-	-	-	-
280	10	2	-	-	-	-	-	1	2	1	1	-	-
290	13	1	-	-	-	-	1	-	2	-	-	-	-
300	37	5	-	-	-	-	1	1	-	-	-	-	-
310	74	20	14	3	-	1	4	2	3	-	-	-	-
320	112	40	21	4	8	5	20	13	10	4	-	-	-
330	133	42	32	21	15	42	58	19	23	4	-	-	-
340	138	46	28	31	27	44	50	9	1	-	-	-	-
350	72	40	64	55	30	21	22	11	1	1	-	-	-
360	74	28	58	67	60	31	10	-	1	2	-	-	-

SUB TOTAL: 4302
 CALM: 67
 TOTAL: 4369

November

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	18	2	3	7	2	4	3	2	1	3	-	-	-
20	14	-	-	-	2	-	1	-	-	1	-	-	-
30	10	-	1	1	1	1	1	-	-	-	-	-	-
40	9	-	-	3	1	2	-	2	-	-	-	-	-
50	4	-	-	-	-	1	-	-	1	-	-	-	-
60	5	1	-	-	1	2	2	2	-	2	-	-	-
70	2	-	-	-	1	-	2	-	1	-	-	-	-
80	2	-	-	-	1	1	1	-	1	-	-	-	-
90	4	-	-	2	2	-	-	2	3	-	-	-	-
100	4	-	-	1	-	-	1	-	1	-	-	-	-
110	4	1	-	-	1	-	-	2	2	2	-	-	-
120	2	-	-	1	-	1	2	2	1	-	-	-	-
130	1	-	-	1	1	-	-	-	-	-	-	-	-
140	3	1	4	17	14	7	1	1	2	-	-	-	-
150	12	6	18	39	33	58	38	17	9	2	-	1	-
160	9	9	43	74	59	63	25	11	4	1	-	-	-
170	16	22	53	43	32	17	7	1	2	-	-	-	-
180	8	15	32	22	17	10	3	-	-	1	-	-	-
190	6	12	19	22	11	4	-	1	2	-	1	-	-
200	6	3	14	6	2	-	3	1	1	-	-	-	-
210	5	3	1	-	-	-	-	-	2	1	-	-	-
220	5	-	-	1	-	4	-	1	1	2	1	-	-
230	2	-	-	-	-	-	1	1	-	-	-	-	1
240	5	-	-	1	1	1	2	1	1	-	1	-	-
250	2	-	-	-	-	-	1	1	-	-	-	-	-
260	7	-	-	1	1	-	2	-	1	1	-	-	-
270	7	-	-	-	-	-	1	-	1	1	-	-	-
280	7	-	-	1	1	3	1	2	3	-	1	-	-
290	19	1	1	-	-	2	-	-	-	1	-	-	-
300	34	10	-	1	1	1	-	1	1	1	-	-	-
310	55	26	15	7	-	2	1	-	1	1	-	-	-
320	135	83	55	27	10	4	2	7	-	4	2	-	-
330	109	103	100	65	70	85	67	24	38	31	3	-	-
340	63	44	48	85	94	132	115	78	50	6	1	-	1
350	104	51	65	66	53	93	86	43	39	17	3	3	-
360	34	16	26	55	19	25	32	13	16	5	1	-	-

SUB TOTAL: 4047
 CALM: 57
 TOTAL: 4104

December

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	8	1	4	1	2	3	2	1	1	-	-	-	-
20	4	2	1	1	1	2	-	2	-	-	-	-	-
30	3	-	1	1	-	-	1	-	1	-	-	-	-
40	1	-	-	-	-	-	-	-	-	1	-	-	-
50	1	-	1	-	-	1	-	1	-	-	-	1	-
60	1	1	-	-	-	-	-	1	1	-	1	-	-
70	5	-	-	1	-	1	1	-	-	1	1	-	-
80	4	-	2	-	1	1	-	-	1	-	-	-	-
90	2	-	-	-	-	-	-	2	-	-	1	-	-
100	2	-	-	-	-	1	-	1	1	1	-	-	-
110	2	-	-	-	-	-	-	-	1	2	1	-	-
120	3	-	-	1	-	-	1	-	2	-	-	-	-
130	3	-	-	-	-	1	1	1	1	1	-	-	-
140	11	3	3	13	12	8	2	1	-	-	-	-	-
150	15	10	17	49	52	43	32	13	2	-	-	-	-
160	17	13	38	87	95	82	33	9	3	-	-	-	-
170	9	14	44	58	51	45	22	12	3	-	-	1	-
180	11	11	30	44	50	27	11	7	-	1	-	-	-
190	7	11	26	17	14	5	-	-	2	2	-	-	-
200	9	5	4	2	1	-	-	-	2	2	-	-	-
210	5	2	1	-	-	-	-	-	1	-	-	-	-
220	1	1	1	-	-	1	-	-	-	-	-	-	-
230	3	-	-	-	-	-	1	-	1	1	1	2	-
240	1	-	-	-	-	-	-	1	-	-	1	-	-
250	4	-	-	2	-	-	-	-	-	-	-	-	-
260	5	-	-	-	-	1	-	1	-	-	-	-	-
270	6	-	-	-	-	-	1	-	1	-	-	-	-
280	11	-	-	-	1	-	1	-	2	1	-	-	-
290	26	2	-	-	-	-	-	-	-	-	-	-	-
300	42	3	-	-	1	-	-	-	1	1	-	-	-
310	95	30	8	6	-	1	1	1	5	-	2	-	-
320	177	74	54	39	16	23	5	2	8	19	4	-	-
330	147	54	53	41	31	42	43	24	41	22	6	1	-
340	53	21	35	41	25	16	23	34	63	15	2	-	-
350	31	25	43	29	26	32	15	29	38	18	2	-	-
360	15	9	14	14	21	19	8	2	6	3	-	-	-

SUB TOTAL: 3269
 CALM: 88
 TOTAL: 3357

Annual

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	365	52	54	49	34	33	10	5	7	5	1	-	-
20	234	10	4	1	4	3	4	4	1	1	1	-	-
30	166	5	2	5	1	2	4	3	4	1	-	-	-
40	137	4	-	5	2	7	4	2	2	2	-	-	1
50	94	1	2	1	2	7	1	2	2	1	-	1	-
60	71	4	-	1	1	4	5	4	1	2	1	-	-
70	56	5	-	3	1	2	5	3	2	2	1	-	-
80	57	1	3	1	2	2	1	3	5	1	1	-	-
90	71	1	2	2	2	2	2	7	3	2	1	-	-
100	91	3	1	1	1	3	3	2	4	2	1	-	-
110	123	3	1	1	1	1	2	5	4	5	1	-	-
120	143	5	2	2	1	3	7	4	7	2	-	-	-
130	175	12	12	14	7	3	4	4	3	3	-	2	-
140	361	93	81	121	84	64	17	8	7	2	-	-	-
150	566	220	361	583	456	345	184	73	28	2	1	1	-
160	984	529	1095	1761	1121	503	174	50	13	4	1	-	-
170	1229	714	1391	1490	664	269	79	24	5	-	-	1	-
180	900	485	726	757	400	202	42	11	2	5	1	-	-
190	379	174	306	278	114	31	5	2	6	4	1	-	-
200	250	70	80	41	12	3	4	3	5	3	1	-	-
210	163	22	11	1	-	2	1	2	9	5	-	-	-
220	106	7	4	2	-	7	3	2	4	3	2	-	-
230	65	-	1	-	-	2	2	1	6	3	1	2	1
240	56	1	-	1	1	3	4	4	4	1	3	-	-
250	47	1	1	2	1	5	1	1	2	2	-	-	-
260	66	2	2	1	1	4	4	4	2	2	-	-	-
270	80	2	1	1	-	2	4	1	4	2	-	-	-
280	119	7	-	2	3	6	5	4	7	5	2	-	-
290	201	17	4	-	-	2	1	2	4	1	-	-	-
300	324	46	13	2	2	2	2	2	3	3	-	-	-
310	539	172	82	25	3	4	8	5	9	2	2	-	-
320	1016	405	248	110	45	45	37	26	22	31	7	1	-
330	1061	514	388	275	206	271	276	133	143	71	22	4	-
340	917	409	366	370	281	356	345	203	155	35	3	-	1
350	1069	462	448	334	253	277	188	112	95	39	5	3	-
360	851	231	268	314	212	152	66	21	29	10	1	-	-

SUB TOTAL: 40083
 CALM: 1338
 TOTAL: 41421

Appendix B Skagway Wind Statistics

January

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	186	126	85	33	5	-	-	-	-	-	-	-	-
20	366	364	518	238	52	5	5	-	-	-	-	-	-
30	680	463	845	526	234	39	5	-	-	-	-	-	-
40	780	577	1159	916	481	144	44	3	-	-	-	-	-
50	518	326	607	616	331	74	14	-	-	-	-	-	-
60	222	84	85	38	9	3	-	-	-	-	-	-	-
70	79	12	13	4	-	-	-	-	-	-	-	-	-
80	27	6	2	1	-	-	-	-	-	-	-	-	-
90	23	1	-	-	-	-	-	-	-	-	-	-	-
100	12	-	-	-	-	-	-	-	-	-	-	-	-
110	12	-	-	-	-	-	-	1	-	-	-	-	-
120	4	-	-	-	-	-	-	-	-	-	-	-	-
130	10	1	-	-	-	-	-	-	-	-	-	-	-
140	2	-	-	-	-	-	-	-	-	-	-	-	-
150	1	-	-	-	-	-	-	-	-	-	-	-	-
160	1	2	-	-	-	-	-	-	-	-	-	-	-
170	6	2	2	-	-	-	-	-	-	-	-	-	-
180	33	32	4	1	-	-	-	-	-	-	-	-	-
190	84	118	41	-	-	-	-	-	-	-	-	-	-
200	144	441	682	173	13	-	-	-	-	-	-	-	-
210	51	193	324	288	226	80	21	-	-	-	-	-	-
220	49	105	145	102	50	15	5	-	-	-	-	-	-
230	34	39	73	19	5	2	-	-	-	-	-	-	-
240	12	6	1	2	-	-	-	-	-	-	-	-	-
250	7	-	-	1	-	-	-	-	-	-	-	-	-
260	12	-	-	-	-	-	-	-	-	-	-	-	-
270	5	-	1	-	-	-	-	-	-	-	-	-	-
280	8	-	-	-	-	-	-	-	-	-	-	-	-
290	4	-	1	-	-	-	-	-	-	-	-	-	-
300	21	-	-	-	-	-	-	-	-	-	-	-	-
310	19	-	-	-	1	-	-	-	-	-	-	-	-
320	21	-	1	-	-	-	-	-	-	-	-	-	-
330	18	2	-	-	-	-	-	-	-	-	-	-	-
340	27	2	-	-	-	1	-	-	-	-	-	-	-
350	29	3	2	-	-	-	-	-	-	-	-	-	-
360	79	27	13	5	-	-	-	-	-	-	-	-	-

SUB TOTAL: 15953
 CALM: 4929
 TOTAL: 20882

February

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	158	113	77	17	-	-	-	-	-	-	-	-	-
20	391	332	345	102	26	2	-	-	-	-	-	-	-
30	683	553	806	325	80	16	4	-	-	-	-	-	-
40	823	644	910	529	173	12	3	-	-	-	-	-	-
50	497	371	484	285	88	9	1	-	-	-	-	-	-
60	201	85	51	20	9	1	-	-	-	-	-	-	-
70	70	15	10	-	-	-	-	-	-	-	-	-	-
80	29	5	1	-	-	-	-	-	-	-	-	-	-
90	16	-	-	-	-	-	-	-	-	-	-	-	-
100	16	-	-	-	-	-	-	-	-	-	-	-	-
110	9	-	-	1	-	-	-	-	-	-	-	-	-
120	12	-	-	-	-	-	-	-	-	-	-	-	-
130	5	-	-	1	-	-	-	-	-	-	-	-	-
140	7	3	-	-	-	-	-	-	-	-	-	-	-
150	3	3	-	1	-	-	-	-	-	-	-	-	-
160	4	1	-	-	-	-	-	-	-	-	-	-	-
170	18	8	3	-	-	-	-	-	-	-	-	-	-
180	23	36	11	-	-	-	-	-	-	-	-	-	-
190	85	124	34	4	-	-	-	-	-	-	-	1	-
200	160	473	756	263	22	8	-	-	-	-	-	-	-
210	100	198	339	330	183	61	11	1	-	-	-	-	-
220	80	96	161	94	55	42	9	2	-	-	-	-	-
230	44	59	97	29	4	-	-	2	-	-	-	-	-
240	25	9	6	-	-	-	-	-	-	-	-	-	-
250	11	1	-	-	-	-	-	-	-	-	-	-	-
260	10	-	-	-	-	-	-	-	-	-	-	-	-
270	7	-	-	-	-	-	-	-	-	-	-	-	-
280	4	-	-	-	-	-	-	-	-	-	-	-	-
290	9	4	-	-	-	-	-	-	-	-	-	-	-
300	18	3	-	-	-	-	-	-	-	-	-	-	-
310	11	-	-	-	-	-	-	-	-	-	-	-	-
320	16	-	-	-	-	-	-	-	-	-	-	-	1
330	16	-	-	-	-	-	-	-	-	-	-	-	-
340	26	2	1	-	-	-	-	-	-	-	-	-	-
350	24	15	3	-	-	-	-	-	-	-	-	-	-
360	72	37	18	1	-	-	-	-	-	-	-	-	-

SUB TOTAL: 13814
 CALM: 4689
 TOTAL: 18503

March

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	211	174	81	10	-	-	-	-	-	-	-	-	-
20	437	485	353	42	2	-	-	-	-	-	-	-	-
30	579	761	714	176	22	1	2	-	-	-	-	-	-
40	613	687	796	252	58	9	2	-	-	-	-	-	-
50	436	271	311	119	23	-	-	-	-	-	-	-	-
60	156	55	28	5	-	-	-	-	-	-	-	-	-
70	65	12	6	1	-	-	-	-	-	-	-	-	-
80	25	4	1	-	-	-	-	-	-	-	-	-	-
90	23	-	1	-	-	-	-	-	-	-	-	-	-
100	12	1	-	1	-	-	-	-	-	-	-	-	-
110	6	-	2	-	-	-	-	-	-	-	-	-	-
120	3	1	2	1	-	-	-	-	-	-	-	-	-
130	6	2	3	-	-	-	-	-	-	-	-	-	-
140	9	-	8	-	-	-	-	-	-	-	-	-	-
150	8	4	6	2	-	-	-	-	-	-	-	-	-
160	11	8	3	-	1	-	-	-	-	-	-	-	-
170	24	15	8	1	-	-	-	-	-	-	-	-	-
180	61	25	7	2	-	-	-	-	1	-	-	-	-
190	106	107	36	4	2	-	-	-	-	-	-	-	-
200	283	632	778	197	26	1	-	-	-	-	-	-	-
210	265	454	576	372	230	69	8	-	-	-	-	-	-
220	212	250	242	131	79	17	6	-	-	-	-	-	-
230	233	139	127	25	5	6	2	-	-	-	-	-	-
240	65	14	5	2	-	-	-	-	-	-	-	-	-
250	34	1	1	-	-	-	-	-	-	-	-	-	-
260	21	-	-	-	-	-	-	-	-	-	-	-	-
270	5	-	1	1	-	-	-	-	-	-	-	-	-
280	7	-	-	-	-	-	-	-	-	-	-	-	-
290	14	1	-	-	-	-	-	-	1	-	-	-	-
300	19	1	-	2	-	-	-	-	-	-	-	-	-
310	14	-	1	-	-	-	-	-	-	-	-	-	-
320	21	3	-	-	-	-	-	-	-	-	-	-	-
330	15	2	-	-	-	-	-	-	-	-	-	-	-
340	33	5	3	1	-	-	-	-	-	-	-	-	-
350	34	10	1	2	-	-	-	-	-	-	-	-	-
360	70	40	11	2	-	-	-	-	-	-	-	-	-

SUB TOTAL: 14336
 CALM: 5041
 TOTAL: 19377

April

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	131	41	16	-	-	-	-	-	-	-	-	-	-
20	275	187	89	2	-	-	1	-	-	-	-	-	-
30	533	331	201	22	-	-	-	-	-	-	-	-	-
40	535	369	312	27	-	-	-	-	-	-	-	-	-
50	310	190	109	10	-	-	-	-	-	-	-	-	-
60	128	33	8	1	-	-	-	-	-	-	-	-	-
70	45	8	1	-	-	-	-	-	-	-	-	-	-
80	32	3	-	-	-	-	-	-	-	-	-	-	-
90	17	-	-	-	-	-	-	-	-	-	-	-	-
100	7	1	-	-	-	-	-	-	-	-	-	-	-
110	8	-	-	-	-	-	-	-	-	-	-	-	-
120	7	1	-	1	-	-	-	-	-	-	-	-	-
130	4	-	-	-	-	-	-	-	-	-	-	-	-
140	5	-	-	-	-	-	-	-	1	-	-	-	-
150	9	1	-	-	-	1	-	1	-	-	-	-	-
160	11	-	1	-	-	-	-	-	-	-	-	-	-
170	20	2	1	1	-	-	-	-	-	-	-	-	-
180	58	17	1	1	-	-	-	-	-	-	-	-	-
190	170	137	62	13	-	-	-	-	-	-	-	-	-
200	480	1021	1056	174	15	-	-	-	-	-	-	-	-
210	532	724	697	219	69	16	-	-	-	-	-	-	-
220	462	444	303	120	31	10	-	-	-	-	-	-	-
230	396	287	131	19	4	-	-	1	-	-	-	-	-
240	222	58	4	5	-	-	-	-	-	1	-	-	-
250	92	12	1	-	-	-	-	-	-	-	-	-	-
260	41	4	-	-	-	-	-	-	-	-	-	-	-
270	24	4	-	-	-	-	-	-	-	-	-	-	-
280	6	-	-	-	-	-	-	-	-	-	-	-	-
290	24	1	-	-	-	-	-	-	-	-	-	-	-
300	13	2	-	-	-	-	-	1	-	-	-	-	-
310	11	-	-	-	-	-	-	-	-	-	-	-	-
320	11	2	2	-	-	-	-	-	-	-	-	-	1
330	8	-	-	-	-	-	-	-	-	-	-	-	-
340	21	5	3	-	-	-	-	-	-	-	-	-	-
350	18	3	-	1	-	-	-	-	-	-	-	-	-
360	54	15	5	1	-	-	-	-	-	-	-	-	-

SUB TOTAL: 12396
 CALM: 5360
 TOTAL: 17756

May

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	108	38	6	-	-	-	-	-	-	-	-	-	-
20	252	70	23	3	-	-	-	-	-	-	-	-	-
30	407	150	54	3	-	-	-	-	-	-	-	-	-
40	359	182	103	3	1	-	-	-	-	-	-	-	-
50	169	82	29	3	1	-	-	-	-	-	-	-	-
60	98	12	3	-	-	-	-	-	-	-	-	-	-
70	40	5	-	-	-	-	-	-	-	-	-	-	-
80	20	-	-	-	-	-	-	-	-	-	-	-	-
90	8	-	1	-	-	-	-	-	-	-	-	-	-
100	3	-	-	-	-	-	-	-	-	-	-	-	-
110	6	-	-	-	-	-	-	-	-	-	-	-	-
120	4	2	1	1	-	-	-	-	-	-	-	-	-
130	3	-	-	-	-	-	-	-	-	-	-	-	-
140	3	-	-	-	-	-	1	-	-	-	-	-	-
150	5	-	-	-	-	1	-	-	-	-	-	-	-
160	7	1	-	1	-	-	-	-	-	-	-	-	-
170	11	6	5	-	-	-	-	1	-	-	-	-	-
180	47	34	14	2	-	-	-	-	-	-	-	-	-
190	171	205	89	10	2	-	-	-	-	-	-	-	-
200	549	1313	1152	180	12	1	-	-	-	-	-	-	-
210	585	989	872	293	72	12	1	-	-	-	-	-	-
220	647	726	362	98	40	6	1	-	-	-	-	-	-
230	691	510	164	12	6	-	-	-	-	-	-	-	-
240	363	91	4	2	-	-	-	-	-	-	-	-	-
250	162	34	2	-	-	-	-	-	-	-	-	-	-
260	46	5	-	-	-	-	-	-	-	-	-	-	-
270	18	2	-	-	-	-	-	-	-	-	-	-	-
280	8	2	-	-	-	-	-	-	-	-	-	-	-
290	13	2	-	-	-	-	-	-	-	-	-	-	-
300	19	1	1	-	-	-	-	-	-	-	-	-	-
310	19	1	-	-	-	-	1	-	-	-	-	-	-
320	19	1	-	-	-	-	-	-	-	-	-	-	-
330	11	1	-	-	-	-	-	-	-	-	-	-	-
340	9	2	-	-	-	-	-	-	-	-	-	-	-
350	12	1	-	-	-	-	-	-	-	-	-	-	-
360	41	9	2	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 13067
 CALM: 4893
 TOTAL: 17960

June

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	90	7	-	-	-	-	-	-	-	-	-	-	-
20	239	19	2	-	-	-	-	-	-	-	-	-	-
30	328	35	12	-	-	-	-	-	-	-	-	-	-
40	284	40	21	-	-	-	-	-	-	-	-	-	-
50	132	14	1	-	-	-	-	-	-	-	-	-	-
60	70	4	-	-	-	-	-	-	-	-	-	-	-
70	17	3	-	-	-	-	-	-	-	-	-	-	-
80	11	-	-	-	-	-	-	-	-	-	-	-	-
90	3	-	-	-	-	-	-	-	-	-	-	-	-
100	1	1	-	-	-	-	-	-	-	-	-	-	-
110	2	1	-	-	-	-	-	-	-	-	-	-	-
120	4	-	-	-	-	-	-	-	-	-	-	-	-
130	-	-	1	-	-	-	-	-	-	-	-	-	-
140	5	-	-	-	-	-	-	-	-	-	-	-	-
150	2	1	1	-	-	1	-	1	-	-	-	-	-
160	11	3	6	1	-	-	-	-	-	-	-	-	-
170	10	17	8	1	-	-	-	-	-	-	-	-	-
180	47	48	26	1	2	-	-	-	-	-	-	-	-
190	151	216	130	7	1	-	-	-	-	-	-	-	-
200	474	1452	1389	180	11	3	-	-	-	-	-	-	-
210	575	1196	990	215	7	-	-	-	-	-	-	-	-
220	642	858	400	47	7	-	-	-	-	-	-	-	-
230	856	601	211	5	-	-	-	-	-	-	-	-	-
240	492	149	16	-	-	-	-	-	-	-	-	-	-
250	229	56	6	-	-	-	-	-	-	-	-	-	-
260	95	8	-	-	-	-	-	-	-	-	-	-	-
270	50	1	-	-	-	-	-	-	-	-	-	-	-
280	25	-	-	-	-	-	-	-	-	-	-	-	-
290	17	-	1	-	-	-	-	-	-	-	-	-	-
300	22	-	-	-	-	1	-	-	-	-	-	-	-
310	15	-	-	1	-	-	-	-	1	-	-	-	-
320	13	2	-	1	-	-	-	-	-	-	-	-	-
330	3	-	-	-	-	-	-	-	-	-	-	-	-
340	4	1	-	-	-	-	-	-	-	-	-	-	-
350	13	1	1	-	-	-	-	-	-	-	-	-	-
360	26	4	1	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 13413
 CALM: 4405
 TOTAL: 17818

July

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	65	2	-	-	-	-	-	-	-	-	-	-	-
20	202	9	1	-	-	-	-	-	-	-	-	-	-
30	269	11	4	-	-	-	-	-	-	-	-	-	-
40	234	12	4	2	-	-	-	-	-	-	-	-	-
50	113	3	-	-	-	-	-	-	-	-	-	-	-
60	49	1	-	-	-	-	-	-	-	-	-	-	-
70	19	-	-	-	-	-	-	-	-	-	-	-	-
80	7	-	-	-	-	-	-	-	-	-	-	-	-
90	6	1	-	-	-	-	-	-	-	-	-	-	-
100	7	-	-	-	-	-	-	-	-	-	-	-	-
110	1	-	-	-	-	-	-	-	-	-	-	-	-
120	3	1	-	-	-	-	-	-	-	-	-	-	-
130	3	-	-	-	-	-	-	-	-	-	-	-	-
140	4	-	-	-	-	-	-	-	-	-	-	-	-
150	6	-	-	-	-	-	-	-	-	-	-	-	-
160	3	-	-	-	-	-	-	-	-	-	-	-	-
170	9	4	-	-	-	-	-	-	-	-	-	-	-
180	32	16	4	-	-	-	-	-	-	-	-	-	-
190	116	231	174	21	1	-	-	-	-	-	-	-	-
200	437	1353	1420	231	7	-	-	-	-	-	-	-	-
210	493	1061	907	197	10	2	-	-	-	-	-	-	-
220	623	671	315	40	8	-	-	-	-	-	1	-	-
230	943	584	221	6	-	-	-	-	-	-	-	-	-
240	584	190	21	-	-	-	-	-	-	-	-	-	-
250	356	94	6	-	-	-	-	-	-	-	-	-	-
260	163	15	1	-	-	-	-	-	-	-	-	-	-
270	75	4	-	-	-	-	-	-	-	-	-	-	-
280	37	1	-	-	-	-	-	-	-	-	-	-	-
290	27	-	-	-	-	-	-	-	-	-	-	-	-
300	32	3	-	-	-	-	-	-	-	-	-	-	-
310	20	-	-	-	-	-	-	-	-	-	-	-	1
320	15	1	-	-	-	-	-	-	-	-	1	-	-
330	17	-	-	-	-	-	-	-	-	-	-	-	-
340	14	-	-	-	-	-	-	-	-	-	-	-	-
350	12	-	-	-	-	-	-	-	-	-	-	-	-
360	33	1	-	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 12904
 CALM: 6313
 TOTAL: 19217

August

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	129	8	1	-	-	-	-	-	-	-	-	-	-
20	253	42	10	-	-	-	-	-	-	-	-	-	-
30	410	53	15	-	-	-	-	-	-	-	-	-	-
40	364	50	22	1	-	-	-	-	-	-	-	-	-
50	192	11	6	-	-	-	-	-	-	-	-	-	-
60	97	2	2	-	-	-	-	-	-	-	-	-	-
70	30	-	-	-	-	-	-	-	-	-	-	-	-
80	22	-	-	-	-	-	-	-	-	-	-	-	-
90	5	1	-	-	-	-	-	-	-	-	-	-	-
100	14	-	-	-	-	-	-	-	-	-	-	-	-
110	8	-	-	-	-	-	-	-	-	-	-	-	-
120	7	1	1	-	-	-	-	-	-	-	-	-	-
130	4	-	-	-	-	-	-	-	-	-	-	-	-
140	6	-	-	-	-	-	-	-	-	-	-	-	-
150	7	-	-	-	-	-	-	-	-	-	-	-	-
160	14	-	1	1	-	-	-	-	-	-	-	-	-
170	15	10	13	5	-	-	-	-	-	-	-	-	-
180	64	35	13	9	1	-	-	-	-	-	-	-	-
190	138	215	129	26	2	-	-	-	-	-	-	-	-
200	457	1063	1158	229	8	-	-	-	-	-	-	-	-
210	397	646	642	183	37	11	2	-	-	-	-	-	-
220	549	412	306	40	1	3	-	2	-	-	-	-	-
230	830	385	142	3	1	-	-	-	-	-	-	-	-
240	612	172	26	-	-	-	-	-	-	-	-	-	-
250	315	57	10	-	-	-	-	-	-	-	-	-	-
260	155	11	-	-	-	-	-	-	-	-	-	-	-
270	76	2	-	-	-	-	-	-	-	-	-	-	-
280	53	-	-	-	-	-	-	-	-	-	-	-	-
290	30	-	-	-	-	-	-	-	-	-	-	-	-
300	25	1	-	-	-	-	-	-	-	-	-	-	-
310	33	1	-	-	-	1	-	-	-	-	-	-	-
320	40	3	-	-	-	-	-	-	-	-	-	-	-
330	20	2	-	-	-	-	-	-	-	-	-	-	-
340	27	1	-	-	-	-	-	-	-	-	-	-	-
350	13	-	-	-	-	-	-	-	-	-	-	-	-
360	48	1	-	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 11707
 CALM: 8281
 TOTAL: 19988

September

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	168	34	4	-	-	-	-	-	-	-	-	-	-
20	395	121	20	-	-	-	-	-	-	-	-	-	-
30	507	149	36	2	-	-	-	-	-	-	-	-	-
40	430	121	30	-	-	-	-	-	-	-	-	-	-
50	254	36	4	1	-	-	-	-	-	-	-	-	-
60	115	11	-	-	-	-	-	-	-	-	-	-	-
70	61	5	-	-	-	-	-	-	-	-	-	-	-
80	28	-	-	-	-	-	-	-	-	-	-	-	-
90	9	-	-	-	-	-	-	-	-	-	-	-	-
100	8	-	-	-	-	-	-	-	-	-	-	-	-
110	10	-	-	-	-	-	-	-	-	-	-	-	-
120	8	1	-	1	-	-	-	-	-	-	-	-	-
130	8	-	1	1	-	-	-	-	-	-	-	-	-
140	9	-	-	-	-	-	-	-	-	-	-	-	-
150	8	-	-	-	-	-	-	-	-	-	-	-	-
160	12	3	-	-	-	-	-	-	-	-	-	-	-
170	19	1	1	-	-	-	-	-	-	-	-	-	-
180	44	18	2	-	-	-	-	1	-	-	-	-	-
190	121	212	120	30	-	-	-	-	-	-	-	-	-
200	330	1095	1322	293	17	1	-	-	-	-	-	-	-
210	309	569	730	371	125	22	6	-	-	1	-	-	-
220	337	338	220	72	47	20	2	-	-	-	-	-	-
230	463	192	160	20	7	2	-	-	-	-	-	-	-
240	265	48	6	1	-	-	-	-	-	-	-	-	-
250	159	12	1	-	-	-	-	-	-	-	-	-	-
260	61	4	-	-	-	-	-	-	-	-	-	-	-
270	38	-	1	-	-	-	-	-	-	-	-	-	-
280	29	3	-	-	-	2	-	-	-	-	-	-	-
290	18	2	1	-	-	-	-	-	-	-	-	-	-
300	29	-	-	-	-	-	-	-	-	-	-	-	-
310	32	1	-	-	-	-	-	-	-	-	-	-	-
320	27	1	-	-	-	-	-	-	-	-	-	-	-
330	24	1	-	-	-	-	-	-	-	-	-	-	-
340	33	4	-	-	-	-	-	-	-	-	-	-	-
350	32	1	-	-	-	-	-	-	-	-	-	-	-
360	83	9	-	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 11179
 CALM: 7688
 TOTAL: 18867

October

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	285	159	41	1	-	-	-	-	-	-	-	-	-
20	522	385	83	3	-	-	-	-	-	-	-	-	-
30	636	460	178	11	-	-	-	-	-	-	-	-	-
40	566	238	157	13	1	-	-	-	-	-	-	-	-
50	336	75	32	1	-	-	-	-	-	-	-	-	-
60	161	14	6	-	-	-	-	-	-	-	-	-	-
70	71	4	-	-	-	-	-	-	-	-	-	-	-
80	27	3	1	-	-	-	-	-	-	-	-	-	-
90	26	1	-	-	-	-	-	-	-	-	-	-	-
100	12	-	-	-	-	-	-	-	-	-	-	-	-
110	12	1	-	-	-	-	-	-	-	-	-	-	-
120	8	-	-	-	1	-	-	-	-	-	-	-	-
130	4	-	-	-	-	-	-	-	-	-	-	-	-
140	10	1	-	-	-	-	-	-	-	-	-	-	-
150	12	-	1	-	-	-	-	-	-	-	-	-	-
160	13	1	1	1	-	-	-	-	-	-	-	-	-
170	16	8	9	4	-	-	-	-	-	-	-	-	-
180	82	29	24	4	-	-	-	-	-	-	-	-	-
190	153	219	73	11	-	-	-	-	-	-	-	-	-
200	312	853	1133	297	50	6	-	-	-	-	-	-	-
210	241	399	607	408	249	68	18	-	-	-	-	-	-
220	226	295	282	143	82	28	7	-	-	-	-	-	-
230	197	178	173	30	11	1	2	-	-	-	-	-	-
240	106	24	14	2	-	-	-	-	-	-	-	-	-
250	58	7	1	-	-	1	-	-	-	-	-	-	-
260	36	1	-	-	-	-	-	-	-	-	-	-	-
270	27	-	-	-	-	-	-	-	-	-	-	-	-
280	20	-	-	-	-	-	-	1	-	-	-	-	-
290	20	-	-	-	-	-	-	-	-	-	-	-	-
300	29	1	-	-	-	-	-	-	-	-	-	-	-
310	39	1	-	-	-	1	-	-	-	-	-	-	-
320	52	4	-	-	-	-	-	-	-	-	-	-	-
330	46	4	-	-	-	-	-	-	-	-	-	-	-
340	72	12	-	-	-	-	-	-	-	-	-	-	-
350	78	10	1	-	-	-	-	-	-	-	-	-	-
360	150	63	8	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 12392
 CALM: 7188
 TOTAL: 19580

November

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	341	213	80	3	1	-	-	-	-	1	-	-	-
20	492	635	394	63	10	1	-	-	-	-	-	-	-
30	636	720	683	206	72	8	1	-	-	-	-	-	-
40	659	467	663	189	48	7	4	-	-	-	-	-	-
50	413	182	235	97	14	2	-	-	-	-	-	-	-
60	165	34	23	8	-	-	-	-	-	-	-	-	-
70	84	8	5	-	-	-	-	-	-	-	-	-	-
80	32	-	1	-	-	-	-	-	-	-	-	-	-
90	22	1	-	-	-	-	-	-	-	-	-	-	-
100	19	-	-	-	-	-	-	-	-	-	-	-	-
110	11	-	-	-	-	-	-	-	-	-	-	-	-
120	14	1	1	-	-	-	-	-	-	-	-	-	-
130	10	-	-	-	-	-	-	-	-	-	-	-	-
140	3	-	-	-	-	-	-	-	-	-	-	-	-
150	13	-	-	-	-	-	-	-	-	-	-	-	-
160	22	-	5	-	-	-	-	-	-	-	-	-	-
170	22	12	13	1	-	-	-	-	-	-	-	-	-
180	55	24	16	2	-	-	-	-	-	-	-	-	-
190	110	118	45	4	-	-	-	-	-	-	-	-	-
200	214	566	650	207	45	4	-	1	-	-	-	-	-
210	92	189	339	316	301	102	44	13	3	-	-	-	-
220	84	129	173	77	46	13	4	-	-	-	-	-	-
230	43	62	98	18	1	-	-	-	-	-	-	-	-
240	32	8	5	-	-	-	-	-	-	-	-	-	-
250	15	3	1	-	-	-	-	-	-	-	-	-	-
260	12	1	-	-	-	-	-	-	-	-	-	-	-
270	12	-	-	-	-	-	-	-	-	-	-	-	-
280	9	-	-	-	-	-	-	-	-	-	-	-	-
290	19	-	-	-	-	-	-	-	-	-	-	-	-
300	22	2	-	-	-	-	-	-	-	-	-	-	-
310	41	1	-	-	-	-	-	-	-	-	-	-	-
320	33	2	1	1	-	-	-	-	1	-	-	-	-
330	51	4	1	-	-	-	-	-	-	-	-	-	-
340	75	9	-	-	-	-	-	-	-	-	-	-	-
350	74	9	2	-	-	-	-	-	-	-	-	-	-
360	151	68	19	1	-	-	-	-	-	-	-	-	-

SUB TOTAL: 12963
CALM: 6103
TOTAL: 19066

December

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	246	157	106	40	2	-	-	-	-	-	-	-	-
20	440	402	466	144	28	1	1	-	-	-	-	-	-
30	773	564	662	281	112	32	11	-	-	-	-	-	-
40	897	627	874	430	161	37	27	10	5	-	-	-	-
50	601	337	507	317	118	41	20	13	1	-	-	-	-
60	258	94	65	33	3	-	-	-	-	-	-	-	-
70	110	36	12	2	-	-	-	-	-	-	-	-	-
80	33	8	3	1	1	-	-	-	-	-	-	-	-
90	24	2	1	-	-	-	-	-	-	-	-	-	-
100	10	1	-	-	-	-	-	-	-	-	-	-	-
110	3	-	-	-	-	-	-	-	-	-	-	-	-
120	10	-	-	-	-	-	-	1	-	-	-	-	-
130	4	-	-	-	-	-	-	-	-	-	-	-	-
140	3	-	-	-	-	-	-	-	-	-	-	-	-
150	3	1	1	-	-	-	-	-	-	-	-	-	-
160	12	8	3	-	-	-	-	-	-	-	-	-	-
170	15	15	7	1	-	1	-	-	1	1	-	-	-
180	44	35	13	6	1	-	-	-	-	-	-	-	-
190	87	127	69	12	1	-	-	-	-	-	-	-	-
200	161	471	829	290	82	12	1	-	-	-	-	-	-
210	75	164	335	380	367	126	47	5	-	-	-	-	-
220	40	120	139	60	64	22	15	2	-	-	-	-	-
230	45	54	102	27	4	4	-	-	-	-	-	-	-
240	29	17	3	-	-	-	-	-	-	-	-	-	-
250	10	-	-	1	-	-	-	-	-	-	-	-	-
260	9	-	-	-	-	-	-	-	-	-	-	-	-
270	10	-	-	-	-	-	-	-	-	-	-	-	-
280	10	-	-	-	-	1	-	-	-	-	-	-	-
290	16	-	1	-	-	-	-	-	-	-	-	-	-
300	25	2	-	-	-	2	-	-	-	-	-	-	-
310	33	1	-	-	1	-	-	-	-	-	-	-	-
320	40	-	-	-	-	-	-	1	-	-	-	-	-
330	49	2	-	-	-	-	-	-	-	-	-	-	-
340	48	10	-	-	-	-	-	-	-	-	-	-	-
350	57	16	-	-	-	-	-	-	-	-	-	-	-
360	88	41	13	1	-	-	-	-	-	-	-	-	-

SUB TOTAL: 15253
 CALM: 5922
 TOTAL: 21175

Annual

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 - <70
10	2118	1072	497	104	8	-	-	-	-	1	-	-	-
20	4264	3051	2304	597	118	9	7	-	-	-	-	-	-
30	6441	4250	4210	1552	520	96	23	-	-	-	-	-	-
40	6544	4014	5051	2362	923	209	80	13	5	-	-	-	-
50	3971	1898	2325	1449	575	126	35	13	1	-	-	-	-
60	1720	429	271	105	21	4	-	-	-	-	-	-	-
70	691	108	47	7	-	-	-	-	-	-	-	-	-
80	293	29	9	2	1	-	-	-	-	-	-	-	-
90	182	7	3	-	-	-	-	-	-	-	-	-	-
100	121	4	-	1	-	-	-	-	-	-	-	-	-
110	88	2	2	1	-	-	-	1	-	-	-	-	-
120	84	8	5	4	1	-	-	1	-	-	-	-	-
130	61	3	5	2	-	-	-	-	-	-	-	-	-
140	66	4	8	-	-	-	1	-	1	-	-	-	-
150	77	10	9	3	-	3	-	2	-	-	-	-	-
160	121	27	20	4	1	-	-	-	-	-	-	-	-
170	185	100	70	14	-	1	-	-	2	1	-	-	-
180	590	349	135	28	4	-	-	-	1	1	-	-	-
190	1492	2029	1002	142	9	-	-	-	-	-	-	1	-
200	4001	10733	12325	2714	308	36	1	1	-	-	-	-	-
210	3715	6782	7358	3572	1876	569	158	19	3	-	1	-	-
220	3951	4444	3048	1024	510	176	49	6	-	-	1	-	-
230	4775	3090	1699	213	48	15	4	3	-	-	-	-	-
240	2807	786	111	14	-	-	-	-	-	1	-	-	-
250	1448	277	29	2	-	1	-	-	-	-	-	-	-
260	661	49	1	-	-	-	-	-	-	-	-	-	-
270	347	13	3	1	-	-	-	-	-	-	-	-	-
280	216	6	-	-	-	1	2	-	1	-	-	-	-
290	211	10	4	-	-	-	-	-	-	-	1	-	-
300	274	16	1	2	-	3	-	1	-	-	-	-	-
310	287	6	1	1	2	1	1	1	-	1	-	-	1
320	308	19	4	2	-	-	-	1	1	-	1	-	2
330	278	18	1	-	-	-	-	-	-	-	-	-	-
340	389	53	7	1	-	1	-	-	-	-	-	-	-
350	396	69	10	3	-	-	-	-	-	-	-	-	-
360	895	315	90	11	-	-	-	-	-	-	-	-	-

SUB TOTAL: 159377
 CALM: 70812
 TOTAL: 230189

Appendix C Point Retreat Wind Statistics

January

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	33	19	13	20	7	-	-	1	1	-	-	-	-
20	22	2	3	10	4	1	1	1	-	1	-	-	-
30	14	-	3	5	2	3	-	-	-	-	-	-	-
40	20	2	4	8	-	1	1	-	1	-	-	-	-
50	12	1	1	3	-	-	2	1	-	-	-	1	-
60	6	1	-	-	1	1	1	-	2	2	1	-	-
70	7	-	-	2	-	1	-	-	1	1	-	-	-
80	15	-	-	-	-	1	1	1	-	-	-	2	-
90	16	-	-	-	-	2	1	1	1	-	-	-	-
100	28	-	-	-	1	-	1	-	2	1	-	-	-
110	59	20	7	1	-	-	1	3	-	-	-	-	-
120	139	64	18	2	-	-	-	-	-	1	-	-	-
130	289	95	29	3	1	1	2	1	2	-	-	-	-
140	264	80	16	2	-	-	1	1	1	-	1	-	-
150	141	24	1	1	-	1	-	-	-	-	-	1	-
160	93	5	1	-	-	-	1	1	-	1	-	-	-
170	62	4	-	-	-	1	1	2	1	-	1	-	-
180	53	6	1	-	-	-	-	1	1	-	-	-	-
190	49	6	-	-	-	2	-	-	1	-	-	-	-
200	33	13	3	3	-	-	1	2	-	-	-	-	-
210	27	7	8	4	-	1	-	1	1	-	1	-	-
220	15	2	5	-	1	4	4	-	-	-	-	-	-
230	11	2	3	3	1	-	-	-	-	-	-	-	1
240	7	1	1	1	1	1	1	1	1	-	-	-	-
250	10	-	5	-	-	-	1	-	1	1	-	-	-
260	11	-	1	-	-	-	1	1	-	-	-	-	-
270	7	1	-	-	-	-	1	1	-	-	-	-	-
280	11	1	2	-	-	2	1	-	1	-	-	-	-
290	17	3	3	-	-	-	-	2	-	-	1	-	-
300	29	2	-	3	1	2	1	1	-	1	-	-	1
310	31	12	5	8	6	1	1	-	1	-	-	-	-
320	66	10	28	38	54	25	11	1	-	1	1	-	-
330	85	50	55	67	43	28	16	4	2	1	-	-	-
340	119	93	145	108	30	34	16	2	2	-	-	-	-
350	73	84	99	76	27	13	13	1	2	1	-	-	-
360	48	44	51	37	24	13	2	-	-	-	-	-	-

SUB TOTAL: 3999
 CALM: 15
 TOTAL: 4014

NOTE: Maximum wind speed measured was 72 kts.

February

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	59	18	15	10	8	2	1	1	-	-	-	-	1
20	29	4	1	3	1	1	-	-	-	1	-	-	-
30	19	2	1	4	3	2	-	-	1	-	-	-	-
40	21	-	-	-	3	1	1	-	-	-	-	-	-
50	13	-	-	-	-	1	1	-	-	-	-	-	-
60	16	1	-	-	-	-	-	-	1	-	-	-	-
70	10	1	-	-	-	-	1	1	-	-	-	-	1
80	11	-	-	-	-	1	-	-	-	-	-	-	-
90	31	-	-	-	-	1	-	-	-	-	-	1	-
100	46	-	-	-	-	-	-	-	1	-	-	-	-
110	85	35	9	-	-	-	1	-	-	-	-	-	-
120	175	78	27	1	-	-	1	-	-	1	1	-	-
130	228	114	25	7	1	1	-	1	-	-	-	-	-
140	215	53	14	1	-	-	1	2	-	-	-	-	-
150	99	10	4	-	-	-	1	1	-	-	1	-	-
160	73	1	-	-	-	-	1	-	-	1	-	-	-
170	31	-	-	-	-	1	-	-	-	-	-	-	-
180	29	1	-	-	-	-	-	-	-	-	-	-	-
190	21	3	2	-	-	-	1	-	-	1	-	-	-
200	18	2	3	-	-	-	-	-	-	-	-	-	-
210	23	1	-	-	-	-	-	-	-	-	-	-	-
220	14	1	1	3	-	-	-	-	-	-	-	-	-
230	10	-	2	1	1	-	1	-	1	-	-	-	-
240	6	1	1	-	-	-	3	-	-	-	-	-	-
250	9	1	1	-	-	-	-	-	-	-	-	-	-
260	8	-	-	-	-	-	-	-	-	-	1	-	-
270	9	-	-	-	-	-	1	-	1	1	-	-	-
280	15	-	1	-	1	-	-	2	1	1	-	-	-
290	37	1	-	-	2	-	-	-	-	-	-	-	1
300	55	6	3	1	-	-	-	-	-	1	-	-	-
310	52	10	7	1	5	11	4	-	-	-	-	-	-
320	61	34	21	18	14	14	6	-	-	-	-	-	-
330	102	47	64	53	46	34	3	1	-	1	-	-	-
340	104	60	96	74	35	30	13	-	1	-	-	-	-
350	103	73	68	41	13	13	11	3	1	-	-	-	-
360	87	37	35	24	17	6	2	-	-	-	-	-	-

SUB TOTAL: 3520
 CALM: 17
 TOTAL: 3537

NOTE: Maximum wind speed measured was 122 kts.

March

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	45	12	7	2	7	-	-	-	-	-	-	-	-
20	29	6	2	-	1	-	-	-	-	-	-	-	-
30	24	-	-	4	1	-	1	-	-	-	-	-	-
40	13	-	1	1	-	-	-	-	-	-	-	-	-
50	15	-	1	2	-	-	1	-	-	-	-	-	-
60	4	1	-	-	1	-	2	1	1	-	-	-	-
70	12	-	-	-	-	1	1	-	-	-	-	-	-
80	15	-	-	-	-	1	-	-	-	-	-	-	-
90	16	-	-	-	-	-	1	1	-	-	-	-	-
100	57	2	-	-	-	-	-	-	-	-	-	-	-
110	104	45	16	3	-	1	1	-	-	-	-	-	-
120	180	53	13	2	-	-	-	-	-	-	-	-	-
130	210	66	13	9	6	2	1	-	-	-	-	-	-
140	198	46	13	3	-	1	1	-	-	-	-	-	-
150	135	8	2	-	-	2	-	-	-	-	-	-	-
160	81	-	-	-	-	-	1	-	-	-	-	-	-
170	77	-	-	-	-	-	-	-	1	-	-	-	-
180	54	-	-	-	-	-	2	-	-	-	-	-	-
190	51	5	1	-	-	1	-	-	-	-	-	-	-
200	32	7	1	-	-	-	1	-	-	-	-	-	-
210	18	4	3	2	-	-	-	1	-	-	-	-	-
220	18	-	2	2	1	-	1	-	-	-	-	-	-
230	15	2	1	1	-	1	-	-	1	-	-	-	-
240	9	1	-	1	-	-	-	2	-	-	-	-	-
250	9	1	1	-	-	-	-	-	-	-	-	-	-
260	10	1	2	-	-	1	-	1	1	-	-	-	-
270	16	-	-	-	-	-	-	1	-	-	-	-	-
280	16	1	1	1	-	-	-	-	-	-	-	-	-
290	28	8	4	2	-	2	-	-	-	-	-	-	-
300	43	14	15	9	3	1	1	-	-	-	-	-	-
310	79	22	19	19	6	7	-	-	-	-	-	-	-
320	75	29	49	56	26	14	3	-	1	-	-	-	-
330	76	56	76	83	28	22	5	-	-	-	-	-	-
340	112	61	110	74	46	22	3	-	-	-	-	-	-
350	93	64	90	58	27	14	1	-	-	-	-	-	-
360	75	63	37	22	14	4	1	-	-	-	-	-	-

SUB TOTAL: 3762
 CALM: 11
 TOTAL: 3773

April

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	80	20	3	-	-	-	-	-	-	-	-	-	-
20	38	10	-	-	-	-	-	-	-	-	-	-	-
30	37	3	1	-	-	-	-	-	-	-	-	-	-
40	24	3	-	-	-	-	-	-	-	-	-	-	-
50	18	2	1	-	-	-	-	-	-	-	-	-	-
60	21	-	-	-	1	-	-	-	-	-	-	-	-
70	20	-	1	-	-	-	-	-	-	-	-	-	-
80	24	-	-	-	-	-	-	-	-	-	-	-	-
90	34	-	-	-	1	-	-	-	-	-	-	-	-
100	71	3	1	-	-	-	-	1	-	-	-	-	-
110	179	64	13	1	-	-	-	-	-	-	-	-	-
120	261	64	13	-	-	-	-	-	-	-	-	-	-
130	259	42	5	3	-	-	-	-	-	-	-	-	-
140	178	12	2	-	-	-	-	-	1	-	-	-	-
150	99	-	-	-	-	-	-	-	-	-	-	-	-
160	78	-	-	-	-	-	-	-	-	-	-	-	-
170	71	1	-	-	-	-	-	-	-	-	-	-	-
180	77	1	-	-	-	-	-	-	-	-	-	-	-
190	104	-	1	-	-	-	-	-	-	-	-	-	-
200	130	7	-	-	-	-	-	-	-	-	-	-	-
210	157	10	7	3	-	-	-	-	-	-	-	-	-
220	123	11	7	1	-	-	-	1	-	-	-	-	-
230	70	4	1	-	-	-	-	-	-	-	-	-	-
240	51	-	-	-	-	-	-	-	-	-	-	-	-
250	38	2	-	-	-	-	-	-	-	-	-	-	-
260	38	-	-	-	-	-	-	-	-	-	-	-	-
270	50	1	-	-	-	-	-	-	-	-	-	-	-
280	51	2	-	-	-	-	-	-	-	-	-	-	-
290	84	3	-	-	-	-	-	-	-	-	-	-	-
300	100	14	5	-	-	-	-	-	-	-	-	-	-
310	127	21	12	1	-	-	-	-	-	-	-	-	-
320	132	31	18	10	5	2	-	-	-	-	-	-	-
330	117	48	24	15	7	1	-	-	-	-	-	-	-
340	136	47	43	27	4	5	-	-	-	-	-	-	-
350	119	49	41	8	2	-	1	-	-	-	-	-	-
360	98	41	14	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 4124
 CALM: 47
 TOTAL: 4171

May

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	68	8	-	1	-	-	-	-	-	-	-	-	-
20	48	3	-	-	-	-	-	-	-	-	-	-	-
30	39	-	-	-	-	-	-	-	-	-	-	-	-
40	24	-	-	-	-	-	-	-	-	-	-	-	-
50	17	-	-	-	-	-	-	-	-	-	-	-	-
60	26	-	-	-	-	-	-	-	-	-	-	-	-
70	23	-	-	-	-	-	-	-	-	-	-	-	-
80	27	-	-	-	-	-	-	-	-	-	-	-	-
90	33	-	-	-	-	-	-	-	-	-	-	-	-
100	73	2	-	-	-	1	-	-	-	-	-	-	-
110	133	21	-	-	-	-	-	-	-	-	-	-	-
120	212	20	3	-	-	-	-	-	-	-	-	-	-
130	222	29	2	-	-	-	-	-	-	-	-	-	-
140	197	23	2	-	-	-	-	-	-	-	-	-	-
150	120	7	-	-	-	-	-	-	-	-	-	-	-
160	126	2	-	-	-	-	-	-	-	-	-	-	-
170	114	-	-	-	-	-	-	-	-	-	-	-	-
180	119	-	-	-	-	-	-	-	-	-	-	-	-
190	161	20	1	-	-	-	-	-	-	-	-	-	-
200	257	47	2	-	-	-	-	-	-	-	-	-	-
210	340	28	2	-	-	-	-	-	-	-	-	-	-
220	208	15	5	-	-	-	-	-	-	-	-	-	-
230	113	2	4	-	-	-	-	-	-	-	-	-	-
240	78	-	-	-	-	-	-	-	-	-	-	-	-
250	54	-	-	-	-	-	-	-	-	-	-	-	-
260	51	-	-	-	-	-	-	-	-	-	-	-	-
270	58	1	-	-	-	-	-	-	-	-	-	-	-
280	55	1	-	-	-	-	-	-	-	-	-	-	-
290	57	2	-	-	-	-	-	-	-	-	-	-	-
300	86	17	5	1	-	-	-	-	-	-	-	-	-
310	100	13	8	5	1	-	-	-	-	-	-	-	-
320	108	17	10	2	1	-	-	-	-	-	-	-	-
330	106	18	9	4	1	-	-	-	-	-	-	-	-
340	108	21	9	4	1	-	-	-	-	-	-	-	-
350	98	29	19	1	-	-	-	-	-	-	-	-	-
360	98	30	10	3	-	-	-	-	-	-	-	-	-

SUB TOTAL: 4250
 CALM: 68
 TOTAL: 4318

June

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	38	3	-	-	-	-	-	-	-	-	-	-	-
20	38	4	-	-	-	-	-	-	-	-	-	-	-
30	33	1	-	-	-	-	-	-	-	-	-	-	-
40	25	-	-	-	-	-	-	-	-	-	-	-	-
50	16	-	-	-	-	-	-	-	-	-	-	-	-
60	22	-	-	-	-	-	-	-	-	-	-	-	-
70	16	-	-	-	-	-	-	-	-	-	-	-	-
80	12	-	-	-	-	-	-	-	-	-	-	-	-
90	42	-	-	-	-	-	-	-	-	-	-	-	-
100	108	3	-	-	-	-	-	-	-	-	-	-	-
110	220	19	-	-	-	-	-	-	-	-	-	-	-
120	274	11	-	-	-	-	-	-	-	-	-	-	-
130	248	16	-	-	-	-	-	-	-	-	-	-	-
140	193	11	1	-	-	-	-	-	-	-	-	-	-
150	142	1	-	-	-	-	-	-	-	-	-	-	-
160	153	-	-	-	-	-	-	-	-	-	-	-	-
170	164	1	-	-	-	-	-	-	-	-	-	-	-
180	207	3	-	-	-	-	-	-	-	-	-	-	-
190	253	10	1	-	-	-	-	-	-	-	-	-	-
200	323	51	7	-	-	-	-	-	-	-	-	-	-
210	292	40	11	-	-	-	-	-	-	-	-	-	-
220	215	25	12	1	-	-	-	-	-	-	-	-	-
230	90	8	6	2	-	-	-	-	-	-	-	-	-
240	55	-	7	1	-	-	-	-	-	-	-	-	-
250	52	1	-	-	-	-	-	-	-	-	-	-	-
260	37	-	-	-	-	-	-	-	-	-	-	-	-
270	40	2	-	-	-	-	-	-	-	-	-	-	-
280	33	1	-	-	-	-	-	-	-	-	-	-	-
290	38	-	-	-	-	-	-	-	-	-	-	-	-
300	57	1	1	-	-	-	-	-	-	-	-	-	-
310	58	2	3	-	-	-	-	-	-	-	-	-	-
320	71	1	1	-	-	-	-	-	-	-	-	-	-
330	58	9	1	1	-	-	-	-	-	-	-	-	-
340	58	13	7	3	-	-	-	-	-	-	-	-	-
350	70	14	12	2	-	-	-	-	-	-	-	-	-
360	47	9	7	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 4145
 CALM: 56
 TOTAL: 4201

July

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	54	3	1	-	-	-	-	-	-	-	-	-	-
20	46	3	-	-	-	-	-	-	1	-	-	-	-
30	44	-	-	-	-	-	-	-	-	-	-	-	-
40	29	-	-	-	1	-	-	-	-	-	-	-	-
50	27	-	-	-	-	-	-	-	-	-	-	-	-
60	33	-	-	1	-	-	-	-	1	-	-	-	-
70	24	-	1	-	-	-	-	-	-	-	-	-	-
80	32	-	-	-	-	-	-	-	-	-	-	-	-
90	39	-	-	-	-	-	1	-	-	-	-	-	-
100	144	7	-	-	-	-	-	-	-	-	-	-	-
110	255	20	-	-	-	-	-	-	-	-	-	-	-
120	299	15	3	-	-	-	-	-	-	-	-	-	-
130	356	12	-	-	-	-	1	-	-	-	-	-	-
140	243	5	-	-	-	-	-	-	-	-	-	-	-
150	183	6	1	-	-	-	-	-	-	-	-	-	-
160	175	3	-	1	-	-	-	-	-	-	-	-	-
170	172	-	-	-	-	-	-	-	-	-	-	-	-
180	189	5	-	-	-	-	-	-	1	-	-	-	-
190	198	7	2	-	-	-	-	-	1	-	-	-	-
200	240	20	-	-	-	-	-	-	-	-	-	-	-
210	263	17	1	-	-	-	-	-	-	-	-	-	-
220	165	16	1	-	-	-	-	-	-	-	-	-	-
230	66	1	2	-	-	-	-	-	-	-	-	-	-
240	42	3	2	-	-	-	-	-	-	-	-	-	-
250	45	3	-	-	-	-	-	-	-	-	-	-	-
260	45	3	-	1	-	-	-	-	1	-	-	-	-
270	42	-	1	1	-	-	-	-	-	-	-	-	-
280	35	1	-	-	-	-	-	-	-	-	-	-	-
290	44	2	-	-	-	-	-	-	-	-	-	-	-
300	50	2	-	-	-	-	-	-	-	-	-	-	-
310	52	3	1	-	-	-	-	-	-	-	-	-	-
320	60	4	-	1	1	-	-	-	-	-	-	-	-
330	53	9	4	1	-	-	-	-	-	-	-	-	-
340	65	15	11	-	2	-	-	-	-	-	-	-	-
350	56	10	9	1	-	1	-	-	-	-	-	-	-
360	62	7	2	-	-	-	-	-	-	-	-	-	-

SUB TOTAL: 4190
 CALM: 95
 TOTAL: 4285

August

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	64	16	5	-	-	-	-	-	-	-	-	-	-
20	66	6	-	1	-	-	-	-	-	-	-	-	-
30	54	2	-	-	-	-	-	-	-	-	-	-	-
40	35	1	-	-	-	-	-	-	-	-	-	-	-
50	24	-	-	-	-	-	-	-	-	-	-	-	-
60	19	-	-	-	1	-	-	-	-	-	-	-	-
70	26	1	1	-	-	-	-	-	-	-	-	-	-
80	27	-	1	-	-	-	-	-	-	-	-	-	-
90	27	-	-	-	-	-	-	-	-	-	-	-	-
100	60	-	-	-	-	-	-	-	-	-	-	-	-
110	152	14	1	-	-	-	-	-	-	-	-	-	-
120	333	14	1	-	-	-	-	-	-	-	-	-	-
130	575	48	4	-	-	-	-	-	-	-	-	-	-
140	340	26	1	-	-	1	-	-	-	-	-	-	-
150	161	2	-	-	-	-	-	-	-	-	-	-	-
160	133	1	-	-	-	-	-	-	-	-	-	-	-
170	98	-	-	-	-	-	-	-	-	-	-	-	-
180	111	-	-	-	-	-	-	-	-	-	-	-	-
190	121	-	-	-	-	-	-	-	-	-	-	-	-
200	157	6	-	-	-	-	-	-	-	-	-	-	-
210	207	8	2	1	-	-	-	-	-	-	-	-	-
220	150	7	1	1	-	-	-	-	-	-	-	-	-
230	71	8	1	-	-	1	-	-	-	-	-	-	-
240	53	1	-	-	-	-	-	-	-	-	-	-	-
250	36	-	-	-	-	-	-	-	-	-	-	-	-
260	26	-	-	-	-	-	-	-	-	-	-	-	-
270	30	-	1	-	-	-	-	-	-	-	-	-	-
280	36	-	-	-	-	-	-	-	-	-	-	-	-
290	34	-	-	-	-	-	-	-	-	-	-	-	-
300	39	-	-	-	-	-	-	-	-	-	-	-	-
310	58	-	-	-	-	-	-	-	-	-	-	-	-
320	56	8	6	-	-	-	-	-	-	-	-	-	-
330	59	6	8	5	-	-	-	-	-	-	-	-	-
340	57	19	13	5	-	-	-	-	-	-	-	-	-
350	74	24	12	6	-	-	-	-	-	-	-	-	-
360	62	14	8	1	1	-	-	-	-	-	-	-	-

SUB TOTAL: 3953
 CALM: 92
 TOTAL: 4045

September

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	61	30	4	-	-	-	-	-	-	-	-	-	-
20	45	14	3	-	-	-	-	-	-	-	-	-	-
30	50	10	-	-	-	-	-	-	-	-	-	-	-
40	22	2	-	-	-	-	-	-	-	-	-	-	-
50	18	1	4	-	-	-	-	-	-	-	-	-	-
60	19	1	-	-	-	-	-	-	-	-	-	-	-
70	17	-	-	-	-	-	-	-	-	-	-	-	-
80	26	-	1	-	-	-	-	-	-	-	-	-	-
90	27	-	1	-	-	-	-	-	-	-	-	-	-
100	52	-	-	-	-	-	-	-	-	-	-	-	-
110	142	12	-	-	-	-	-	-	-	-	-	-	-
120	283	19	3	-	-	-	-	-	-	-	-	-	-
130	484	84	6	1	-	-	-	-	-	-	-	-	-
140	369	87	20	1	-	-	-	-	-	-	-	-	-
150	274	25	2	-	-	-	-	-	-	-	-	-	-
160	164	4	-	-	-	-	-	-	-	-	-	-	-
170	126	-	1	-	-	-	-	-	-	-	-	-	-
180	110	-	-	-	-	-	-	-	-	-	-	-	-
190	95	-	-	-	-	-	-	-	-	-	-	-	-
200	83	-	-	-	-	-	-	-	-	-	-	-	-
210	90	4	1	-	-	-	-	-	-	-	-	-	-
220	75	2	1	1	-	-	-	-	-	-	-	-	-
230	40	2	-	-	-	-	-	-	-	-	-	-	-
240	38	2	-	-	-	-	-	-	-	-	-	-	-
250	24	-	-	-	-	-	-	-	-	-	-	-	-
260	24	-	-	-	-	-	-	-	-	-	-	-	-
270	26	-	-	-	-	-	-	-	-	-	-	-	-
280	34	-	-	-	1	-	-	-	-	-	-	-	-
290	26	-	-	1	-	-	-	-	-	-	-	-	-
300	39	3	-	-	-	-	-	-	-	-	-	-	-
310	62	4	-	-	-	-	-	-	-	-	-	-	-
320	84	14	6	1	-	-	-	-	-	-	-	-	-
330	87	23	21	2	-	-	-	-	-	-	-	-	-
340	83	54	29	6	-	-	-	-	-	-	-	-	-
350	117	51	45	6	1	-	-	-	-	-	-	-	-
360	63	37	18	2	1	-	-	-	-	-	-	-	-

SUB TOTAL: 4054
 CALM: 48
 TOTAL: 4102

October

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	68	25	18	17	5	-	-	-	-	-	-	-	-
20	63	11	6	2	-	1	-	-	-	-	-	-	-
30	43	2	1	1	1	-	-	-	-	-	-	-	-
40	40	3	-	2	-	-	1	-	-	-	-	-	-
50	26	-	-	1	-	-	-	-	-	-	-	-	-
60	16	2	1	1	-	-	1	-	-	-	-	-	-
70	17	-	2	-	-	-	-	-	-	-	-	-	-
80	20	-	-	-	-	1	-	-	-	-	-	-	-
90	38	-	-	-	-	-	-	-	-	-	-	-	-
100	49	-	-	-	-	-	-	-	-	-	-	-	-
110	104	20	9	1	-	-	-	-	-	-	-	-	-
120	245	85	34	11	-	-	-	-	-	-	-	-	-
130	438	131	27	2	1	-	-	-	-	-	-	-	-
140	419	115	19	3	-	-	-	-	-	-	-	-	-
150	287	47	10	1	-	-	-	-	-	-	-	-	-
160	175	15	3	-	-	-	-	-	-	-	-	-	-
170	114	4	-	-	-	1	-	-	-	-	-	-	-
180	83	-	1	-	-	-	-	-	-	-	-	-	-
190	59	4	3	-	-	-	-	-	-	-	-	-	-
200	45	5	1	-	1	-	-	-	-	-	-	-	-
210	31	3	3	1	-	-	-	-	-	-	-	-	-
220	30	6	2	1	2	-	-	-	-	-	-	-	-
230	30	3	2	1	-	-	-	-	-	-	-	-	-
240	18	-	1	2	-	-	-	-	-	-	-	-	-
250	17	-	-	-	-	-	-	-	-	-	-	-	-
260	6	1	1	-	-	1	-	-	-	-	-	-	-
270	17	1	-	-	-	-	-	-	-	-	-	-	-
280	13	1	-	-	-	-	-	-	-	-	-	-	-
290	20	2	-	-	-	-	-	-	-	-	-	-	-
300	37	6	6	-	-	-	-	-	-	-	-	-	-
310	57	9	8	7	2	-	-	-	-	-	-	-	-
320	61	18	18	11	3	1	-	-	-	-	-	-	-
330	77	28	51	53	9	-	-	-	-	-	-	-	-
340	93	65	96	81	12	1	-	-	-	-	-	-	-
350	130	84	88	67	23	3	-	-	-	-	-	-	-
360	100	59	54	41	12	1	-	-	-	-	-	-	-

SUB TOTAL: 4696
CALM: 37
TOTAL: 4733

November

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	42	23	28	12	2	2	1	-	1	-	-	-	2
20	30	5	8	2	-	-	-	1	1	-	-	-	-
30	14	5	2	-	-	-	-	1	2	-	1	-	-
40	17	5	1	-	-	1	1	1	2	-	-	-	-
50	18	-	-	-	-	-	-	1	-	-	-	-	1
60	10	1	-	1	-	-	5	3	-	-	1	-	-
70	6	-	-	-	-	-	4	2	-	-	-	-	1
80	13	-	-	-	-	-	4	-	1	1	-	-	-
90	14	-	2	-	-	1	2	-	-	1	-	-	-
100	26	-	-	-	-	1	2	2	1	1	-	-	-
110	66	13	-	-	1	-	1	-	2	1	-	-	-
120	151	58	9	-	-	-	-	2	3	1	-	-	-
130	261	146	24	5	6	-	1	2	1	-	-	-	-
140	325	124	17	1	-	1	1	1	-	-	-	-	-
150	223	37	6	-	-	-	-	-	-	-	-	-	-
160	107	6	2	-	-	-	3	1	-	-	-	-	1
170	72	-	-	-	-	-	-	1	1	-	-	-	-
180	50	2	-	-	1	-	-	2	2	-	-	-	-
190	39	3	-	-	1	1	-	-	-	-	-	-	-
200	26	5	-	-	1	-	1	2	2	-	-	-	-
210	13	2	1	1	-	2	1	-	1	-	-	1	-
220	9	2	1	1	-	1	-	1	-	1	-	-	-
230	7	1	3	-	-	-	1	2	1	-	-	-	1
240	4	1	1	-	-	-	-	-	2	-	-	-	-
250	8	-	1	-	-	-	-	1	1	-	-	-	1
260	7	1	-	-	-	-	1	2	-	-	1	-	-
270	8	1	-	-	-	-	-	1	1	-	-	-	-
280	6	-	-	-	-	-	-	1	2	-	1	-	-
290	9	1	-	2	-	-	-	2	-	-	-	-	-
300	14	14	3	1	1	-	1	-	-	-	-	-	-
310	42	12	8	7	3	-	1	-	3	-	-	-	1
320	61	30	22	8	11	9	5	4	2	-	-	-	-
330	110	72	69	77	72	54	14	2	1	1	-	-	-
340	138	145	134	164	136	118	30	2	1	2	1	-	-
350	103	108	109	82	56	23	6	-	1	1	-	-	-
360	62	52	62	31	11	10	9	-	2	-	-	-	-

SUB TOTAL: 4616
 CALM: 7
 TOTAL: 4623

NOTE: Maximum wind speed measured was 128 kts.

December

Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	32	22	11	6	1	3	1	2	1	-	-	-	-
20	33	9	6	2	1	2	1	2	1	-	-	-	-
30	16	1	2	-	2	-	-	1	1	-	-	-	-
40	15	1	1	-	3	-	-	-	1	-	-	-	-
50	14	3	4	1	4	2	-	1	1	-	-	-	-
60	6	1	2	2	3	8	7	-	1	-	-	-	-
70	10	1	-	1	4	1	2	1	1	-	-	-	-
80	17	1	-	1	-	2	4	1	-	-	-	-	-
90	31	-	1	-	-	2	4	-	-	-	-	-	-
100	52	1	-	-	-	1	5	2	1	2	-	-	-
110	111	19	4	-	1	2	-	3	1	-	-	-	-
120	231	69	20	3	4	2	1	1	-	2	-	-	-
130	330	168	57	9	6	1	-	2	1	-	-	-	-
140	295	123	26	2	-	-	2	2	-	-	-	-	-
150	159	17	3	-	-	-	2	1	-	-	-	-	-
160	92	6	-	-	-	1	2	2	-	-	-	-	-
170	48	2	-	-	-	-	2	2	-	2	-	-	-
180	56	2	-	-	-	2	1	-	1	-	-	-	-
190	51	2	-	-	-	1	-	-	2	-	-	-	-
200	24	15	2	-	1	-	1	2	-	-	-	-	-
210	18	8	5	1	-	-	2	-	1	1	-	-	-
220	7	4	5	3	1	-	1	1	1	-	-	-	-
230	13	6	4	4	-	1	2	1	1	1	-	-	-
240	8	1	1	3	3	1	-	-	-	-	-	-	-
250	7	-	-	1	-	-	1	1	1	-	-	-	-
260	14	1	-	-	2	-	2	1	1	1	-	-	-
270	8	-	-	-	-	1	1	1	-	-	-	-	-
280	11	-	-	-	-	2	3	-	-	-	-	-	-
290	14	-	1	-	-	-	-	-	-	-	-	-	-
300	17	1	4	3	-	-	1	-	-	-	-	-	-
310	49	5	7	3	4	5	-	1	1	-	-	-	-
320	55	24	24	23	15	16	5	-	2	-	-	-	-
330	89	59	81	70	48	46	12	2	1	-	-	-	-
340	141	109	173	173	112	75	9	-	-	-	-	-	-
350	108	80	115	61	48	45	5	-	-	1	-	-	-
360	66	37	37	10	4	-	1	1	1	-	-	-	-

SUB TOTAL: 4660
CALM: 8
TOTAL: 4668

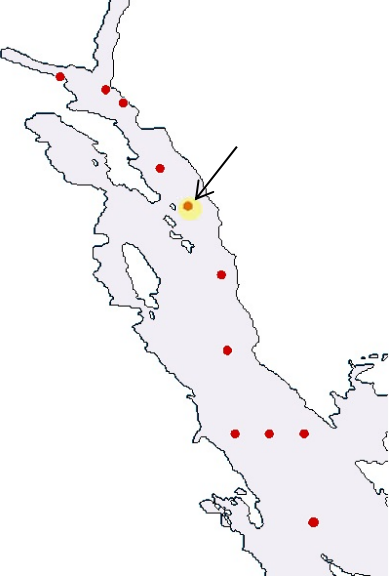
Annual

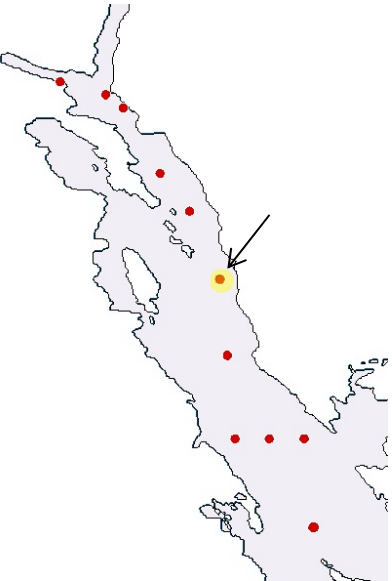
Dir (deg)	Two-minute Average Wind Speed at 10 m (knots)												
	>0 - <10	>=10 - <15	>=15 - <20	>=20 - <25	>=25 - <30	>=30 - <35	>=35 - <40	>=40 - <45	>=45 - <50	>=50 - <55	>=55 - <60	>=60 - <65	>=65 +
10	644	199	105	68	30	7	3	4	3	-	-	-	3
20	487	77	29	20	7	5	2	4	3	2	-	-	-
30	387	26	10	14	9	5	1	2	4	-	1	-	-
40	285	17	7	11	7	3	4	1	4	-	-	-	-
50	218	7	11	7	4	3	4	3	1	-	-	1	1
60	198	8	3	5	7	9	16	4	6	2	2	-	-
70	188	3	5	3	4	3	8	4	2	1	-	-	2
80	239	1	2	1	-	6	9	2	1	1	-	2	-
90	348	-	4	-	1	6	9	2	1	1	-	1	-
100	766	18	1	-	1	3	8	4	6	4	-	-	-
110	1610	302	59	6	2	3	4	6	3	1	-	-	-
120	2783	550	144	19	4	2	2	3	3	5	1	-	-
130	3900	951	192	39	21	5	5	6	4	-	-	-	-
140	3236	705	131	13	-	2	7	6	1	1	1	-	-
150	2023	184	29	2	-	3	3	2	-	-	1	1	-
160	1450	43	6	1	-	1	8	4	-	2	-	-	1
170	1149	12	1	-	-	3	3	5	3	2	1	-	-
180	1138	20	2	-	1	2	3	3	5	-	-	-	-
190	1202	60	11	-	1	5	1	-	4	1	-	-	-
200	1368	178	19	3	3	-	4	6	2	-	-	-	-
210	1479	132	44	13	-	3	3	2	3	1	1	1	-
220	1029	91	43	14	5	5	6	2	2	1	-	-	-
230	536	39	29	12	2	3	4	3	4	1	-	-	2
240	369	11	14	8	4	2	4	3	3	-	-	-	-
250	309	8	8	1	-	-	2	2	3	1	-	-	1
260	277	7	4	1	2	2	4	5	3	1	2	-	-
270	311	7	2	1	-	1	3	4	2	1	-	-	-
280	316	8	4	1	2	4	4	3	4	1	1	-	-
290	408	22	8	5	2	2	-	4	-	-	1	-	1
300	566	80	42	18	5	3	4	1	-	2	-	-	1
310	767	113	78	51	27	24	6	1	5	-	-	-	1
320	890	220	203	168	130	81	30	5	5	1	1	-	-
330	1019	425	463	431	254	185	50	9	4	3	-	-	-
340	1214	702	866	719	378	285	71	4	4	2	1	-	-
350	1144	670	707	409	197	112	37	4	4	3	-	-	-
360	868	430	335	171	84	34	15	1	3	-	-	-	-

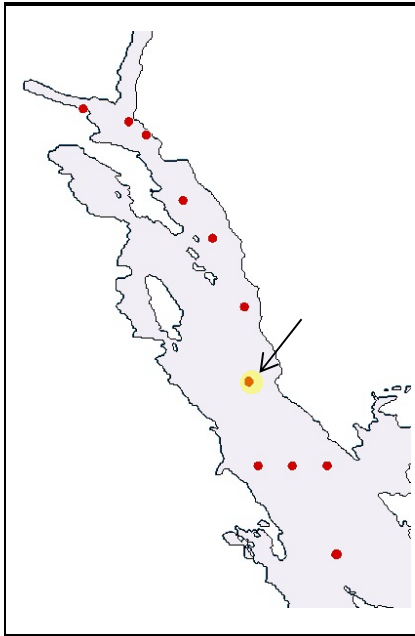
SUB TOTAL: 49969
 CALM: 501
 TOTAL: 50470

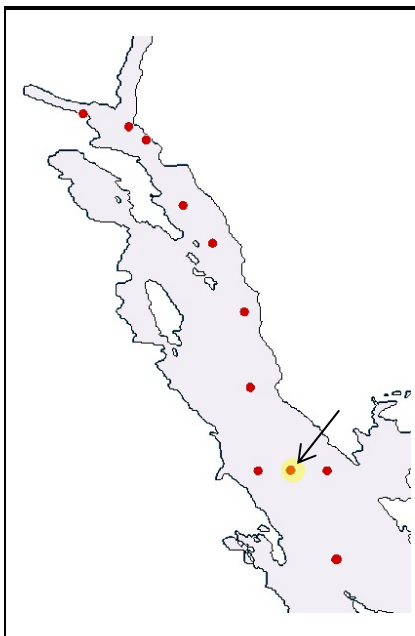
NOTE: Maximum wind speed measured was 128 kts.

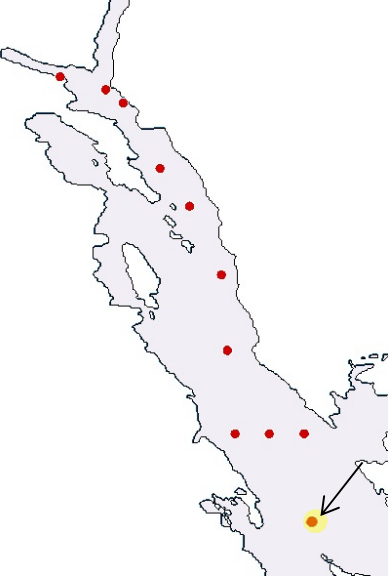
Appendix D Monthly and Annual Wave Statistics

	Abrest Talsani Island								
	50th		90th		95th		99th		
	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	
Jan	0.7	3.7	1.4	5.0	1.7	5.4	2.1	6.0	
Feb	0.6	3.3	1.3	4.8	1.4	5.0	2.0	5.9	
Mar	0.4	2.9	1.1	4.5	1.3	4.9	1.7	5.4	
Apr	0.3	2.5	0.8	3.9	0.8	4.0	1.1	4.5	
May	0.3	2.5	0.8	3.9	1.0	4.4	1.4	5.0	
June	0.4	2.8	0.8	4.0	1.1	4.5	1.1	4.5	
July	0.4	2.8	1.0	4.4	1.1	4.5	1.4	5.0	
Aug	0.4	2.8	1.1	4.5	1.1	4.5	1.4	5.0	
Sept	0.6	3.3	1.1	4.5	1.4	5.0	1.7	5.4	
Oct	0.6	3.3	1.3	4.8	1.4	5.0	2.0	5.8	
Nov	0.7	3.5	1.4	5.0	1.6	5.3	2.1	6.0	
Dec	0.6	3.4	1.5	5.2	1.7	5.5	2.1	6.0	
Annual	0.4	2.9	1.1	4.5	1.4	5.0	1.8	5.7	

	Abrest Eldred Rock								
	50th		90th		95th		99th		
	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	
Jan	0.9	4.0	1.8	5.6	2.1	6.0	2.8	6.8	
Feb	0.7	3.4	1.5	5.1	1.8	5.5	2.2	6.1	
Mar	0.6	3.4	1.5	5.1	1.6	5.2	2.1	6.0	
Apr	0.4	2.7	0.9	4.0	1.0	4.2	1.3	4.8	
May	0.4	2.7	0.9	4.0	1.2	4.5	1.5	5.1	
June	0.4	2.8	0.9	4.0	1.2	4.5	1.2	4.6	
July	0.4	2.8	1.1	4.4	1.2	4.6	1.5	5.1	
Aug	0.4	2.8	1.2	4.5	1.2	4.6	1.5	5.1	
Sept	0.6	3.4	1.2	4.6	1.5	5.1	1.9	5.6	
Oct	0.7	3.5	1.5	5.1	1.8	5.5	2.3	6.2	
Nov	0.8	3.9	1.8	5.5	2.1	6.0	2.5	6.4	
Dec	0.8	3.9	1.9	5.6	2.1	6.0	2.6	6.5	
Annual	0.6	3.4	1.5	5.1	1.7	5.4	2.3	6.2	

	Abrest Point Sherman								
	50th		90th		95th		99th		
	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	
Jan	0.8	3.7	2.0	5.4	2.4	5.8	3.0	6.4	
Feb	0.7	3.5	1.7	5.1	1.8	5.2	2.4	5.9	
Mar	0.5	3.2	1.5	4.8	1.7	5.1	2.4	5.8	
Apr	0.4	2.7	0.9	3.9	1.0	4.1	1.4	4.6	
May	0.4	2.7	0.8	3.7	1.0	4.2	1.4	4.6	
June	0.4	2.7	0.8	3.7	1.0	4.2	1.2	4.4	
July	0.4	2.7	1.0	4.1	1.0	4.2	1.4	4.6	
Aug	0.5	3.0	1.0	4.2	1.2	4.4	1.5	4.8	
Sept	0.5	3.2	1.2	4.4	1.4	4.6	1.7	5.0	
Oct	0.7	3.5	1.5	4.9	1.7	5.1	2.4	5.8	
Nov	0.9	3.9	2.0	5.5	2.4	5.8	2.8	6.3	
Dec	0.8	3.7	2.1	5.5	2.4	5.9	2.8	6.3	
Annual	0.5	3.2	1.4	4.7	1.8	5.1	2.4	5.9	

	JNU EIS Alt 3 route mark #1								
	50th		90th		95th		99th		
	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	
Jan	0.7	3.6	2.1	5.7	2.5	6.2	3.1	6.7	
Feb	0.6	3.3	1.6	5.0	1.9	5.4	2.5	6.2	
Mar	0.5	3.0	1.5	5.0	1.9	5.4	2.5	6.2	
Apr	0.3	2.4	0.8	3.7	1.0	4.1	1.2	4.6	
May	0.3	2.4	0.7	3.6	0.9	4.0	1.2	4.6	
June	0.3	2.4	0.6	3.5	0.8	3.7	1.0	4.1	
July	0.3	2.4	0.7	3.7	0.8	3.8	1.0	4.2	
Aug	0.4	2.8	0.8	3.8	1.0	4.1	1.3	4.6	
Sept	0.5	3.0	1.0	4.1	1.2	4.5	1.5	5.0	
Oct	0.6	3.3	1.5	5.0	1.8	5.4	2.4	6.1	
Nov	0.8	3.8	1.9	5.5	2.5	6.2	3.0	6.7	
Dec	0.7	3.6	2.2	5.8	2.6	6.3	3.1	6.7	
Annual	0.4	2.9	1.3	4.6	1.8	5.4	2.6	6.3	

	Abrest Vanderbilt Reef							
	50th		90th		95th		99th	
	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec	H _S m	T _P sec
Jan	0.5	3.4	1.9	5.8	2.6	6.6	3.2	7.2
Feb	0.4	3.1	1.5	5.2	1.9	5.7	2.6	6.6
Mar	0.4	2.9	1.5	5.2	1.8	5.7	2.6	6.6
Apr	0.3	2.4	0.7	3.7	0.9	4.2	1.2	4.8
May	0.2	2.4	0.5	3.4	0.7	3.7	1.2	4.8
June	0.3	2.5	0.5	3.3	0.5	3.4	0.9	4.2
July	0.3	2.5	0.5	3.3	0.5	3.4	0.7	3.8
Aug	0.3	2.5	0.5	3.4	0.7	3.8	1.2	4.7
Sept	0.4	2.9	0.7	3.8	0.9	4.3	1.5	5.2
Oct	0.4	2.9	1.5	5.2	1.8	5.6	2.5	6.5
Nov	0.7	3.7	1.9	5.7	2.6	6.6	3.2	7.2
Dec	0.5	3.3	2.2	6.1	2.6	6.6	3.2	7.2
Annual	0.4	2.9	1.2	4.8	1.8	5.7	2.7	6.7