[Historical Information]

New York University
School of Engineering and Science
Department of Meteorology and Oceanography
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Technical Report No. TR-73-1

Meteorological Observations at Indian Point, Trap Rock, Montrose Point and Cape Charles 1 January 1970-31 December 1971

Prepared by

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for

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Summary

Meteorological data collected at Indian Point 3, Trap Rock, Montrose Point and the Cape Charles in 1970 and 1971 were analyzed annually, seasonally and diurnally. The results were compared with observations made by Davidson in 1955-57 at similar installations.

Results

A) Comparison between two years of Indian Point 3 (1970 and 1971) data with Indian Point 1 (1956) confirm the findings of Halitsky, et al. (1970) that any apparent meteorological differences during the intervening years are such that they favor an increase in the diffusion potential at the Indian Point site. Improvements include: a) a substantial decrease of the occurrence of inversions and b) a decrease in the probability of low wind speeds in the critical quadrant during inversion conditions.

B) A shift of the secondary maximum direction to a more southeasterly orientation was found in the annual direction frequency density distribution.

C) Seasonal differences included a binodal distribution of the summer wind directions with SSE and NNE peaks. The winter curve is tri-nodal with N, WNW-NW and SSE peaks in descending order of magnitude. The percentage of low wind speeds is highest during the summer when neutral and lapse conditions are most prevalent.

D) The seasonal variation of the diurnal mean wind direction and speed is clearly defined. A direction shift occurs during the summer with upvalley winds during the day and downvalley winds at night. The IP3 diurnal curves can be expected to rotate through 360°.

E) The seasonal diurnal persistence of the wind is maximum at night and minimum during the day. The winter

persistence values are approximately twice those of the summer.

The winter has a single minimum occurring between 1800-2100 while the summer minimum is binodal: 1000-1300 and 1900-2000.

The winter maximum persistence occurs between 0500-0900 while the summer maximum generally occurs between 0500-0600.

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1.

1. Introduction

This is the third of three progress reports covering the continuous meteorological data collection program in the Hudson River Valley at Consolidated Edison's Indian Point nuclear generating complex in Buchanan, New York (Figure 1).

The first report (Halitsky, Laznow and Leahey (1970)) covered wind observations at the Indian Point 2 (IP2), Montrose Point (MP) and Bowline Point (BP) meteorological tower sites, and temperature difference observations at Indian Point 2 and Bowline Point for the period 31 August 1968-30 June 1969.

The second report (Halitsky, Kaplin and Laznow (1970)) covered wind and temperature difference observations at Indian Point 3 (IP3) for the period 26 November 1969-1 October 1970, and wind observations from the U.S.S. Cape Charles for the period 16 March 1970-18 September 1970. The data were compared with similar measurements taken in 1955-1957 by Davidson ((Davidson and Halitsky (1957) and FSAR)) at approximately the same locations. The analysis was made to determine if significant changes had occurred in onsite meteorology during the intervening years.

The function of the present study was to provide meteorological data to support analyses for nuclear units at Indian point as specified by the following items:

a) Turbulence analysis at Indian Point;
b) Analysis of spatial variability of winds between Indian Point 3, Trap Rock (TR) and Montrose Point;
c) Acquisition of wind statistics at Indian Point 3 and Trap Rock; and
d) Additional instrumentation at Trap Rock to develop annual wind statistics and turbulence measurements comparable to those being collected at Indian Point 3.

Item (a) was satisfied, in part by Leahey and Halitsky (1971) whose study developed the techniques and procedures for the analysis of diffusion parameters at Indian Point and

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provided initial results.

Items (b) and (c) are covered in this report. Seasonal, diurnal and annual analyses are provided and the comparison with the 1955-57 data has been extended through December 1971.

The instrumentation required to satisfy item (d) was obtained but due to de-emphasis of the Verplank site (TR) it was never installed.

2. Instrumentation Characteristics

Meteorological station locations, tower base elevations and information pertaining to instrumentation, parameter of measurement, elevation of sensor above tower base and period of record are presented in Table 1.

2.1 Sensors

a) Climet Wind Speed: threshold, 0.6 MPH; accuracy, ± % or ± 0.15 MPH; distance constant, 5 feet. (Distance constant is defined as the feet of air required to pass through the transmitter to give 63% of a sharp change.)

b) Climet Wind Direction: threshold, < 1 MPH; damping ratio, 0.4; accuracy, ± 3°.

c) Aerovane Wind Speed: threshold, 2.5 MPH; distance constanct, 15 feet.

d) Aerovane Wind Direction: distance constant, 34 feet.

e) Net Exchange Thermal Radiometer: temperature compensation to an accuracy of ± 1% over a range of –20 to ±160° F.

f) R. M. Young-Gill Bivane: threshold, 0.3-0.5 MPH for both azimuth and eletion.

g) Honeywell-Brown Resistance Bulb: when placed in specially designed wells, the time constant is about 3 minutes in a wind of 20 fps, the bulbs are in shielded gold leafed cylinders and aspirated at

4.

about 20 fps (Davidson and Halitsky (1955)).

h) Rosemount Nickel Resistance Bulb (Temperature Difference): response time 63% < 90 sec. With 15 fps air flow; accuracy, ± 0.5% at icepoint, linear to 0.05% of full scale; overall accuracy, < ± 0.1° F.

i) Rosemount Nickel Resistance Bulb (Ambient Temperature): same as (h) except overall accuracy, ± 0.1° F.

j) Foxboro Dewcel: if ambient temperature • 32° F, dew point accuracy, ± 0.5° F; if ambient temperature • 0° F < 32° F, dew point accuracy, ± 1.0° F; if ambient temperature < 0° F, dew point accuracy, ± 1.5° F.

Items (h), (i), and (j) are mounted in Climet aspirated shields.

Table 1. Instrumentation Data

Meteorological Station Location	Base Elev. (ft) Above River	Operating Period	Parameter	Instruments	Elev. (ft) Above Base
Indian Point 3 (IP3)	120	1 Jan 70-Present	Wind Speed	Climet	100
			Wind Direction	Climet	100
		1 Jan 70-20 July 71 & 24 July 72-Present	Wind Speed	Aerovane	100
			Wind Direction	Aerovane	100
		14 Aug 70-Present	Net Radiation	Thermal Radiometer	30
		May 70-Dec 70 (Intermittent)	Turbulence	Bivane	100
		1 Jan 70-25 Oct 71	Temperature Difference	Honeywell-Brown Resistance Bulb	95-7
		14 Aug 72-Present	Temperature Difference	Rosemount	10-100
				Nickle Resistance Bulb	10-30
			Ambient Temperature	Rosemount	30
				Nickle Resistance Bulb	
			Dew Point	Foxboro Dew-cel	100, 30, 10
Trap Rock (TR)	90	1 Jan 70-27 July 72	Wind Speed	Climet	100
			Wind Direction	Climet	100
Montrose Point (MP)	60	1 Jan 70-7 June 71	Wind Speed	Climet	100
			Wind Direction	Climet	100
Cape Charles (CC)	0	16 Mar 70-18 Sept 70	Wind Speed	Aerovane	100
			Wind Direction	Aerovane	100

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3.

Table 4. Indian Point 3 Frequency Distribution of Wind Speed and Direction at 100 ft Tower Level According to Temperature Gradient Class-January 1, 1970-December 31, 1970

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
349- 11	I	.0016	.0031	.0046	.0042	.0038	.0019	.0002	.0005	.0000	.0000	.0001	.0200
	N	.0009	.0010	.0018	.0063	.0093	.0086	.0063	.0045	.0006	.0001	.0015	.0408
	L	.0000	.0007	.0010	.0056	.0104	.0071	.0043	.0050	.0003	.0000	.0001	.0346
	M	.0003	.0008	.0007	.0021	.0040	.0047	.0029	.0019	.0002	.0000	.0000	.0176
	T	.0029	.0056	.0081	.0182	.0274	.0223	.0137	.0119	.0011	.0001	.0017	.1131
12- 33	I	.0003	.0022	.0047	.0125	.0102	.0050	.0013	.0002	.0000	.0000	.0002	.0366
	N	.0002	.0016	.0033	.0091	.0131	.0085	.0021	.0022	.0008	.0001	.0018	.0429
	L	.0001	.0006	.0015	.0067	.0073	.0034	.0018	.0025	.0000	.0000	.0001	.0241
	M	.0001	.0010	.0018	.0080	.0085	.0049	.0022	.0006	.0000	.0000	.0000	.0271
	T	.0008	.0054	.0113	.0364	.0391	.0218	.0073	.0055	.0008	.0001	.0022	.1307
34-56	I	.0007	.0031	.0050	.0090	.0041	.0010	.0003	.0000	.0000	.0000	.0006	.0239
	N	.0002	.0006	.0023	.0043	.0032	.0011	.0003	.0003	.0005	.0000	.0011	.0141
	L	.0002	.0009	.0016	.0048	.0043	.0009	.0006	.0007	.0001	.0000	.0002	.0144
	M	.0002	.0009	.0015	.0051	.0048	.0018	.0007	.0001	.0000	.0000	.0000	.0152
	T	.0014	.0055	.0104	.0233	.0165	.0049	.0019	.0011	.0006	.0000	.0019	.0676
57-78	I	.0009	.0017	.0022	.0019	.0007	.0001	.0001	.0000	.0000	.0000	.0000	.0077
	N	.0003	.0006	.0016	.0011	.0007	.0002	.0000	.0001	.0000	.0000	.0005	.0051
	L	.0001	.0005	.0007	.0014	.0003	.0003	.0000	.0005	.0001	.0000	.0002	.0041
	M	.0001	.0001	.0010	.0018	.0013	.0007	.0005	.0000	.0000	.0000	.0000	.0055
	T	.0015	.0029	.0055	.0063	.0030	.0014	.0006	.0006	.0001	.0000	.0007	.0224
79-101	I	.0001	.0013	.0011	.0016	.0007	.0001	.0000	.0002	.0000	.0000	.0000	.0051
	N	.0002	.0005	.0014	.0016	.0011	.0009	.0006	.0000	.0000	.0000	.0002	.0065
	L	.0000	.0006	.0007	.0008	.0005	.0001	.0000	.0003	.0000	.0000	.0000	.0030
	M	.0000	.0005	.0005	.0018	.0007	.0001	.0003	.0001	.0000	.0000	.0000	.0040
	T	.0003	.0027	.0037	.0058	.0030	.0013	.0009	.0007	.0000	.0000	.0002	.0186

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13.

Table 4 (continued)

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
102-123	I	.0005	.0008	.0011	.0011	.0011	.0000	.0001	.0000	.0000	.0000	.0001	.0049
	N	.0005	.0015	.0009	.0014	.0015	.0007	.0006	.0003	.0000	.0000	.0003	.0077
	L	.0001	.0005	.0006	.0018	.0002	.0008	.0002	.0002	.0000	.0000	.0000	.0045
	M	.0003	.0006	.0007	.0006	.0010	.0006	.0008	.0001	.0000	.0000	.0000	.0047
	T	.0014	.0033	.0033	.0049	.0039	.0021	.0017	.0007	.0000	.0000	.0005	.0217
124-146	I	.0003	.0014	.0023	.0019	.0014	.0006	.0000	.0000	.0001	.0000	.0001	.0081
	N	.0003	.0010	.0014	.0032	.0027	.0018	.0006	.0006	.0003	.0000	.0001	.0121
	L	.0001	.0006	.0016	.0018	.0015	.0026	.0009	.0017	.0002	.0000	.0000	.0111
	M	.0003	.0009	.0005	.0015	.0022	.0007	.0001	.0002	.0000	.0000	.0000	.0064
	T	.0011	.0039	.0057	.0085	.0078	.0057	.0016	.0025	.0007	.0000	.0002	.0377
147-168	I	.0007	.0015	.0027	.0047	.0040	.0014	.0002	.0002	.0003	.0001	.0000	.0159
	N	.0002	.0008	.0011	.0039	.0064	.0037	.0022	.0035	.0003	.0000	.0002	.0224
	L	.0003	.0003	.0022	.0050	.0098	.0081	.0080	.0110	.0001	.0000	.0001	.0450
	M	.0001	.0005	.0011	.0043	.0057	.0027	.0015	.0003	.0000	.0000	.0000	.0163
	T	.0014	.0031	.0072	.0179	.0260	.0159	.0119	.0151	.0008	.0001	.0003	.0997
169-191	I	.0003	.0013	.0021	.0058	.0047	.0014	.0010	.0002	.0002	.0003	.0000	.0174
	N	.0001	.0005	.0013	.0043	.0049	.0026	.0014	.0005	.0000	.0000	.0001	.0157
	L	.0002	.0010	.0022	.0106	.0101	.0046	.0046	.0027	.0000	.0000	.0003	.0364
	M	.0002	.0005	.0014	.0037	.0065	.0034	.0009	.0007	.0000	.0000	.0000	.0173
	T	.0009	.0032	.0069	.0245	.0262	.0120	.0079	.0041	.0002	.0003	.0005	.0867
192-213	I	.0002	.0021	.0032	.0071	.0040	.0022	.0011	.0002	.0000	.0000	.0002	.0203
	N	.0003	.0006	.0016	.0025	.0013	.0013	.0013	.0008	.0000	.0000	.0000	.0096
	L	.0001	.0002	.0022	.0065	.0039	.0023	.0019	.0008	.0000	.0000	.0001	.0181
	M	.0001	.0003	.0007	.0041	.0032	.0021	.0003	.0002	.0000	.0000	.0000	.0111
	T	.0008	.0032	.0077	.0202	0123	.0078	.0047	.0021	.0000	.0000	.0003	.0591

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14.

Table 4 (continued)

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
214-236	I	.0011	.0022	.0027	.0062	.0032	.0009	.0008	.0005	.0001	.0000	.0002	.0179
	N	.0002	.0010	.0008	.0014	.0009	.0007	.0003	.0002	.0001	.0001	.0001	.0059
	L	.0000	.0014	.0010	.0042	.0010	.0007	.0010	.0014	.0000	.0000	.0002	.0110
	M	.0001	.0002	.0011	.0031	.0015	.0003	.0002	.0002	.0000	.0000	.0000	.0069
	T	.0015	.0048	.0057	.0149	.0066	.0026	.0024	.0023	.0002	.0001	.0006	.0417
237-258	I	.0007	.0018	.0021	.0021	.0017	.0008	.0013	.0006	.0006	.0000	.0002	.0118
	N	.0000	.0003	.0005	.0010	.0010	.0003	.0003	.0008	.0002	.0001	.0000	.0047
	L	.0003	.0011	.0010	.0014	.0006	.0007	.0007	.0009	.0000	.0000	.0001	.0069
	M	.0000	.0005	.0005	.0007	.0006	.0002	.0001	.0007	.0000	.0000	.0000	.0032
	T	.0010	.0038	.0040	.0051	.0039	.0021	.0024	.0030	.0008	.0001	.0003	.0265
259-281	I	.0009	.0017	.0013	.0008	.0015	.0014	.0006	.0008	.0007	.0003	.0001	.0101
	N	.0001	.0009	.0005	.0008	.0009	.0016	.0009	.0021	.0010	.0002	.0000	.0090
	L	.0001	.0003	.0007	.0017	.0016	.0023	.0018	.0027	.0006	.0001	.0007	.0127
	M	.0000	.0005	.0005	.0006	.0007	.0005	.0008	.0007	.0001	.0000	.0000	.0042
	T	.0011	.0034	.0029	.0039	.0047	.0057	.0041	.0063	.0024	.0007	.0008	.0360
282-303	I	.0005	.0013	.0011	.0003	.0005	.0009	.0014	.0022	.0016	.0010	.0000	.0107
	N	.0001	.0003	.0006	.0003	.0010	.0019	.0033	.0114	.0070	.0011	.0000	.0272
	L	.0006	.0006	.0002	.0011	.0014	.0029	.0015	.0101	.0042	.0017	.0011	.0254
	M	.0000	.0003	.0001	.0005	.0010	.0006	.0009	.0023	.0002	.0003	.0000	.0063
	T	.0011	.0025	.0021	.0023	.0039	.0063	.0071	.0260	.0130	.0042	.0011	.0696
304-326	I	.0005	.0014	.0009	.0006	.0009	.0008	.0007	.0018	.0006	.0002	.0000	.0083
	N	.0003	.0006	.0001	.0010	.0022	.0026	.0047	.0162	.0048	.0016	.0001	.0343
	L	.0001	.0002	.0006	.0010	.0014	.0030	.0033	.0088	.0064	.0025	.0005	.0278
	M	.0000	.0005	.0002	.0010	.0006	.0007	.0026	.0056	.0015	.0003	.0000	.0130
	T	.0009	.0026	.0018	.0037	.0050	.0071	.0113	.0325	.0133	.0047	.0006	.0835

Table 4 (continued)

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
327-348	I	.0009	.0015	.0015	.0016	.0011	.0009	.0006	.0010	.0000	.0000	.0001	.0093
	N	.0001	.0005	.0008	.0034	.0033	.0034	.0049	.0083	.0015	.0000	.0002	.0265
	L	.0002	.0005	.0005	.0026	.0043	.0027	.0031	.0077	.0016	.0002	.0000	.0234
	M	.0000	.0005	.0008	.0008	.0011	.0022	.0027	.0053	.0009	.0001	.0000	.0144
	T	.0013	.0029	.0035	.0085	.0099	.0093	.0113	.0223	.0040	.0003	.0003	.0736
Calm	I	.0000										.0000	.0000
	N	.0000										.0000	.0000
	L	.0000										.0000	.0000
	M	.0000										.0000	.0000
	T	.0000										.0000	.0000
Miss	I	.0001	.0003	.0007	.0005	.0003	.0002	.0001	.0003	.0000	.0000	.0017	.0043
	N	.0000	.0000	.0000	.0000	.0000	.0001	.0005	.0010	.0009	.0000	.0010	.0035
	L	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0001	.0024	.0027
	M	.0000	.0000	.0001	.0000	.0006	.0002	.0002	.0000	.0000	.0000		.0011
	T	.0001	.0003	.0008	.0005	.0009	.0006	.0008	.0014	.0011	.0001	.0051	.0118
Total	I	.0104	.0285	.0393	.0620	.0439	.0197	.0098	.0088	.0042	.0021	.0038	.2324
	N	.0043	.0122	.0199	.0458	.0536	.0401	.0302	.0529	.0181	.0034	.0074	.2881
	L	.0027	.0099	.0182	.0573	.0586	.0425	.0338	.0570	.0139	.0047	.0063	.3051
	M	.0021	.0085	.0131	.0397	.0439	.0264	.0178	.0191	.0030	.0009	.0000	.1743
	T	.0195	.0591	.0905	.2048	.2001	.1287	.0917	.1379	.0392	.0110	.0175	1.0000

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Table 5. Indian Point 3 Frequency Distribution of Wind Speed and Direction at 100 ft Tower Level According to Temperature Gradient Class-January 1, 1971-December 31, 1971

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
349- 11	I	.0007	.0023	.0041	.0071	.0063	.0041	.0013	.0019	.0003	.0007	.0000	.0288
	N	.0001	.0005	.0009	.0041	.0065	.0050	.0018	.0046	.0008	.0002	.0002	.0248
	L	.0000	.0005	.0010	.0050	.0067	.0047	.0033	.0037	.0011	.0000	.0001	.0262
	M	.0002	.0021	.0031	.0078	.0121	.0074	.0067	.0031	.0000	.0006	.0008	.0439
	T	.0010	.0053	.0091	.0240	.0317	.0213	.0132	.0133	.0023	.0015	.0011	.1237
12- 33	I	.0005	.0033	.0039	.0150	.0169	.0053	.0016	.0018	.0000	.0000	.0000	.0483
	N	.0001	.0011	.0010	.0037	.0070	.0047	.0032	.0016	.0001	.0000	.0000	.0225
	L	.0001	.0002	.0007	.0045	.0043	.0021	.0003	.0007	.0000	.0000	.0001	.0130
	M	.0002	.0023	.0041	.0136	.0145	.0096	.0040	.0022	.0006	.0000	.0002	.0513
	T	.0009	.0070	.0097	.0367	.0428	.0216	.0091	.0063	.0007	.0000	.0003	.1352
34- 56	I	.0002	.0030	.0051	.0070	.0045	.0008	.0001	.0000	.0000	.0000	.0000	.0207
	N	.0001	.0010	.0017	.0025	.0023	.0010	.0001	.0006	.0001	.0000	.0010	.0105
	L	.0001	.0005	.0013	.0022	.0009	.0008	.0001	.0000	.0000	.0000	.0001	.0059
	M	.0002	.0018	.0048	.0096	.0080	.0024	.0009	.0003	.0002	.0000	.0000	.0284
	T	.0007	.0063	.0129	.0213	.0157	.0050	.0013	.0009	.0003	.0000	.0011	.0655
57- 78	I	.0001	.0017	.0027	.0023	.0005	.0003	.0001	.0000	.0000	.0000	.0000	.0078
	N	.0001	.0005	.0006	.0010	.0007	.0016	.0002	.0001	.0000	.0000	.0002	.0050
	L	.0002	.0003	.0001	.0009	.0001	.0002	.0006	.0002	.0000	.0000	.0000	.0027
	M	.0002	.0017	.0022	.0035	.0032	.0006	.0000	.0000	.0000	.0000	.0000	.0114
	T	.0007	.0042	.0056	.0078	.0045	.0027	.0009	.0003	.0000	.0000	.0002	.0270
79-101	I	.0002	.0009	.0017	.0016	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0047
	N	.0001	.0005	.0009	.0013	.0008	.0005	.0001	.0000	.0000	.0000	.0000	.0041
	L	.0000	.0003	.0002	.0000	.0005	.0007	.0001	.0000	.0000	.0000	.0000	.0018
	M	.0003	.0021	.0016	.0024	.0013	.0003	.0000	.0000	.0000	.0000	.0000	.0080
	T	.0007	.0038	.0045	.0053	.0027	.0015	.0002	.0000	.0000	.0000	.0000	.0186

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Table 5 (continued)

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
102-123	I	.0002	.0015	.0016	.0024	.0008	.0001	.0000	.0000	.0000	.0000	.0000	.0066
	N	.0000	.0008	.0002	.0010	.0011	.0001	.0001	.0000	.0000	.0000	.0000	.0034
	L	.0001	.0003	.0003	.0010	.0003	.0003	.0003	.0002	.0000	.0000	.0000	.0031
	M	.0000	.0011	.0021	.0019	.0009	.0001	.0000	.0001	.0000	.0000.	.0000	.0063
	T	.0003	.0038	.0042	.0064	.0032	.0007	.0005	.0003	.0000	.0000	.0000	.0194
124-146	I	.0003	.0021	.0015	.0046	.0030	.0007	.0000	.0001	.0000	.0000	.0000	.0122
	N	.0000	.0008	.0005	.0015	.0030	.0011	.0008	.0008	.0000	.0000	.0000	.0085
	L	.0000	.0002	.0005	.0011	.0009	.0021	.0015	.0022	.0001	.0000	.0000	.0086
	M	.0001	.0011	.0007	.0029	.0023	.0017	.0014	.0015	.0002	.0002	.0000	.0121
	T	.0005	.0042	.0031	.0101	.0091	.0056	.0037	.0046	.0003	.0002	.0000	.0414
147-168	I	.0005	.0010	.0026	.0051	.0047	.0025	.0007	.0005	.0000	.0000	.0000	.0176
	N	.0000	.0006	.0005	.0032	.0018	.0019	.0022	.0017	.0000	.0000	.0000	.0119
	L	.0000	.0003	.0011	.0047	.0053	.0051	.0048	.0024	.0003	.0000	.0000	.0241
	M	.0000	.0015	.0021	.0071	.0088	.0046	.0022	.0027	.0000	.0002	.0000	.0292
	T	.0005	.0034	.0063	.0201	.0206	.0142	.0098	.0073	.0003	.0002	.0000	.0828
169-191	I	.0002	.0016	.0038	.0070	.0055	.0017	.0001	.0006	.0001	.0000	.0000	.0206
	N	.0000	.0003	.0005	.0018	.0017	.0014	.0006	.0011	.0000	.0000	.0000	.0074
	L	.0000	.0005	.0015	.0055	.0045	.0023	.0019	.0013	.0000	.0000	.0000	.0174
	M	.0001	.0019	.0027	.0090	.0079	.0034	.0030	.0022	.0000	.0000	.0000	.0303
	T	.0003	.0043	.0085	.0233	.0196	.0088	.0056	.0051	.0001	.0000	.0000	.0757
192-213	I	.0005	.0017	.0034	.0051	.0042	.0021	.0007	.0003	.0002	.0000	.0000	.0183
	N	.0001	.0002	.0005	.0010	.0007	.0006	.0006	.0006	.0001	.0000	.0000	.0043
	L	.0000	.0003	.0008	.0032	.0017	.0009	.0014	.0009	.0000	.0000	.0000	.0093
	M	.0000	.0015	.0031	.0061	.0061	.0039	.0013	.0006	.0000	.0000	.0002	.0226
	T	.0006	.0038	.0078	.0154	.0127	.0074	.0039	.0024	.0003	.0000	.0002	.0545

Table 5 (continued)

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
214-236	I	.0001	.0014	.0023	.0033	.0024	.0010	.0003	.0011	.0001	.0000	.0000	.0121
	N	.0000	.0006	.0005	.0007	.0002	.0009	.0005	.0017	.0002	.0001	.0000	.0054
	L	.0001	.0006	.0010	.0018	.0006	.0007	.0002	.0014	.0001	.0000	.0000	.0065
	M	.0002	.0013	.0025	.0046	.0025	.0010	.0008	.0007	.0000	.0000	.0003	.0140
	T	.0005	.0038	.0063	.0104	.0057	.0037	.0018	.0049	.0005	.0001	.0003	.0380
237-258	I	.0005	.0021	.0019	.0024	.0018	.0021	.0007	.0013	.0007	.0002	.0000	.0136
	N	.0001	.0003	.0005	.0002	.0009	.0014	.0013	.0016	.0006	.0001	.0000	.0070
	L	.0000	.0002	.0003	.0018	.0007	.0007	.0011	.0035	.0014	.0006	.0000	.0104
	M	.0002	.0014	.0013	.0015	.0021	.0006	.0006	.0006	.0000	.0000	.0001	.0082
	T	.0008	.0040	.0040	.0059	.0055	.0047	.0037	.0070	.0026	.0009	.0001	.0392
259-281	I	.0003	.0016	.0013	.0017	.0016	.0019	.0016	.0013	.0007	.0001	.0000	.0121
	N	.0001	.0002	.0000	.0000	.0009	.0013	.0024	.0053	.0013	.0001	.0000	.0115
	L	.0000	.0003	.0003	.0005	.0015	.0027	.0021	.0038	.0023	.0003	.0000	.0138
	M	.0005	.0013	.0014	.0016	.0022	.0023	.0016	.0030	.0014	.0000	.0001	.0152
	T	.0009	.0034	.0030	.0038	.0062	.0082	.0077	.0133	.0056	.0006	.0001	.0527
282-303	I	.0008	.0014	.0009	.0010	.0014	.0017	.0024	.0029	.0008	.0001	.0001	.0135
	N	.0001	.0002	.0003	.0002	.0008	.0023	.0030	.0069	.0024	.0013	.0013	.0188
	L	.0001	.0001	.0009	.0009	.0008	.0023	.0035	.0090	.0041	.0010	.0000	.0229
	M	.0006	.0008	.0014	.0014	.0024	.0025	.0030	.0080	.0024	.0009	.0001	.0234
	T	.0016	.0025	.0035	.0035	.0054	.0088	.0119	.0268	.0097	.0033	.0015	.0786
304-326	I	.0001	.0017	.0005	.0010	.0013	.0019	.0023	.0029	.0003	.0001	.0000	.0121
	N	.0000	.0002	.0002	.0003	.0003	.0015	.0032	.0072	.0011	.0003	.0002	.0148
	L	.0001	.0010	.0006	.0007	.0018	.0023	.0015	.0079	.0041	.0005	.0000	.0205
	M	.0005	.0008	.0010	.0006	.0025	.0030	.0040	.0113	.0056	.0008	.0000	.0301
	T	.0007	.0038	.0023	.0026	.0059	.0087	.0110	.0293	.0112	.0017	.0002	.0774

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Table 5 (continued)

Wind Direction	Temp. Grad.	Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
327-348	I	.0006	.0021	.0011	.0017	.0018	.0010	.0014	.0015	.0002	.0000	.0000	.0114
	N	.0001	.0002	.0002	.0003	.0017	.0017	.0023	.0040	.0003	.0001	.0001	.0112
	L	.0000	.0000	.0003	.0017	.0035	.0040	.0019	.0053	.0005	.0002	.0000	.0175
	M	.0000	.0010	.0014	.0025	.0031	.0042	.0039	.0095	.0032	.0003	.0006	.0297
	T	.0007	.0033	.0031	.0063	.0102	.0110	.0095	.0202	.0042	.0007	.0007	.0699
Calm	I	.0000										.0000	.0000
	N	.0000										.0000	.0000
	L	.0000										.0000	.0000
	M	.0000										.0000	.0000
	T	.0000										.0000	.0000
Miss	I	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	N	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001
	L	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0002
	M	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	T	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0003	.0003
Total	I	.0058	.0293	.0385	.0684	.0568	.0273	.0133	.0161	.0035	.0013	.0001	.2605
	N	.0011	.0081	.0089	.0230	.0305	.0270	.0223	.0377	.0071	.0023	.0032	.1713
	L	.0009	.0058	.0111	.0356	.0342	.0319	.0248	.0424	.0141	.0026	.0006	.2040
	M	.0034	.0237	.0353	.0760	.0798	.0477	.0333	.0457	.0136	.0031	.0025	.3642
	T	.0113	.0669	.0939	.2030	.2014	.1339	.0937	.1420	.0383	.0093	.0064	1.0000

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Table 6. Trap Rock Frequency Distribution of Wind Speed and Direction
January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
349- 11	N	.0049	.0113	.0146	.0247	.0203	.0155	.0117	.0170	.0030	.0013	.0029	.1271
12- 33	NNE	.0024	.0101	.0137	.0244	.0215	.0087	.0051	.0034	.0007	.0002	.0022	.0925
34- 56	NE	.0035	.0088	.0105	.0118	.0086	.0024	.0005	.0009	.0005	.0000	.0007	.0481
57- 78	ENE	.0021	.0047	.0058	.0052	.0015	.0003	.0001	.0008	.0000	.0000	.0002	.0208
79-101	E	.0012	.0028	.0036	.0056	.0028	.0012	.0003	.0003	.0000	.0000	.0001	.0178
102-123	ESE	.0020	.0038	.0039	.0058	.0046	.0022	.0009	.0007	.0001	.0000	.0000	.0241
124-146	SE	.0012	.0044	.0058	.0146	.0152	.0130	.0081	.0133	.0027	.0002	.0002	.0786
147-168	SSE	.0019	.0057	.0109	.0210	.0208	.0126	.0075	.0111	.0010	.0007	.0003	.0935
169-191	S	.0012	.0072	.0084	.0178	.0141	.0084	.0050	.0041	.0001	.0000	.0008	.0671
192-213	SSW	.0021	.0057	.0088	.0130	.0091	.0036	.0027	.0023	.0002	.0001	.0007	.0483
214-236	SW	.0029	.0064	.0065	.0075	.0031	.0024	.0013	.0029	.0001	.0005	.0002	.0338
237-258	WSW	.0028	.0041	.0025	.0045	.0038	.0029	.0028	.0024	.0005	.0005	.0000	.0267
259-281	W	.0023	.0038	.0027	.0034	.0043	.0051	.0042	.0083	.0030	.0012	.0001	.0383
282-303	WNW	.0022	.0038	.0031	.0065	.0073	.0089	.0079	.0204	.0091	.0056	.0010	.0758
304-326	NW	.0023	.0047	.0049	.0081	.0109	.0131	.0087	.0306	.0191	.0076	.0030	.1130
327-348	NNW	.0038	.0087	.0079	.0145	.0139	.0114	.0076	.0139	.0031	.0030	.0020	.0898
Calm		.0000											.0000
Miss		.0000	.0003	.0005	.0023	.0012	.0001	.0000	.0001	.0001	.0000		.0046
Total		.0385	.0963	.1140	.1905	.1630	.1117	.0743	.1326	.0434	.0208	.0146	1.0000

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Table 7. Trap Rock Frequency Distribution of Wind Speed and Direction
January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
349- 11	N	.0011	.0105	.0123	.0240	.0217	.0166	.0126	.0266	.0041	.0030	.0002	.1328
12- 33	NNE	.0015	.0061	.0159	.0375	.0281	.0145	.0046	.0037	.0002	.0001	.0008	.1130
34- 56	NE	.0012	.0070	.0078	.0231	.0120	.0044	.0013	.0013	.0001	.0000	.0007	.0590
57- 78	ENE	.0007	.0033	.0055	.0069	.0032	.0012	.0004	.0001	.0001	.0000	.0001	.0214
79-101	E	.0008	.0033	.0033	.0040	.0025	.0009	.0004	.0000	.0000	.0000	.0001	.0152
102-123	ESE	.0011	.0027	.0027	.0071	.0046	.0013	.0009	.0002	.0000	.0000	.0001	.0207
124-146	SE	.0006	.0019	.0036	.0091	.0139	.0099	.0079	.0084	.0007	.0001	.0002	.0565
147-168	SSE	.0007	.0040	.0084	.0179	.0188	.0122	.0086	.0081	.0009	.0001	.0000	.0797
169-191	S	.0015	.0033	.0078	.0161	.0124	.0067	.0041	.0043	.0002	.0001	.0001	.0567
192-213	SSW	.0012	.0047	.0079	.0145	.0099	.0061	.0033	.0027	.0000	.0000	.0008	.0511
214-236	SW	.0012	.0047	.0068	.0120	.0058	.0029	.0025	.0037	.0000	.0002	.0008	.0407
237-258	WSW	.0018	.0053	.0044	.0040	.0047	.0033	.0037	.0071	.0027	.0009	.0008	.0387
259-281	W	.0013	.0040	.0029	.0044	.0053	.0047	.0057	.0106	.0042	.0009	.0016	.0457
282-303	WNW	.0013	.0044	.0029	.0042	.0088	.0111	.0118	.0261	.0085	.0034	.0027	.0852
304-326	NW	.0013	.0057	.0037	.0047	.0071	.0129	.0117	.0360	.0161	.0037	.0022	.1052
327-348	NNW	.0014	.0083	.0077	.0090	.0094	.0113	.0092	.0139	.0026	.0007	.0013	.0748
Calm		.0000											.0000
Miss		.0000	.0000	.0005	.0012	.0005	.0005	.0004	.0005	.0001	.0002		.0037
Total		.0185	.0790	.1043	.1997	.1685	.1204	.0891	.1535	.0407	.0137	.0127	1.0000

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Table 8. Montrose Frequency Distribution of Wind Speed and Direction
January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (m/s) 0.0-0.5	>0.5-1.0	>1.0-1.5	>1.5-2.5	>2.5-3.5	>3.5-4.5	>4.5-5.5	>5.5-8.5	>8.5-11.0	>11.0	Miss	Total
349- 11	N	.0038	.0072	.0054	.0084	.0143	.0099	.0050	.0067	.0010	.0003	.0123	.0743
12- 33	NNE	.0033	.0064	.0125	.0294	.0200	.0102	.0077	.0078	.0011	.0000	.0241	.1224
34- 56	NE	.0024	.0065	.0092	.0203	.0146	.0054	.0016	.0010	.0001	.0000	.0223	.0834
57- 78	ENE	.0016	.0037	.0052	.0038	.0033	.0009	.0001	.0013	.0001	.0000	.0078	.0278
79-101	E	.0010	.0027	.0014	.0044	.0009	.0004	.0009	.0007	.0004	.0000	.0065	.0193
102-123	ESE	.0016	.0028	.0023	.0043	.0021	.0007	.0001	.0006	.0000	.0000	.0047	.0191
124-146	SE	.0013	.0035	.0060	.0102	.0094	.0054	.0020	.0010	.0000	.0000	.0098	.0485
147-168	SSE	.0007	.0026	.0082	.0271	.0240	.0184	.0081	.0070	.0001	.0001	.0160	.1123
169-191	S	.0009	.0030	.0075	.0153	.0133	.0079	.0026	.0011	.0003	.0006	.0140	.0665
192-213	SSW	.0017	.0037	.0051	.0108	.0092	.0058	.0026	.0016	.0001	.0001	.0148	.0555
214-236	SW	.0023	.0045	.0072	.0082	.0044	.0033	.0020	.0026	.0006	.0003	.0099	.0452
237-258	WSW	.0021	.0037	.0045	.0052	.0024	.0013	.0016	.0023	.0007	.0003	.0071	.0312
259-281	W	.0023	.0028	.0030	.0034	.0035	.0038	.0031	.0058	.0011	.0011	.0070	.0370
282-303	WNW	.0017	.0026	.0021	.0030	.0047	.0044	.0051	.0148	.0079	.0028	.0068	.0559
304-326	NW	.0018	.0024	.0020	.0045	.0058	.0067	.0084	.0262	.0148	.0050	.0135	.0911
327-348	NNW	.0040	.0034	.0031	.0045	.0071	.0065	.0081	.0200	.0047	.0007	.0119	.0740
Calm		.0000											.0000
Miss		.0054	.0060	.0070	.0085	.0058	.0021	.0010	.0003	.0003	.0000		.0363
Total		.0377	.0675	.0918	.1712	.1448	.0932	.0597	.1006	.0335	.0113	.1885	1.000

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25.

2.2 Recorders

All instruments produce ink trace records on strip chart analog recorders. Items (a) and (b) use Esterline Angus continuous trace recorders at chart speed of 3 in./hr. Items (c) and (d) use a Bendix-Friez continuous trace recorder at chart speed of 3 in./hr. Item (e) uses a continuous trace recorder at chart speed of 1 in./hr. Item (f) uses a Texas Instrument dual channel continuous trace recorder for elevation and azimuth readings at chart speeds of either 3 in./hr. or 3 in./min. Item (g) uses a 6 channel Honeywell-Brown dot print recorder with a three minute recording cycle. Items (h), (i) and (j) use a common 8 point Bristol recorder which dot prints every 30 seconds at a chart speed of 3 in./hr.

3. Data Log

A monthly tabulation of days in which 12 or more hours of missing data occurred during the period of data collection

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ts. Complete breakdowns due to lightning strikes on the Montrose Point and Trap Rock towers were another source of data loss.

A special reference must be made to the Honeywell-Brown temperature difference system. One of the initial purposes for data collection at Indian Point was to determine initial data from January 1970-December 1971 is presented in Table 2. Data collected beyond this period is indicated as well as instrumentation activation and termination dates.

Data recovery information is given in Table 3. Most data loss occurred when instruments were out of service for repair or when data were deemed erroneous due to improper functioning of instruments. Major instrumentation difficulties included: for the Climet wind system, speed head bearing failures and hypersensitivity of the directional module; and for the Honeywell-Brown Temperature Difference system, aspirator failures due to corroded connections and loss of calibration due to unobserved deterioration of recorder componen f any climatic changes had occurred since 1955-57 that could be detrimental to the Indian Point accident model. It was felt that the utilization of the exact instruments used in 1955-57 would facilitate the evaluation. The original Honeywell-Brown system was rehabilitated and placed in operation. Because of age factors it became difficult to maintain temperature difference data recovery at greater than 70-80% after July 1970. The amount of valid data output, however, was considered sufficient to meet its original function. As it became apparent that a reliable, continuously operating temperature difference system was a necessity, and with the complete breakdown of the aging system on 25 October 1971, a new system was acquired and subsequently installed on 14 August 1972.

4. Analytical Procedure

4.1 Wind Direction

To facilitate the development of the statistical analysis, the parameter categories were standardized on the basis of sixteen compass point (22 1/2° sectors) as opposed to eighteen 20° sectors from 002 1/2° as used by Davidson. IP1 No recovery information indicated.

Table 3. Record of Data Recovery

Station	Parameter	Period	Hours of Valid Data	Total Hours in Period	% Recovery
IP3	Wind Direction (Climet)	Annual 1970	8644	8760	98.68
		Summer 1970	5072	5136	98.75
		Winter 1970	3572	3624	98.57
		Annual 1971	8742	8760	99.80
		Summer 1971	4406	4416	99.77
		Winter 1971	4336	4344	99.82
	Wind Speed (Climet)	Annual 1970	8594	8760	98.11
		Summer 1970	5019	5136	97.72
		Winter 1970	3575	3624	98.65
		Annual 1971	8689	8760	99.19
		Summer 1971	4381	4416	99.21
		Winter 1971	4308	4344	99.17
	Wind Direction (Aerovane)	Summer 1970 (Partial: until Sept. 18)	4003	4104	97.54
	Wind Speed (Aerovane)	Summer 1970 (Partial: until Sept. 18)	4001	4104	97.49
	Temperature Difference	Annual 1970	7222	8760	82.44
		Annual 1971	5560	8760	63.47
TR	Wind Direction	Annual 1970	8600	8760	98.17
		Summer 1970	4983	5136	97.02
		Winter 1970	3617	3624	99.81
		Annual 1971	8524	8760	97.31
		Summer 1971	4242	4416	96.06
		Winter 1971	4282	4344	98.57
	Wind Speed	Annual 1970	8514	8760	97.19
		Summer 1970	5018	5136	97.70
		Winter 1970	3496	3624	96.47
		Annual 1971	8447	8760	96.43

		Summer 1971	4243	4416	96.08
		Winter 1971	4204	4344	96.78

Table 3 (continued)

Station	Parameter	Hours of Valid Period	Total Hours in Data	% Period	Recovery
MP	Wind Direction	Annual 1970	6794	8760	77.56
		Summer	4045	5136	78.76
	Wind Speed	Annual 1970	5721	8760	65.31
		Summer	3140	5136	61.14
CC	Wind Direction	Summer 1970	4093	4104	99.73
	Wind Speed	Summer 1970	4091	4104	99.68

The frequency density for each wind quadrant is determined by:

$$f = \frac{n}{(N-m)^{\theta}}$$

where:

f = frequency density

n = number of data hours in a specified category

N = total number of hours possible for a selected time period

m = number of hours for which no data was available

u = sector interval (Note: 20.0° for 1955-1957 data and 22.5° for 1970-1971 data.)

The sum of the sector frequency densities is equal to 1. Calm and missing data are assumed to be equally distributed throughout the compass and are divided by a sector width of 360°.

4.2 Wind Speed

Wind speeds are presented in m/s. (For conversion to mph, multiply by 2.237) The number of speed categories were increased at low end to provide more detailing of the speed distribution in this critical range.

For wind speeds, the frequency is defined by

$$F_x = \frac{n_x}{(N-m)}$$

where:

F_x = frequency in a class interval

n_x = number of data hours within a specified interval

N = total number of hours possible for a selected time period

m = number of hours for which no data was available

The percent probability is defined by

$$P_x = \left[\frac{n_x}{(N-m)+1}\right] x100$$

The cumulative percent probability is defined by

$$CP = \sum_{i=1}^{i=x} P_i$$

where:

i = number of class intervals.

When CP is plotted, a point on the curve is read as the percent time that the wind speed • indicated value.

4.3 Stability Categories

4.31 Atmospheric Stability Categories Defined in Terms of Temperature Difference

Class		IP1 – 1955-57 (300 ft tower)	IP3 – 1970-71 (100 ft tower)
I =	Inversion ("stable")	$T_{150} - T_7 \geq 0$	$T_{95} - T_7 \geq 0$
N =	Isothermal-Adiabatic ("neutral")	$0 > T_{150} - T_7 \geq -0.98$	$0 > T_{95} - T_7 \geq -0.58F$
L =	Lapse ("unstable")	$-0.98F > T_{150} - T_7$	$-0.58F > T_{95} - T_7$

4.32 Classification of Atmospheric Stability According to U. S. A. E. C. Safety Guide 23

Stablity Classification	Pasquill Categories	Temperature Change with Height (8C/100m)	(°F/88 ft) (IP3)
Extremely Unstable	A	< -1.9	< -0.9
Moderately Unstable	B	-1.9 to –1.7	-0.9 to < -0.8
Slightly Unstable	C	-1.7 to –1.5	-0.8 to < -0.7
Neutral	D	-1.5 to –0.5	-0.7 to < -0.2
Slightly Stable	E	-0.5 to 1.5	-0.2 to < +0.7
Moderately Stable	F	1.5 to 4.0	+0.7 to <1.9
Extremely Stable	G	>4.0	$1.9

4.4 Seasonal Distributions

After careful examination of individual monthly frequency distributions it was determined that a definite seasonal effect existed. Two distinct seasons emerge: summer and winter, with no distinctive transition months. November-March are always "winter" months and May-September always "summer" months. April and October distribution patterns may appropriately fit either a winter or summer season. There was no means of predicting, in advance, what season was appropriate for these two months until the actual data was analyzed. The seasonal breakdown, as used, is as follows:

	Winter	Summer
1970	January-March, November-December (5 months)	April-October (7 months)
1971	January-April, November-December (6 months)	May-October (6 months)

4.5 Diurnal Analysis

The hourly diurnal mean wind direction and speed were determined by resolving each individual data point into its N-S and E-W components, summing the components within each hourly category and calculating a mean wind direction and speed. When plotting the diurnal direction curve it is assumed that the rotation of the mean between two points will circumvent the smallest arc.

Persistence is defined as,

$$P = \frac{\text{Vector Average Speed}\left(\left|\overline{\vec{V}}\right|\right)}{\text{Magnitude of Scalar Average Speed}\left(\left|\overline{V}\right|\right)}$$

4.6 Spatial Variation

The spatial relationship of wind direction and speed between two tower sites was determined by selecting the category range at one station as the independent variable and calculating a frequency distribution and mean value at the second station for each of the independent variable's categories. This method assumes a gaussian distribution around the mean value at the independent station.

5. Discussion of Data

5.1 Joint Frequency Distribution of Wind Direction, Wind Speed and Temperature Difference

5.1.1 Inversion – Neutral – Lapse Temperature Difference Classification

Annual frequency distributions of wind speed and direction according to temperature gradient class at Indian Point 3 for 1970 and 1971 are given in Tables 4 and 5, respectively.

5.1.2 Pasquill Stability Classification

Annual joint frequency distributions of wind direction and speed according to the Pasquill stability categories, as established by the U. S. A. E. C. Safety Guide 23, at Indian Point 3 for 1970 and 1971 are given in Appendix Table 1 and 2, respectively.

5.2 Joint Frequency Distribution of Wind Direction and Temperature Difference

5.2.1 Monthly Distribution of Temperature Difference

A monthly distribution of temperature difference at IP3 for 1970 and 1971 is given in Figure 2. The distribution for missing hours of temperature difference data is also presented so that a measure of reliability can be determined.

The frequency of inversions remain relatively constant throughout the year. Neutral conditions are more frequent during the winter months while lapse conditions reach their peak during the summer months. These features seem most apparent during those time periods, in both years, when data collection efficiency was greater than 80%.

5.2.2 Annual Joint Frequency Distribution

The annual frequency distributions of wind direction according to temperature difference category for IP1 (1956) and IP3 (1970 and 1971) are presented in Figure 3.

For inversion conditions, a marked discrepancy is observed between the 1956 and 1970-71 data. Substantial decreases are observed in the frequency of observed inversions during 1970-71 in all quadrants except those between 050 to 160°. The reduction is by a factor of 0.50 in some sectors. The cause of this deviation may be due to one, or more of the following: a) different tower locations; b) different measurement height intervals ((150-7 ft (1956) and 95-7 ft (1970-71)); c) change in the surrounding environs (the area is now more developed); or d) a calibration error ((only 0.9°F (1956) and 0.5°F (1970-71)) separate inversions from lapse conditions).

The distribution for neutral and lapse conditions between 1956 and 1970-71 are generally similar. The neutral maxima are from the same quadrant (NNE) as the inversion for all years. Under lapse conditions, maximums are observed of approximately equal magnitude for winds from the N and SSE quadrants.

Major discrepancies between the 1970 and 1971 data occur in the neutral category from 300° -030° and in the lapse category from 140° -200°. These can be attributed to periods of missing data. The decrease in frequency of neutral condition northerly winds in 1971 may be due to missing data during October-December. A strong northwesterly wind persists during these months resulting in dominating neutral atmospheric conditions. The decrease in frequency of lapse conditions for southerly winds in 1971 may be due to data loss during May-July. These are the months in which lapse conditions normally prevail.

In general, throughout 1970-71 most specific descrepancies are associated with periods of maximum data losses.

5.3 Joint Frequency Distribution of Wind Direction and Wind Speed

The annual joint frequency distribution of wind direction and wind speed for Trap Rock (TR) 1970 and 1971, and Montrose Point (MP) 1970 are given in Tables 6, 7, and 8, respectively.

Wind direction distributions for various speed categories are presented in Figure 4. Discrepancies between 1956 and 1970-71 are less apparent than when classified by temperature difference. The 1970 and 1971 distributions are almost a duplicate of each other.

Halitsky, et al. (1971) found that there was a significant increase in the frequency of occurrence of low speed winds from the critical sector, 000° -040°, for 10 months of 1970 data compared to 1956. With 1970 and 1971 data, the frequencies are nearly the same. The

remaining small discrepancy may be due to alteration of quadrant angles. The improvement can be attributed to the extension of 1970 data to a complete year and the difference in category range, 0.0-1.5 m/s in this report versus 0.4-2.0 m/s in the 1971 report. The generally slight increase of frequency in 1970 through most directions is due to a change in instrumentation. A Climet speed unit (threshold: 0.6 MPH) was used in 1970-71 while an aerovane (threshold: 2.5 MPH) was used in 1956. Thus, data points which were measured as calm by the aerovane in 1956 would now be present within the distribution with speed between 0.27-1.2 m/s (0.6-2.5 MPH) when measured with the Climet.

Figure 4 also indicates a general backing into the NW of the maximum frequency direction as wind speeds increase for all years.

5.4 Frequency Distribution of Wind Direction

5.4.1 Annual

Annual frequency distributions of wind direction for the various meteorological tower sites are given in Figure 5. Obvious differences that exist between IP1 (1956) and IP3 (1970-71) are: a) decrease in magnitude of the maximum direction; and b) shifting of the secondary maximum from 172° backing to 156° in 1970-71.

Comparison between IP3 and TR for the same years show differences which are no doubt caused by local topographical effects. The IP3 NNE maximum has backed to the N at Trap Rock. There is also a marked increase in both NW and SE winds at Trap Rock with the NW direction now becoming the secondary maximum.

The frequency density distribution at Montrose Point closely resembles that at IP3.

5.4.2 Seasonal

A definite seasonal pattern was observed during the analysis of monthly data at each station. The seasonal frequency distributions for IP3, Trap Rock and Montrose Point are given in Figures 6, 7 and 8, respectively.

The winter season wind direction frequency distribution at IP3 is tri-nodal. The primary maximum appears with winds from N-NNE. The secondary maximum appears for winds from WNW-NW. This second maximum is of the same order of frequency of the primary. The binodal maximum for winds from these northern quadrants may be attributed to the effect of blockage by the Dunderberg Mountain (Figure 1). The winds, as is seen, preferentially go around it rather than over its top. The tertiary maximum during the winter season is for winds from SSE at half the frequency of the north-quadrant maxima.

During the summer season the direction frequency distributions are binodal with two well defined peaked regions, one northerly (NNE) and the other southerly (SSE). Over the 1970-71 seasons, the maxima are approximately equal in frequency. The winter season secondary peak (WNW-NW) is completely lacking during the summer.

Seasonal differences can be attributed to the influence or lack of influence of the atmospheric geostrophic wind. A persistent and strong NW winter geostrophic wind is

responsible for the W-N quadrant peaks at the valley stations. The summer distributions reflect the diurnal wind pattern which flows along the valley axis: upvalley during the day and downvalley at night. The diurnal winds dominate the valley flow system during calm and nearly zero atmospheric pressure gradient conditions, which occur primarily during the summer months and account for the increased frequency of SSE-SSW winds.

Comparison between IP3 (Figure 6) and TR (Figure 7) shows that during the winter TR has the same tri-nodal distribution as IP3. At TR, however, the maximum frequency density is for winds from NNW quadrant without a significant change in frequency of NNE or SSE winds. During the summer the IP3 NNE maximum has backed to N at TR as occurs with the annual distribution and becomes binodal. The previously mentioned sharp increase of annual SE winds at TR is seen to occur almost entirely during the summer season. The annual NW increase is divided between the two seasons.

Based on limited data, the seasonal distributions at Montrose Point (Figure 8) are similar to those of IP3 except for a semblance of retention of the tri-nodal aspect during the summer season.

5.4.3 Comparison Between IP3 and Cape Charles for a Summer Season

Cape Charles as compared to IP3 is further indication of the blocking action of the Dunderberg.

Both stations compare relatively well during northerly quadrant winds. The IP3 sharp peak at NNE is spread out at the Cape Charles almost uniformly over the N, NNE and NE quadrants. This disp On 16 March 1970, an aerovane was installed aboard the U.S.S. Cape Charles. The intent of this station was to obtain comparable data to that collected by Davidson in September-October 1955 aboard the U.S. S. Jones in order to produce diurnal hodographs of the mean vector wind for virtually zero and weak pressure gradient conditions. Data retrieval over a lengthy time span could not be achieved because of the "mothball" fleet's disposal operations. However, a hodograph was constructed for July-September 1970 for comparative purposes (Halitsky, et al. (1971).

Frequency distributions of wind direction for Cape Charles and IP3 aerovanes are given in Figure 9. For the record period, SSE winds are most frequent at IP3 and SW at Cape Charles. This variation is related to the dominant valley terrain features that influence each station (Figure 1). The proximity of the Cape Charles to the Dunderberg Mountain is the controlling feature. The prevailing SSE valley wind, as measured at IP3, is forced to veer and flow parallel to the face of Dunderberg Mountain giving the Cape Charles its SW flow. The lack of NW and NNW winds at the ersion probability reflects the vortex generated as the air is deflected by the eastern tip of Dunderberg. In particular the NE peak could also represent nocturnal drainage flow from the Annsville Creek, Sprout Brook and Peekskill Hollow Brook valley complexes.

It should be cautioned that the Cape Charles aerovane was exposed at an elevation of approximately 100 ft MSL while the IP3 aerovane measured at an elevation of 220 ft MSL and some variations may be due to this difference in exposure elevations.

5.5 Cumulative Probability Distribution for Wind Speed

5.5.1 Annual

The annual cumulative probability curves for wind speed are presented for IP1, IP3, Trap Rock and Montrose Point in Figures 10-13. A summary of annual and seasonal median wind speeds is given in Table 9.

Table 9. Annual and Seasonal Median Wind Speeds

Station	Period			Median Wind (m/s)
Indian Point 1	1956	-	Annual	3.0
Indian Point 3	1970	-	Annual	3.0
			-Winter	3.4
			-Summer	2.9
	1971	-	Annual	3.1
			-Winter	3.7
			-Summer	2.7
Trap Rock	1970	-	Annual	2.8
			-Winter	3.3
			-Summer	2.5
	1971	-	Annual	3.0
			-Winter	3.6
			-Summer	2.7
Montrose Point	1970	-	Annual	2.7
			-Winter	3.3
			-Summer	2.3
Cape Charles	1970	-	Summer	2.8
Indian Point 3 (Aerovane)	1970	-	Summer	2.3

Figure 10 is a comparison of data collected at IP3 in 1970 and 1971. It shows the relationship between the two years for all wind speed data and as functions of temperature gradient categories. When all wind speed data is considered at each of the stations, there is less than 1% probability deviation between the two annual curves. The maximum deviation is observed at 0.5 m/s where the probability of speeds # 0.5 m/s is about 2.0% and 1.1% for 1970 and 1971, respectively.

Before discussing the curves in terms of temperature gradient categories, it should be borne in mind that the annual curve contains all hours for which wind speed data was available. The speed data recovery was 98.1% in 1970 and 99.2% in 1971 (Table 3). The curves now to be considered were constructed from those data hours in which both wind speed and temperature gradient were available: 82% in 1970 and 63.5% in 1971.

In the total inversion category, the two years are nearly identical in the speed range 1.0-2.5 m/s with 1970 having the greater probability of low wind speeds at 0.5 m/s, and 1971 the greater probability of low wind speeds > 2.5 m/s with a spread of approximately 4%. From 3 m/s to 11 m/s the probability of lower speeds is increased from 16.5% to 23.0% in 1970, and from 17.5% to 26.0% in 1971.

In 1970 the neutral and lapse probabilities curves were quite similar. Below 2.4 m/s there were more neutral occurrences and above 2.4 m/s more lapse observations. The neutral-lapse conditions were, as can be anticipated, more frequent at wind speeds greater than 5.5 m/s and less frequent at speeds below 5.5 m/s. This is consistent with their normal association as being high speed phenomena while inversions are associated with low wind speeds. In 1971, however, the neutral-lapse curves were significantly lower than in 1970 and did not approach the probability of the 1971 annual inversion curve. These discrepancies may be, in part, real but most probably the explanation lies in the fact that there was about 20% less valid data available in 1971 compared to 1970. These excess losses are distributed as follows (from Table 2) in terms of missing days:

	J	F	M	A	M	J	J	A	S	O	N	D
1970	0	3	3	0	0	3	0	13	17	20	4	0
1971	0	12	2	1	16	11	13	2	7	5	30	31
1971-1970	0	9	-1	1	16	8	13	-11	-10	-15	26	31

The losses during the summer may account for the lack of lapse data and the excessive winter losses can account for the decrease in neutral data since these are the seasons when such gradients normally prevail.

A comparison of the probability curves between IP1 (1956) and IP3 (1970 and 1971) on an annual basis, for total inversions and inversions in the critical sector, is shown in Figure 11. For all available wind speeds, IP3 is nearly identical to IP1 until 4 m/s after which IP1 indicates a higher probability of lower wind speeds. For all inversion data IP1 indicates a significantly higher probability of low winds speeds. When the analysis of inversion data is restricted to the critical quadrants (002.5° -22.5° in 1956, and 011.5°-033.5° in 1970-71), the 1956 curve always indicates a higher probability of low wind speeds than does IP3 (1970 and 1971).

A comparison between IP3 and Trap Rock (figure 12) shows that a greater percent probability of low wind speeds are observed at TR until about 5.5 m/s in 1970 and 3.5 m/s in 1971 after which TR has greater probability of higher wind speeds.

The low wind speed conditions occur mostly as part of the valley diurnal system. Here, where atmospheric influences are negligible the driving force to a crossvalley or diagonal wind is the gravitational drainage of the valley slopes. The IP3 location is more influenced by such a drainage pattern and will therefore exhibit higher wind speeds at the lower range than over leveler terrain as surrounds Trap Rock.

The Montrose Point cumulative probability resembles that of Trap Rock. It has been found previously that the Montrose Point direction distribution most resembles IP3.

The variations merely emphasize the dominant effects of strictly local terrain.

5.5.2 Seasonal

Seasonal cumulative frequency distributions of wind speed for Montrose Point, IP3 and Trap Rock are given in Figures 13, 14 and 15, respectively. The winter curves show a greater probability of high speeds at all stations than during the summer with but two exceptions: at IP3 in 1970 the winter curve shows a greater probability for wind speeds below 0.68 m/s and Trap Rock in 1971 below 0.87 m/s. Overall, however, the probability of low wind speeds is generally greatest during the summer season.

The summer cumulative frequency speed curves for the Cape Charles and IP3 aerovanes are given in Figure 16. The Cape Charles exhibits a greater percentage of higher wind speeds up to 8.8 m/s after which the IP3 percentage is greater. Higher wind speeds exist at Cape Charles because there are fewer local effects and less frictional loss over water than over land. The deviation at the high speed winds is generally associated with strong W-N geostrophic flow and the Cape Charles is shielded from these by the Dunderberg and Buckberg Mountains.

5.6 Diurnal Variation of the Mean Wind Direction

A primary analysis for data collected in a valley is to determine the extent of the diurnal wind pattern. This pattern is generally ignored in diffusion meteorology models used for nuclear generating sites. The models used are based on air flow over level and unobstructed terrain. The diurnal wind direction fluctuations and the ever present motion of air (zero frequency of calms) in the valley is a definite positive affect on the diffusion potential.

Seasonal diurnal variations of the mean wind direction for IP3, TR, MP and CC are presented in Figures 17-20, respectively.

The seasonal differences are clearly evident. The winter means fluctuate over shorter ranges exhibiting only a slight diurnal variation between the night and day hours. The winter mean at IP3 ranges from 352°-302° in 1970, and from 332°-305° in 1971. The TR mean ranges from 341°-308° in 1970, and from 332°-305° in 1971. The winter range at MP for 1970 was 357°-319°.

On a point by point basis, during the night, TR's mean direction tends to be west of that at IP3 while MP is about the same as IP3. During the day, IP3 and TR are similar while MP holds more to the north.

The summer diurnal curves at IP3 shows the direction rotating through a complete circle, being downvalley at night and upvalley during the day. From 2300-0800 the means hold from 20°-40°. Thereafter the wind direction backs; rapidly during the transition hours of 1000-1100 and 2000-2200, and slower during the intervening hours at a rate of approximately 8 degrees per hour.

The TR summer diurnal wind pattern is similar to that at IP3. From 2300-1000 a downvalley wind exists ranging from 006°-034°. Both transition periods are sharp, occurring at 1000-1100 and 2000-2100. In 1970 the wind backed into the upvalley direction during the day and veered into the downvalley direction at night. This pattern was reversed in 1971.

MP (Figure 19) shows a similar diurnal summer pattern for 1970 but unlike TR it veered into an upvalley flow during the transition hours.

The question of backing or veering during transition hours may be somewhat more complex than is nominally indicated. Referring it back to original analog records during the transition period one can find either the backing or the veering on any particular day. The diurnal wind itself, however, is related not only to a primary valley circulation (katabatic-anabatic)
but a locally induced land-sea breeze. It is the strength of this latter feature that will ultimately determine the backing or veering nature of the diurnal wind during transition hours.

The preceding diurnal analyses indicate that there is small likelihood of a wind persisting in the same direction for as much as 24 hours. The valley structure seems to have a built-in natural mechanism which would prevent such a wind condition from existing particularly at low wind speeds.

5.7 Diurnal Variation of the Mean Wind Speed

Seasonal diurnal variations of mean wind speeds for the various stations are given in Figure 21. The curves indicate that the winter mean speeds are greater than the summer speeds for all the stations throughout the day with both winter and summer maximum speeds occurring between 1300-1500 hours.

5.8 Diurnal Variation of Wind Persistence

The wind persistence is used as a measure of the constancy of a wind direction with time. If a wind always blows from the same direction, the persistence is equal to 1. If the wind is equally likely to blow from all directions or blows half the time from one sector and half the time from the opposite sector, the persistence will be zero.

The seasonal diurnal variation of wind persistence for the various stations is given in Figures 22 and 23. It is clearly evident that the higher persistence values are associated with the winter season. This result is however due to atmospheric conditions which enhance the diffusion, mainly high wind speeds.

Both seasons show a diurnal shift with the summer being more pronounced. Maximum persistence occurs between 04-0600 EST. The times of occurrence of the maximum values of persistence correspond to those times at which the nocturnal downvalley flow is a maximum and the daytime upvalley flow reaches its peak. At CC it almost equals the magnitude of the nighttime maximum. The summer minimums occur between 1100-1200 and 1900-2100 which are about the times of the diurnal wind direction transition periods.

5.9 Spatial Variability of Wind Velocity Between Tower Sites

The annual and seasonal spatial variabilities of wind direction and speed between selected stations are presented in Tables 10 through 17.

Table 10. Annual Spatial Variability of Wind Direction Between Indian Point 3 and Trap Rock.

IP3 1970	TR 1970	TR 1970	IP3 1970	IP3 1971	TR 1971	TR 1971	IP3 1971
000.0	354	000.0	012	000.0	358	000.0	008
022.5	010	022.5	025	022.5	017	022.5	024
045.0	024	045.0	041	045.0	033	045.0	043
067.5	048	067.5	070	067.5	047	067.5	065
090.0	078	090.0	094	090.0	076	090.0	091
112.5	107	112.5	126	112.5	104	112.5	118
135.0	129	135.0	154	135.0	134	135.0	146
157.5	147	157.5	171	157.5	154	157.5	167
180.0	168	180.0	188	180.0	177	180.0	182
202.5	190	202.5	206	202.5	200	202.5	199
225.0	212	225.0	224	225.0	224	225.0	219
247.5	239	247.5	256	247.5	250	247.5	244
270.0	270	270.0	285	270.0	277	270.0	271
292.5	295	292.5	301	292.5	296	292.5	293
315.0	308	315.0	321	315.0	313	315.0	318
337.5	330	337.5	353	337.5	333	337.5	346

Table 11. Seasonal Spatial Variability of Wind Direction Between Indian Point 3 and Trap Rock (1970).

IP3 1970	TR 1970	TR 1970	IP3 1970	IP3 1970	TR 1970	TR 1970	IP3 1970

Wntr	Wntr	Wntr	Wntr	Smmr	Smmr	Smmr	Smmr
000.0	358	000.0	008	000.0	350	000.0	016
022.5	013	022.5	019	022.5	008	022.5	030
045.0	029	045.0	034	045.0	022	045.0	047
067.5	059	067.5	066	067.5	043	067.5	072
090.0	085	090.0	080	090.0	074	090.0	100
112.5	116	112.5	120	112.5	103	112.5	129
135.0	138	135.0	146	135.0	126	135.0	155
157.5	158	157.5	166	157.5	145	157.5	173
180.0	176	180.0	184	180.0	166	180.0	190
202.5	194	202.5	201	202.5	188	202.5	209
225.0	216	225.0	219	225.0	210	225.0	228
247.5	244	247.5	252	247.5	233	247.5	261
270.0	275	270.0	281	270.0	261	270.0	290
292.5	299	292.5	298	292.5	284	292.5	306
315.0	310	315.0	315	315.0	306	315.0	330
337.5	335	337.5	346	337.5	325	337.5	359

Table 12. Seasonal Spatial Variability of Wind Direction Between Indian Point 3 and Trap Rock (1971).

IP3	TR	TR	IP3	IP3	TR	TR	IP3
1971	1971	1971	1971	1971	1971	1971	1971
Wntr	Wntr	Wntr	Wntr	Smmr	Smmr	Smmr	Smmr
000.0	359	000.0	007	000.0	358	000.0	009
022.5	014	022.5	022	022.5	018	022.5	025
045.0	030	045.0	048	045.0	034	045.0	040
067.5	046	067.5	070	067.5	049	067.5	062
090.0	076	090.0	091	090.0	076	090.0	091
112.5	109	112.5	112	112.5	102	112.5	119
135.0	136	135.0	143	135.0	132	135.0	148

157.5	157	157.5	165	157.5	152	157.5	168
180.0	178	180.0	181	180.0	176	180.0	183
202.5	203	202.5	201	202.5	198	202.5	198
225.0	226	225.0	222	225.0	222	225.0	215
247.5	250	247.5	243	247.5	249	247.5	246
270.0	277	270.0	272	270.0	275	270.0	268
292.5	296	292.5	292	292.5	296	292.5	296
315.0	313	315.0	317	315.0	312	315.0	322
337.5	331	337.5	345	337.5	335	337.5	348

Table 13. Annual Spatial Variability of Wind Speed (m/s) Between Indian Point 3 and Trap Rock.

IP3 1970	TR 1970	TR 1970	IP3 1970	IP3 1971	TR 1971	TR 1971	IP3 1971
0.25	0.6	0.25	1.0	0.25	0.7	0.25	0.9
0.75	0.9	0.75	1.4	0.75	0.9	0.75	1.1
1.25	1.2	1.25	1.8	1.25	1.3	1.25	1.6
2.0	1.9	2.0	2.5	2.0	2.0	2.0	2.2
3.0	2.8	3.0	3.3	3.0	3.0	3.0	3.1
4.0	3.9	4.0	4.1	4.0	4.0	4.0	4.0
5.0	4.9	5.0	4.9	5.0	5.1	5.0	4.9
7.0	6.8	7.0	6.2	7.0	6.9	7.0	6.5
9.75	9.9	9.75	8.4	9.75	9.7	9.75	9.0

Table 14. Seasonal Spatial Variability of Wind Speed (m/s) Between Indian Point 3 and Trap Rock.

IP3 1970 Wntr	TR 1970 Wntr	TR 1970 Wntr	IP3 1970 Wntr	IP3 1970 Smmr	TR 1970 Smmr	TR 1970 Smmr	IP3 1970 Smmr
0.25	0.5	0.25	0.8	0.25	0.6	0.25	1.1
0.75	0.8	0.75	1.3	0.75	0.9	0.75	1.4
1.25	1.3	1.25	1.8	1.25	1.2	1.25	1.9
2.0	2.0	2.0	2.4	2.0	1.8	2.0	2.6
3.0	3.0	3.0	3.3	3.0	2.8	3.0	3.4
4.0	4.1	4.0	4.1	4.0	3.8	4.0	4.2
5.0	5.1	5.0	5.0	5.0	4.7	5.0	4.8
7.0	7.2	7.0	6.4	7.0	6.4	7.0	6.0
9.75	10.0	9.75	8.5	9.75	9.3	9.75	8.1

IP3 1971 Wntr	TR 1971 Wntr	TR 1971 Wntr	IP3 1971 Wntr	IP3 1971 Summr	TR 1971 Summr	TR 1971 Summr	IP3 1971 Summr
0.25	0.6	0.25	1.0	0.25	0.7	0.25	0.7
0.75	0.8	0.75	1.1	0.75	1.0	0.75	1.1
1.25	1.2	1.25	1.7	1.25	1.3	1.25	1.5
2.0	1.9	2.0	2.4	2.0	2.1	2.0	2.2
3.0	2.9	3.0	3.3	3.0	3.0	3.0	3.0
4.0	3.9	4.0	4.2	4.0	4.1	4.0	3.8
5.0	5.1	5.0	5.1	5.0	5.2	5.0	4.6
7.0	6.9	7.0	6.8	7.0	6.8	7.0	6.0
9.75	9.6	9.75	9.1	9.75	9.9	9.75	8.5

Table 15. Annual Spatial Variability of Wind Direction and Speed (m/s) Between Montrose Point and Trap Rock.

Wind Direction				Wind Speed			
MP 1970	TR 1970	TR 1970	MP 1970	MP 1970	TR 1970	TR 1970	MP 1970
000.0	351	000.0	018	0.25	0.8	0.25	0.7
022.5	009	022.5	033	0.75	1.2	0.75	1.0
045.0	023	045.0	049	1.25	1.7	1.25	1.4
067.5	035	067.5	069	2.0	2.5	2.0	1.9
090.0	054	090.0	096	3.0	3.7	3.0	2.7
112.5	089	112.5	127	4.0	4.9	4.0	3.4
135.0	135	135.0	150	5.0	5.7	5.0	4.1
157.5	151	157.5	166	7.0	7.4	7.0	5.6
180.0	173	180.0	189	9.75	10.0	9.75	8.0
202.5	191	202.5	207				
225.0	214	225.0	229				
247.5	236	247.5	253				
270.0	269	270.0	277				
292.5	289	292.5	302				
315.0	309	315.0	324				
337.5	323	337.5	356				

Table 16. Annual Spatial Variability of Wind Direction and Speed (m/s) Between Indian Point 3 and Montrose Point.

Wind Direction				Wind Speed			
IP3 1970	MP 1970	MP 1970	IP3 1970	IP3 1970	MP 1970	MP 1970	IP3 1970
000.0	011	000.0	358	0.25	0.6	0.25	0.9
022.5	029	022.5	015	0.75	0.8	0.75	1.3
045.0	043	045.0	027	1.25	1.2	1.25	1.8
067.5	067	067.5	040	2.0	1.8	2.0	2.6
090.0	088	090.0	070	3.0	2.6	3.0	3.5
112.5	123	112.5	108	4.0	3.5	4.0	4.5
135.0	142	135.0	153	5.0	4.4	5.0	5.3
157.5	158	157.5	167	7.0	6.2	7.0	6.9
180.0	175	180.0	183	9.75	9.1	9.75	9.1
202.5	198	202.5	198				
225.0	216	225.0	220				
247.5	238	247.5	244				
270.0	272	270.0	275				
292.5	304	292.5	297				
315.0	320	315.0	315				
337.5	338	337.5	330				

Table 17. Summer (1970) Spatial Variability of Wind Direction and Speed (m/s) Between Cape Charles and Indian Point 3.

CC 1970 Smmr	IP3 1970 Smmr	IP3 1970 Smmr	CC 1970 Smmr	CC 1970 Smmr	IP3 1970 Smmr	IP3 1970 Smmr	CC 1970 Smmr
000.0	001	000.0	007	0.25	0.9	0.25	1.1
022.5	017	022.5	022	0.75	1.1	0.75	1.4
045.0	031	045.0	028	1.25	1.5	1.25	1.9
067.5	049	067.5	044	2.0	1.8	2.0	2.5
090.0	088	090.0	069	3.0	2.5	3.0	3.4
112.5	102	112.5	107	4.0	3.4	4.0	4.5
135.0	122	135.0	153	5.0	4.4	5.0	5.3
157.5	146	157.5	187	7.0	5.4	7.0	6.0
180.0	163	180.0	212	9.75	7.2	9.75	7.3
202.5	180	202.5	221				
225.0	196	225.0	234				
247.5	216	247.5	247				
270.0	285	270.0	268				
292.5	301	292.5	286				
315.0	321	315.0	317				
337.5	346	337.5	355				

The station listed first in each tabular set is the independent variable.

When the role of independent and dependent stations are reversed, the relationships between the mean values are not, a priori, similarly inverted. This discrepancy may be attributed, in part, to the effects of local topography as well as to a reaction time lag engendered by the spatial distance between stations.

The significance of any degree of change in magnitude of speed or wind direciton angle between stations are arbitrary. An angular change of $ 6 10° and speed change of $ 6 0.5 m/s may be considered.

The spatial variability analysis indicated:

1) A general backing of wind direction between IP3 and TR, with TR having a lower speed at the low range and a higher speed at the high range. Seasonal analysis showed the greatest variations occurring during the "summer" months.

2) A general backing of wind direction between MP and TR with speeds being greater at TR.

3) Based on the comparable data available (1970), the wind directions at IP3 and MP were similar to each other and in the relationship to TR. The magnitude of the wind speeds were similar at IP3 and TR, with each being generally stronger than at MP.

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Appendix Table 1. Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category A – January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0010	.0086	.0097	.0025	.0002	.0000	.0001	.0222
12- 33	NNE	.0008	.0059	.0031	.0010	.0000	.0000	.0001	.0110
34- 56	NE	.0015	.0041	.0008	.0005	.0001	.0000	.0001	.0071
57- 78	ENE	.0005	.0006	.0000	.0003	.0002	.0000	.0000	.0016
79-101	E	.0003	.0005	.0002	.0002	.0000	.0000	.0000	.0013
102-123	ESE	.0005	.0005	.0003	.0002	.0000	.0000	.0000	.0015
124-146	SE	.0013	.0010	.0010	.0016	.0002	.0000	.0000	.0051
147-168	SSE	.0016	.0074	.0109	.0078	.0003	.0000	.0000	.0280
169-191	S	.0016	.0122	.0081	.0015	.0000	.0000	.0000	.0234
192-213	SSW	.0010	.0071	.0033	.0002	.0000	.0000	.0001	.0118
214-236	SW	.0009	.0034	.0016	.0006	.0000	.0000	.0000	.0065
237-258	WSW	.0010	.0010	.0011	.0002	.0000	.0000	.0001	.0035
259-281	W	.0009	.0022	.0030	.0013	.0007	.0001	.0001	.0082
282-303	WNW	.0005	.0014	.0031	.0053	.0024	.0008	.0010	.0144
304-326	NW	.0005	.0016	.0042	.0054	.0035	.0007	.0005	.0163
327-348	NNW	.0007	.0039	.0049	.0041	.0011	.0001	.0000	.0149
Calm			.0000						.0000
Miss			.0000	.0000	.0000	.0000	.0000	.0000	.0022
Total		.0145	.0614	.0554	.0327	.0089	.0017.	0043.	1790

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category B – January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0002	.0007	.0006	.0001	.0000	.0000	.0000	.0016
12- 33	NNE	.0001	.0009	.0006	.0000	.0000	.0000	.0000	.0016
34- 56	NE	.0005	.0008	.0002	.0000	.0000	.0000	.0000	.0015
57- 78	ENE	.0001	.0003	.0000	.0000	.0000	.0000	.0001	.0006
79-101	E	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0002
102-123	ESE	.0003	.0007	.0000	.0000	.0000	.0000	.0000	.0010
124-146	SE	.0000	.0003	.0001	.0000	.0000	.0000	.0000	.0005
147-168	SSE	.0001	.0002	.0008	.0008	.0001	.0000	.0000	.0021
169-191	S	.0003	.0010	.0005	.0005	.0000	.0000	.0000	.0023
192-213	SSW	.0000	.0005	.0003	.0002	.0000	.0000	.0000	.0010
214-236	SW	.0002	.0001	.0000	.0000	.0000	.0000	.0000	.0003
237-258	WSW	.0007	.0002	.0000	.0001	.0000	.0000	.0000	.0010
259-281	W	.0000	.0000	.0002	.0001	.0000	.0000	.0000	.0003
282-303	WNW	.0001	.0000	.0001	.0003	.0003	.0001	.0000	.0010
304-326	NW	.0001	.0001	.0007	.0007	.0003	.0003	.0000	.0023
327-348	NNW	.0000	.0001	.0005	.0001	.0000	.0001	.0000	.0008
Calm			.0000						.0000

Miss		.0000	.0000	.0000	.0000	.0000	.0000	.0000
Total	.0031	.0061	.0046	.0030	.0008.	0006.	0001	.0182

Appendix Table 1 (continued)

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category C – January 1, 1970-December 31, 1970

Wind Direction		Wind Speed (mph) 01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0000	.0007	.0008	.0006	.0000	.0000	.0000	.0021
12- 33	NNE	.0001	.0008	.0009	.0003	.0001	.0000	.0000	.0023
34- 56	NE	.0002	.0006	.0003	.0001	.0000	.0000	.0000	.0013
57- 78	ENE	.0002	.0000	.0003	.0000	.0000	.0000	.0000	.0006
79-101	E	.0001	.0001	.0000	.0001	.0000	.0000	.0000	.0003
102-123	ESE	.0000	.0001	.0000	.0000	.0000	.0000	.0000	.0001
124-146	SE	.0002	.0005	.0006	.0001	.0000	.0000	.0000	.0014
147-168	SSE	.0002	.0013	.0018	.0008	.0000	.0000	.0000	.0041
169-191	S	.0002	.0014	.0008	.0001	.0000	.0000	.0000	.0025
192-213	SSW	.0001	.0005	.0003	.0001	.0000	.0000	.0000	.0010
214-236	SW	.0003	.0005	.0002	.0003	.0000	.0000	.0000	.0014
237-258	WSW	.0001	.0000	.0001	.0003	.0000	.0000	.0000	.0006
259-281	W	.0000	.0002	.0003	.0008	.0001	.0000	.0000	.0015
282-303	WNW	.0003	.0005	.0002	.0015	.0010	.0005	.0000	.0040
304-326	NW	.0000	.0000	.0001	.0001	.0010	.0006	.0000	.0018
327-348	NNW	.0003	.0005	.0005	.0007	.0006	.0000	.0000	.0025
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0002	.0001		.0006
Total		.0026	.0074	.0074	.0061	.0031	.0011	.0002	.0280

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category D - January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (mph) 01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0024	.0143	.0173	.0051	.0007	.0001	.0014	.0413
12- 33	NNE	.0042	.0178	.0122	.0029	.0006	.0001	.0014	.0392
34- 56	NE	.0031	.0078	.0026	.0003	.0003	.0000	.0006	.0147
57- 78	ENE	.0022	.0016	.0001	.0001	.0000	.0000	.0006	.0046
79-101	E	.0021	.0021	.0009	.0000	.0000	.0000	.0002	.0053
102-123	ESE	.0026	.0016	.0011	.0002	.0000	.0000	.0003	.0059
124-146	SE	.0025	.0053	.0038	.0003	.0002	.0000	.0001	.0122
147-168	SSE	.0023	.0110	.0098	.0032	.0000	.0000	.0003	.0266
169-191	S	.0025	.0098	.0053	.0010	.0000	.0000	.0003	.0190
192-213	SSW	.0030	.0038	.0021	.0008	.0000	.0000	.0000	.0096
214-236	SW	.0023	.0017	.0009	.0006	.0001	.0000	.0003	.0059
237-258	WSW	.0008	.0016	.0007	.0008	.0000	.0000	.0000	.0039
259-281	W	.0011	.0019	.0019	.0016	.0008	.0001	.0006	.0081
282-303	WNW	.0011	.0010	.0051	.0095	.0062	.0011	.0001	.0242

304-326	NW	.0010	.0019	.0061	.0109	.0074	.0026	.0000	.0300
327-348	NNW	.0009	.0054	.0069	.0079	.0022	.0002	.0002	.0237
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0001	.0005	.0000		.0010
Total		.0342	.0886	.0768	.0454	.0190	.0043	.0070	.2753

Appendix Table 1 (continued)

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category E – January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0045	.0067	.0043	.0014	.0001	.0000	.0002	.0173
12- 33	NNE	.0045	.0166	.0080	.0005	.0003	.0000	.0006	.0304
34- 56	NE	.0030	.0078	.0019	.0001	.0001	.0000	.0008	.0137
57- 78	ENE	.0023	.0018	.0003	.0000	.0000	.0000	.0000	.0045
79-101	E	.0011	.0023	.0011	.0001	.0001	.0000	.0000	.0048
102-123	ESE	.0014	.0029	.0016	.0001	.0000	.0000	.0001	.0061
124-146	SE	.0027	.0035	.0017	.0001	.0003	.0000	.0001	.0086
147-168	SSE	.0022	.0053	.0041	.0016	.0005	.0002	.0000	.0138
169-191	S	.0017	.0062	.0043	.0003	.0002	.0003	.0001	.0133
192-213	SSW	.0027	.0063	.0045	.0005	.0000	.0000	.0000	.0139
214-236	SW	.0024	.0045	.0024	.0006	.0001	.0001	.0000	.0101
237-258	WSW	.0019	.0027	.0016	.0008	.0007	.0002	.0000	.0080
259-281	W	.0015	.0015	.0034	.0014	.0008	.0005	.0000	.0090
282-303	WNW	.0010	.0006	.0038	.0054	.0041	.0014	.0000	.0162
304-326	NW	.0008	.0017	.0054	.0071	.0016	.0005	.0001	.0171
327-348	NNW	.0017	.0034	.0046	.0027	.0001	.0000	.0001	.0127
Calm		.0000							.0000
Miss		.0005	.0007	.0009	.0007	.0010	.0000		.0048
Total		.0359	.0744	.0541	.0233	.0102	.0032	.0032	.2043

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category F – January 1, 1970-December 31, 1970

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0047	.0022	.0008	.0001	.0000	.0000	.0000	.0078
12- 33	NNE	.0030	.0075	.0022	.0000	.0000	.0000	.0000	.0127
34- 56	NE	.0034	.0042	.0009	.0000	.0000	.0000	.0005	.0090
57- 78	ENE	.0015	.0011	.0001	.0000	.0000	.0000	.0000	.0027
79-101	E	.0011	.0005	.0000	.0000	.0000	.0000	.0000	.0016
102-123	ESE	.0010	.0006	.0000	.0000	.0000	.0000	.0000	.0016
124-146	SE	.0009	.0006	.0000	.0000	.0000	.0000	.0000	.0015
147-168	SSE	.0023	.0027	.0005	.0001	.0002	.0000	.0000	.0058
169-191	S	.0016	.0035	.0009	.0000	.0000	.0000	.0000	.0061

192-213	SSW	.0013	.0032	.0008	.0000	.0000	.0000	.0053
214-236	SW	.0024	.0040	.0006	.0000	.0000	.0001	.0071
237-258	WSW	.0018	.0009	.0009	.0000	.0000	.0001	.0038
259-281	W	.0011	.0003	.0003	.0000	.0003	.0001	.0023
282-303	WNW	.0007	.0002	.0003	.0002	.0001	.0000	.0017
304-326	NW	.0011	.0002	.0001	.0000	.0002	.0000	.0017
327-348	NNW	.0013	.0007	.0003	.0002	.0000	.0000	.0025
Calm		.0000						.0000
Miss		.0007	.0001	.0000	.0000	.0000	.0000	.0013
Total		.0300	.0327	.0088	.0007	.0009	.0001	.0013	.0744

Appendix Table 1 (Continued)

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category C – January 1, 1970-December 31, 1970.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0019	.0010	.0003	.0000	.0000	.0000	.0000	.0033
12- 33	NNE	.0018	.0037	.0008	.0000	.0000	.0000	.0001	.0064
34- 56	NE	.0030	.0021	.0000	.0000	.0000	.0000	.0000	.0050
57- 78	ENE	.0018	.0006	.0000	.0000	.0000	.0000	.0000	.0024
79-101	E	.0008	.0003	.0000	.0000	.0000	.0000	.0000	.0011
102-123	ESE	.0006	.0002	.0000	.0000	.0000	.0000	.0000	.0008
124-146	SE	.0014	.0007	.0000	.0000	.0000	.0000	.0000	.0021
147-168	SSE	.0013	.0014	.0002	.0000	.0000	.0000	.0000	.0029
169-191	S	.0009	.0015	.0005	.0000	.0000	.0000	.0000	.0029
192-213	SSW	.0024	.0024	.0003	.0000	.0000	.0000	.0002	.0054
214-236	SW	.0019	.0013	.0002	.0000	.0000	.0000	.0001	.0035
237-258	WSW	.0015	.0006	.0003	.0000	.0000	.0000	.0001	.0025
259-281	W	.0018	.0005	.0000	.0000	.0000	.0000	.0000	.0023
282-303	WNW	.0015	.0002	.0000	.0000	.0000	.0000	.0000	.0017
304-326	NW	.0011	.0000	.0000	.0000	.0000	.0000	.0000	.0011
327-348	NNW	.0015	.0005	.0001	.0001	.0000	.0000	.0000	.0022
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000		.0008
Total		.0253	.0168	.0029	.0001	.0000	.0000	.0014	.0464

Appendix Table 2. Indian Point B(3) Point Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category A - January 1, 1971-December 31, 1971

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0006	.0054	.0057	.0021	.0011	.0000	.0001	.0150
12- 33	NNE	.0003	.0043	.0018	.0005	.0000	.0000	.0000	.0070

34- 56	NE	.0008	.0011	.0002	.0000	.0000	.0000	.0000	.0022
57- 78	ENE	.0001	.0008	.0000	.0000	.0000	.0000	.0000	.0009
79-101	E	.0000	.0000	.0002	.0000	.0000	.0000	.0000	.0002
102-123	ESE	.0001	.0005	.0005	.0001	.0000	.0000	.0000	.0011
124-146	SE	.0002	.0005	.0018	.0016	.0001	.0000	.0000	.0042
147-168	SSE	.0006	.0050	.0065	.0015	.0003	.0000	.0000	.0140
169-191	S	.0005	.0062	.0041	.0007	.0000	.0000	.0000	.0114
192-213	SSW	.0003	.0029	.0014	.0006	.0000	.0000	.0000	.0051
214-236	SW	.0003	.0015	.0007	.0005	.0000	.0000	.0000	.0030
237-258	WSW	.0003	.0018	.0011	.0024	.0009	.0003	.0000	.0070
259-281	W	.0003	.0009	.0039	.0022	.0017	.0002	.0000	.0093
282-303	WNW	.0008	.0008	.0042	.0050	.0027	.0009	.0000	.0145
304-326	NW	.0005	.0016	.0031	.0046	.0035	.0006	.0000	.0138
327-348	NNW	.0003	.0033	.0046	.0039	.0007	.0001	.0000	.0129
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000		.0002
Total		.0062	.0366	.0399	.0255	.0112	.0022	.0003	.1219

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category B – January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0000	.0013	.0009	.0001	.0000	.0000	.0000	.0023
12- 33	NNE	.0000	.0008	.0000	.0000	.0000	.0000	.0000	.0008
34- 56	NE	.0002	.0001	.0001	.0000	.0000	.0000	.0000	.0005
57- 78	ENE	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0002
79-101	E	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
102-123	ESE	.0000	.0001	.0001	.0001	.0000	.0000	.0000	.0003
124-146	SE	.0000	.0001	.0003	.0002	.0000	.0000	.0000	.0007
147-168	SSE	.0002	.0008	.0014	.0001	.0001	.0000	.0000	.0026
169-191	S	.0002	.0009	.0000	.0000	.0000	.0000	.0000	.0011
192-213	SSW	.0003	.0008	.0002	.0001	.0000	.0000	.0000	.0015
214-236	SW	.0001	.0001	.0002	.0001	.0000	.0000	.0000	.0006
237-258	WSW	.0001	.0002	.0000	.0002	.0001	.0001.	0000	.0007
259-281	W	.0000	.0002	.0005	.0000	.0002	.0001	.0000	.0010
282-303	WNW	.0000	.0001	.0005	.0010	.0003	.0000	.0000	.0019
304-326	NW	.0005	.0002	.0003	.0006	.0003	.0001	.0000	.0021
327-348	NNW	.0000	.0003	.0002	.0006	.0000	.0000	.0000	.0011
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000		.0000
Total		.0018	.0062	.0048	.0032	.0011	.0003	.0000	.0175

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70.

Appendix Table 2 (continued)

Indian Point B(3) Joint Frequency Distribution of Wind Speed and

Direction for Pasquill Stability Category C – January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0003	.0014	.0006	.0002	.0000	.0000	.0000	.0025
12- 33	NNE	.0001	.0006	.0006	.0001	.0000	.0000	.0001	.0015
34- 56	NE	.0001	.0003	.0001	.0000	.0000	.0000	.0000	.0006
57- 78	ENE	.0000	.0000	.0001	.0000	.0000	.0000	.0000	.0001
79-101	E	.0001	.0002	.0001	.0000	.0000	.0000	.0000	.0005
102-123	ESE	.0003	.0001	.0002	.0000	.0000	.0000	.0000	.0007
124-146	SE	.0001	.0003	.0005	.0000	.0000	.0000	.0000	.0009
147-168	SSE	.0001	.0006	.0003	.0002	.0000	.0000	.0000	.0013
169-191	S	.0005	.0011	.0005	.0002	.0000	.0000	.0000	.0023
192-213	SSW	.0000	.0005	.0001	.0000	.0000	.0000	.0000	.0006
214-236	SW	.0003	.0001	.0001	.0001	.0001	.0000	.0000	.0008
237-258	WSW	.0001	.0001	.0003	.0001	.0002	.0001	.0000	.0010
259-281	W	.0001	.0001	.0003	.0003	.0001	.0000	.0000	.0010
282-303	WNW	.0001	.0001	.0006	.0010	.0000	.0001	.0000	.0019
304-326	NW	.0003	.0002	.0002	.0005	.0003	.0000	.0000	.0016
327-348	NNW	.0000	.0007	.0007	.0001	.0001	.0000	.0000	.0016
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000		.0000
Total		.0027	.0065	.0054	.0030	.0009	.0002	.0001	.0180

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category D – January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0014	.0079	.0067	.0034	.0005	.0000	.0001	.0200
12- 33	NNE	.0023	.0066	.0050	.0015	.0000	.0000	.0000	.0154
34- 56	NE	.0029	.0026	.0014	.0005	.0000	.0000	.0001	.0074
57- 78	ENE	.0010	.0011	.0018	.0003	.0000	.0000	.0000	.0043
79-101	E	.0015	.0008	.0011	.0000	.0000	.0000	.0000	.0034
102-123	ESE	.0011	.0015	.0002	.0000	.0000	.0000	.0000	.0029
124-146	SE	.0013	.0026	.0026	.0008	.0001	.0000	.0000	.0074
147-168	SSE	.0013	.0040	.0065	.0014	.0001	.0000	.0000	.0133
169-191	S	.0015	.0030	.0014	.0009	.0001	.0000	.0000	.0069
192-213	SSW	.0009	.0017	.0018	.0006	.0000	.0001	.0000	.0051
214-236	SW	.0017	.0013	.0013	.0019	.0001	.0001	.0000	.0064
237-258	WSW	.0008	.0010	.0026	.0018	.0008	.0002	.0000	.0073
259-281	W	.0005	.0005	.0024	.0041	.0023	.0001	.0000	.0098
282-303	WNW	.0008	.0002	.0056	.0051	.0024	.0010	.0003	.0156
304-326	NW	.0009	.0002	.0031	.0055	.0014	.0000	.0001	.0112
327-348	NNW	.0003	.0010	.0039	.0019	.0008	.0001	.0001	.0082
Calm			.0000						.0000
Miss			.0000	.0000	.0000	.0000	.0000	.0000	.0001

Total	.0201	.0361	.0476	.0298	.0086	.0017	.0009	.1449

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71.

Appendix Table 2 (continued)

Indian Point B (3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category E – January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (mph) 01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0027	.0072	.0094	.0037	.0013	.009	.0001	.0253
12- 33	NNE	.0029	.0144	.0129	.0019	.0002	.0000	.0000	.0324
34- 56	NE	.0035	.0063	.0019	.0001	.0001	.0000	.0010	.0130
57- 78	ENE	.0021	.0021	.0014	.0000	.0000	.0000	.0002	.0057
79-101	E	.0016	.0021	.0001	.0000	.0000	.0000	.0000	.0038
102-123	ESE	.0015	.0034	.0006	.0000	.0000	.0000	.0000	.0055
124-146	SE	.0019	.0063	.0024	.0002	.0000	.0000	.0000	.0109
147-168	SSE	.0016	.0061	.0058	.0009	.0000	.0000	.0000	.0144
169-191	S	.0019	.0058	.0038	.0009	.0001	.0000	.0000	.0126
192-213	SSW	.0016	.0034	.0031	.0005	.0002	.0000	.0000	.0088
214-236	SW	.0010	.0013	.0015	.0008	.0002	.0000	.0000	.0048
237-258	WSW	.0017	.0014	.0026	.0014	.0005	.0002	.0000	.0078
259-281	W	.0006	.0015	.0050	.0025	.0009	.0001	.0000	.0106
282-303	WNW	.0006	.0015	.0051	.0051	.0024	.0006	.0010	.0164
304-326	NW	.0005	.0010	.0063	.0054	.0013	.0003	.0001	.0149
327-348	NNW	.0008	.0016	.0035	.0030	.0006	.0001	.0000	.0096
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000		.0000

Total	.0265	.0653	.0655	.0264	.0078	.0023	.0025	.1963

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category F – January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (mph) 01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0019	.0042	.0015	.0001	.0000	.0000	.0000	.0078
12- 33	NNE	.0026	.0113	.0029	.0000	.0000	.0000	.0000	.0168
34- 56	NE	.0024	.0046	.0008	.0000	.0000	.0000	.0000	.0078
57- 78	ENE	.0010	.0009	.0000	.0000	.0000	.0000	.0000	.0019
79-101	E	.0008	.0003	.0001	.0000	.0000	.0000	.0000	.0013
102-123	ESE	.0011	.0005	.0000	.0000	.0000	.0000	.0000	.0016
124-146	SE	.0010	.0023	.0000	.0000	.0000	.0000	.0000	.0033
147-168	SSE	.0013	.0024	.0005	.0001	.0000	.0000	.0000	.0042
169-191	S	.0014	.0040	.0002	.0001	.0000	.0000	.0000	.0057
192-213	SSW	.0016	.0030	.0006	.0001	.0000	.0000	.0000	.0053
214-236	SW	.0008	.0023	.0005	.0008	.0000	.0000	.0000	.0043
237-258	WSW	.0010	.0016	.0007	.0001	.0002	.0000	.0000	.0037

259-281	W	.0007	.0011	.0008	.0001	.0000	.0000	.0027
282-303	WNW	.0013	.0005	.0007	.0005	.0001	.0000	.0030
304-326	NW	.0006	.0008	.0003	.0000	.0000	.0001	.0018
327-348	NNW	.0010	.0014	.0006	.0001	.0000	.0000	.0031
Calm		.0000						.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000	.0000
Total		.0206	.0412	.0101	.0021	.0003	.0001	.0000	.0743

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72.

Appendix Table 2 (continued)

Indian Point B(3) Joint Frequency Distribution of Wind Speed and Direction for Pasquill Stability Category G – January 1, 1971-December 31, 1971.

Wind Direction		Wind Speed (mph)							
		01-03	04-07	08-12	13-18	19-24	>24	Miss	Total
349- 11	N	.0031	.0034	.0005	.0000	.0000	.0000	.0000	.0070
12- 33	NNE	.0027	.0064	.0008	.0000	.0000	.0000	.0000	.0099
34- 56	NE	.0031	.0026	.0000	.0000	.0000	.0000	.0000	.0057
57- 78	ENE	.0019	.0003	.0000	.0000	.0000	.0000	.0000	.0023
79-101	E	.0009	.0006	.0000	.0000	.0000	.0000	.0000	.0015
102-123	ESE	.0009	.0001	.0000	.0000	.0000	.0000	.0000	.0010
124-146	SE	.0013	.0005	.0000	.0001	.0000	.0000	.0000	.0018
147-168	SSE	.0016	.0019	.0002	.0001	.0000	.0000	.0000	.0039
169-191	S	.0024	.0030	.0000	.0000	.0000	.0000	.0000	.0054
192-213	SSW	.0027	.0027	.0000	.0000	.0000	.0000	.0000	.0055
214-236	SW	.0022	.0016	.0003	.0000	.0000	.0000	.0000	.0041
237-258	WSW	.0019	.0013	.0002	.0001	.0000	.0000	.0000	.0035
259-281	W	.0021	.0007	.0002	.0000	.0000	.0000	.0000	.0030
282-303	WNW	.0014	.0002	.0002	.0000	.0000	.0000	.0000	.0018
304-326	NW	.0013	.0007	.0000	.0000	.0000	.0000	.0000	.0019
327-348	NNW	.0022	.0011	.0002	.0000	.0000	.0000	.0000	.0035
Calm		.0000							.0000
Miss		.0000	.0000	.0000	.0000	.0000	.0000		.0000
Total		.0317	.0272	.0027	.0003	.0000	.0000	.0000	.0620

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