

THE UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
Department of Civil Engineering
Meteorological Laboratories

Fifth Progress Report

METEOROLOGICAL ANALYSIS

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UMRI Project 2515

under contract with:

POWER REACTOR DEVELOPMENT COMPANY
DETROIT, MICHIGAN

administered by:

THE UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE ANN ARBOR

June 1960

Enqm

UMR

2055

no. 5

PREFACE

This report presents the data collected at the Enrico Fermi site from 1 December 1958 to 30 November 1959. The data are tabulated in four appendices to the report. Appendix A contains the wind data, Appendix B the temperature-lapse data, Appendix C the precipitation data, and Appendix D continuous inversion data from 1 December 1956 to November 1957. The data within the first three appendices are grouped according to the four seasons of the year with a one-year and three-year summary at the end of each appendix. Appendix D is arranged according to seasons with a yearly summary at the end.

The fourth progress report compared meteorological parameters between the first year, 1957, and the data collected during 1958. This fifth report compares the data collected during 1958 with those of 1959. Comparisons are also made with 1957 to obviate reference to Progress Report No. 4.

We wish to acknowledge the assistance of Mrs. Sally Pugsley, Miss Louise Straus, and Miss Ana Lucia Torres, who abstracted the data from the chart rolls and prepared the tables, and to Mrs. Anne C. Rivette, who typed the manuscript.

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ABSTRACT

The chi-square test was used to compare the 1958 and 1959 wind data. The wind data for the two years were found to be quite similar. The temperature-lapse-rate data were compared in the same manner, and the results indicate that there is no significant statistical difference between the lapse-rate data for the two years. The chi-square test comparing the precipitation data for the two years indicates that the data for the two years are quite similar.

I. COMPARISON OF WIND DATA

1. INTRODUCTION

For early progress reports, few meteorological data were available from the Enrico Fermi plant site. For this reason the data from the Detroit City and Toledo Express Airports played an important role in the early progress reports. The wind speed and wind direction occurrences at the plant site were compared with those at the above-mentioned sites. Sufficient data for the plant site are now available to permit comparison of wind observations at the Enrico Fermi site made in 1959 with those made in 1958.

The wind records from the plant site, Detroit City Airport, and Toledo Express Airport are included in this report by seasons, 1959 annual, and a three-year summary from 1957 through 1959. These data appear as Appendix A of this report. Once again, the wind data from Toledo Municipal Airport for the five-year period 1950-1954 have been included for comparison. These data are presented in Tables I-A through XXXV-A and Figs. 1A through 6A.

2. WIND DIRECTIONS AT THE ENRICO FERMI PLANT SITE

To aid the reader in understanding the significance of the wind direction distribution at the plant site, a topographic map of the site and its surroundings has been included as Fig. 1.

In this section of the report the distribution of wind-direction frequencies for 1958 will be compared with that of 1959. An excellent statistical tool in making such a comparison is the chi-square test, which will indicate whether there is any statistical difference between the 1958 and 1959 data.

Chi-square can be calculated using the formula:

$$\chi^2 = \sum_{\underline{i}=1}^{\underline{k}} \frac{(o_{\underline{i}} - e_{\underline{i}})^2}{e_{\underline{i}}},$$

where \underline{k} = number of pairs of frequencies to be compared, $o_{\underline{i}}$ and $e_{\underline{i}}$ denote the " \underline{i} "th pair of observed and expected frequencies, and $\sum o_{\underline{i}} = \sum e_{\underline{i}}$. The wind data for 1958 are used as the theoretical frequencies, and the 1959 data as the observed frequencies. Table I shows the limiting values of chi-square, which are dependent on a parameter ν , the number of degrees of freedom. This parameter is equal to the number of categories being compared minus the number of restrictions. The only restriction in the com-

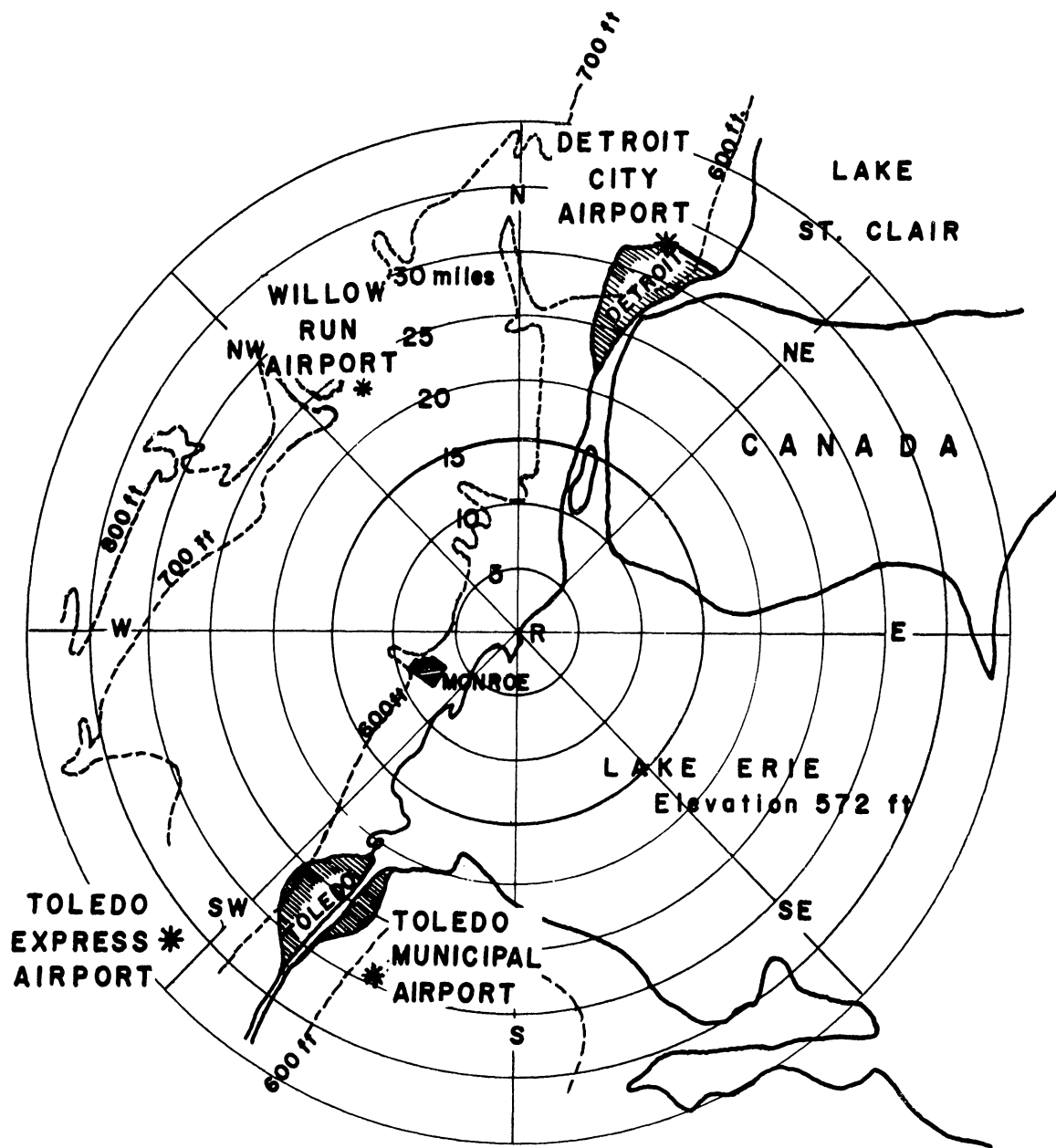


Fig. 1. A topographic map of Enrico Fermi site and surroundings.

TABLE I
LIMITING VALUES OF CHI SQUARE

ν	10%	5%	1%	0.1%
1	2.71	3.84	6.64	10.83
2	4.61	5.99	9.21	13.82
3	6.25	7.82	11.34	16.27
4	7.78	9.49	13.28	18.46
5	9.24	11.07	15.09	20.52
6	10.64	12.59	16.81	22.46
7	12.02	14.07	18.48	24.32
8	13.36	15.51	20.09	26.12
9	14.68	16.92	21.67	27.88
10	15.99	18.31	23.21	29.59
11	17.28	19.68	24.73	31.26
12	18.55	21.03	26.22	32.91
13	19.81	22.36	27.69	34.53
14	21.06	23.69	29.14	36.12
15	22.31	25.00	30.58	37.70
16	23.54	26.30	32.00	39.25
18	25.99	28.87	34.81	42.31
20	28.41	31.41	37.57	45.32
23	32.01	35.17	41.64	49.73
26	35.56	38.88	45.67	54.05
30	40.26	43.77	50.89	59.70

parisons being made in this report is that the total number of occurrences in the theoretical distribution must equal the total number of occurrences in the sample distribution. As an example, in this report, once the total number of occurrences are given, 16 categories are independent so the seventeenth category is therefore fixed. For this reason 16 degrees of freedom will be used in the chi-square testing of the 1958 and 1959 data.

The hypothesis to be tested is that 1959 data come from a population represented by the 1958 data. This hypothesis assumes that the 1958 data are typical of the actual wind-distribution picture at the plant site. As long as the values of chi-square are smaller than the limiting values at the 1% level in Table I, the above hypothesis will be accepted, and we can say that the 1959 data are not significantly different from the 1958 data. The annual summaries were compared using the chi-square test.

The value of chi-square computed from the annual 1958 and 1959 data was 1.695. For 16 degrees of freedom, this value is well below the 1% value. We can therefore say that the 1958 and 1959 data were drawn from the same population. It is interesting to note that the value of 1.695 is below the limiting value for 99.9% probability level. This result is quite similar to the one resulting from the comparison of 1957-1958 data in Progress Report No. 4. We can probably say that all three years were typical of the wind-direction frequencies at the plant site. However, there are certain seasonal variations which are to be expected due to the differences in weather regimes that predominate for a particular season and year.

The wind directions at the plant site have been grouped according to the centers of population in the area and comparisons within these groupings follow:

W, WNW, NW, NNW, N, and NNE (Combined).--The frequency distribution of occurrence of winds within this combined category is listed in Table XXXI-A for the seasons of 1959, the 1959 annual, and the three-year summary for 1957-1959 period at the plant site, Detroit City Airport, and Toledo Express Airport. The five-year seasonal and annual summaries for 1950 through 1954 for the Toledo Municipal Airport have also been included for continuity with past reports. Once again chi-square tests were applied to the seasonal occurrences for 1959 and 1958 at the plant site to see if any seasonal differences are present in this particular combined wind direction category. The question to be answered is whether the 1959 data came from the same population as the 1958 data. Since only the four seasonal distributions were being compared, the computed values of chi-square with 3 degrees of freedom were used. The value of chi-square calculated was 3.437, which is below the 1% level in Table I, so that the question must be answered affirmatively. The 1958 and 1959 data within this combined category are from the same population.

ENE Monroe.--Table XXXII-A presents the seasonal distribution of ENE winds for 1959. These data were compared with the 1958 ENE data (Table XXXII-A in Progress Report 2515-4-P) in the same manner as was the previous wind category. The value of chi-square calculated was 3.315, which is below the 1% limit. Therefore we can say that the 1958 data are quite similar to the 1959 data for this wind direction.

E, ESE, SE, SSE, and S (Combined).--Table XXXIII-A contains the 1959 seasonal summaries for this combined wind category. These data were compared with the 1958 seasonal summaries for this wind category listed in Table XXXIII-A in Progress Report 2515-4-P. The chi-square value computed was 2.467. It can therefore be said that the 1958 and 1959 data for this wind direction category are in very close agreement.

SSW - Detroit River Communities.--Table XXXIV-A in this report and Table XXXIV-A in the last report were compared and the chi-square value found was 2.899. The SSW data for both 1958 and 1959 are therefore quite similar.

SW and WSW - Ontario Shores.—Table XXXV-A in the report and in the fourth progress report list the combined SW and WSW wind category for 1959 and 1958, respectively. The chi-square value, with three degrees of freedom, was 5.465 which although relatively high, is well below the 1% level. This relatively high value of chi-square was primarily due to the large difference in percent occurrence of SW and WSW winds during summer, 1958, and summer, 1959. These winds occurred 24.3% of the time in 1958 and 15.2% of the time in 1959. The 1958 summer season was typified by meridional flow, while the 1959 season was typified by zonal flow. It is to be noted that this relationship is quite similar to the one which existed when comparing the 1957 and 1958 combined wind data. The wind direction within this combined category for 1959 is quite similar to that of 1957 (see Table XLVII of Progress Report No. 3).

The results of the comparisons outlined above exactly mirror those of the comparison of the 1957 and 1958 wind-direction data made in Progress Report No. 4.

3. WIND SPEED AT THE ENRICO FERMI PLANT SITE

Figures 7-A through 12-A present a visual comparison of the mean wind speed for each direction at the plant site as a percentage of the overall mean wind speed for all directions at Toledo and Detroit combined. This section, however, deals with a comparison of mean speeds for each direction at the plant site for 1958 with that of 1959. The above-mentioned figures are included for continuity with previous reports.

The directional mean speeds in Tables XXI-A for 1959 were compared with the same data for 1958 listed in Table XXI-A of Progress Report No. 4. The computed chi-square value, with 15 degrees of freedom, is 2.237 which is below the 1% level. The mean wind speed distribution for 1958 is in close agreement with that of 1959. There are seasonal variations but none is striking. The same results were reported in Progress Report No. 4 when the comparison of 1958 and 1957 wind data was made.

II. COMPARISON OF TEMPERATURE-LAPSE-RATE DATA

1. INTRODUCTION

Temperature-lapse-rate measurements at the plant site are taken as the temperature difference between 25 and 100 ft. The differences of temperature are considered in three categories: weak lapse, strong lapse, and inversions. The strong-lapse condition is defined as any temperature decrease with height greater than the dry adiabatic lapse rate and is associated with above-average condition of diffusion. The weak-lapse rate is defined as a decrease in temperature with height that is anywhere between zero and dry adiabatic. It is associated with average diffusion conditions. Inversion conditions are those where the temperature increases with height and are characterized by poor diffusion conditions. The temperature-lapse-rate data are tabulated in Appendix B. The percentage frequency of strong lapse, weak lapse, and inversion at the Enrico Fermi plant site are tabulated in Tables I-B, VIII-B, XV-B, XXII-B, XXIX-B, and XXXIV-B.

In past reports the lapse-rate data from the plant site were compared with the lapse-rate data taken at the WJBK-TV tower. Since the temperature differences are recorded up to 800 ft on the WJBK-TV tower, it was felt that these data should still be used for comparison. The lapse-rate data are recorded somewhat differently for the WJBK data from the data from the plant site. For this reason, only the percentage frequency of inversion occurrence between the 20- and 300-ft levels are recorded in Tables II-B, IX-B, XVI-B, XXIII-B, XXX-B, and XXXV-B.

Since the continuous inversion data for 1957 were inadvertently omitted from earlier progress reports, they are included as Appendix D of this report.

2. FREQUENCY OF INVERSIONS

The frequency of inversions for 1958 (Table XXXIII-B in Progress Report No. 4) was compared with the data for 1959 listed in Tables XXXIII-B. Using the chi-square techniques with 16 degrees of freedom, a value of 1.114 was calculated. This value is well below the value at the 1% level in Table I. We must again conclude that the 1958 and 1959 data are drawn from the same population.

Seasonal comparisons can be made using Tables VII-B, XIV-B, XXI-B, and XXVIII-B. The seasonal variations of inversions were great due to the presence of different weather patterns. The visual representations of the above-mentioned tabular data appear in Figs. 1-B through 6-B.

The frequency of occurrence of inversions was greater at the plant site than at the WJBK-TV tower for both 1958 and 1959 except for spring, 1958, and summer, 1959, when there was a greater frequency at the tower. This is to be expected because the plant site has both radiational inversions at night and lake-breeze inversions during the day, due to the proximity of Lake Erie. Only the evening radiational inversions are prevalent at the tower. Both sites are equally affected by the circulation-type inversions. (See Progress Report 2515-3-P for definitions of various inversions.)

Theoretically, inversions should be at a maximum during the summer and at a minimum during the winter. That is what was observed at the plant site, but at the tower the maximum occurrence was in summer and the minimum in the spring, at least during 1959. The 1958 data follow the theoretical distribution exactly at both the plant site and the WJBK-TV tower.

3. THE DIURNAL VARIATION OF INVERSION

The hourly percent frequency of inversions at the plant site and at the tower are listed in Tables XXXIX-B through XLII-B. The visual representations of these tables are presented in Figs. 7-B through 12-B. By observing the figures, it can be seen that the 1959 data are similar to the 1958 data. The tower data illustrate the typical continental pattern of diurnal variation with a marked maximum at night and marked minimum during the day. The plant site has superimposed on this pattern a secondary maximum during the afternoon due to the lake-breeze inversions. Although the primary maximum at the plant site occurs at night, inversions occur frequently during the day.

4. THE PERSISTENCE OF INVERSIONS

The frequency of continuous inversion at the tower and the plant site are listed in Tables III-B, IV-B, X-B, XI-B, XVII-B, XVIII-B, XXIV-B, and XXV-B. Generally speaking, for both 1958 and 1959 the frequency of continuous inversions during five hours was greater at the WJBK-TV tower than at the plant site. The plant site, however, has a greater frequency of continuous inversion during a 25-hour period. For the first time since December, 1956, there was continuous inversion over a 25-hour period at the WJBK-TV tower: this was an occurrence of 49 consecutive hours of inversion in the early winter of 1959. It was found that, over this period of time, a strong flow from Lake Erie was present with the probable formation of a long-period circulation-type inversion. The relatively warm air from over the lake was carried by the wind over the cold land surface, producing an inversion of measurable horizontal extent.

Since the nocturnal inversion predominates at the WJBK-TV tower, inversions of 13 hours duration are quite common. At the plant site either lake-breeze inversions or nocturnal inversions may occur. The inversion patterns are therefore completely different at the two locations.

5. THE ASSOCIATION OF LAPSE RATE WITH WIND SPEED

The lower-level wind speeds associated with inversions should, in general, be less than those associated with lapse conditions. The mean wind speeds during inversion and noninversion at the plant site are tabulated in Tables VII-B, XIV-B, XXI-B, XXVIII-B, XXXIII-B, and XXXVIII-B.

The average wind generally is greater during noninversion than during inversion for both 1958 and 1959. However, there are seasons in both years winds from the SE, SSE, S, SSW, and SW have a higher average wind speed during inversion than during noninversion periods.

A chi-square test was performed on the 1958 annual and 1959 annual mean wind speeds for inversion-period data (see Table XXXIII-B in this report and in Progress Report No. 3). With 15 degrees of freedom, a value of 6.831 for chi-square was computed. This indicates that the mean wind speeds during inversion periods were quite similar for 1958 and 1959.

6. THE ASSOCIATION OF LAPSE RATES WITH WIND DIRECTION

The frequency of lapse-rate categories with wind direction at the plant is presented in Tables V-B, XII-B, XIX-B, XXVI-B, XXXI-B, and XXXVI-B. The seasonal distribution of the lapse-rate-category occurrence with wind direction is similar for 1958 and 1959. As indicated previously, the chi-square test indicates that no significant statistical difference exists between the 1958 and 1959 lapse-rate data.

All the generalizations made for 1958 and 1959 lapse-rate data hold true for the 1957 data. It can be said that all three years were typical of the long-term lapse-rate picture both at WJBK-TV tower and at the plant site.

III. COMPARISON OF PRECIPITATION DATA

1. INTRODUCTION

Washout and rainout exert a cleansing action on the atmosphere, which can be either beneficial or otherwise, depending on whether the precipitation occurs over a populated or over an uninhabited area.

The precipitation data are presented as Appendix C. In Progress Report No. 4, the analyses of precipitation during the various lapse-rate categories were included but these data yielded little or no useful information. For that reason these data will not be included in this report.

2. SEASONAL VARIATIONS IN THE FREQUENCY OF PRECIPITATION

Precipitation is found to be one of the most variable of meteorological elements. Precipitation occurrence often varies considerably from year to year. No substantial variation is seen when the 1958 precipitation data, Tables I-C, VI-C, XI-C, XVI-C, and XXI-C in Progress Report No. 4, are compared with the 1959 precipitation data, presented in Tables I-C, IV-C, VII-C, X-C, and XIII-C. The seasonal distributions of precipitation for the two years are actually quite similar. For both years precipitation was at a maximum during the winter season. In 1958 the minimum occurrence of precipitation was during the spring, while in 1959 it was during the summer season. The summer of 1959 was an extremely dry season with precipitation only 5.6% of the time. The distribution of the occurrence of precipitation during the other seasons was quite similar during the two years of 1958 and 1959. The 1957 seasonal distributions of precipitation were substantially different from those of 1958 and 1959. The maximum precipitation took place in spring and the minimum was during the summer. In general, 1957 was much drier than 1958 or 1959.

The 1958 annual precipitation summary, Table XXI-C in Progress Report No. 4, and the 1959 annual precipitation, Table XIII-C, were compared using the chi-square test with 16 degrees of freedom. The value of chi-square calculated was 4.650, which is below the 1% level. We must again state that no significant difference exists between the two years of precipitation data, although there was a significant difference between the data of 1957 and 1958.

3. THE ASSOCIATION OF WIND SPEED AND WIND DIRECTION WITH PRECIPITATION

The influence of washout by precipitation is related to the wind velocity associated with the periods of precipitation. For this reason an analysis of the precipitation versus wind velocity associated with periods of precipitation has been included in this report as Tables I-C through XVIII-C for the plant site, Toledo Express Airport, and Toledo Municipal Airport for the five-year period 1950-1954. The visual representations of these data are presented as Fig. 1-C to 6-C.

Precipitation, during both 1958 and 1959, was associated with above-average wind speeds. The breakdown of prevalent wind directions with precipitation by seasons was the same for both years. During the winter, precipitation was most frequently associated with winds from the SW to WNW quadrant, which were characterized by pre- and post-cold frontal precipitation. The spring precipitation pattern indicated the presence of both cold and warm frontal activity, with easterly and westerly winds predominating during periods of precipitation. During both the summer and fall, precipitation associated with winds from the SW predominated. Such a precipitation pattern indicated that pre-cold frontal precipitation predominated during these seasons. The 1957 data are in close agreement with the general conclusions previously stated for 1958 and 1959.

IV. SUMMARY

1. Chi-square tests indicate no significant difference between the 1958 and 1959 wind direction and wind-speed data.
2. The 1958 inversion-frequency data are quite similar to the 1959 inversion-frequency data.
3. In both 1958 and 1959 inversions occurred more frequently at the plant site than at the WJBK-TV tower.
4. At the plant site, the maximum inversion frequency occurred during the summer and the minimum during the winter, but at the WJBK-TV tower, maximum occurrence was in summer and minimum in the spring.
5. The TV tower data illustrate a typical continental pattern of diurnal variation of inversions with a marked maximum at night and marked minimum during the day. The plant site has superimposed on this pattern a secondary maximum during the afternoon due to lake-breeze inversions.
6. Continuous inversions lasting 5 hours or more were more frequent at the WJBK-TV tower than at the plant site. However, shorter duration continuous inversions were more frequent at the plant site due to the presence of lake-breeze inversions.
7. The lower-level wind speeds associated with inversion periods were lighter than those associated with lapse conditions.
8. The 1958 and 1959 precipitation data were found to be from the same populations.
9. The distribution of meteorological parameters in 1958 were similar to those in 1959.

APPENDIX A

WIND DATA

TABLE I-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Enrico Fermi Site
(Aerovane at height of 102 ft)
1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Speed, mph					Total Observations		Mean Speed		
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.2	2.9	1.3			4.2	4.4	94	10.9	88
NNE	0.4	1.7	0.9	0.0		2.6	3.0	66	10.6	86
NE	0.2	1.0	2.7			3.7	3.9	84	14.7	119
ENE	0.2	1.8	0.7	0.1		2.6	2.8	41	12.3	99
E	0.0	1.5	1.0	0.1		2.6	2.6	37	15.7	127
ESE	0.0	0.6	0.5			1.1	1.1	23	12.3	99
SE	0.2	0.8	0.5			1.3	1.5	31	10.5	85
SSE	0.2	2.1	0.7			2.8	3.0	65	10.2	82
S		3.9	0.9			4.8	4.8	103	9.9	80
SSW	0.2	5.6	3.8			9.4	9.6	208	12.0	97
SW	0.4	3.7	4.0	0.0		7.7	8.1	174	13.0	105
WSW	0.2	7.6	10.6	0.4		18.6	18.8	405	14.3	115
W	0.5	5.2	6.7	0.1		12.0	12.5	267	13.6	110
WNW	0.2	5.7	4.0			9.7	9.9	213	12.0	97
NW	0.6	4.9	3.2			8.1	8.7	185	11.4	92
NNW	0.7	4.5	1.4			5.9	6.6	142	9.7	78
Calm	0.4						0.4	8	0.0	0
Totals	4.6	53.5	42.9	0.7		97.1	101.7	2146		
Average									12.4	100

TABLE II-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Toledo Express Airport
(Wind instruments at height of 72 ft)
1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.3	2.5	1.4			3.9	4.2	93	11.0	95
NNE	0.1	1.6	0.5			2.1	2.2	47	10.0	86
NE	0.2	2.0	1.6			3.6	3.8	83	12.0	103
ENE	0.3	1.9	1.2			3.1	3.4	74	11.3	97
E	0.4	1.9	0.1			2.0	2.4	52	7.6	65
ESE	0.8	1.5	0.0			1.5	2.3	51	5.9	51
SE	0.8	2.5	0.1			2.6	3.4	74	6.8	59
SSE	0.4	4.4	0.6			5.0	5.4	115	8.6	74
S	0.6	5.2	1.4			6.6	7.2	157	9.5	82
SSW	0.5	5.8	3.3	0.0		9.1	9.6	209	11.3	97
SW	0.7	7.5	9.7	0.1		17.3	18.0	389	13.5	116
WSW	0.5	6.5	8.1	0.2	0.0	14.8	15.3	326	13.8	119
W	0.3	2.5	2.9	0.1		5.5	5.8	125	13.2	114
WNW	0.2	2.7	3.2			5.9	6.1	132	13.3	115
NW	0.5	2.3	2.3			4.6	5.1	110	12.0	103
NNW	0.5	2.2	1.9			4.1	4.6	99	11.6	100
Calm	1.1						1.1	4	0.0	0
Totals	8.2	53.0	38.3	0.4	0.0	91.7	99.9	2160		
Average									11.6	100

TABLE III-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Detroit City Airport
(Wind instruments at height of 81 ft)
1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	1.1	5.5	4.1			9.6	10.7	233	11.3	86
NNE	0.2	2.3	1.4			3.7	3.9	86	11.3	86
NE	0.0	1.9	0.8			2.7	2.7	60	11.0	83
ENE	0.0	1.6	0.5			2.1	2.1	45	10.2	77
E	0.5	1.7	0.3			2.0	2.5	54	8.0	61
ESE	0.2	1.2	0.2			1.4	1.6	36	8.7	66
SE	0.5	1.2	0.3			1.5	2.0	41	8.0	61
SSE	0.1	1.4	0.0			1.4	1.5	33	7.9	60
S	0.2	6.7	1.9			8.6	8.8	190	10.1	77
SSW	0.1	2.9	2.4			5.3	5.4	115	12.5	95
SW	0.2	4.6	6.4	0.1		11.1	11.3	245	13.9	120
WSW	0.0	2.4	6.1	0.1		8.6	8.6	188	15.7	119
W	0.3	2.9	9.0	0.4	0.1	12.4	12.7	274	16.2	123
WNW	0.1	2.3	6.7	0.1		9.1	9.2	199	15.7	119
NW	0.7	3.3	7.9	0.0		11.2	11.9	257	14.6	111
NNW	0.1	1.8	2.6			4.4	4.5	99	13.8	105
Calm	0.2						0.2	5	0.0	0
Totals	4.5	43.7	50.6	0.7	0.1	95.1	99.6	2160		
Average									13.2	100

TABLE IV-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS,
BIASED AND UNBIASED

Detroit City Airport
1 December 1958 - 28 February 1959
(Winter)

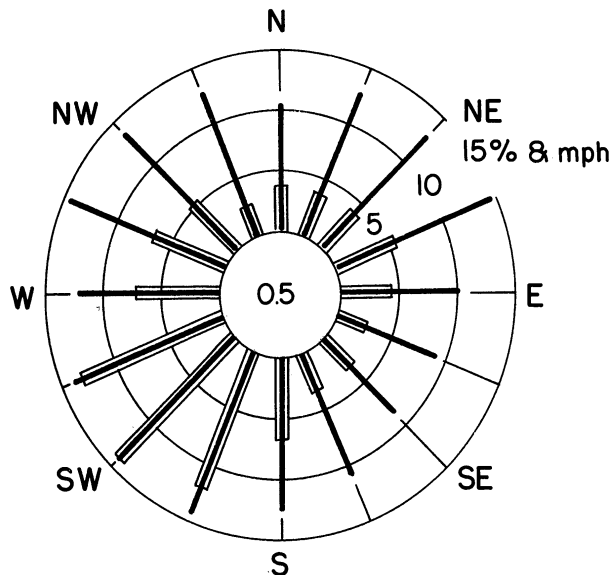
Wind Direction	Total Observations			
	Biased Record		Unbiased Record	
	No.	%	No.	%
N	233	10.7	174	8.1
NNE	86	3.9	114	5.3
NE	60	2.7	51	2.4
ENE	45	2.1	44	2.0
E	54	2.5	48	2.2
ESE	36	1.6	37	1.7
SE	41	2.0	32	1.5
SSE	33	1.5	45	2.1
S	190	8.8	134	6.2
SSW	115	5.4	179	8.3
SW	245	11.3	200	9.3
WSW	188	8.6	239	11.1
W	274	12.7	238	11.0
WNW	199	9.2	257	11.9
NW	257	11.9	203	9.4
NNW	99	4.5	160	7.4
Calm	5	0.2	5	0.2
Totals	2160	99.6	2160	100.1

TABLE V-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

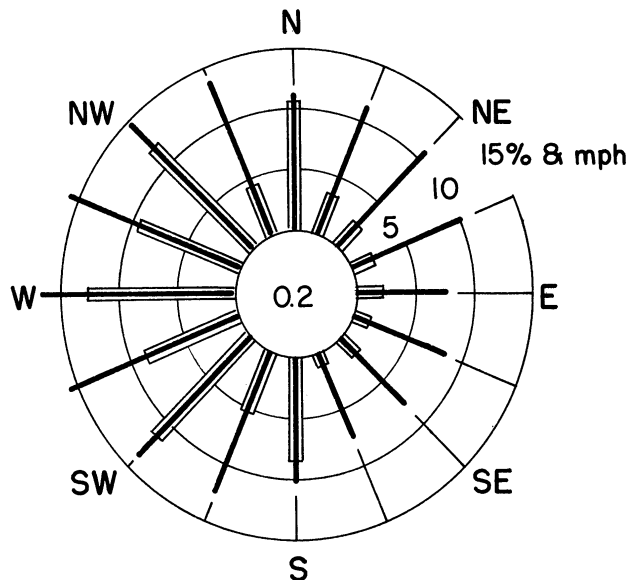
Toledo Municipal Airport
(Wind instruments at height of 47 ft)
1 January 1950 - 31 December 1954
(Winter Seasons)

Wind Direction	Speed, mph					Total Observations		Mean Speed	
	0-3	4-12	13-24	25 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.3	2.3	1.0		3.4	3.6	395	10.1	78
NNE	0.1	1.8	1.6	0.1	3.4	3.6	385	12.4	96
NE	0.2	1.9	1.8	0.1	3.8	4.0	432	12.3	95
ENE	0.2	2.1	2.8	0.4	5.3	5.5	591	14.3	111
E	0.3	2.6	1.4		4.0	4.3	467	10.1	78
ESE	0.2	2.0	0.6		2.5	2.8	301	9.1	71
SE	0.3	2.3	0.7		3.0	3.3	352	8.9	69
SSE	0.2	2.2	1.3		3.6	3.8	411	11.1	86
S	0.4	3.2	3.4	0.2	6.8	7.2	777	12.9	100
SSW	0.2	4.8	6.5	0.8	12.1	12.3	1330	14.5	112
SW	0.3	5.7	7.1	1.0	13.8	14.1	1524	14.1	109
WSW	0.3	5.4	6.6	1.0	12.9	13.2	1429	14.0	109
W	0.3	3.6	2.9	0.2	6.8	7.2	774	12.1	94
WNW	0.1	2.6	3.5	0.5	6.7	6.8	732	14.3	111
NW	0.2	2.1	2.7	0.2	5.0	5.3	570	13.5	105
NNW	0.1	1.2	2.2	0.1	2.6	2.7	295	12.5	97
Calm	<u>0.5</u>	—	—	—	—	<u>0.5</u>	<u>59</u>	<u>0.0</u>	<u>0</u>
Totals	3.9	45.8	45.1	4.7	95.6	100.0	10824		
Mean								12.9	100



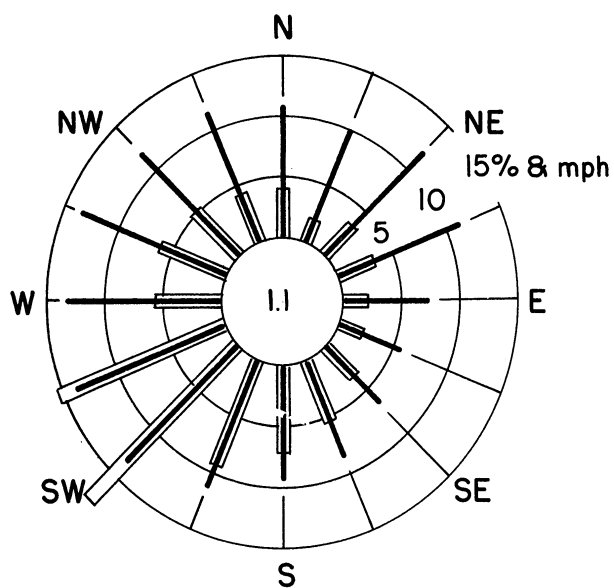
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 47 ft.
Winter (Dec., Jan., Feb.) 1950-1954



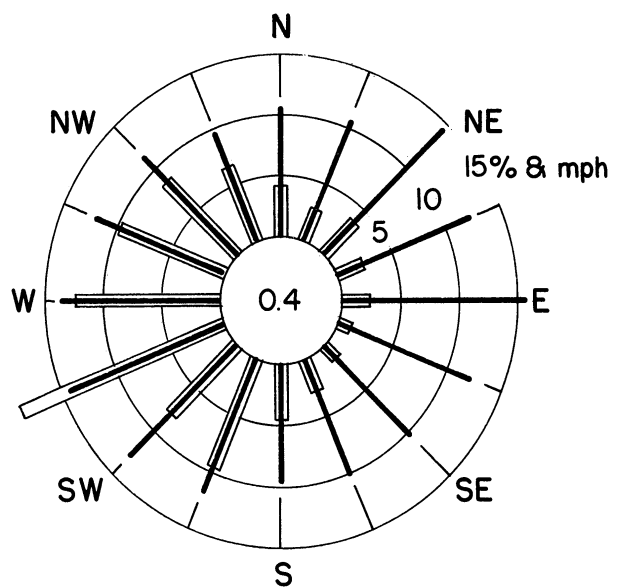
DETROIT CITY AIRPORT
DETROIT, MICHIGAN

Wind Instrument at Height of 81 ft.
Winter (Dec., Jan., Feb.) 1959



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 72 ft.
Winter (Dec., Jan., Feb.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Aerovane at Height of 102 ft.
Winter (Dec., Jan., Feb.) 1959

Fig. 1-A. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at Toledo Municipal Airport, Winter Seasons, 1950-1954; Detroit City Airport, Toledo Express Airport, and Enrico Fermi site, Winter, 1958-1959.

TABLE VI-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Enrico Fermi Site
(Aerovane at height of 102 ft)
1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.1	2.6	0.4			3.0	3.1	69	8.9	67
NNE	0.1	2.9	2.2	0.2		5.3	5.4	120	12.9	97
NE	0.1	1.6	5.1	0.4	0.1	7.2	7.3	161	16.5	124
ENE	0.1	2.7	3.0	0.4		6.1	6.2	136	14.2	107
E	0.1	2.7	3.1	0.5		6.3	6.4	141	14.5	109
ESE	0.1	3.7	2.9	0.5		7.1	7.2	158	13.5	101
SE	0.3	3.3	1.3	0.1		4.7	5.0	110	10.5	79
SSE	0.2	3.6	1.9			5.5	5.7	125	11.3	85
S		3.2	1.3	0.1		4.6	4.6	101	11.4	86
SSW	0.1	3.7	4.4	0.1		8.2	8.3	181	13.6	102
SW	0.2	5.2	4.0	0.3	0.4	9.9	10.1	220	13.5	101
WSW	0.2	4.3	3.7	0.5	0.2	8.7	8.9	196	14.0	105
W		3.3	1.8	0.9	0.1	6.1	6.1	135	14.5	109
WNW	0.1	3.3	2.0	0.4		5.7	5.8	126	12.8	96
NW	0.1	2.2	2.4	0.1		4.7	4.8	105	13.6	102
NNW	0.1	2.5	1.8	0.2		4.5	4.6	102	12.7	95
Calm	0.1						0.1	2	0.0	0
Totals	2.0	50.8	41.3	4.7	0.8	97.6	99.6	2188		
Average									13.3	100

TABLE VII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Toledo Express Airport
1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Over-all Mean
N	0.5	2.5	0.6			3.1	3.6	78	8.9	90
NNE	0.6	2.8	1.0	0.0		3.8	4.4	100	9.7	98
NE	0.6	6.5	2.0			8.5	9.1	202	9.8	99
ENE	0.6	6.0	1.9	0.1		8.0	8.6	192	10.1	102
E	0.5	2.9	0.4			3.3	3.8	84	8.1	82
ESE	0.9	1.7	0.1			1.8	2.7	60	6.4	65
SE	0.9	2.3	0.2			2.5	3.4	75	7.0	71
SSE	0.6	3.4	0.8			4.2	4.8	106	9.0	91
S	1.0	5.2	1.4	0.0		6.6	7.6	169	9.1	92
SSW	1.3	6.3	2.9	0.2	0.1	9.5	10.8	239	10.6	107
SW	1.1	7.2	3.1	0.2	0.2	10.7	11.8	261	10.9	110
WSW	0.6	4.9	3.3	0.3		8.3	8.9	201	11.9	120
W	0.0	2.5	1.5	0.2		4.2	4.2	94	12.6	127
WNW	0.3	2.9	2.5			5.4	5.7	124	12.3	124
NW	0.4	2.4	1.1			3.5	3.9	86	10.4	105
NNW	0.5	2.7	0.7			3.4	3.9	86	8.9	90
Calm	2.3						2.3	51	0.0	0
Totals	12.7	62.2	23.5	1.0	0.3	86.8	99.5	2208		
Average									9.9	100

TABLE VIII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Detroit City Airport
(Wind instruments at height of 81 ft)
1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.6	4.6	2.5	0.1		7.2	7.8	174	11.2	93
NNE	0.2	3.7	2.6	0.1		6.4	6.6	147	12.1	100
NE	0.7	4.1	1.7			5.8	6.5	142	10.0	83
ENE		4.1	1.5			5.6	5.6	123	10.8	89
E	0.7	4.3	1.1			5.4	6.1	133	9.2	76
ESE	0.4	4.1	1.4			5.5	5.9	129	10.0	83
SE	0.3	4.3	0.8			5.1	5.4	119	9.2	76
SSE	0.1	2.6	0.4			3.0	3.1	68	9.2	76
S	0.4	7.3	2.4			9.7	10.1	222	10.3	85
SSW		3.7	1.9			5.6	5.6	124	11.6	96
SW	0.0	3.4	4.7	0.6	0.1	8.8	8.8	196	15.3	126
WSW		2.3	2.9	0.3	0.1	5.6	5.6	122	14.9	123
W	0.0	2.7	2.5	0.7	0.1	6.0	6.0	135	15.0	24
WNW	0.0	1.6	3.3	0.2	0.1	5.2	5.2	117	16.0	132
NW	0.0	2.8	4.3	0.5	0.0	7.6	7.6	170	15.2	126
NNW	0.1	1.5	1.4			2.9	3.0	68	12.5	103
Calm	0.9						0.9	19	0.0	0
Totals	4.4	58.1	36.4	2.5	0.4	95.4	99.8	2208		
Average									12.1	100

TABLE IX-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS,
BIASED AND UNBIASED

Detroit City Airport
1 March 1959 - 31 May 1959
(Spring)

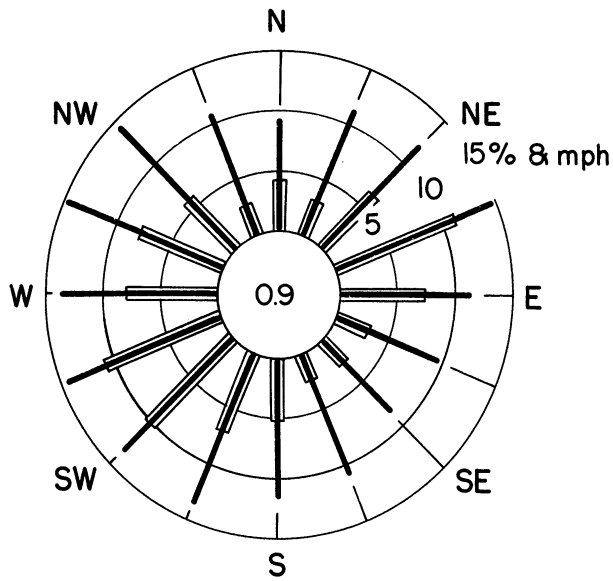
Wind Direction	Total Observations			
	Biased Record		Unbiased Record	
	No.	%	No.	%
N	174	7.8	145	6.6
NNE	147	6.6	171	7.7
NE	142	6.5	136	6.2
ENE	123	5.6	125	5.7
E	133	6.1	131	5.9
ESE	129	5.9	134	6.1
SE	119	5.4	102	4.6
SSE	68	3.1	94	4.3
S	222	10.1	166	7.5
SSW	124	5.6	190	8.6
SW	196	8.8	164	7.4
WSW	122	5.6	141	6.4
W	135	6.0	118	5.3
WNW	117	5.2	142	6.4
NW	170	7.6	135	6.1
NNW	68	3.0	95	4.3
Calm	19	0.9	19	0.9
Totals	2208	99.8	2208	100.0

TABLE X-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

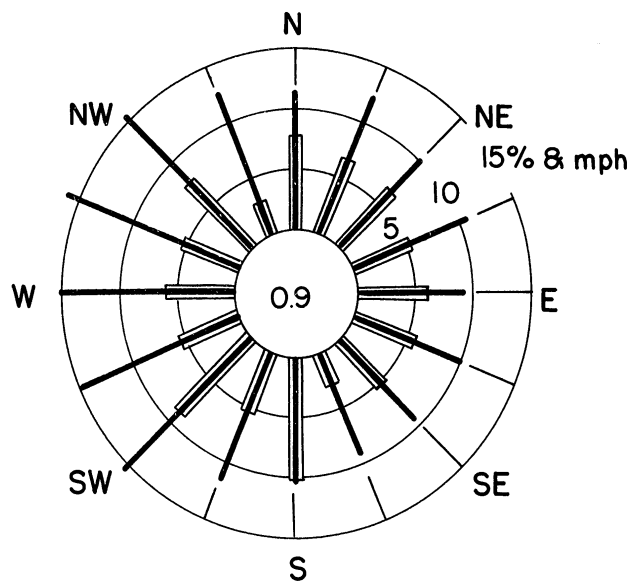
Toledo Municipal Airport
(Wind instruments at height of 47 ft)
1 January 1950 - 31 December 1954
(Spring Seasons)

Wind Direction	Speed, mph					Total Observations		Mean Speed	
	0-3	4-12	13-24	25	Total	%	No.	mph	% of Over- all Mean
				and	4 and				
N	0.3	2.9	1.0		3.9	4.2	468	9.1	72
NNE	0.1	1.9	1.2		3.1	3.2	351	11.1	87
NE	0.2	3.0	2.7		5.8	6.0	667	11.8	93
ENE	0.2	4.1	6.5	0.7	11.2	11.4	1258	14.6	115
E	0.4	3.8	3.0	0.1	6.9	7.3	811	11.4	90
ESE	0.2	2.2	0.7		3.0	3.2	350	9.4	74
SE	0.3	2.3	0.5		2.7	3.0	332	8.4	66
SSE	0.2	1.8	0.9	0.1	2.7	2.9	323	11.0	87
S	0.3	2.9	1.8	0.2	4.9	5.3	582	11.7	92
SSW	0.2	3.1	3.5	0.4	7.0	7.2	796	13.7	108
SW	0.4	4.8	4.4	0.7	9.8	10.2	1127	13.3	105
WSW	0.3	4.2	5.4	0.9	10.4	10.8	1189	14.3	113
W	0.2	3.6	3.7	0.4	7.7	8.0	881	13.4	106
WNW	0.3	2.4	4.7	0.4	7.6	7.8	865	14.9	117
NW	0.1	2.2	3.1	0.3	5.6	5.8	636	14.0	110
NNW	0.2	1.7	0.8	0.1	2.6	2.8	307	10.6	83
Calm	<u>0.9</u>	---	---	---	---	<u>0.9</u>	<u>97</u>	<u>0.0</u>	<u>0</u>
Totals	3.9	46.9	43.9	4.3	95.2	100.0	11040		
Mean								12.7	100



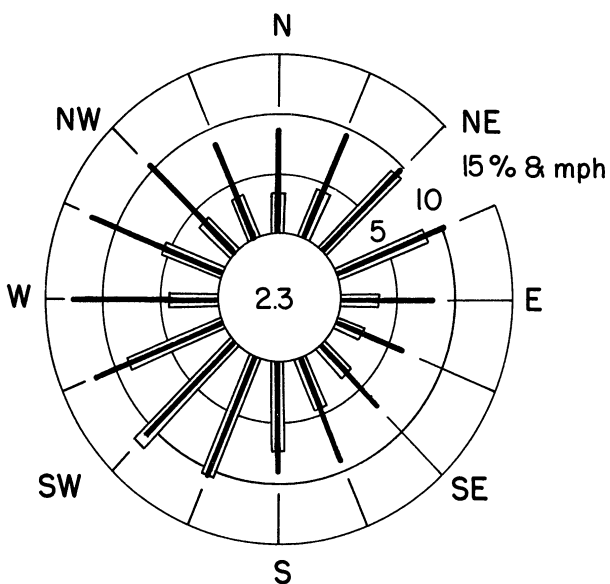
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 47 ft.
Spring (Mar., Apr., May.) 1950-1954



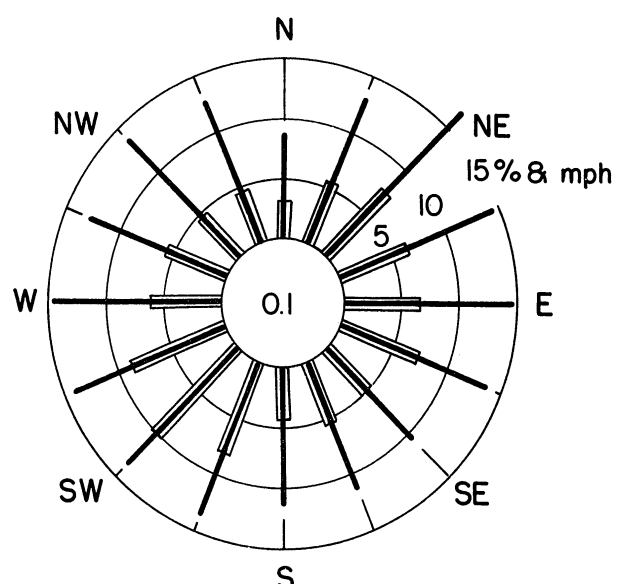
DETROIT CITY AIRPORT
DETROIT, MICHIGAN

Wind Instrument at Height of 81 ft.
Spring (Mar., Apr., May.) 1959



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 72 ft.
Spring (Mar., Apr., May.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Aerovane at Height of 102 ft.
Spring (Mar., Apr., May.) 1959

Fig. 2-A. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at Toledo Municipal Airport, Spring Seasons, 1950-1954; Detroit City Airport, Toledo Express Airport, and Enrico Fermi site, Spring, 1959

TABLE XI-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Enrico Fermi Site
(Aerovane at height of 102 ft)
1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Speed, mph					Total Observations		Mean Speed		
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Over-all Mean
N	0.4	4.5	0.2			4.7	5.1	81	7.9	76
NNE	0.3	3.1	0.8			3.9	4.2	68	9.5	91
NE	0.2	2.5	2.1			4.6	4.8	78	12.3	118
ENE	0.1	2.5	1.9	0.1		4.5	4.6	74	12.9	124
E	0.1	2.2	1.2			3.4	3.5	56	11.4	110
ESE		2.3	1.8			4.1	4.1	66	12.6	121
SE		5.2	3.2			8.4	8.4	136	12.0	115
SSE	0.1	5.8	2.0			7.8	7.9	127	10.5	101
S		5.0	0.4			5.4	5.4	87	8.7	84
SSW		6.3	1.9			8.2	8.2	133	10.4	100
SW	0.1	6.4	2.4			8.8	8.9	144	10.8	104
WSW	0.1	5.0	1.2			6.2	6.3	101	9.8	94
W	0.1	5.3	0.4			5.7	5.	94	8.5	82
WNW		5.7	1.9			7.6	7.6	123	10.6	102
NW		6.6	1.1			7.7	7.7	125	9.5	91
NNW	0.4	5.2	1.7			6.9	7.3	119	10.1	97
Calm										
Totals	1.9	73.6	24.2	0.1		97.9	99.8	1612		
Average									10.4	100

TABLE XII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Toledo Express Airport
(Wind instruments at height of 72 ft)
1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Speed, mph					Total Observations		Mean Speed		
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	1.1	3.9	0.7			4.6	5.7	128	8.1	114
NNE	0.7	3.7	0.3			4.0	4.7	102	7.7	108
NE	1.0	2.6	0.2			2.8	3.8	83	6.8	95
ENE	1.4	3.1	0.3			3.4	4.8	108	6.8	95
E	0.9	1.9	0.0			1.9	2.8	62	6.2	87
ESE	1.4	3.0				3.0	4.4	98	5.9	83
SE	1.8	1.9	0.0			1.9	3.7	84	5.0	78
SSE	1.6	2.7	0.1			2.8	4.4	96	5.8	82
S	1.2	5.2	0.1			5.3	6.5	145	7.0	99
SSW	1.4	6.9	0.4			7.3	8.7	191	7.4	104
SW	2.8	10.4	1.2			11.6	14.4	318	7.6	107
WSW	1.7	8.0	0.8			8.8	10.5	233	7.8	110
W	1.2	3.6	0.3			3.9	5.1	111	7.0	99
WNW	0.7	3.7	1.2			4.9	5.6	123	13.0	183
NW	0.8	4.2	0.5			4.7	5.5	123	8.1	114
NNW	0.9	3.4	0.8			4.2	5.1	112	8.5	120
Calm	4.1						4.1	91	0.0	0
Totals	24.7	68.2	6.9			75.1	99.8	2208		
Average									7.1	100

TABLE XIII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Detroit City Airport
(Wind instruments at height of 81 ft)
1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Speed, mph					Total Observations		Mean Speed		
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	% No.	mph	% of Over-all Mean	
N	1.0	8.7	1.7			10.4	11.4	252	9.0	97
NNE	0.6	4.3	0.6			4.9	5.5	123	8.4	90
NE	0.9	3.1	0.4			3.5	4.4	98	7.6	82
ENE	0.1	3.2	0.3			3.5	3.6	79	8.6	92
E	0.6	3.4	0.1			3.5	4.1	92	7.4	80
ESE	0.0	2.2	0.1			2.3	2.3	52	8.3	89
SE	0.4	4.0	0.1			4.1	4.5	99	7.8	84
SSE	0.3	3.6	0.3			3.9	4.2	92	8.4	90
S	0.9	9.8	1.2			11.0	11.9	264	8.6	92
SSW	0.2	5.8	1.4			7.2	7.4	165	9.8	105
SW	0.5	6.8	3.2			10.0	10.5	232	10.9	117
WSW	0.1	3.4	1.3			4.7	4.8	106	10.7	115
W	0.3	4.3	0.9			5.2	5.5	121	9.3	100
WNW	0.0	4.3	1.6			5.9	5.9	131	10.8	116
NW	0.5	5.5	1.8			7.3	7.8	172	9.9	107
NNW	0.3	3.1	1.8	0.0		4.9	5.2	115	11.4	123
Calm	0.7						0.7	15	0.0	0
Totals	7.4	75.5	17.0	0.0		92.3	99.7	2208		
Average									9.3	100

TABLE XIV-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS,
BIASED AND UNBIASED

Detroit City Airport
1 June 1959 - 31 August 1959
(Summer)

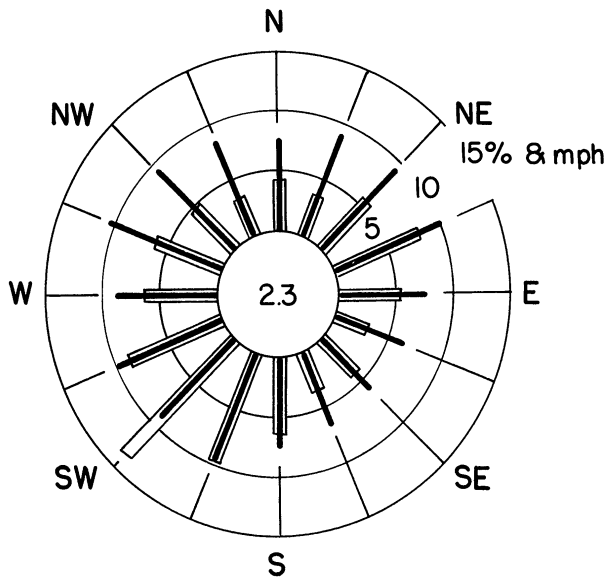
Wind Direction	Total Observations			
	Biased Record		Unbiased Record	
	No.	%	No.	%
N	252	11.4	205	9.3
NNE	123	5.5	157	7.1
NE	98	4.4	87	3.9
ENE	79	3.6	80	3.6
E	92	4.1	78	3.5
ESE	52	2.3	58	2.6
SE	99	4.5	76	3.4
SSE	92	4.2	123	5.6
S	264	11.9	210	9.5
SSW	165	7.4	249	11.3
SW	232	10.5	190	8.6
WSW	106	4.8	121	5.5
W	121	5.5	106	4.8
WNW	131	5.9	137	6.2
NW	172	7.8	148	6.7
NNW	115	5.2	168	7.6
Calm	15	0.7	15	0.7
Totals	2208	99.7	2208	99.9

TABLE XV-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

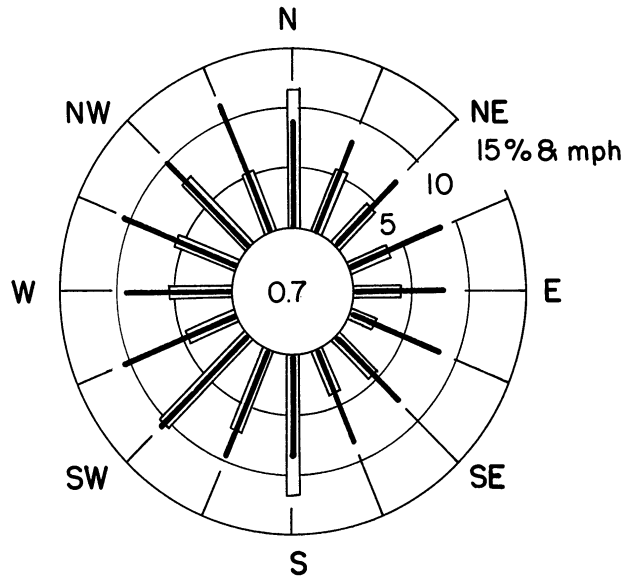
Toledo Municipal Airport
(Wind instruments at height of 47 ft)
1 January 1950 - 31 December 1954
(Summer Seasons)

Wind Direction	Speed, mph					Total Observations		Mean Speed	
	0-3	4-12	13-24	25	Total	%	No.	mph	% of Over- all Mean
				and	4 and				
				Over	Over				
N	0.7	3.3	0.6		3.9	4.6	509	7.8	91
NNE	0.3	2.4	0.8		3.2	3.5	391	9.1	106
NE	0.6	3.7	1.3		5.0	5.6	619	9.1	106
ENE	0.6	4.9	2.2		7.1	7.7	849	9.9	115
E	0.7	4.1	0.6		4.7	5.4	604	7.7	90
ESE	0.4	2.5	0.1		2.6	3.0	330	6.4	74
SE	0.7	3.3	0.1		3.4	4.1	456	6.0	70
SSE	0.6	2.9	0.3		3.2	3.8	416	6.7	78
S	0.7	5.2	0.7		5.9	6.6	727	7.6	88
SSW	0.7	6.6	2.4	0.1	9.1	9.8	1086	9.7	113
SW	1.1	9.0	3.1	0.1	12.2	13.3	1463	9.1	106
WSW	0.7	5.5	2.6	0.1	8.2	8.9	973	9.7	113
W	0.8	4.1	1.4		5.5	6.3	705	8.8	102
WNW	0.5	3.8	2.1		5.9	6.4	721	10.5	122
NW	0.7	2.9	1.3		4.2	4.9	545	9.3	108
NNW	0.5	2.2	0.8		3.0	3.5	394	8.8	102
Calm	<u>2.3</u>	—	—	—	—	<u>2.3</u>	<u>252</u>	<u>0.0</u>	<u>0</u>
Totals	12.6	66.4	20.4	0.3	87.1	99.7	11040		
Mean								8.6	100



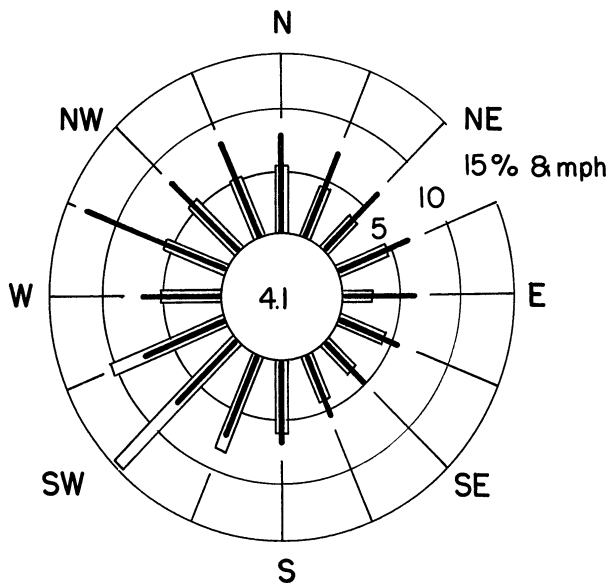
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 47 ft.
Summer (June, July, Aug.) 1950-1954



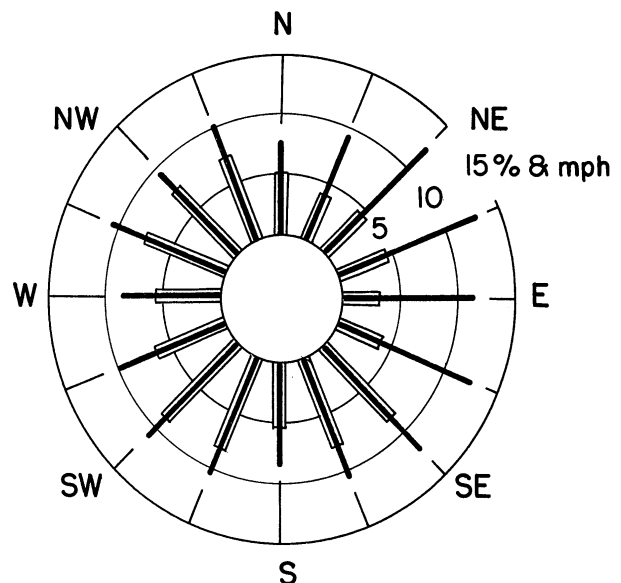
DETROIT CITY AIRPORT
DETROIT, MICHIGAN

Wind Instrument at Height of 81 ft.
Summer (June, July, Aug.) 1959



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 72 ft.
Summer (June, July, Aug.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Aerovane at Height of 102 ft.
Summer (June, July, Aug.) 1959

Fig. 3-A. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at Toledo Municipal Airport, Summer Seasons, 1950-1954; Detroit City Airport, Toledo Express Airport, and Enrico Fermi site, Summer, 1959.

TABLE XVI-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Enrico Fermi Site
(Aerovane at height of 102 ft)
1 September 1959 - 30 November 1959
(Fall)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.9	4.6				4.6	5.5	108	6.9	61
NNE	0.3	3.3	0.4			3.7	4.0	78	8.5	75
NE	0.5	2.5	3.2	0.3		6.0	6.5	126	13.6	120
ENE	0.2	2.3	2.2	0.1		4.6	4.8	94	13.0	115
E	0.4	1.8	1.5			3.3	3.7	72	11.5	102
ESE	0.1	1.7	1.0			2.7	2.8	55	11.7	104
SE	0.1	2.1	2.1			4.2	4.3	84	13.2	117
SSE	0.1	2.0	1.2			3.2	3.3	65	11.5	102
S	0.2	3.1	1.5			4.6	4.8	94	11.1	98
SSW	0.4	6.0	4.5	0.1		10.6	11.0	216	12.3	109
SW	0.2	7.4	3.9			11.3	11.5	228	11.5	102
WSW	0.3	6.7	4.0	0.2		10.9	11.2	220	11.9	105
W	0.5	3.8	4.1	0.1		8.0	8.5	167	15.0	115
WNW	0.5	4.9	1.6	0.3		6.8	7.3	141	20.6	94
NW	0.5	4.6	1.6			6.2	6.7	132	10.1	89
NNW	0.6	3.8	0.6			4.4	5.0	97	8.5	75
Calm										
Totals	5.8	60.6	33.4	1.1		95.1	100.9	1977		
Average									11.3	100

TABLE XVII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Toledo Express Airport
(Wind instruments at height of 72 ft)
1 September 1959 - 30 November 1959
(Fall)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.7	3.2	0.1			3.3	4.0	88	7.1	82
NNE	0.7	3.8	0.2			4.0	4.7	103	7.5	86
NE	1.0	5.3	0.4			5.7	6.7	145	7.6	87
ENE	0.8	2.8	0.8			3.6	4.4	98	8.7	100
E	0.5	2.0	0.1			2.1	2.6	58	7.0	80
ESE	0.7	1.9				1.9	2.6	57	6.3	72
SE	0.9	1.8	0.1			1.9	2.8	63	6.4	74
SSE	1.0	3.4	0.3			3.7	4.7	103	7.3	84
S	1.1	6.6	0.8			7.4	8.5	188	8.1	93
SSW	0.8	6.9	1.7			8.6	9.4	205	9.4	108
SW	2.0	7.7	2.2			9.9	11.9	259	8.9	102
WSW	1.0	7.2	4.7			11.9	12.9	282	11.4	131
W	0.6	3.5	2.2			5.7	6.3	138	11.1	128
WNW	0.3	3.5	1.8	0.1		5.4	5.7	125	11.2	128
NW	0.7	3.0	0.7			3.7	4.4	98	8.7	100
NNW	0.5	2.7	1.0			3.7	4.2	93	9.7	111
Calm	3.7						3.7	81	0.0	0
Totals	17.0	65.3	17.1	0.1		82.5	99.5	2184		
Average									8.7	100

TABLE XVIII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Detroit City Airport
(Wind instruments at height of 81 ft)
1 September 1959 - 30 November 1959
(Fall).

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Over-all Mean
N	1.3	8.1	2.0			10.1	11.4	248	9.1	85
NNE	0.6	3.9	1.1			5.0	5.6	124	9.4	88
NE	0.7	2.6	0.5			3.1	3.8	82	8.1	76
ENE	0.2	2.8	0.4			3.2	3.4	74	8.8	82
E	0.7	3.0	0.1			3.1	3.8	84	7.0	65
ESE	0.2	1.8	0.3			2.1	2.3	50	8.7	81
SE	0.2	3.5	0.2			3.7	3.9	86	8.1	76
SSE		3.1	0.2			3.3	3.3	72	8.6	80
S	0.2	8.2	2.0			10.2	10.4	227	9.9	93
SSW	0.1	5.6	3.0			8.6	8.7	191	11.5	107
SW	0.2	4.6	4.0			8.6	8.8	193	12.7	119
WSW	0.0	3.0	2.9			5.9	5.9	130	13.0	121
W	0.4	4.3	3.9	0.2		8.4	8.8	190	12.8	120
WNW	0.1	3.7	3.8	0.2		7.7	7.8	171	13.5	126
NW	0.6	3.9	2.7	0.1		6.7	7.3	159	11.6	108
NNW	0.1	2.2	1.9			4.1	4.2	90	12.6	118
Calm	0.6						0.6	13	0.0	0
Totals	6.2	64.3	29.0	0.5		93.8	100.0	2184		
Average									10.7	100

TABLE XIX-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS,
BIASED AND UNBIASED

Detroit City Airport
1 September 1959 - 30 November 1959
(Fall)

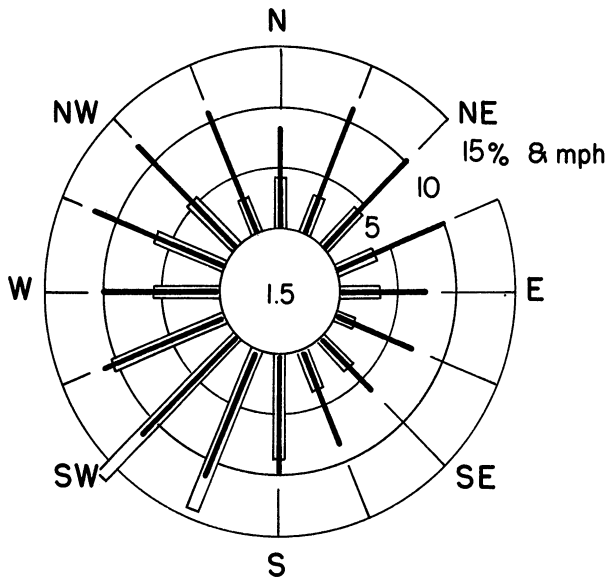
Wind Direction	Total Observations			
	Biased Record		Unbiased Record	
	No.	%	No.	%
N	248	11.4	198	9.1
NNE	124	5.6	161	7.4
NE	82	3.8	75	3.4
ENE	74	3.4	72	3.3
E	84	3.8	74	3.4
ESE	50	2.3	56	2.6
SE	86	3.9	68	3.0
SSE	72	3.3	91	4.2
S	227	10.4	191	8.7
SSW	191	8.7	242	11.1
SW	193	8.8	173	7.9
WSW	130	5.9	145	6.6
W	190	8.8	173	7.9
WNW	171	7.8	188	8.6
NW	159	7.3	136	6.2
NNW	90	4.2	130	6.0
Calm	13	0.6	13	0.6
Totals	2184	100.0	2184	100.0

TABLE XX-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

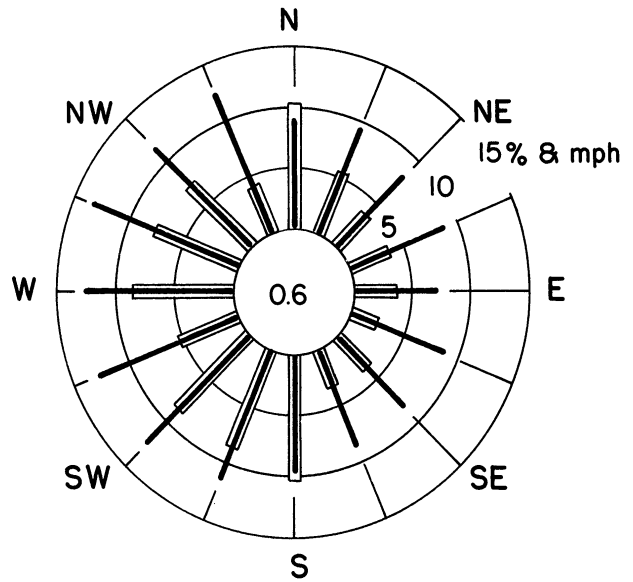
Toledo Municipal Airport
(Wind instruments at height of 47 ft)
1 January 1950 - 31 December 1954
(Fall Seasons)

Wind Direction	Speed, mph					Total Observations		Mean Speed	
	0-3	4-12	13-24	25	Total	%	No.	mph	% of Over- all Mean
				and	4 and				
					Over	Over			
N	0.6	3.0	0.9		3.9	4.5	493	8.7	85
NNE	0.2	1.7	1.3		3.0	3.2	347	11.3	110
NE	0.4	2.4	1.5		3.9	4.3	478	10.4	100
ENE	0.4	2.1	1.2		3.3	3.7	403	10.0	97
E	0.6	2.6	0.5		3.1	3.7	405	7.5	73
ESE	0.2	1.6	0.1		1.7	1.9	221	7.1	69
SE	0.6	2.5	0.1		2.6	3.3	355	6.3	61
SSE	0.5	2.5	0.5	0.1	3.1	3.6	395	8.6	84
S	0.7	5.8	2.0	0.1	7.9	8.6	940	9.8	95
SSW	0.6	7.9	5.4	0.2	13.5	14.1	1556	11.4	111
SW	0.9	9.4	5.2	0.6	15.2	16.1	1745	11.3	110
WSW	0.8	5.5	3.7	0.3	9.5	10.3	1122	11.2	109
W	0.5	3.6	1.6	0.1	5.3	5.8	630	10.0	97
WNW	0.3	3.2	2.8	0.1	6.1	6.4	703	12.1	118
NW	0.6	2.3	2.6	0.1	5.0	5.5	606	12.1	118
NNW	0.2	1.7	1.3		3.0	3.2	362	11.2	109
Calm	<u>1.5</u>	—	—	—	—	<u>1.5</u>	<u>159</u>	<u>0.0</u>	<u>0</u>
Totals	9.6	57.8	30.7	1.6	90.1	99.7	10920		
Mean								10.3	100



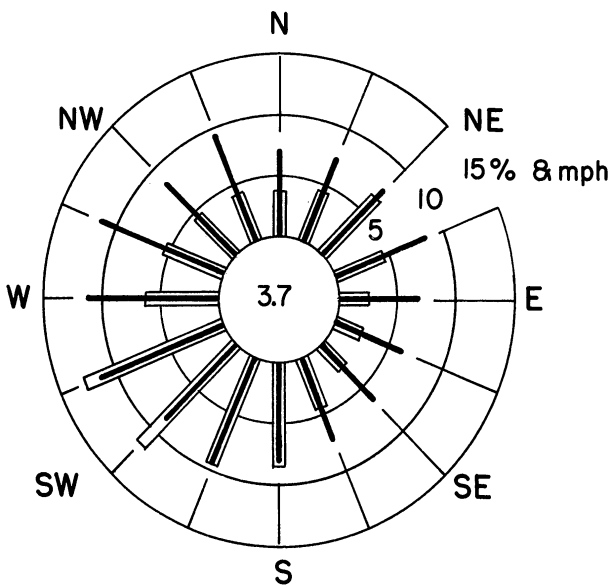
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 47 ft.
Fall (Sept., Oct., Nov.) 1950-1954



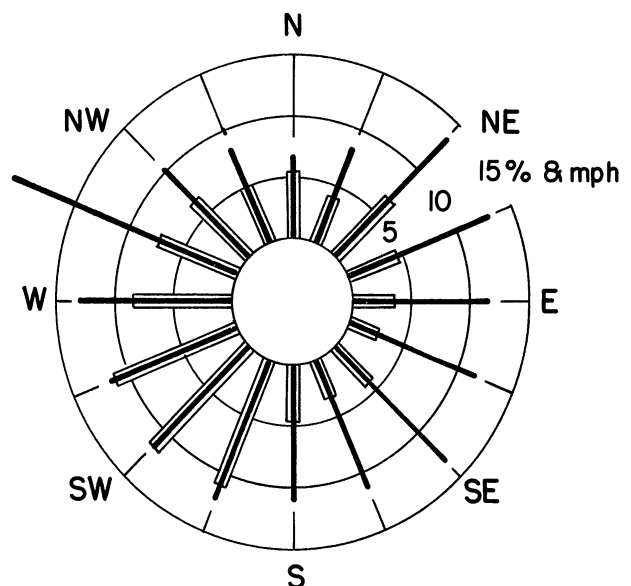
DETROIT CITY AIRPORT
DETROIT, MICHIGAN

Wind Instrument at Height of 81 ft.
Fall (Sept., Oct., Nov.) 1959



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 72 ft.
Fall (Sept., Oct., Nov.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Aerovane at Height of 102 ft.
Fall (Sept., Oct., Nov.) 1959

Fig. 4-A. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at Toledo Municipal Airport, Fall Seasons, 1950-1954; Detroit City Airport, Toledo Express Airport, and Enrico Fermi site, Fall, 1959.

TABLE XXI-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Enrico Fermi Site
(Aerovane at height of 102 ft)
1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Over-all Mean
N	0.4	3.6	0.5			4.1	4.5	352	8.6	72
NNE	0.3	2.7	1.1	0.1		3.9	4.2	332	10.7	89
NE	0.3	1.9	3.4	0.2	0.0	5.5	5.8	449	14.6	122
ENE	0.2	2.1	2.0	0.2		4.3	4.5	345	13.3	111
E	0.2	1.8	1.7	0.2		3.7	3.9	306	13.4	112
ESE	0.1	2.1	1.5	0.1		3.7	3.8	302	12.9	107
SE	0.2	2.7	1.7	0.0		4.4	4.6	361	11.7	97
SSE	0.2	3.2	1.4			4.6	4.8	382	10.9	91
S	0.0	3.7	1.0	0.0		4.7	4.7	385	10.3	86
SSW	0.2	5.3	3.8	0.0		9.1	9.3	738	12.2	102
SW	0.2	5.6	3.7	0.1	0.1	9.5	9.7	766	12.3	102
WSW	0.2	5.9	5.1	0.3	0.1	11.4	11.6	922	13.1	109
W	0.3	4.4	3.4	0.3	0.0	8.1	8.4	663	12.9	107
WNW	0.2	4.8	2.4	0.2		7.4	7.6	603	11.6	97
NW	0.3	4.4	2.2	0.0		6.6	6.9	547	11.1	92
NNW	0.4	3.9	1.4	0.1		5.4	5.8	460	10.2	85
Calm	0.1						0.1	10	0.0	0
Totals	3.8	58.1	36.3	1.8	0.2	96.4	100.2	7923		
Average									12.0	100

TABLE XXII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Toledo Express Airport
(Wind instruments at height of 72 ft)
1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.7	3.0	0.7			3.7	4.4	387	8.7	94
NNE	0.5	3.0	0.5	0.0		3.5	4.0	352	8.5	91
NE	0.7	4.1	1.0			5.1	5.8	513	9.1	98
ENE	0.8	3.5	1.1	0.0		4.6	5.4	372	9.2	99
E	0.6	2.2	0.2			2.4	3.0	256	7.3	78
ESE	1.0	2.0	0.0			2.0	3.0	266	6.1	66
SE	1.1	2.1	0.1			2.2	3.3	296	6.3	68
SSE	0.9	3.4	0.4			3.8	4.7	420	7.8	84
S	1.0	5.6	0.9	0.0		6.5	7.5	659	8.5	91
SSW	1.0	6.5	2.1	0.1		8.7	9.7	844	9.8	105
SW	1.7	8.2	4.0	0.1	0.0	12.3	14.0	1227	10.4	112
WSW	1.0	6.6	4.2	0.1	0.0	10.9	11.9	1042	11.4	123
W	0.5	3.0	1.7	0.1	0.0	4.8	5.3	468	11.0	118
WNW	0.4	3.2	2.2	0.0		5.4	5.8	504	11.6	125
NW	0.6	3.0	1.2			4.2	4.8	417	9.7	104
NNW	0.6	2.7	1.1			3.8	4.4	390	9.7	104
Calm	2.8						2.8	247	0.0	0
Totals	15.9	62.1	21.4	0.4	0.0	83.9	98.9	8760		
Average									9.3	100

TABLE XXIII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Detroit City Airport
(Wind instruments at height of 81 ft)
1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Over-all Mean
N	1.0	6.7	2.6	0.0		9.3	10.3	907	10.0	88
NNE	0.4	3.6	1.4	0.0		5.0	5.4	480	10.3	91
NE	0.6	2.9	0.8			3.7	4.3	382	9.2	81
ENE	0.1	2.9	0.7			3.6	3.7	321	9.7	86
E	0.6	3.1	0.4			3.5	4.1	363	8.1	72
ESE	0.2	2.4	0.5			2.9	3.1	267	9.3	82
SE	0.3	3.2	0.4			3.6	3.9	345	8.4	74
SSE	0.1	2.7	0.2			2.9	3.0	265	8.6	76
S	0.4	8.0	1.9			9.9	10.3	903	9.7	86
SSW	0.1	4.5	2.2			6.7	6.8	595	11.3	100
SW	0.2	4.9	4.6	0.2	0.0	9.7	9.9	866	13.1	116
WSW	0.0	2.8	3.3	0.1	0.0	6.2	6.2	546	13.9	123
W	0.2	3.5	4.0	0.3	0.1	7.9	8.1	720	14.0	124
WNW	0.1	3.0	3.8	0.1	0.0	6.9	7.0	618	14.1	125
NW	0.5	3.9	4.2	0.1	0.0	8.2	8.7	758	13.1	116
NNW	0.2	2.2	1.9	0.0		4.1	4.3	372	12.6	112
Calm	0.6						0.6	52	0.0	0
Totals	5.6	60.3	32.9	0.8	0.1	94.1	99.7	8760		
Average									11.3	100

TALBE XXIV-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS,
BIASED AND UNBIASED

Detroit City Airport
1 December 1958 - 30 November 1959
(Annual)

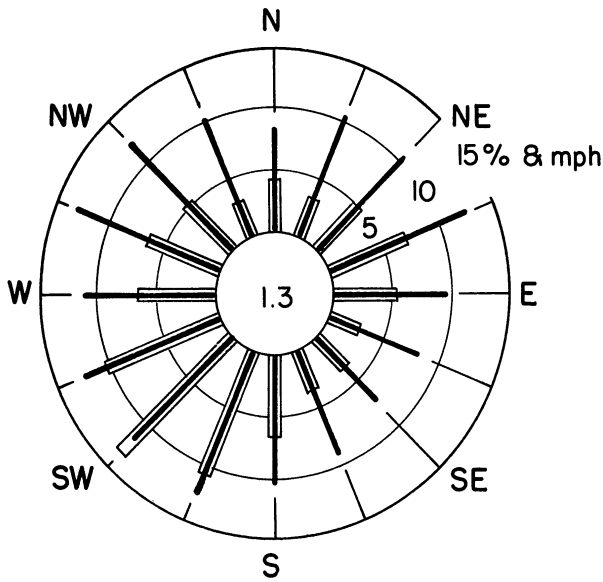
Wind Direction	Total Observations			
	Biased Record		Unbiased Record	
	No.	%	No.	%
N	907	10.3	723	8.2
NNE	480	5.4	612	7.0
NE	382	4.3	345	3.9
ENE	321	3.7	317	3.6
E	363	4.1	329	3.8
ESE	267	3.1	286	3.3
SE	345	3.9	274	3.1
SSE	265	3.0	352	4.0
S	903	10.3	697	8.0
SSW	595	6.8	862	9.8
SW	866	9.9	730	8.3
WSW	546	6.2	647	7.4
W	720	8.1	635	7.2
WNW	618	7.0	726	8.3
NW	758	8.7	623	7.1
NNW	372	4.3	550	6.3
Calm	52	0.6	52	0.6
Totals	8760	99.7	8760	99.9

TABLE XXV-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

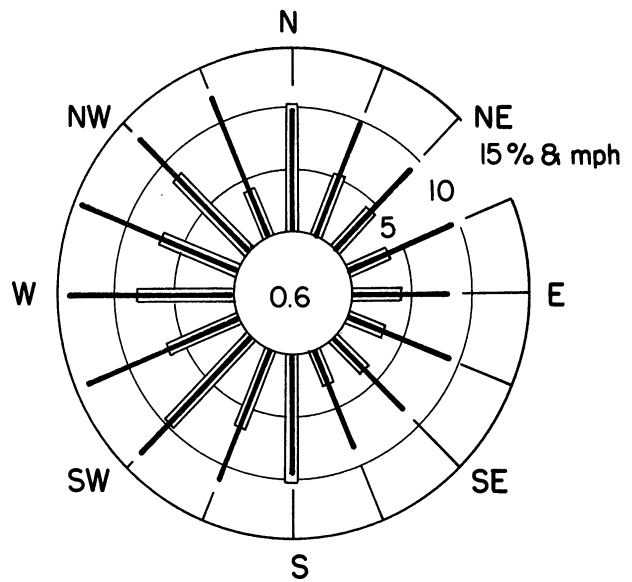
Toledo Municipal Airport
(Wind instruments at height of 47 ft)
1 January 1950 - 31 December 1954
(5-Year Summary)

Wind Direction	Speed, mph					Total Observations		Mean Speed	
	0-3	4-12	13-24	25 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.5	2.9	0.9		3.8	4.3	1865	8.8	79
NNE	0.2	2.0	1.2		3.2	3.4	1474	10.9	98
NE	0.4	2.8	1.8		4.6	5.0	2196	10.8	97
ENE	0.3	3.3	3.2	0.2	6.7	7.0	3101	12.6	113
E	0.5	3.3	1.4		4.7	5.2	2287	9.5	86
ESE	0.3	2.1	0.4		2.5	2.8	1202	8.1	73
SE	0.5	2.6	0.3		2.9	3.4	1495	7.3	66
SSE	0.3	2.4	0.7	0.1	3.2	3.5	1545	9.2	83
S	0.5	4.2	2.0	0.1	6.3	6.8	3026	10.4	94
SSW	0.4	5.6	4.5	0.4	10.5	10.9	4768	12.3	111
SW	0.7	7.2	4.9	0.5	12.6	13.3	5859	11.9	107
WSW	0.5	5.1	4.6	0.5	10.2	10.7	4713	12.5	113
W	0.5	3.7	2.4	0.2	6.3	6.8	2990	11.3	102
WNW	0.3	3.0	3.3	0.2	6.5	6.8	3021	13.1	118
NW	0.4	2.4	2.4	0.1	4.9	5.3	2357	12.3	111
NNW	0.3	1.7	1.1		2.8	3.1	1358	10.6	95
Calm	<u>1.3</u>	—	—	—	—	<u>1.3</u>	<u>567</u>	<u>0.0</u>	<u>0</u>
Totals	7.9	54.3	35.1	2.3	91.7	99.6	43824		
Mean								11.1	100



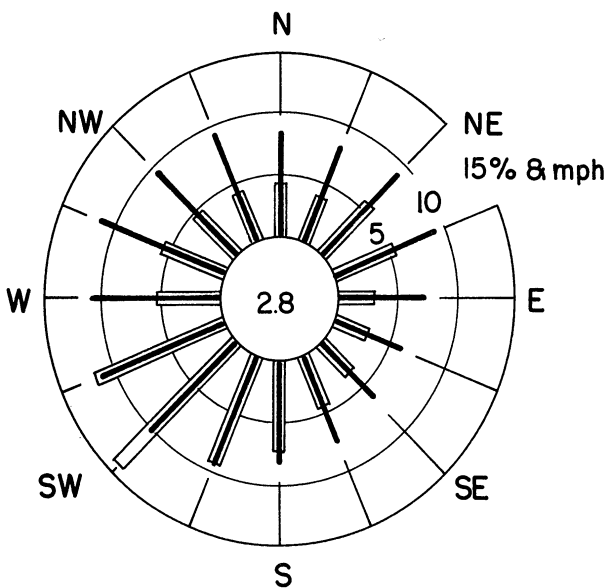
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 47 ft.
Five Year Summary 1950-1954



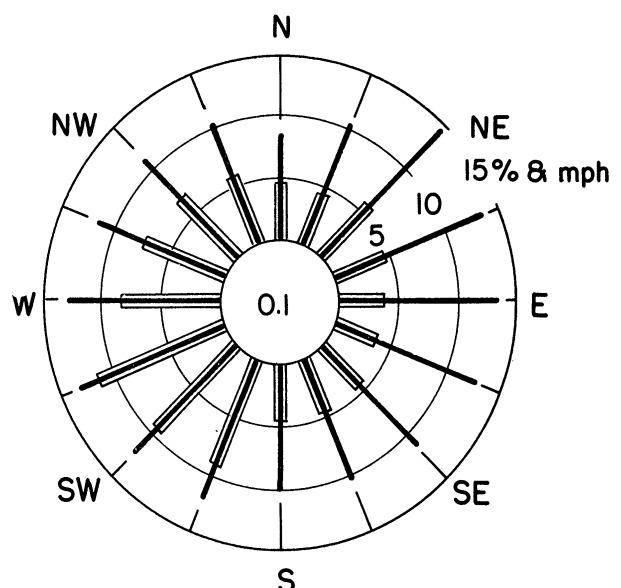
DETROIT CITY AIRPORT
DETROIT, MICHIGAN

Wind Instrument at Height of 81 ft.
Annual Summary 1959



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 72 ft.
Annual Summary 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Aerovane at Height of 102 ft.
Annual Summary 1959

Fig. 5-A. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at Toledo Municipal Airport, Five-Year Summary, 1950-1954; Detroit City Airport, Toledo Express Airport, and Enrico Fermi Site, Annual Summary, 1958-1959.

TABLE XXVI-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Enrico Fermi Site
(Aerovane at height of 102 ft)
1 December 1956 - 30 November 1959
(3-Year Summary)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.2	2.9	0.8	0.1		3.8	4.0	1015	10.1	81
NNE	0.2	2.4	1.4	0.1		3.9	4.1	1023	12.6	102
NE	0.2	1.6	3.6	0.2	0.0	5.4	5.6	1423	15.3	123
ENE	0.2	2.0	2.7	0.2	0.0	4.9	5.1	1271	14.2	115
E	0.2	1.9	1.9	0.2	0.1	4.1	4.3	1077	14.3	115
ESE	0.1	2.4	1.7	0.1	0.0	4.2	4.3	1070	12.4	100
SE	0.1	2.4	1.5	0.1		4.0	4.1	1033	12.0	97
SSE	0.1	3.3	1.3	0.0		4.6	4.7	1204	10.8	87
S	0.1	3.6	1.3	0.0		4.9	5.0	1264	10.7	86
SSW	0.2	4.6	3.2	0.1	0.0	7.9	8.1	2043	12.3	99
SW	0.2	4.8	4.5	0.1	0.0	9.4	9.6	2429	13.0	105
WSW	0.2	5.6	5.1	0.4	0.1	11.2	11.4	2851	13.4	108
W	0.2	4.7	3.5	0.2	0.0	8.4	8.6	2175	12.7	102
WNW	0.2	4.5	3.2	0.1	0.0	7.8	8.0	2013	12.3	99
NW	0.2	3.9	2.5	0.1		6.5	6.7	1690	11.9	96
NNW	0.2	3.9	1.6	0.1		5.6	5.8	1471	10.9	88
Calm	0.3						0.3	83	0.0	0
Totals	3.1	54.5	39.8	2.1	0.2	96.6	99.7	25135		
Average									12.4	100

TABLE XXVII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Toledo Express Airport
(Wind instruments at height of 72 ft)
1 December 1956 - 30 November 1959
(3-Year Summary)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	0.5	4.1	1.1	0.0		5.2	5.7	1498	9.6	91
NNE	0.4	3.1	0.8	0.0		3.9	4.3	1149	9.5	90
NE	0.5	3.8	1.1			4.9	5.4	1400	9.5	90
ENE	0.5	3.2	1.6	0.0		4.8	5.3	1395	10.6	101
E	0.4	3.1	1.3	0.0	0.0	4.4	4.8	1267	10.5	100
ESE	0.5	2.5	0.3			2.8	3.3	874	8.0	76
SE	0.6	2.2	0.2			2.4	3.0	792	7.4	70
SSE	0.5	2.9	0.6	0.0	0.0	3.5	4.0	1048	8.9	85
S	0.5	4.8	1.4	0.0		6.2	6.7	1756	9.6	91
SSW	0.5	4.5	2.3	0.1	0.0	6.9	7.4	1935	11.0	105
SW	0.7	6.1	5.0	0.1	0.0	11.2	11.9	3130	12.3	117
WSW	0.5	6.5	5.2	0.2	0.0	11.9	12.4	3275	12.7	121
W	0.3	4.3	2.4	0.1	0.0	6.8	7.1	1875	11.6	110
WNW	0.3	4.0	2.2	0.0		6.2	6.5	1691	11.4	109
NW	0.4	4.0	1.4	0.0		5.4	5.8	1522	10.0	95
NNW	0.4	3.3	1.2			4.5	4.9	1277	10.0	95
Calm	1.5						1.5	396	0.0	0
Totals	9.0	62.4	28.1	0.5	0.0	91.0	100.0	26280		
Average									10.5	100

TABLE XXVIII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

Detroit City Airport
(Wind instruments at height of 81 ft)
1 December 1956 - 30 November 1959
(3-Year Summary)

Wind Direction	Speed, mph						Total Observations		Mean Speed	
	0-3	4-12	13-24	25-31	32 and Over	Total 4 and Over	%	No.	mph	% of Overall Mean
N	1.0	6.5	2.9	0.0	0.0	9.4	10.4	2744	10.3	88
NNE	0.4	3.4	1.2	0.0		4.6	5.0	1312	10.2	87
NE	0.6	2.9	1.1			4.0	4.6	1209	9.8	84
ENE	0.2	2.7	1.0			3.7	3.9	1001	10.4	89
E	0.7	3.7	0.9	0.0		4.6	5.3	1391	8.9	76
ESE	0.2	2.2	0.5			2.7	2.9	761	9.3	79
SE	0.4	3.3	0.5			3.8	4.2	1111	8.7	74
SSE	0.1	2.4	0.4	0.0		2.8	2.9	776	9.2	79
S	0.4	7.0	1.9	0.0		8.9	9.3	2442	9.9	85
SSW	0.1	3.1	2.2	0.0		5.3	5.4	1414	12.3	105
SW	0.2	4.2	5.3	0.2	0.0	9.7	9.9	2624	14.1	121
WSW	0.1	2.4	3.2	0.1	0.0	5.7	5.8	1526	14.2	121
W	0.4	4.1	4.3	0.3	0.1	8.8	9.2	2398	13.6	116
WNW	0.1	2.5	4.2	0.3	0.0	7.0	7.1	1887	15.0	128
NW	0.4	3.7	4.2	0.2	0.0	8.1	8.5	2244	13.3	114
NNW	0.2	2.0	2.3	0.0		4.3	4.5	1195	13.2	113
Calm	0.9						0.9	245	0.0	0
Totals	6.4	56.1	36.1	1.1	0.1	93.4	99.8	26280		
Average									11.7	100

TABLE XXIX-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS,
BIASED AND UNBIASED

Detroit City Airport
1 December 1956 - 30 November 1959
(3-Year Summary)

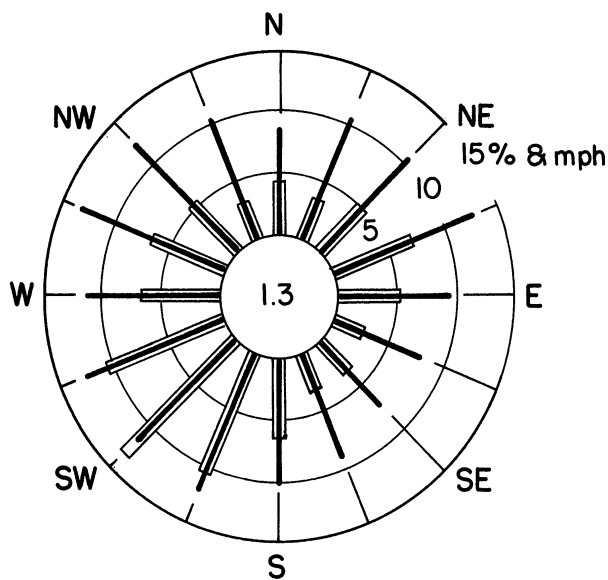
Wind Direction	Total Observations			
	Biased Record		Unbiased Record	
	No.	%	No.	%
N	2744	10.4	2156	8.2
NNE	1312	5.0	1716	6.5
NE	1209	4.6	1038	3.9
ENE	1001	3.9	1116	4.2
E	1391	5.3	1175	4.5
ESE	761	2.9	926	3.5
SE	1111	4.2	846	3.2
SSE	776	2.9	1074	4.1
S	2442	9.3	1829	7.0
SSW	1414	5.4	2178	8.3
SW	2624	9.9	2077	7.9
WSW	1526	5.8	1997	7.6
W	2398	9.2	2051	7.8
WNW	1887	7.1	2263	8.6
NW	2244	8.5	1848	7.0
NNW	1195	4.5	1745	6.6
Calm	245	0.9	245	0.9
Totals	26280	99.8	26280	99.8

TABLE XXX-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS IN VARIOUS DIRECTIONS
GROUPED ACCORDING TO WIND SPEEDS

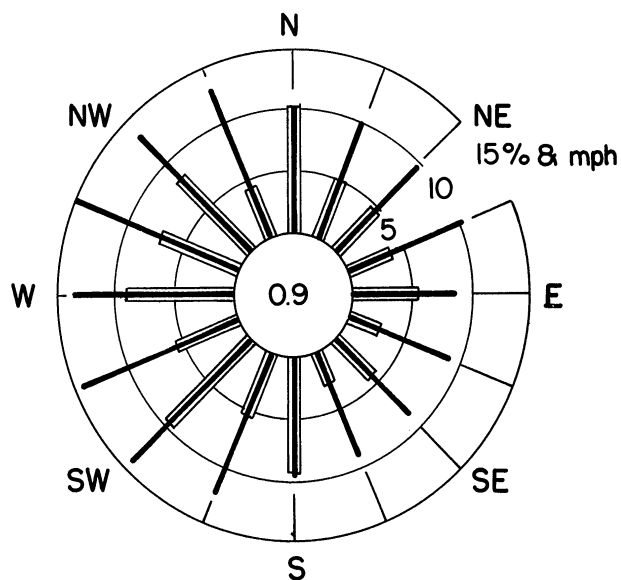
Toledo Municipal Airport
(Wind instruments at height of 47 ft)
1 January 1950 - 31 December 1954
(5-Year Summary)

Wind Direction	Speed, mph					Total Observations		Mean Speed	
	0-3	4-12	13-24	25	Total	%	No.	mph	% of Over- all Mean
				and Over	4 and Over				
N	0.5	2.9	0.9		3.8	4.3	1865	8.8	79
NNE	0.2	2.0	1.2		3.2	3.4	1474	10.9	98
NE	0.4	2.8	1.8		4.6	5.0	2196	10.8	97
ENE	0.3	3.3	3.2	0.2	6.7	7.0	3101	12.6	113
E	0.5	3.3	1.4		4.7	5.2	2287	9.5	86
ESE	0.3	2.1	0.4		2.5	2.8	1202	8.1	73
SE	0.5	2.6	0.3		2.9	3.4	1495	7.3	66
SSE	0.3	2.4	0.7	0.1	3.2	3.5	1545	9.2	83
S	0.5	4.2	2.0	0.1	6.3	6.8	3026	10.4	94
SSW	0.4	5.6	4.5	0.4	10.5	10.9	4768	12.3	111
SW	0.7	7.2	4.9	0.5	12.6	13.3	5859	11.9	107
WSW	0.5	5.1	4.6	0.5	10.2	10.7	4713	12.5	113
W	0.5	3.7	2.4	0.2	6.3	6.8	2990	11.3	102
WNW	0.3	3.0	3.3	0.2	6.5	6.8	3021	13.1	118
NW	0.4	2.4	2.4	0.1	4.9	5.3	2357	12.3	111
NNW	0.3	1.7	1.1		2.8	3.1	1358	10.6	95
Calm	<u>1.3</u>	—	—	—	—	<u>1.3</u>	<u>567</u>	<u>0.0</u>	—
Totals	7.9	54.3	35.1	2.3	91.7	99.6	43824		
Mean								11.1	100



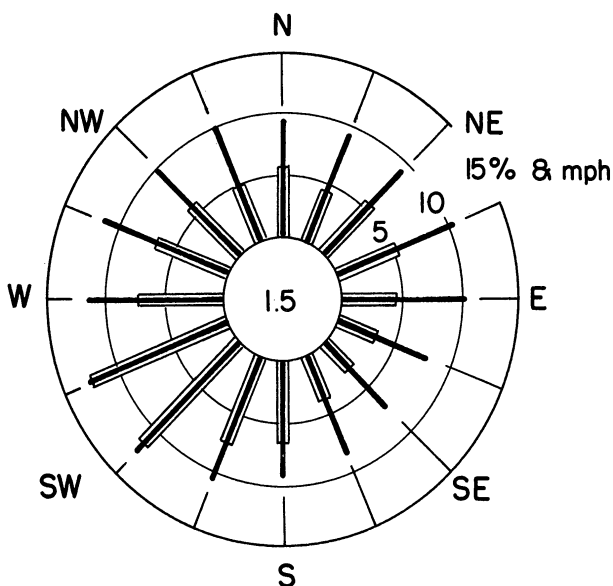
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 47 ft.
Five year Summary 1950-1954



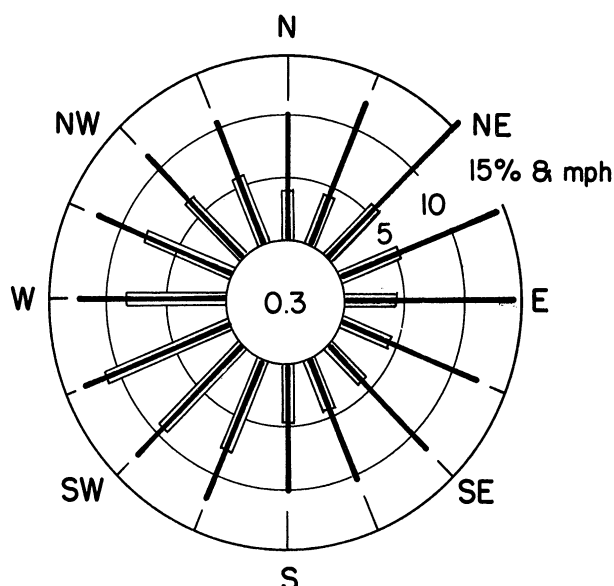
DETROIT CITY AIRPORT
DETROIT, MICHIGAN

Wind Instrument at Height of 81 ft.
Three year Summary 1956-1959



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Wind Instrument at Height of 72 ft.
Three year Summary 1956-1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Aerovane at Height of 102 ft.
Three year Summary 1956-1959

Fig. 6-A. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at Toledo Municipal Airport, Five-Year Summary, 1950-1954; Detroit City Airport, Toledo Express Airport, and Enrico Fermi Site, Three-Year Summary, 1956-1959.

TABLE XXXI-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS FROM

1 DECEMBER 1958 - 30 NOVEMBER 1959

(W, WNW, NW, NNW, N, and NNE)

	Enrico Fermi Site	Toledo Express Airport	Detroit City Airport (approximation)	Toledo Municipal Airport (5-year average)
Winter	45.1	29.0	53.1	29.2
Spring	29.8	25.7	36.4	31.8
Summer	37.6	31.7	41.7	29.2
Fall	37.0	29.3	45.2	28.6
Annual	37.4	28.7	44.1	29.7
3-Year Summary	37.2	34.3	44.7	

TABLE XXXII-A
 PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS FROM
 1 DECEMBER 1958 - 30 NOVEMBER 1959
 (ENE)

	Enrico Fermi Site	Toledo Express Airport	Detroit City Airport (approximation)	Toledo Municipal Airport (5-year average)
Winter	2.8	3.4	2.0	5.3
Spring	6.2	8.6	5.7	11.4
Summer	4.6	4.8	3.6	7.1
Fall	4.8	4.4	3.3	3.7
Annual	4.5	5.4	3.6	7.0
3-Year Summary	5.1	5.3	4.2	

TABLE XXXIII-A

PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS FROM

1 DECEMBER 1958 - 30 NOVEMBER 1959

(E, ESE, SE, SSE, and S)

	Enrico Fermi Site	Toledo Express Airport	Detroit City Airport (approximation)	Toledo Municipal Airport (5-year average)
Winter	13.0	20.7	13.7	21.4
Spring	28.9	22.3	28.4	21.7
Summer	29.3	21.8	24.6	22.9
Fall	18.9	21.2	21.9	21.1
Annual	21.8	21.5	22.2	21.7
3-Year Summary	22.4	21.8	22.3	

TABLE XXXIV-A
 PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS FROM
 1 DECEMBER 1958 - 30 NOVEMBER 1959
 (SSW)

	Enrico Fermi Site	Toledo Express Airport	Detroit City Airport (approximation)	Toledo Municipal Airport (5-year average)
Winter	9.6	9.6	8.3	12.1
Spring	8.3	10.8	8.6	7.2
Summer	8.2	8.7	11.3	9.1
Fall	11.0	9.4	11.1	14.1
Annual	9.3	9.7	9.8	10.9
3-Year Summary	8.1	7.4	8.3	

TABLE XXXV-A
 PERCENTAGE FREQUENCY OF OCCURRENCE OF WINDS FROM
 1 DECEMBER 1958 - 30 NOVEMBER 1959
 (SW and WSW)

	Enrico Fermi Site	Toledo Express Airport	Detroit City Airport (approximation)	Toledo Municipal Airport (5-year average)
Winter	26.9	33.3	20.4	26.7
Spring	19.0	20.7	13.8	21.0
Summer	15.2	24.9	14.1	20.4
Fall	22.7	24.8	14.5	26.4
Annual	21.3	25.9	15.7	24.0
3-Year Summary	21.0	24.3	15.5	

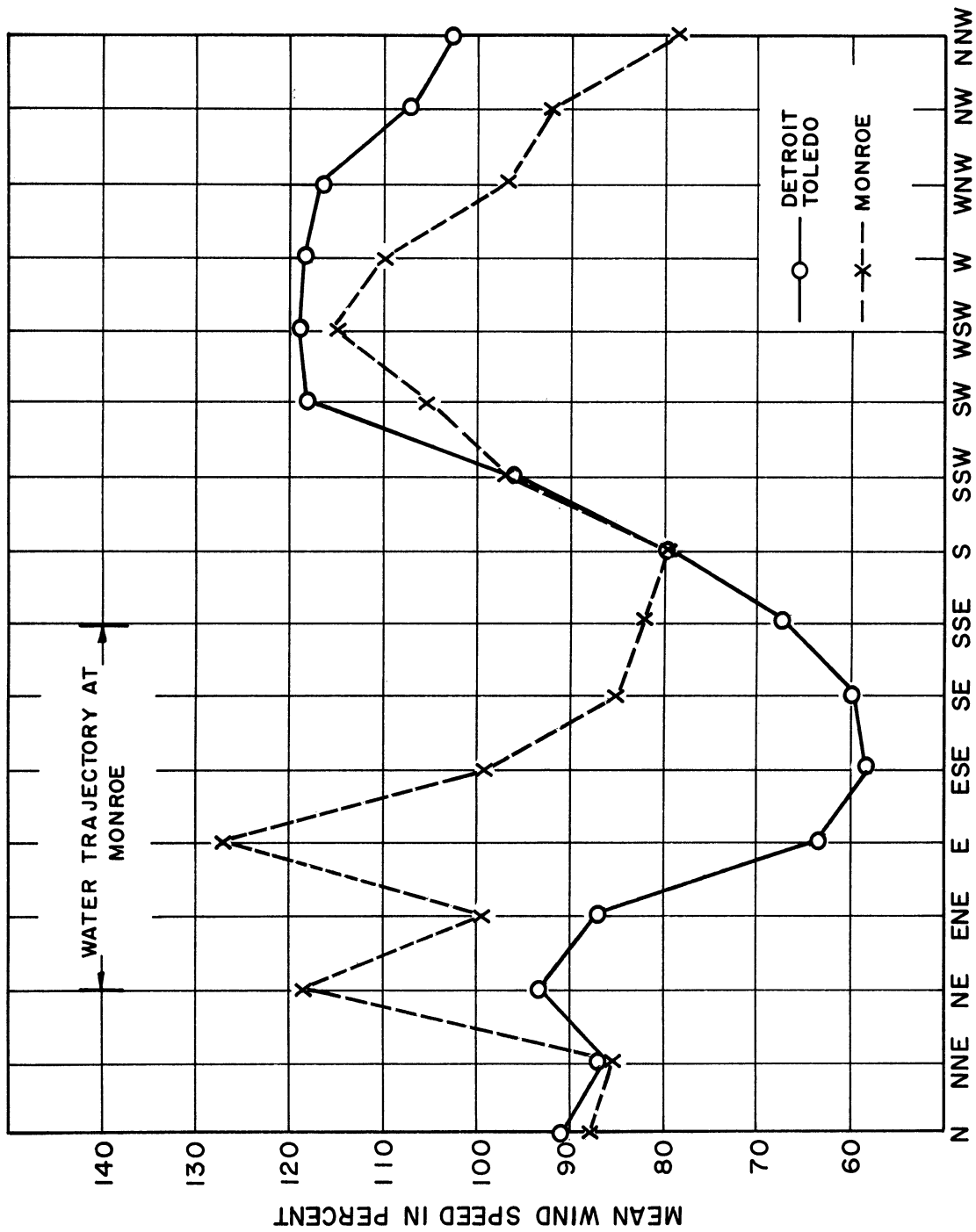


Fig. 7-A. Mean wind speed at the Enrico Fermi site and Detroit-Toledo combined, for 16 directions, expressed as a percentage of the overall mean winter wind speed, 1958-1959.

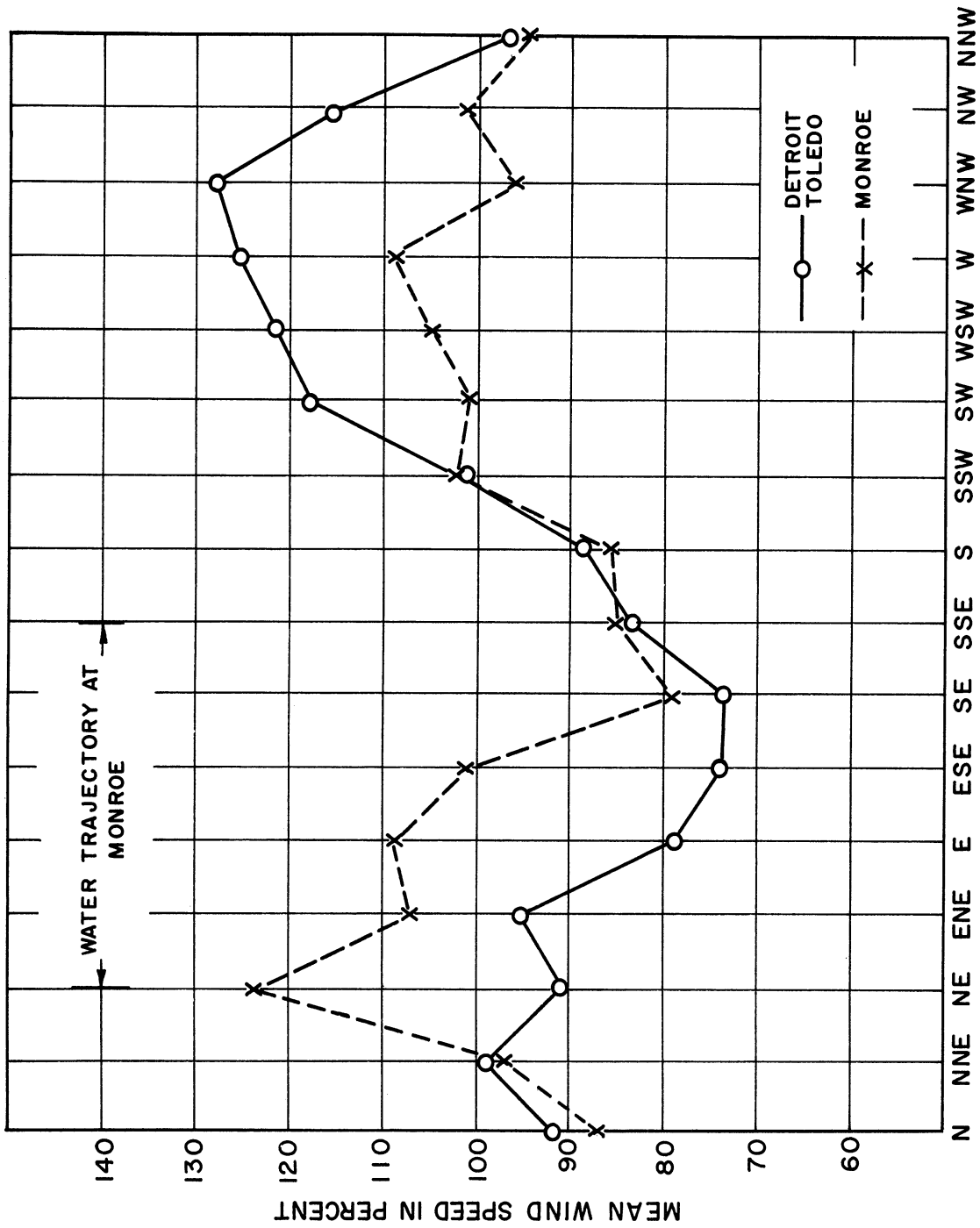


Fig. 8-A. Mean wind speed at the Enrico Fermi site and Detroit-Toledo combined, for 16 directions, expressed as a percentage of the overall mean spring wind speed, 1959.

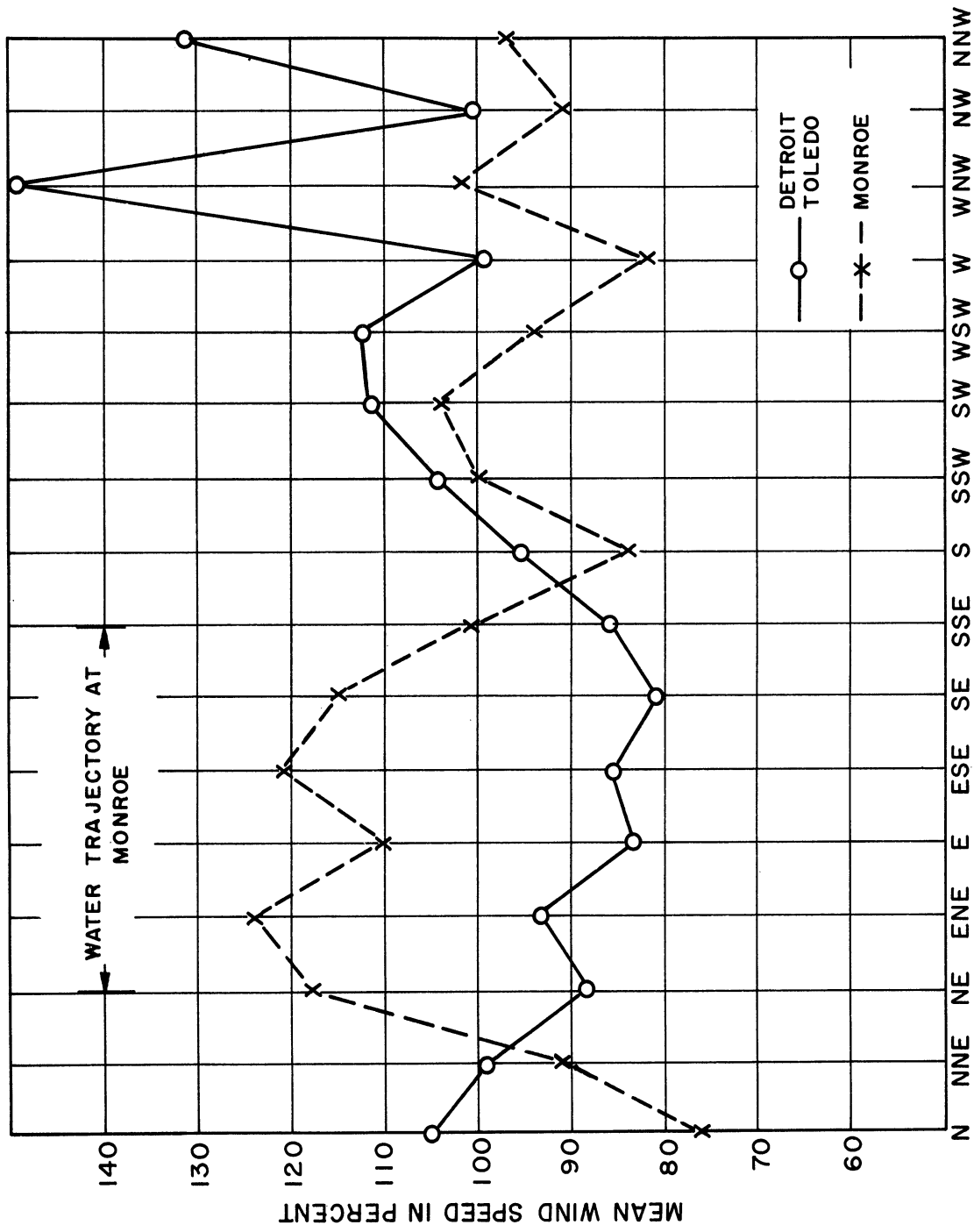


Fig. 9-A. Mean wind speed at the Enrico Fermi site and Detroit-Toledo combined, for 16 directions, expressed as a percentage of the overall mean summer wind speed, 1959.

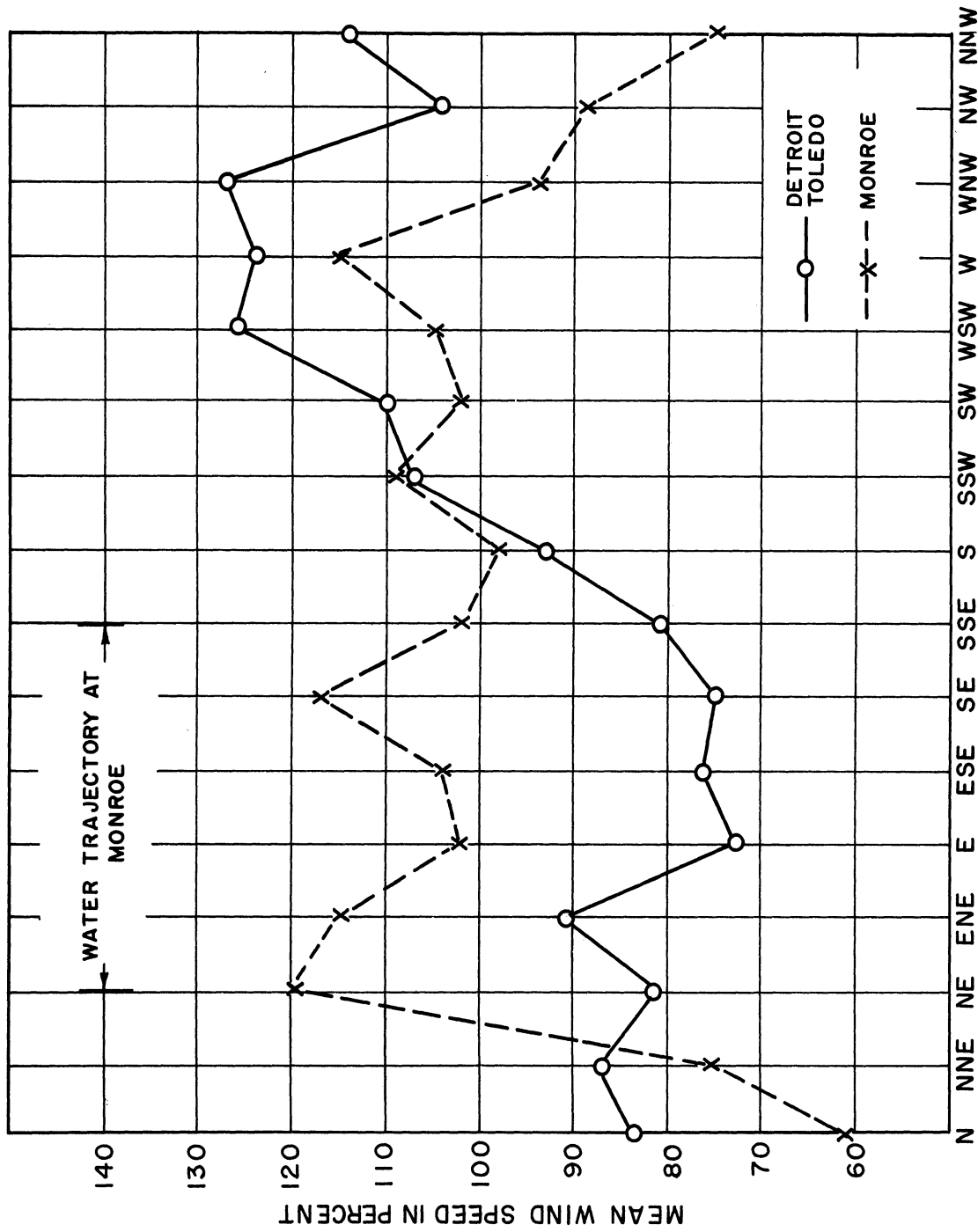


Fig. 10-A. Mean wind speed at the Enrico Fermi site and Detroit-Toledo combined, for 16 directions, expressed as a percentage of the overall mean fall wind speed, 1959.

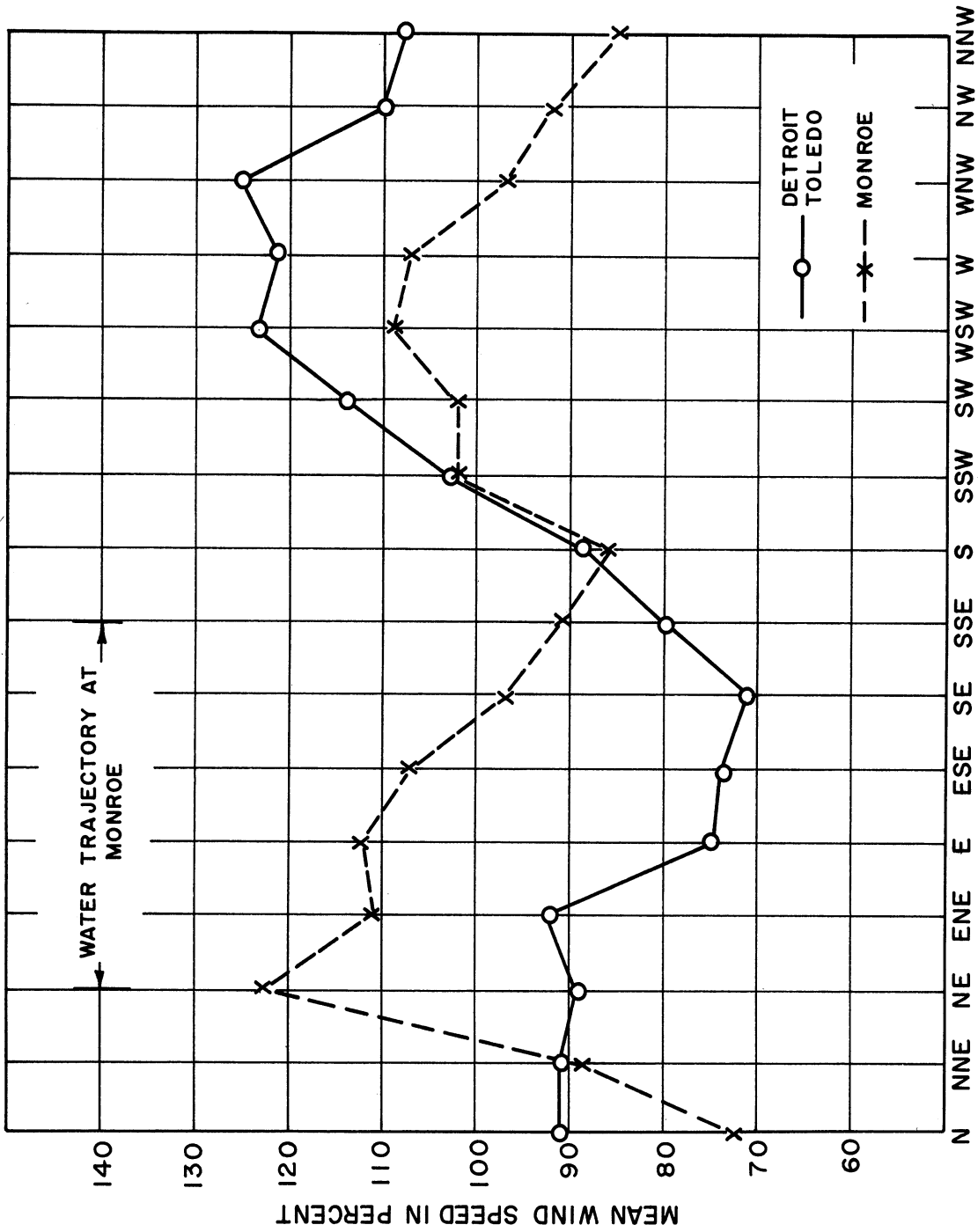


Fig. 11-A. Mean wind speed at the Enrico Fermi site and Detroit-Toledo combined, for 16 directions, expressed as a percentage of the overall mean annual wind speed, 1958-1959.

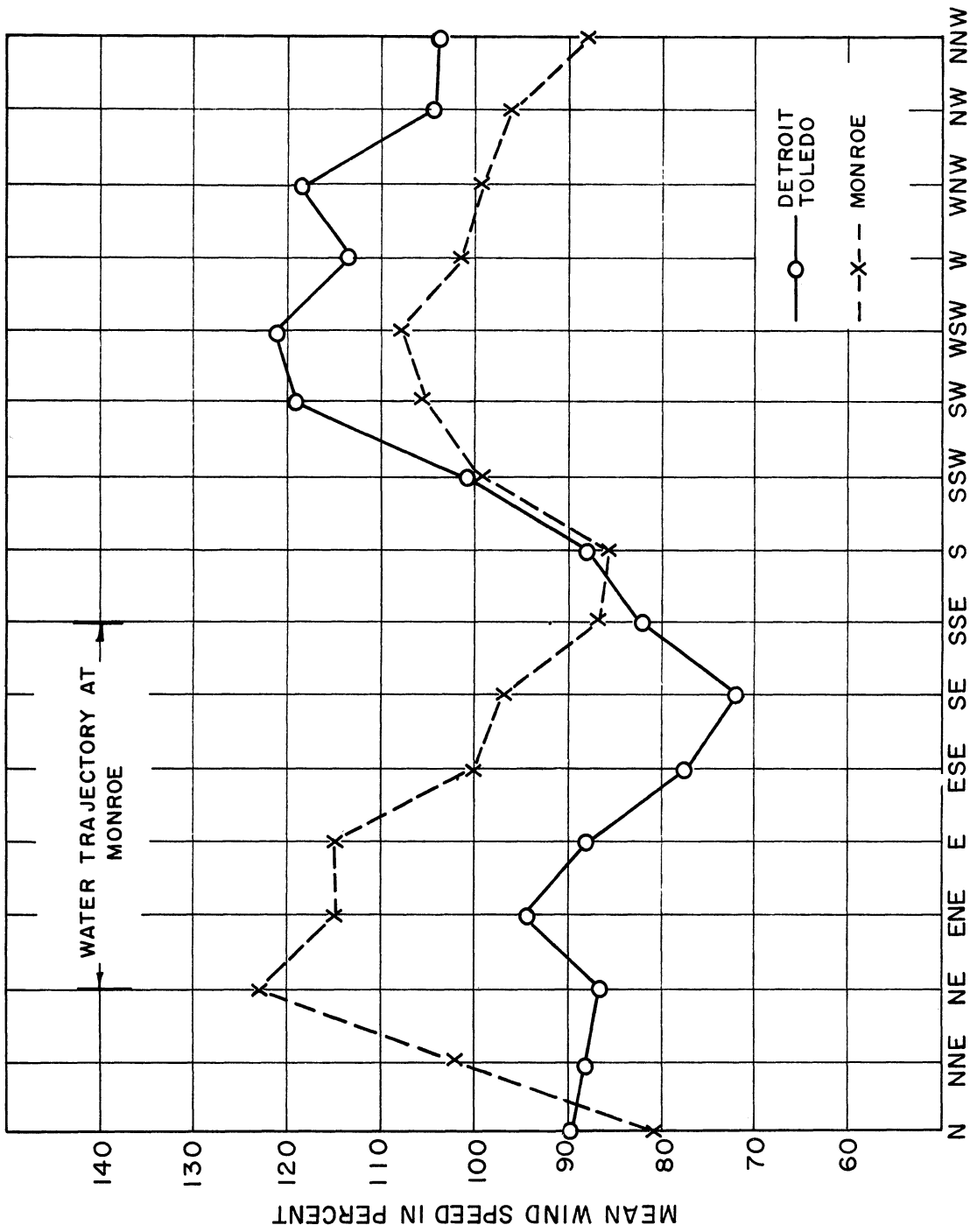


Fig. 12-A. Mean wind speed at the Enrico Fermi site and Detroit-Toledo combined, for 16 directions, expressed as a percentage of the overall mean two-year wind speed, 1956-1959.

APPENDIX B

TEMPERATURE-LAPSE-RATE DATA

TABLE I-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE ENRICO FERMI SITE

1 December 1958- 28 February 1959
(Winter)

Total hours	2160	
Number missing hours	61	
Number hourly observations	2099	
Percent missing data	2.8	
Percent inversions	30.4	
Percent strong lapse	26.8	
Percent weak lapse	<u>42.8</u>	100.0%

TABLE II-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE WJBK-TV TOWER

1 December 1958 - 28 February 1959
(Winter)

Total hours	2160	
Number missing hours	8	
Number hourly observations	2152	
Percent missing data		0.4%
Numbers hours inversion	551	
Percent inversions		25.6%

TABLE III-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 December 1958 - 28 February 1959
(Winter)

Duration, hr					
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
6	12	14	10	39	8
8	11	14	8	42	7
9	9	14	12	40	11
6	10	13	12		
7	20	14	12		
7	4	14	11		
8	11	13	10		
8	5	18	8		
9	12	16	16		
9	11	14	14		
6	12	13	10		
8	11				
7	3				
12	8				
9	13				
11	7				
6	15				
11	9				
9	11				
8	14				
12	8				
8	10				

Total number of inversions over 5 hr in duration = 36
 Total hours of continuous inversion over 5 hr in duration = 462
 Average length of continuous inversions over 5 hr in duration = 12.8

TABLE IV-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

10 December 1958 - 28 February 1959
(Winter)

Duration, hr		
6-12	13-24	25 and Over
11	14	49
6	13	
12	15	
8	16	
12	15	
7	20	
12	17	
6	17	
6	14	
7	13	
9	13	
6		
8		
6		
6		
8		
10		
12		
8		
6		
8		
7		
7		
8		
7		

Total number of inversions over 5 hr in duration = 37
 Total hours of continuous inversions over 5 hr in duration = 419
 Average length of continuous inversions over 5 hr in duration = 11.3

TABLE V-B

THE ASSOCIATION OF TEMPERATURE-LAPSE RATES WITH WIND DIRECTION
AT THE ENRICO FERMI SITE

1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Hourly Lapse Rates			Compass Totals	Percent Frequency of Lapse Rate					
	S	W	I		Observations Within Categories			Total Observations		
					S	W	I	S	W	I
N	59	23	13	95	10.5	2.6	2.0	2.9	1.1	0.6
NNE	31	19	17	67	5.5	2.1	2.7	1.5	0.9	0.8
NE	50	16	13	79	8.9	1.8	2.0	2.4	0.8	0.6
ENE	16	20	6	42	2.9	2.2	0.9	0.8	1.0	0.3
E	19	8	6	33	3.4	0.9	0.9	0.9	0.4	0.3
ESE	8	8	5	21	1.4	0.9	0.8	0.4	0.4	0.2
SE	2	11	18	31	0.4	1.2	2.8	0.1	0.5	0.9
SSE	7	26	28	61	1.2	2.9	4.4	0.3	1.2	1.3
S	9	48	41	98	1.6	5.4	6.5	0.4	2.3	2.0
SSW	12	95	97	204	2.1	10.7	15.3	0.6	4.6	4.7
SW	13	79	73	165	2.3	8.9	11.5	0.6	3.8	3.5
WSW	78	218	100	396	13.9	24.5	15.7	3.7	10.5	4.8
W	69	122	71	262	12.3	13.7	11.2	3.3	5.9	3.4
WNW	61	72	70	203	10.9	8.1	11.0	2.9	3.5	3.4
NW	59	73	50	182	10.5	8.2	7.9	2.8	3.5	2.4
NNW	67	48	23	138	12.0	5.4	3.6	3.2	2.3	1.1
Calm		4	4	8		0.4	0.6		0.2	0.2
Totals	560	890	635	2085	99.8	99.9	99.8	26.7	42.9	30.5

Code:

S = A lapse rate in excess of the dry adiabatic lapse rate.

W = A positive lapse rate that is less than the dry adiabatic lapse rate.

I = A temperature increase with height.

TABLE VI-B

THE ASSOCIATION OF INVERSION PERIODS AND WIND DIRECTION
AT THE ENRICO FERMI SITE

1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Daytime				Nighttime			
	No.	Occurrences, %		Mean Wind Speed	No.	Occurrences, %		Mean Wind Speed
		Total	Overall			Total	Overall	
N	6	2.4	1.9	7.7	7	1.8	1.1	6.9
NNE	6	2.4	0.9	4.0	11	2.8	1.7	6.7
NE	6	2.4	0.9	13.7	7	1.8	1.1	14.4
ENE	1	0.4	0.2	3.0	5	1.3	0.8	4.2
E	2	0.8	0.3	3.5	4	1.0	0.6	4.3
ESE	2	0.8	0.3	4.5	3	0.8	0.5	4.3
SE	6	2.4	0.9	9.8	12	3.1	1.9	10.3
SSE	15	6.1	2.4	9.3	13	3.3	2.0	9.3
S	15	6.1	2.4	10.2	26	6.7	4.1	9.3
SSW	40	16.3	6.3	11.9	57	14.6	9.0	12.1
SW	35	14.2	5.5	11.4	38	9.8	6.0	10.7
WSW	42	17.1	6.6	11.3	58	14.9	9.1	10.6
W	22	8.9	3.5	10.1	49	12.6	7.7	8.4
WNW	23	9.3	3.6	12.0	47	12.1	7.4	10.2
NW	17	6.9	2.7	12.6	33	8.5	5.2	8.2
NNW	7	2.8	1.1	7.6	16	4.1	2.5	6.9
Calm	1	0.4	0.2	0.0	3	0.8	0.5	0.0
Totals	246	99.7	38.7		389	100.0	61.2	
Average				10.7				9.6

TABLE VII-B

WIND DIRECTION AND MEAN WIND SPEED ASSOCIATED WITH INVERSIONS AND NONINVERSIONS
AT THE ENRICO FERMI SITE1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Inversion		Noninversion	
	Occurrence, %	Mean Speed, mph	Occurrence, %	Mean Speed, mph
N	0.6	7.2	4.0	10.0
NNE	0.8	5.8	2.4	12.5
NE	0.6	14.0	2.2	14.2
ENE	0.3	4.0	1.7	12.7
E	0.3	4.0	1.3	17.2
ESE	0.2	4.4	0.8	12.5
SE	0.9	10.1	0.6	10.8
SSE	1.3	9.3	1.6	10.7
S	2.0	9.7	2.7	10.8
SSW	4.6	12.0	5.1	12.2
SW	3.5	11.1	4.4	14.0
WSW	4.8	10.9	14.2	14.9
W	3.4	8.9	9.2	8.6
WNW	3.4	10.8	6.4	12.7
NW	2.4	9.7	6.3	11.9
NNW	1.1	7.0	5.5	10.2
Calm	0.2	0.0	0.2	0.0
Totals	30.4		68.6	
Average		10.0		12.2

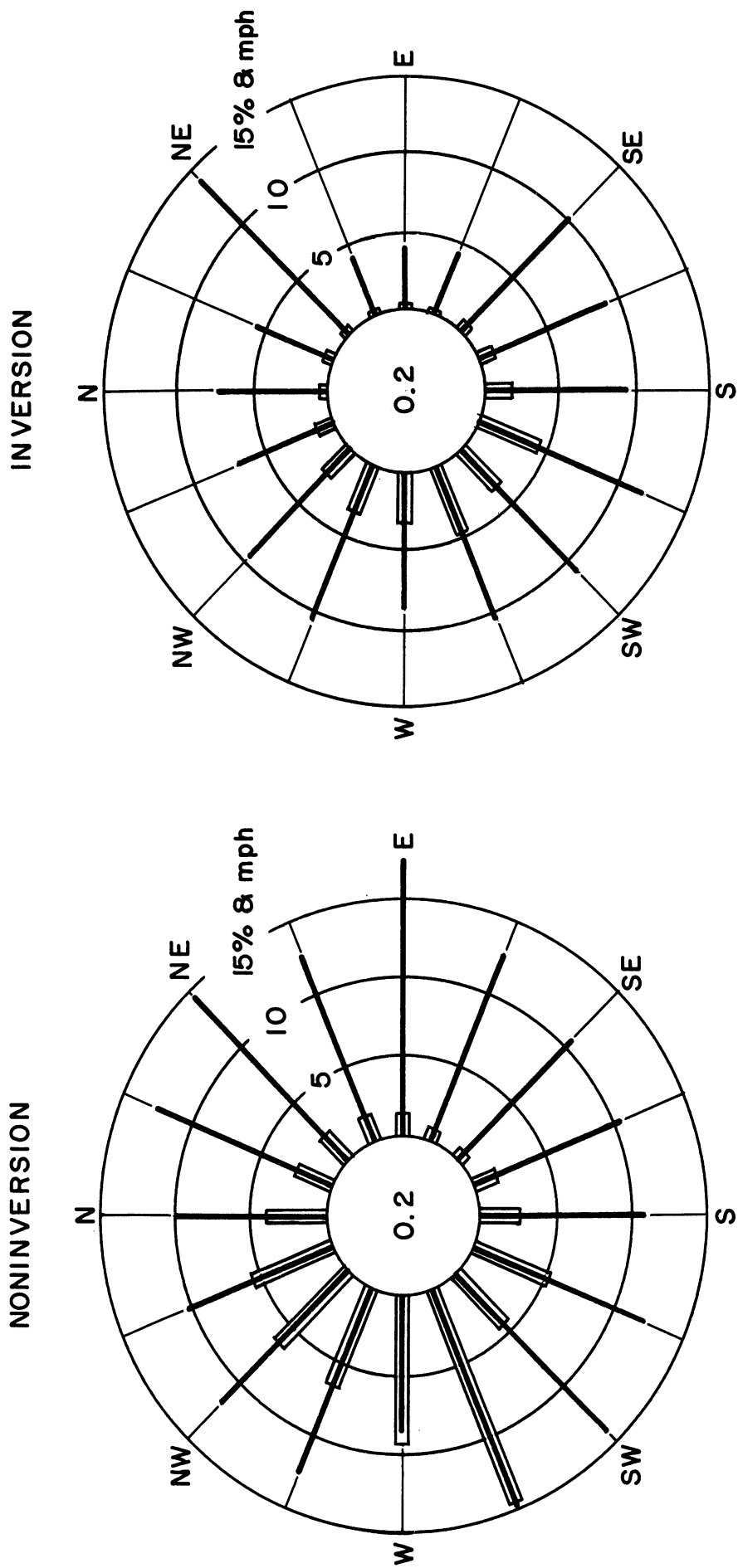


Fig 1-B. Percentage frequency of inversions and noninversions associated with winds for 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at the Enrico Fermi site: Winter, 1958-1959.

TABLE VIII-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE ENRICO FERMI SITE

1 March 1959 - 31 May 1959
(Spring)

Total hours	2208	
Number missing hours	1060	
Number hourly observations	1148	
Percent missing data	48.0	
Percent inversions	35.3	
Percent strong lapse	32.7	
Percent weak lapse	<u>32.1</u>	100.1%

TABLE IX-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE WJBK-TV TOWER

1 March 1959 - 31 May 1959
(Spring)

Total hours	2208	
Number missing hours	678	
Number hourly observations	1530	
Percent missing data		30.7%
Numbers hours inversion	236	
Percent inversions		15.4%

TABLE X-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 March 1959 - 31 May 1959
(Spring)

Duration, hr					
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
6	17.2	17	6.8	27	13.3
6	3.3	17	12.0		
10	9.3	14	14.9		
6	6.7	17	11.9		
10	4.8	18	14.9		
12	7.5	21	11.3		
7	14.7				
6	24.5				
6	11.5				
6	5.0				
9	10.3				
12	7.8				
12	7.5				
6	12.2				
7	10.9				
9	9.6				
6	11.8				
6	10.0				
10	7.7				
7	8.0				

Total number of inversions over 5 hr in duration = 27
 Total hours of continuous inversion over 5 hr in duration = 290
 Average length of continuous inversions over 5 hr in duration = 10.7

TALBE XI-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 March 1959 - 31 May 1959
(Spring)

Duration, hr		
6-12	13-24	25 and Over
11	13	
6		
9		
12		
12		
12		
7		
12		
10		
12		
9		
11		
9		
8		
11		
7		
8		
9		
7		
7		
6		

Total number of inversions over 5 hr in duration = 22
 Total hours of continuous inversions over 5 hr in duration = 208
 Average length of continuous inversions over 5 hr in duration = 9.5

TABLE XII-B

THE ASSOCIATION OF TEMPERATURE-LAPSE RATES WITH WIND DIRECTION
AT THE ENRICO FERMI SITE

1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Hourly Lapse Rates			Compass Totals	Percent Frequency of Lapse Rate					
	S	W	I		Observations Within Categories			Total Observations		
					S	W	I	S	W	I
N	23	9	9	41	6.2	2.5	2.3	2.0	0.8	0.8
NNE	37	11	8	56	10.1	3.0	2.0	3.3	1.0	0.7
NE	80	8	10	98	21.7	2.2	2.5	7.1	0.7	0.9
ENE	70	4	1	75	19.0	1.1	0.3	6.2	0.4	0.1
E	37	10	13	60	10.1	2.7	3.3	3.3	0.9	1.1
ESE	19	43	16	78	5.2	11.7	4.0	1.7	3.8	1.4
SE	7	30	11	48	2.0	8.6	2.8	0.6	2.6	1.0
SSE	11	23	42	76	3.0	6.3	10.5	1.0	2.0	3.7
S	3	13	43	59	0.8	3.5	10.8	0.3	1.1	3.8
SSW	7	38	51	96	2.0	10.4	12.8	0.6	3.4	4.5
SW	4	50	72	126	1.1	13.6	18.0	0.4	4.4	6.3
WSW	8	52	52	112	2.2	14.2	13.0	0.7	4.6	4.6
W	8	19	32	59	2.2	5.2	8.0	0.7	1.7	2.8
WNW	13	15	23	51	3.5	4.1	5.8	1.1	1.3	2.0
NW	25	18	7	50	6.8	4.9	1.8	2.2	1.6	0.6
NNW	16	24	7	47	4.3	6.5	1.8	1.4	2.1	0.6
Calm			2	2			0.5			0.2
Totals	368	367	399	1134	100.2	100.5	100.2	32.6	32.4	35.1

Code:

S = A lapse rate in excess of the dry adiabatic lapse rate.

W = A positive lapse rate that is less than the dry adiabatic lapse rate.

I = A temperature increase with height.

TABLE XIII-B

THE ASSOCIATION OF INVERSION PERIODS AND WIND DIRECTION
AT THE ENRICO FERMI SITE

1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Daytime				Nighttime			
	No.	Occurrences, %		Mean Wind Speed	No.	Occurrences, %		Mean Wind Speed
		Total	Overall			Total	Overall	
N	3	1.7	0.8	4.3	6	2.7	1.5	6.3
NNE	1	0.6	0.2	4.0	7	3.1	1.7	9.1
NE	3	1.7	0.8	11.3	7	3.1	1.7	4.3
ENE	1	0.6	0.2	7.0				
E	5	2.9	1.3	11.8	8	3.6	2.0	9.0
ESE	11	6.3	2.8	11.8	5	2.2	1.3	12.4
SE	8	4.6	2.0	13.6	3	1.3	0.8	4.7
SSE	37	21.3	9.3	12.4	5	2.2	1.3	6.4
S	22	12.6	5.5	10.9	21	9.3	5.3	11.5
SSW	24	13.8	6.0	13.4	27	12.0	6.8	11.5
SW	26	14.9	6.5	14.0	46	20.4	11.5	9.6
WSW	11	6.3	2.8	11.6	41	18.2	10.3	9.1
W	11	6.3	2.8	12.3	21	9.3	5.3	8.4
WNW	7	4.0	1.7	9.3	16	7.1	4.0	9.0
NW	3	1.7	0.8	15.0	4	1.8	1.0	8.3
NNW	1	0.7	0.2	5.0	6	2.7	1.5	7.0
Calm					2	0.9	0.5	0.0
Totals	174	99.9	43.7		225	99.9	56.5	
Average				12.2				9.2

TABLE XIV-B

WIND DIRECTION AND MEAN WIND SPEED ASSOCIATED WITH INVERSIONS AND NONINVERSIONS
AT THE ENRICO FERMI SITE1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Inversion		Noninversion	
	Occurrence, %	Mean Speed, mph	Occurrence, %	Mean Speed, mph
N	0.8	5.7	2.8	7.9
NNE	0.7	8.5	4.2	11.1
NE	0.9	6.4	7.8	16.8
ENE	0.1	7.0	6.5	14.9
E	1.1	10.1	4.0	15.7
ESE	1.4	12.0	5.5	11.6
SE	1.0	11.2	3.3	9.6
SSE	3.7	11.6	3.0	10.4
S	3.8	11.2	1.4	9.3
SSW	4.5	12.3	4.0	12.2
SW	6.3	11.2	4.8	13.5
WSW	4.6	9.7	5.3	13.6
W	2.8	9.7	2.4	14.0
WNW	2.0	9.1	2.5	10.8
NW	0.6	11.1	3.8	10.7
NNW	0.6	6.7	3.5	8.8
Calm	0.2	0.0		
Totals	35.1		64.8	
Average		10.5		12.6

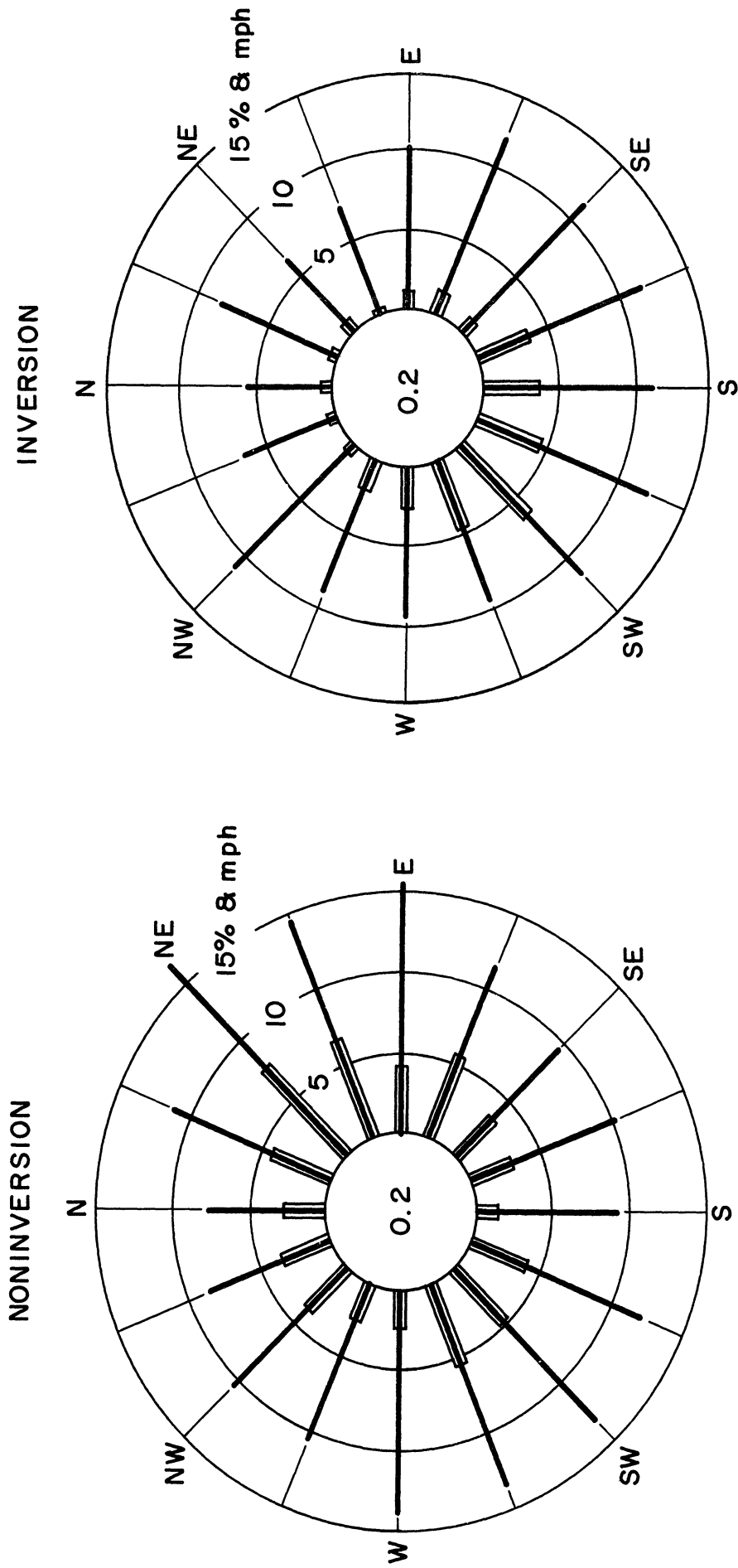


Fig. 2-B. Percentage frequency of inversions and noninversions associated with winds for 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at the Enrico Fermi site: Spring, 1959.

TABLE XV-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE ENRICO FERMI SITE

1 June 1959 - 31 August 1959
(Summer)

Total hours	2208	
Number missing hours	423	
Number hourly observations	1785	
Percent missing data	19.2	
Percent inversions	37.8	
Percent strong lapse	29.6	
Percent weak lapse	<u>32.7</u>	100.1%

TABLE XVI-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE WJBK-TV TOWER

1 June 1959 - 31 August 1959
(Summer)

Total hours	2208	
Number missing hours	52	
Number hourly observations	2156	
Percent missing data		2.4%
Numbers hours inversion	645	
Percent inversions		29.9%

TABLE XVII-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 June 1959 - 31 August 1959
(Summer)

Duration, hr					
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
7	9.1	20	9.2	56	9.2
7	4.6	21	9.0		
10	10.6	14	12.4		
9	4.8	14	8.9		
8	6.3	13	9.8		
7	9.9	15	8.6		
8	9.9	15	msg		
11	6.2	15	8.4		
11	9.2	14	8.8		
8	7.8				
10	8.4				
7	10.6				
12	13.1				
10	12.6				
6	6.1				
6	11.0				
11	7.7				
9	10.9				
12	msg				
7	8.0				
7	10.4				
7	1.7				
7	9.1				
6	7.1				
12	8.4				
12	9.9				
9	10.7				
12	13.1				
6	8.0				
10	10.1				
6	5.3				
12	8.1				
9	6.0				
8	6.4				

Total number of inversions over 5 hr in duration = 44
 Total hours of continuous inversion over 5 hr in duration = 496
 Average length of continuous inversions over 5 hr in duration = 11.3

TABLE XVIII-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 June 1959 - 31 August 1959
(Summer)

		Duration, hr	
6-12		13-24	25 and Over
7	10	15	
6	12	17	
11	7	21	
12	8	14	
7	11	17	
9	11	17	
10	12	15	
12	11	13	
10	9	13	
9	12	16	
12	10	13	
10	12		
9	8		
12	10		
9	12		
7	7		
11	10		
12	12		
7	11		
11	11		
11	11		
11	9		
7	11		
11	11		
7	7		
11	10		
11	6		
11	10		

Total number of inversions over 5 hr in duration = 67
 Total hours of continuous inversions over 5 hr in duration = 735
 Average length of continuous inversions over 5 hr in duration = 11.0

TABLE XIX-B

THE ASSOCIATION OF TEMPERATURE-LAPSE RATES WITH WIND DIRECTION
AT THE ENRICO FERMI SITE

1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Hourly Lapse Rates			Compass Totals	Percent Frequency of Lapse Rate					
	S	W	I		Observations Within Categories			Total Observations		
					S	W	I	S	W	I
N	34	28	19	81	7.3	5.2	3.1	2.1	1.7	1.2
NNE	22	28	15	65	4.7	5.2	2.5	1.4	1.7	0.9
NE	44	18	16	78	9.4	3.3	2.6	2.7	1.1	1.0
ENE	56	17	2	75	12.0	3.1	0.3	3.5	1.1	0.1
E	34	17	4	55	7.3	3.1	0.7	2.1	1.1	0.2
ESE	30	24	16	70	6.4	4.5	2.6	1.9	1.5	1.0
SE	44	47	45	136	9.4	8.7	7.4	2.7	2.9	2.8
SSE	18	45	60	123	3.8	8.4	9.9	1.1	2.8	3.7
S	12	18	56	86	2.6	3.3	9.2	0.7	1.1	3.5
SSW	18	49	64	131	3.8	9.1	10.6	1.1	3.0	4.0
SW	6	65	75	146	1.3	12.1	12.3	0.4	4.0	4.7
WSW	12	54	39	105	2.6	10.0	6.4	0.7	3.3	2.4
W	9	26	58	93	1.9	4.8	9.6	0.6	1.6	3.6
WNW	33	38	50	121	7.1	7.1	8.3	2.0	2.4	3.1
NW	42	33	52	127	9.0	6.1	8.6	2.6	2.0	3.2
NNW	54	31	35	120	11.5	5.8	5.8	3.3	1.9	2.2
Calm										
Totals	468	538	606	1612	100.1	99.8	99.9	28.9	33.2	37.6

Code:

S = A lapse rate in excess of the dry adiabatic lapse rate.

W = A positive lapse rate that is less than the dry adiabatic lapse rate.

I = A temperature increase with height.

TABLE XX-B

THE ASSOCIATION OF INVERSION PERIODS AND WIND DIRECTION
AT THE ENRICO FERMI SITE

1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Daytime				Nighttime			
	No.	Occurrences, %		Mean Wind Speed	No.	Occurrences, %		Mean Wind Speed
		Total	Overall			Total	Overall	
N	8	2.8	1.3	6.4	11	3.5	1.8	5.6
NNE	4	1.4	0.7	5.3	11	3.5	1.8	9.0
NE	5	1.7	0.8	9.0	11	3.5	1.8	8.2
ENE					2	0.6	0.3	2.5
E	4	1.4	0.7	8.5				
ESE	15	5.2	2.5	10.4	1	0.3	0.2	7.0
SE	43	14.8	7.1	10.5	2	0.6	0.3	8.5
SSE	55	19.0	9.1	10.5	5	1.6	0.8	9.2
S	27	9.3	4.5	8.5	29	9.2	4.8	8.5
SSW	26	9.0	4.3	9.3	38	12.0	6.3	9.7
SW	29	10.0	4.8	11.4	46	14.6	7.6	8.7
WSW	15	5.2	2.5	9.1	24	7.6	4.0	8.5
W	23	7.9	3.8	8.5	35	11.1	5.8	8.4
WNW	18	6.2	3.0	10.0	32	10.1	5.3	10.3
NW	12	4.1	2.0	10.4	40	12.7	6.6	9.8
NNW	6	2.1	1.0	6.3	29	9.2	4.8	7.9
Calm								
Totals	290	100.1	48.1		316	100.1	52.2	
Average				9.7				8.9

TABLE XXI-B

WIND DIRECTION AND MEAN WIND SPEED ASSOCIATED WITH INVERSIONS AND NONINVERSIONS
AT THE ENRICO FERMI SITE1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Inversion		Noninversion	
	Occurrence, %	Mean Speed, mph	Occurrence, %	Mean Speed, mph
N	1.2	5.9	3.8	7.2
NNE	0.9	8.0	3.1	9.4
NE	1.0	8.4	3.8	13.5
ENE	0.1	12.5	4.5	13.4
E	0.2	8.5	3.2	12.1
ESE	1.0	10.2	3.3	11.2
SE	2.8	10.7	5.6	12.4
SSE	3.7	10.4	3.9	11.2
S	3.5	8.5	1.9	10.0
SSW	4.0	9.5	4.2	10.7
SW	4.7	9.7	4.4	11.0
WSW	2.4	8.7	4.1	10.5
W	3.6	8.5	2.2	9.5
WNW	3.1	10.2	4.4	10.6
NW	3.2	9.9	4.7	10.0
NNW	2.2	7.6	5.3	10.6
Calm				
Totals	37.6		62.4	
Average		9.3		11.0

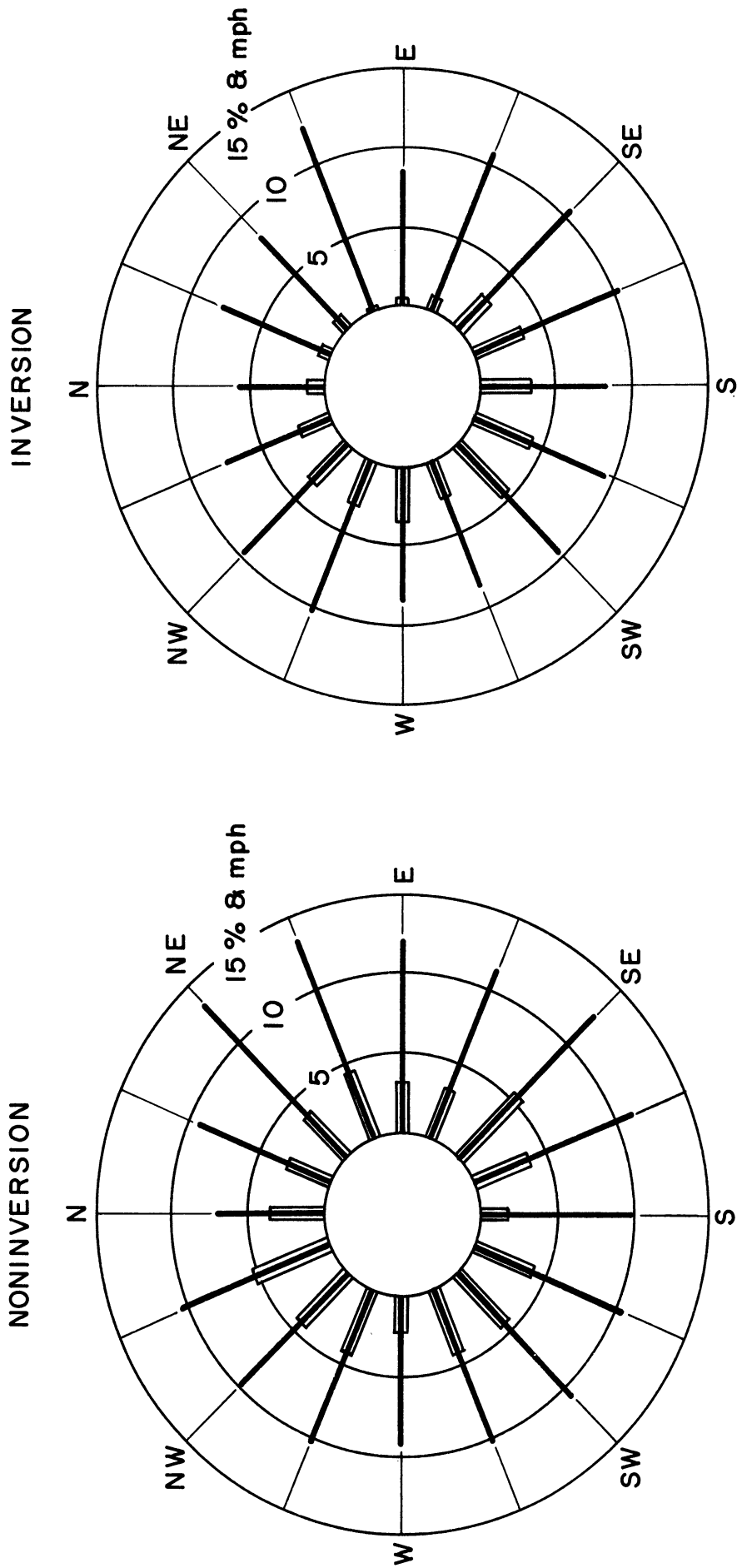


Fig. 3-B. Percentage frequency of inversions and noninversions associated with winds for 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at the Enrico Fermi site: Summer, 1959.

TABLE XXII-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE ENRICO FERMI SITE

1 September 1959 - 30 November 1959
(Fall)

Total hours	2184	
Number missing hours	691	
Number hourly observations	1493	
Percent missing data	31.6	
Percent inversions	30.2	
Percent strong lapse	43.2	
Percent weak lapse	<u>26.5</u>	99.9%

TABLE XXIII-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE WJBK-TV TOWER

1 September 1959 - 30 November 1959
(Fall)

Total hours	2184	
Number missing hours	422	
Number hourly observations	1762	
Percent missing data		19.3%
Numbers hours inversion	383	
Percent inversions		21.7%

TABLE XXIV-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 September 1959 - 30 November 1959
(Fall)

		Duration, hr			
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
10	msg	16	msg	26	13.2
12	7.2	16	10.8	47	10.4
9	11.1	18	7.0		
8	msg	22	7.6		
8	3.4	13	6.6		
8	6.9	13	msg		
6	16.2	13	11.7		
6	3.0	15	9.5		
10	4.5	17	12.3		
11	4.7	14	4.4		
6	10.0	14	22.4		
9	9.1	16	9.4		
8	5.5	17	15.1		

Total number of inversions over 5 hr in duration = 28
 Total hours of continuous inversion over 5 hr in duration = 388
 Average length of continuous inversions over 5 hr in duration = 13.9

TABLE XXV-B

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 September 1959 - 30 November 1959
(Fall)

Duration, hr	
6-12	13-24
	25 and Over
8	14
7	14
12	13
11	14
12	13
11	15
7	
12	
12	
9	
7	
8	
10	
9	
6	
8	
10	
8	
7	
12	
11	
7	

Total number of inversions over 5 hr in duration = 28
 Total hours of continuous inversions over 5 hr in duration = 287
 Average length of continuous inversions over 5 hr in duration = 10.3

TABLE XXVI-B

THE ASSOCIATION OF TEMPERATURE-LAPSE RATES WITH WIND DIRECTION
AT THE ENRICO FERMI SITE

1 September 1959 - 30 November 1959
(Fall)

Wind Direction	Hourly Lapse Rates			Compass Totals	Percent Frequency of Lapse Rate					
	S	W	I		Observations Within Categories			Total Observations		
					S	W	I	S	W	I
N	35	11	32	78	6.2	3.0	7.9	2.6	0.8	2.4
NNE	23	14	21	58	4.0	3.8	5.2	1.7	1.0	1.6
NE	74	11	24	109	13.0	3.0	5.9	5.5	0.8	1.8
ENE	60	10	14	84	10.6	2.8	3.5	4.5	0.7	1.0
E	28	15	11	54	4.9	4.1	2.7	2.1	1.1	0.8
ESE	13	13	7	33	2.3	3.6	1.7	1.0	1.0	0.5
SE	11	18	15	44	1.9	4.9	3.7	0.8	1.3	1.1
SSE	1	11	15	27	0.2	3.0	3.7	0.1	0.8	1.1
S	3	17	34	54	0.5	4.7	8.4	0.2	1.3	2.5
SSW	26	30	58	114	4.6	8.3	14.4	1.9	2.2	4.3
SW	18	58	69	145	3.2	16.0	17.1	1.3	4.3	5.2
WSW	56	47	46	149	9.9	13.0	11.4	4.2	3.5	3.4
W	57	44	12	113	10.0	12.2	3.0	4.3	3.3	0.9
WNW	56	27	10	93	9.9	7.5	2.5	4.2	2.0	0.7
NW	67	26	16	109	11.8	7.2	4.0	5.0	1.9	1.2
NNW	40	10	20	70	7.0	2.8	5.0	3.0	0.7	1.5
Calm										
Totals	568	362	404	1334	100.0	99.9	100.1	42.4	26.7	30.0

Code:

S = A lapse rate in excess of the dry adiabatic lapse rate.

W = A positive lapse rate that is less than the dry adiabatic lapse rate.

I = A temperature increase with height.

TABLE XXVII-B

THE ASSOCIATION OF INVERSION PERIODS AND WIND DIRECTION
AT THE ENRICO FERMI SITE

1 September 1959 - 30 November 1959
(Fall)

Wind Direction	Daytime				Nighttime			
	No.	Occurrences, %		Mean Wind Speed	No.	Occurrences, %		Mean Wind Speed
		Total	Overall			Total	Overall	
N	3	2.2	0.7	5.7	29	10.8	7.2	7.1
NNE	3	2.2	0.7	5.7	18	6.7	4.5	6.7
NE	5	3.7	1.2	8.8	19	7.1	4.7	5.9
ENE	5	3.7	1.2	4.0	9	3.3	2.2	6.2
E	6	4.4	1.5	4.5	5	1.9	1.2	9.2
ESE	3	2.2	0.7	11.0	4	1.5	1.0	9.5
SE	8	5.9	2.0	9.5	7	2.6	1.7	14.3
SSE	7	5.2	1.7	9.0	8	3.0	2.0	9.0
S	12	8.8	3.0	10.3	22	8.2	5.4	12.4
SSW	22	16.3	5.4	11.2	36	13.4	8.9	12.4
SW	33	24.4	8.2	13.0	36	13.4	8.9	10.2
WSW	21	15.6	5.2	13.3	25	9.3	6.2	7.4
W					12	4.5	3.0	9.3
WNW	4	3.0	1.0	7.0	6	2.2	1.5	7.2
NW	3	2.2	0.7	12.0	13	4.8	3.2	6.0
NNW					20	7.4	5.0	7.7
Calm								
Totals	135	99.8	33.2		269	100.1	66.6	
Average				10.7				8.9

TABLE XXVIII-B

WIND DIRECTION AND MEAN WIND SPEED ASSOCIATED WITH INVERSIONS AND NONINVERSIONS
AT THE ENRICO FERMI SITE1 September 1959 - 30 November 1959
(Fall)

Wind Direction	Inversion		Noninversion	
	Occurrence, %	Mean Speed, mph	Occurrence, %	Mean Speed, mph
N	2.4	6.9	3.4	5.9
NNE	1.6	6.5	2.8	9.4
NE	1.8	6.5	6.4	15.7
ENE	1.0	5.4	5.2	14.6
E	0.8	6.6	3.2	11.5
ESE	0.5	10.1	1.9	10.1
SE	1.1	11.7	2.2	10.6
SSE	1.1	9.0	1.0	8.8
S	2.5	11.6	1.5	10.0
SSW	4.3	11.9	4.2	11.0
SW	5.2	11.5	5.7	11.4
WSW	3.4	10.1	7.7	12.6
W	0.9	9.3	7.6	14.0
WNW	0.7	7.1	6.2	11.0
NW	1.2	7.1	7.0	9.6
NNW	1.5	7.7	3.7	8.5
Calm				
Totals	30.0		69.7	
Average		9.5		11.6

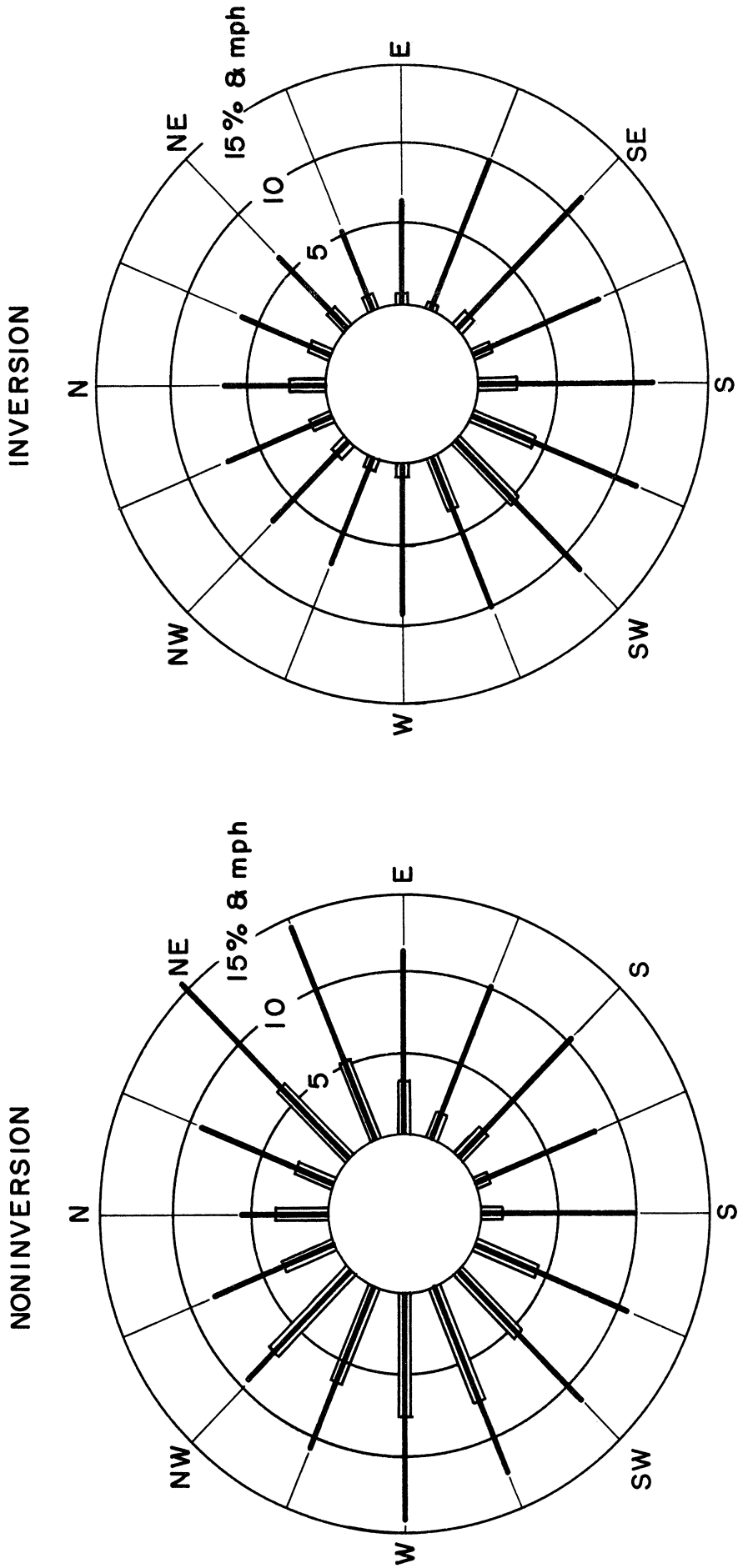


Fig. 4-B. Percentage frequency of inversions and noninversions associated with winds for 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at the Enrico Fermi site: Fall, 1959.

TABLE XXIX-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE ENRICO FERMI SITE

1 December 1958 - 30 November 1959
(Annual)

Total hours	8760	
Number missing hours	2235	
Number hourly observations	6525	
Percent missing data	25.5	
Percent inversions	33.2	
Percent strong lapse	32.4	
Percent weak lapse	<u>34.4</u>	100.0%

TABLE XXX-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE WJBK-TV TOWER

1 December 1958 - 30 November 1959
(Annual)

Total hours	8760	
Number missing hours	1160	
Number hourly observations	7600	
Percent missing data		13.2%
Numbers hours inversion	1815	
Percent inversions		23.9%

TABLE XXXI-B

THE ASSOCIATION OF TEMPERATURE-LAPSE RATES WITH WIND DIRECTION
AT THE ENRICO FERMI SITE

1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Hourly Lapse Rates			Compass Totals	Percent Frequency of Lapse Rate					
	S	W	I		Observations Within Categories			Total Observations		
					S	W	I	S	W	I
N	151	71	73	295	7.7	3.3	3.6	2.4	1.2	1.2
NNE	113	72	61	246	5.6	3.3	3.0	1.8	1.2	1.0
NE	248	53	63	364	12.6	2.5	3.1	4.0	0.9	1.0
ENE	202	51	23	276	10.3	2.4	1.1	3.3	0.8	0.4
E	118	50	34	202	6.0	2.3	1.7	1.9	0.8	0.6
ESE	70	88	44	202	3.6	4.1	2.2	1.1	1.4	0.7
SE	64	106	89	259	3.3	4.9	4.4	1.0	1.7	1.4
SSE	37	105	145	287	1.9	4.9	7.1	0.6	1.7	2.4
S	27	96	174	297	1.4	4.5	8.5	0.4	1.6	2.8
SSW	63	212	270	545	3.2	9.8	13.2	1.0	3.4	4.4
SW	41	252	289	582	2.1	11.7	14.1	0.7	4.1	4.7
WSW	154	371	237	762	7.8	17.2	11.6	2.5	6.0	3.8
W	143	211	173	527	7.3	9.8	8.5	2.3	3.4	2.8
WNW	163	152	153	468	8.4	7.0	7.5	2.6	2.5	2.5
NW	193	150	125	468	9.8	7.0	6.1	3.1	2.4	2.0
NNW	177	113	85	375	9.0	5.2	4.2	2.9	1.8	1.4
Calm		4	6	10		0.2	0.3		0.1	0.1
Totals	1964	2157	2044	6165	100.0	100.1	100.2	31.6	35.0	33.2

Code:

S = A lapse rate in excess of the dry adiabatic lapse rate.

W = A positive lapse rate that is less than the dry adiabatic lapse rate.

I = A temperature increase with height.

TABLE XXXII-B

THE ASSOCIATION OF INVERSION PERIODS AND WIND DIRECTION
AT THE ENRICO FERMI SITE

1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Daytime				Nighttime			
	No.	Occurrences, %		Mean Wind Speed	No.	Occurrences, %		Mean Wind Speed
		Total	Overall			Total	Overall	
N	20	2.3	1.0	6.4	53	4.4	2.6	6.7
NNE	14	1.7	0.7	4.7	47	3.9	2.3	7.6
NE	19	2.2	0.9	10.8	44	3.7	2.2	7.6
ENE	7	0.8	0.3	4.3	16	1.3	0.8	6.4
E	17	2.0	0.8	7.5	17	1.4	0.8	7.9
ESE	31	3.7	1.5	10.6	13	1.1	0.6	9.2
SE	65	7.7	3.2	10.9	24	2.0	1.2	10.6
SSE	114	13.5	5.6	10.8	31	2.6	1.3	8.7
S	76	9.0	3.7	9.8	98	8.2	4.8	10.2
SSW	112	13.3	6.0	11.5	158	13.2	7.7	11.5
SW	123	14.6	6.0	12.4	166	13.8	8.1	9.7
WSW	89	10.5	4.4	11.4	148	12.3	7.2	9.3
W	56	6.6	2.7	9.9	117	9.8	5.7	8.5
WNW	52	6.2	2.5	10.6	101	8.4	4.9	9.7
NW	35	4.1	1.7	12.0	90	7.5	4.4	8.6
NNW	14	1.7	0.7	6.7	71	6.0	3.5	7.5
Calm	1	0.1	0.0	0	5	0.4	0.2	0
Totals	845	100.0	41.7		1199	100.5	58.5	
Average				10.7				9.2

TABLE XXXIII-B

WIND DIRECTION AND MEAN WIND SPEED ASSOCIATED WITH INVERSIONS AND NONINVERSIONS
AT THE ENRICO FERMI SITE1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Inversion		Noninversion	
	Occurrence, %	Mean Speed, mph	Occurrence, %	Mean Speed, mph
N	1.2	6.6	3.6	8.2
NNE	1.0	6.9	3.0	10.7
NE	1.0	8.5	4.9	15.2
ENE	0.4	5.7	4.1	14.1
E	0.6	7.7	2.7	13.6
ESE	0.7	10.2	2.6	11.3
SE	1.4	10.8	2.8	11.3
SSE	2.4	10.4	2.3	10.7
S	2.8	10.0	2.0	10.3
SSW	4.4	11.5	4.5	11.6
SW	4.7	10.9	4.8	12.5
WSW	3.8	10.1	8.5	13.8
W	2.8	8.9	5.7	10.7
WNW	2.5	10.1	5.1	11.6
NW	2.0	9.5	5.6	10.9
NNW	1.4	7.4	4.7	9.8
Calm	0.1			
Totals	33.2		66.9	
Average		9.8		11.9

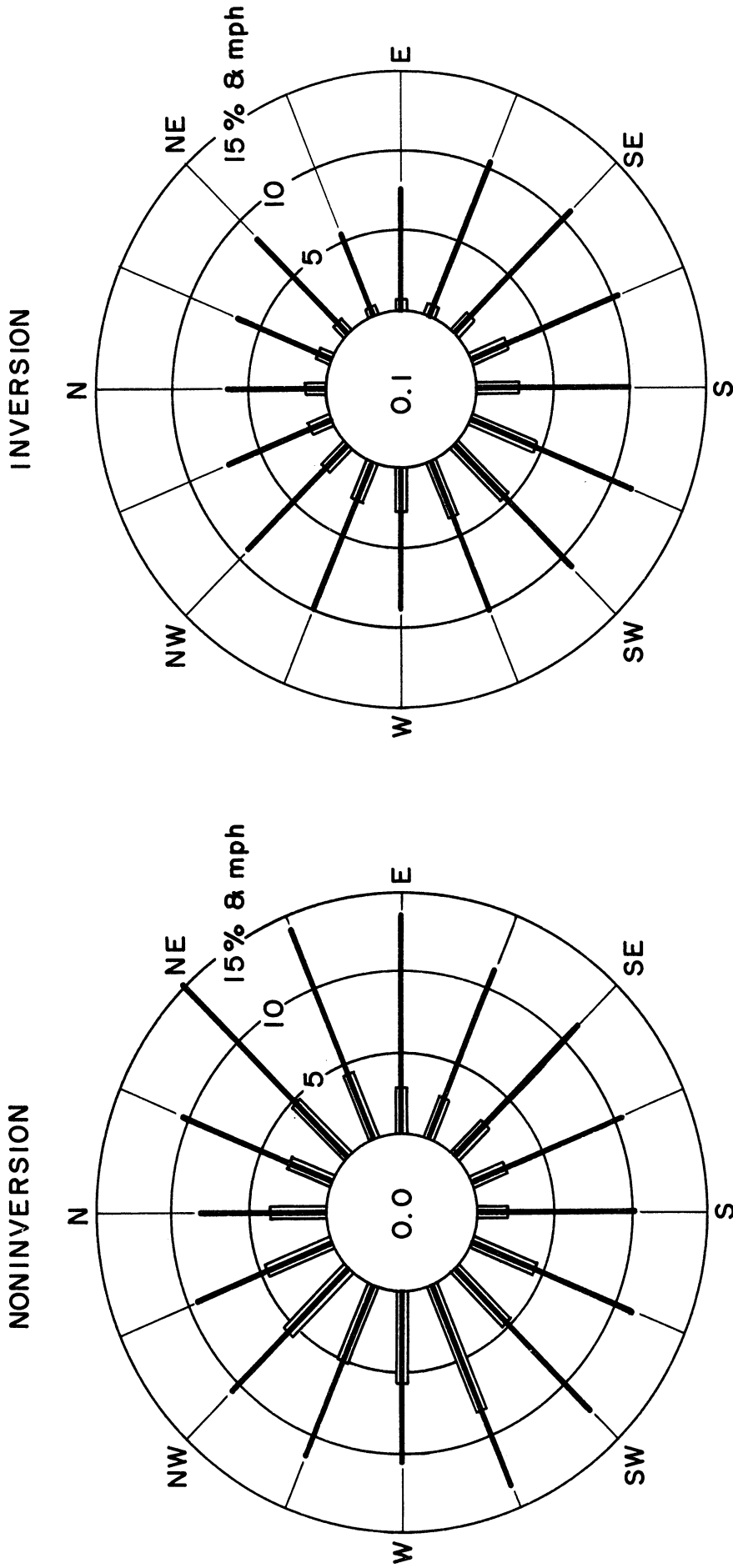


Fig. 5-B. Percentage frequency of inversions and noninversions associated with winds for 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at the Enrico Fermi site: Annual Summary, 1958-1959.

TABLE XXXIV-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE ENRICO FERMI SITE

1 December 1956 - 30 November 1959
(3-Year Summary)

Total hours	26280	
Number missing hours	5850	
Number hourly observations	20530	
Percent missing data	22.2	
Percent inversions	28.0	
Percent strong lapse	45.3	
Percent weak lapse	<u>26.7</u>	100.0%

TABLE XXXV-B

SUMMARY OF TEMPERATURE-LAPSE-RATE DATA AT THE WJBK-TV TOWER

1 December 1956 - 30 November 1959
(3-Year Summary)

Total hours	26280	
Number missing hours	3518	
Number hourly observations	22762	
Percent missing data		13.4%
Numbers hours inversion	6383	
Percent inversions		28.0%

TABLE XXXVI-B

THE ASSOCIATION OF TEMPERATURE-LAPSE RATES WITH WIND DIRECTION
AT THE ENRICO FERMI SITE

1 December 1956 - 30 November 1959
(3-Year Summary)

Wind Direction	Hourly Lapse Rates			Compass Totals	Percent Frequency of Lapse Rate					
	S	W	I		Observations Within Categories			Total Observations		
					S	W	I	S	W	I
N	462	167	201	830	5.1	3.1	3.6	2.3	0.8	1.0
NNE	444	134	206	784	4.9	2.5	3.7	2.2	0.7	1.0
NE	885	135	162	1182	9.7	2.5	2.9	4.4	0.7	0.8
ENE	754	120	115	989	8.2	2.2	2.0	3.7	0.6	0.6
E	529	148	128	805	5.8	2.7	2.3	2.6	0.7	0.6
ESE	418	233	192	843	4.6	4.3	3.4	2.1	1.2	1.0
SE	302	209	300	811	3.3	3.9	5.3	1.5	1.0	1.5
SSE	280	213	433	926	3.1	4.0	7.7	1.4	1.1	2.1
S	259	289	471	1019	2.8	5.4	8.4	1.3	1.4	2.3
SSW	494	519	664	1677	5.4	9.6	11.8	2.5	2.6	3.3
SW	487	685	761	1933	5.3	12.7	13.5	2.4	3.4	3.8
WSW	893	881	557	2331	9.8	16.4	9.9	4.4	3.4	2.8
W	703	575	465	1743	7.7	10.7	8.3	3.5	2.9	2.3
WNW	791	408	403	1602	8.6	7.6	7.2	3.9	2.0	2.0
NW	730	367	317	1414	8.0	6.8	5.6	3.6	1.8	1.6
NNW	700	282	222	1204	7.7	5.2	3.9	3.5	1.4	1.1
Calm	16	20	32	68	0.2	0.4	0.6	0.1	0.1	0.2
Totals	9147	5385	5629	20161	100.2	100.0	100.1	45.4	25.8	28.0

Code:

S = A lapse rate in excess of the dry adiabatic lapse rate.

W = A positive lapse rate that is less than the dry adiabatic lapse rate.

I = A temperature increase with height.

TABLE XXXVII-B

THE ASSOCIATION OF INVERSION PERIODS AND WIND DIRECTION
AT THE ENRICO FERMI SITE

1 December 1956 - 30 November 1959
(3-Year Summary)

Wind Direction	Daytime				Nighttime			
	No.	Occurrences, %		Mean Wind Speed	No.	Occurrences, %		Mean Wind Speed
		Total	Overall			Total	Overall	
N	58	2.3	1.0	7.2	143	4.6	2.5	7.1
NNE	63	2.5	1.1	8.1	143	4.6	2.5	8.2
NE	68	2.7	1.2	11.9	94	3.0	1.7	8.3
ENE	55	2.2	1.0	10.2	59	1.9	1.0	9.3
E	66	2.6	1.2	9.7	63	2.0	1.1	10.6
ESE	128	5.0	2.3	11.3	64	2.1	1.1	12.9
SE	228	9.0	4.1	11.3	77	2.5	1.4	12.2
SSE	324	12.8	5.6	10.6	104	3.4	1.8	10.9
S	232	9.1	4.1	10.0	239	7.7	4.2	10.0
SSW	290	11.4	5.2	11.5	374	12.1	6.6	11.6
SW	347	13.7	6.2	13.1	414	13.4	7.4	11.0
WSW	214	8.4	3.8	11.8	342	11.1	6.1	9.8
W	168	6.6	3.0	11.8	297	9.6	5.3	9.2
WNW	138	5.4	2.5	12.0	265	8.6	4.7	9.4
NW	93	3.7	1.7	12.2	224	7.3	4.0	8.9
NNW	54	2.1	1.0	9.1	168	5.4	3.0	7.9
Calm	14	0.6	0.2	0	18	0.6	0.3	0
Totals	2540	100.1	45.2		3088	99.9	54.7	
Average				11.2				9.8

TABLE XXXVIII-B

WIND DIRECTION AND MEAN WIND SPEED ASSOCIATED WITH INVERSIONS AND NONINVERSIONS
AT THE ENRICO FERMI SITE1 December 1956 - 30 November 1959
(3-Year Summary)

Wind Direction	Inversion		Noninversion	
	Occurrence, %	Mean Speed, mph	Occurrence, %	Mean Speed, mph
N	1.0	7.1	3.1	10.1
NNE	1.0	8.1	2.9	12.4
NE	0.8	9.8	5.1	15.9
ENE	0.6	9.6	4.3	14.8
E	0.6	10.2	3.4	15.3
ESE	1.0	11.8	3.2	11.8
SE	1.5	11.8	2.5	11.7
SSE	2.1	10.6	2.4	10.6
S	2.3	10.0	2.7	10.7
SSW	3.3	11.5	5.0	12.4
SW	3.8	12.0	5.8	13.2
WSW	2.8	10.6	8.8	14.0
W	2.3	10.1	6.3	12.6
WNW	2.0	10.3	5.9	13.0
NW	1.6	10.0	5.4	12.1
NNW	1.1	8.2	4.9	11.4
Calm	0.2	0.0	0.2	0.0
Totals	28.0		71.9	
Average		10.4		12.8

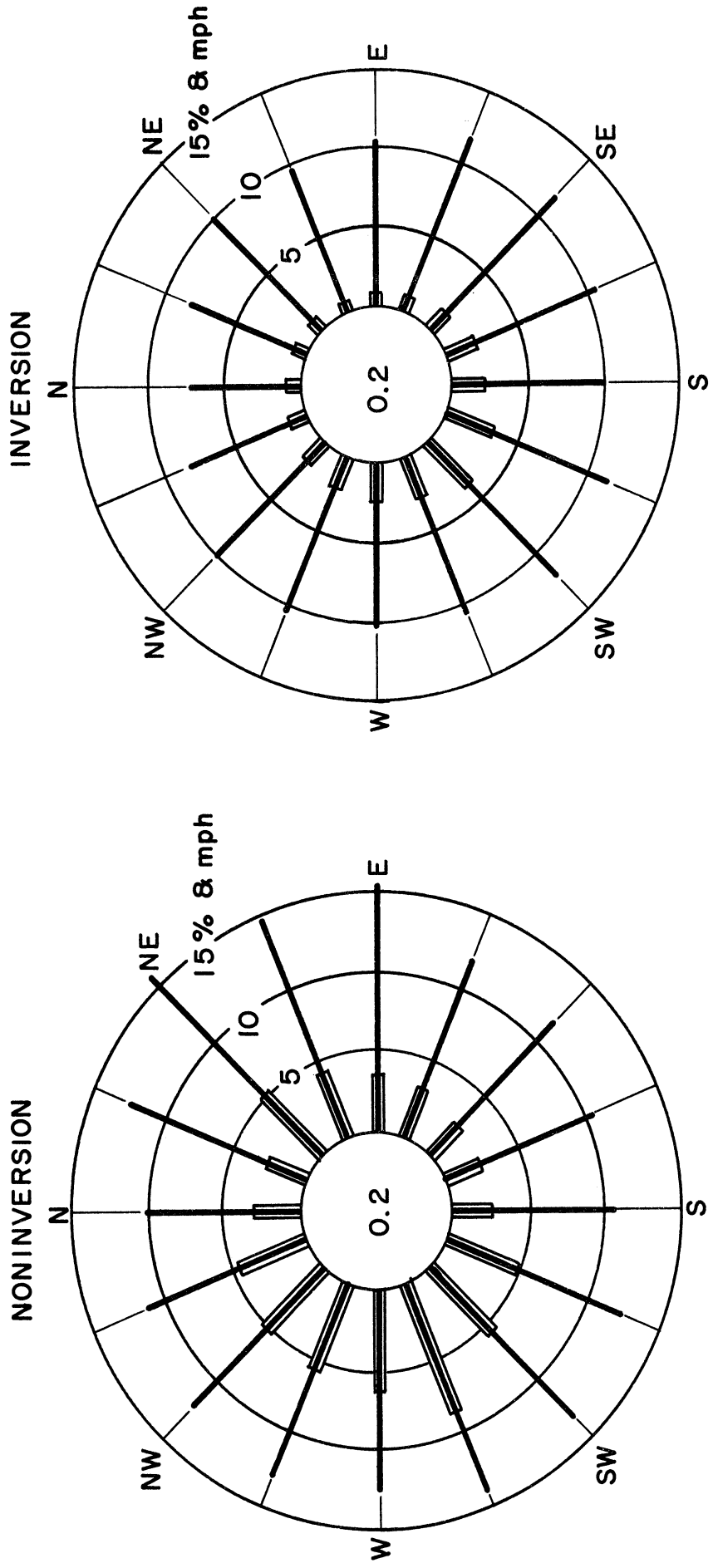


Fig. 6-B. Percentage frequency of inversions and noninversions associated with winds for 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) at the Enrico Fermi site: Three-Year Summary, 1956-1959.

TABLE XXXIX-B

HOURLY PERCENTAGE FREQUENCY OF INVERSIONS BY SEASONS AT THE
ENRICO FERMI SITE

1 December 1958 - 30 November 1959

Hour Ending	Winter	Spring	Summer	Fall
0100	28.9	42.0	52.0	33.3
0200	28.9	50.0	53.3	39.3
0300	28.3	42.0	57.3	44.2
0400	31.3	43.8	54.1	44.2
0500	25.8	41.7	54.1	40.3
0600	24.9	43.8	54.7	41.0
0700	26.9	44.4	49.3	35.5
0800	27.4	29.8	21.3	32.8
0900	24.6	19.0	6.8	17.7
1000	20.9	14.0	13.5	14.5
1100	22.6	16.7	16.2	18.8
1200	19.9	16.3	11.0	18.8
1300	27.1	21.3	13.5	20.0
1400	34.5	26.1	24.7	13.8
1500	36.0	25.0	28.8	18.5
1600	32.5	44.9	41.0	21.5
1700	31.9	42.6	45.3	24.2
1800	32.2	43.8	50.7	26.6
1900	38.3	34.0	38.7	34.3
2000	36.2	30.6	37.3	36.6
2100	40.0	39.2	46.7	38.1
2200	44.1	42.0	45.3	38.8
2300	38.4	42.0	41.3	37.1
2400	35.3	38.8	46.7	33.9
Average	30.4	31.2	37.8	30.0

TABLE XL-B

HOURLY PERCENTAGE FREQUENCY OF INVERSIONS BY SEASONS AT THE
WJBK-TV TOWER

1 December 1958 - 30 November 1959

Hour Ending	Winter	Spring	Summer	Fall
0100	35.6	35.9	61.1	37.3
0200	37.8	34.4	66.7	42.5
0300	37.8	35.9	66.7	43.8
0400	34.4	34.4	71.1	43.8
0500	34.4	34.4	70.7	39.2
0600	34.8	35.9	69.6	38.4
0700	32.6	30.2	62.9	39.7
0800	34.8	22.2	35.2	41.7
0900	33.7	9.5	10.2	18.1
1000	23.6	3.2	4.6	
1100	14.6	1.6	3.4	
1200	11.2	1.6	1.1	
1300	11.1	1.6	2.2	
1400	15.7		2.2	1.4
1500	14.4		2.2	
1600	12.2			1.4
1700	7.8		1.1	1.3
1800	8.9		2.2	2.6
1900	15.6		1.1	6.7
2000	26.7	3.1	5.5	23.0
2100	31.1	15.6	26.4	31.5
2200	35.6	21.9	42.9	32.9
2300	34.4	23.4	50.5	38.7
2400	35.6	28.1	58.9	38.4
Average	25.6	15.6	29.9	21.7

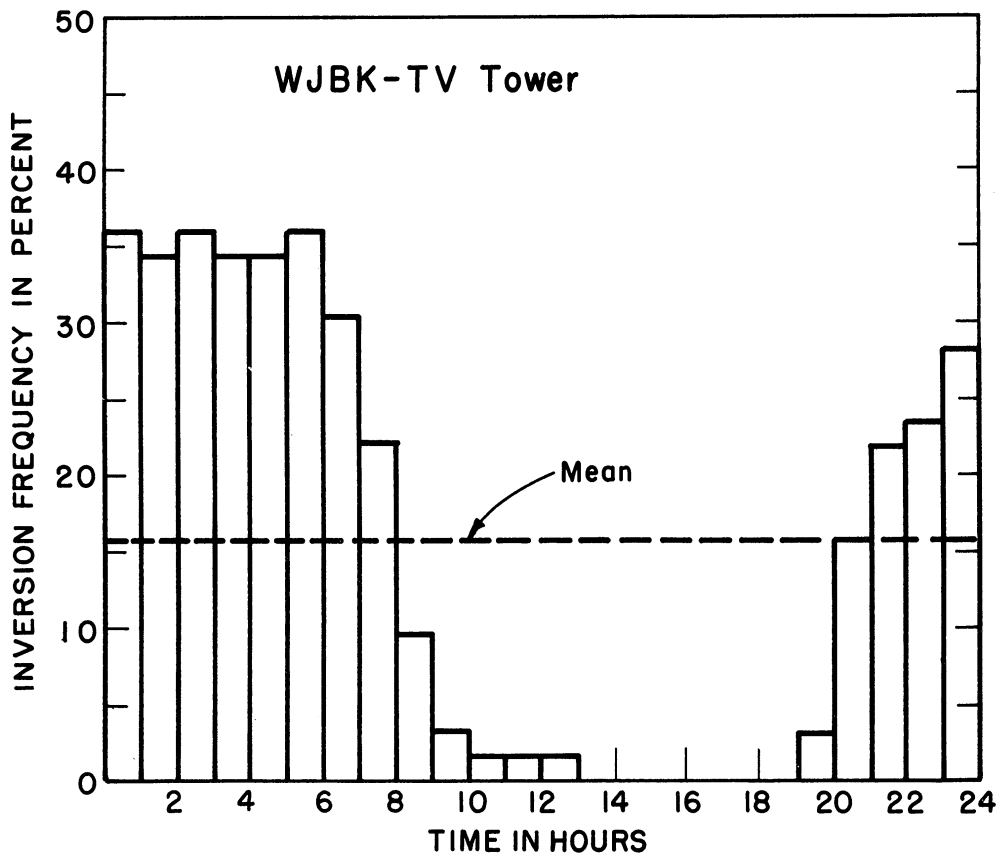
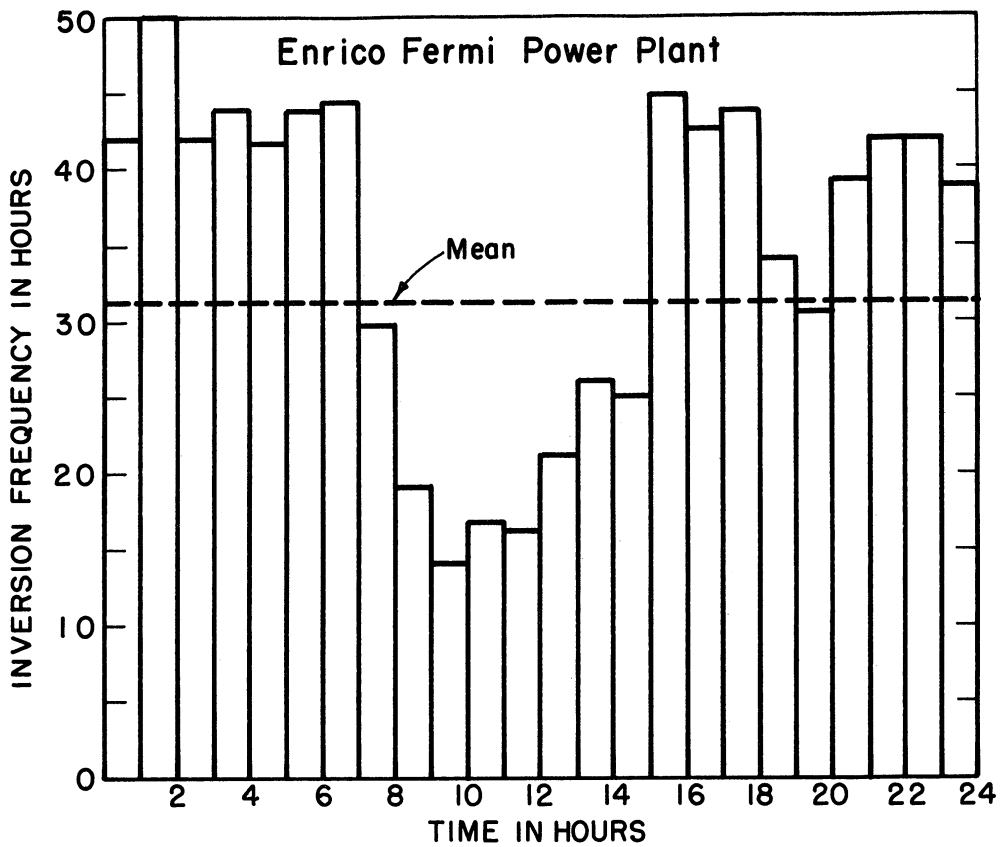


Fig. 7-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower: Winter, 1958-1959.

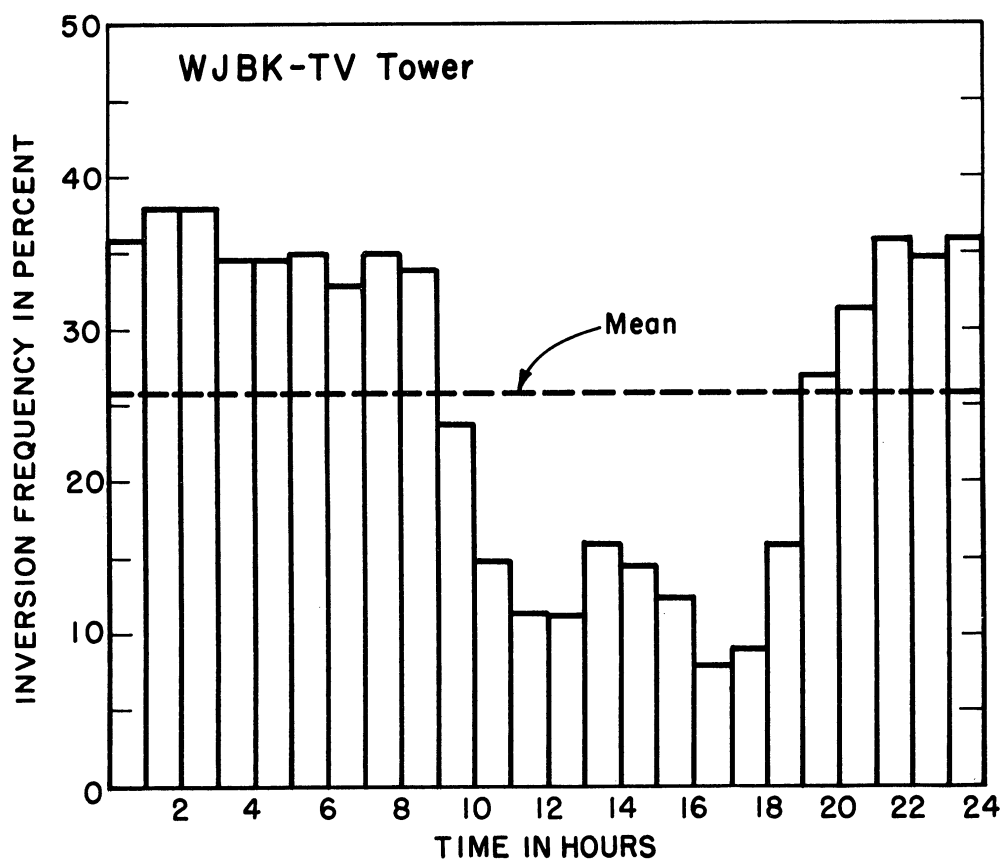
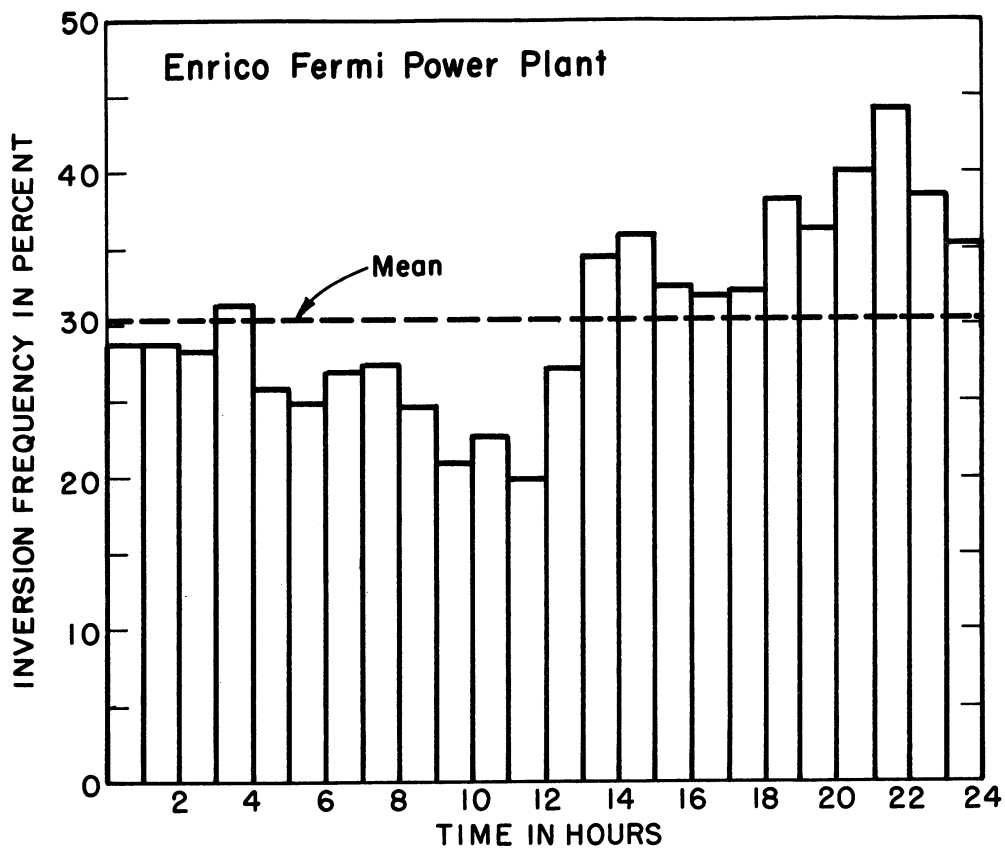


Fig. 8-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower; Spring, 1959.

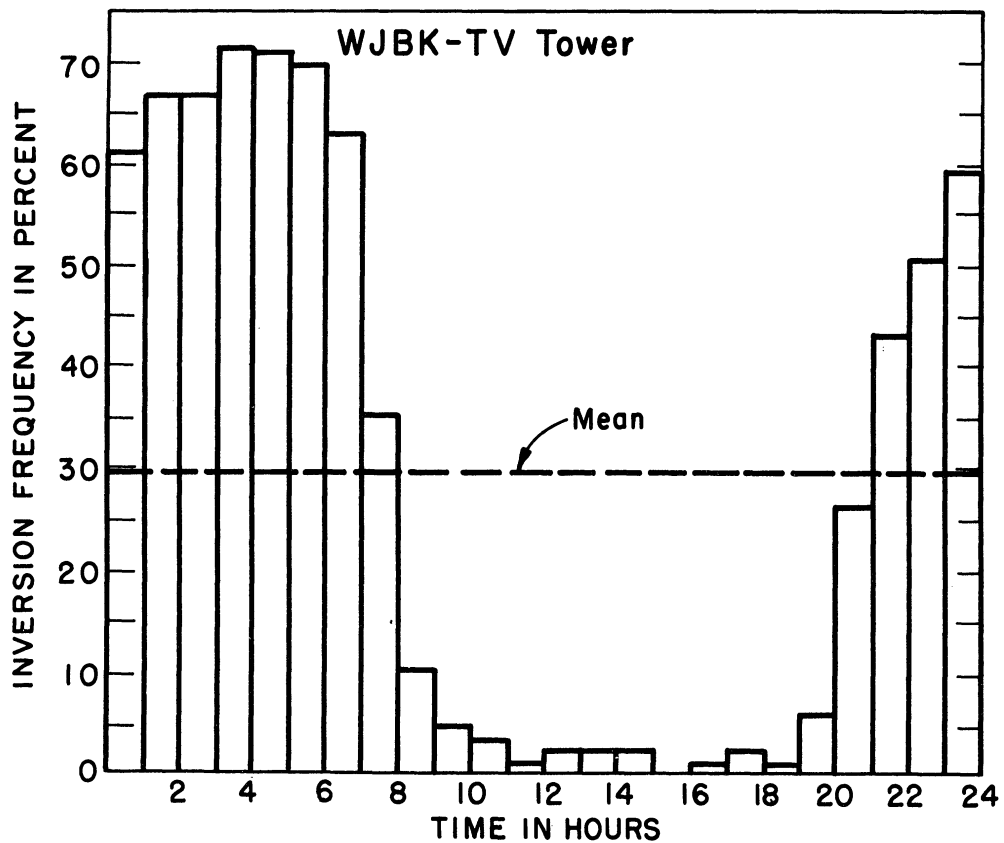
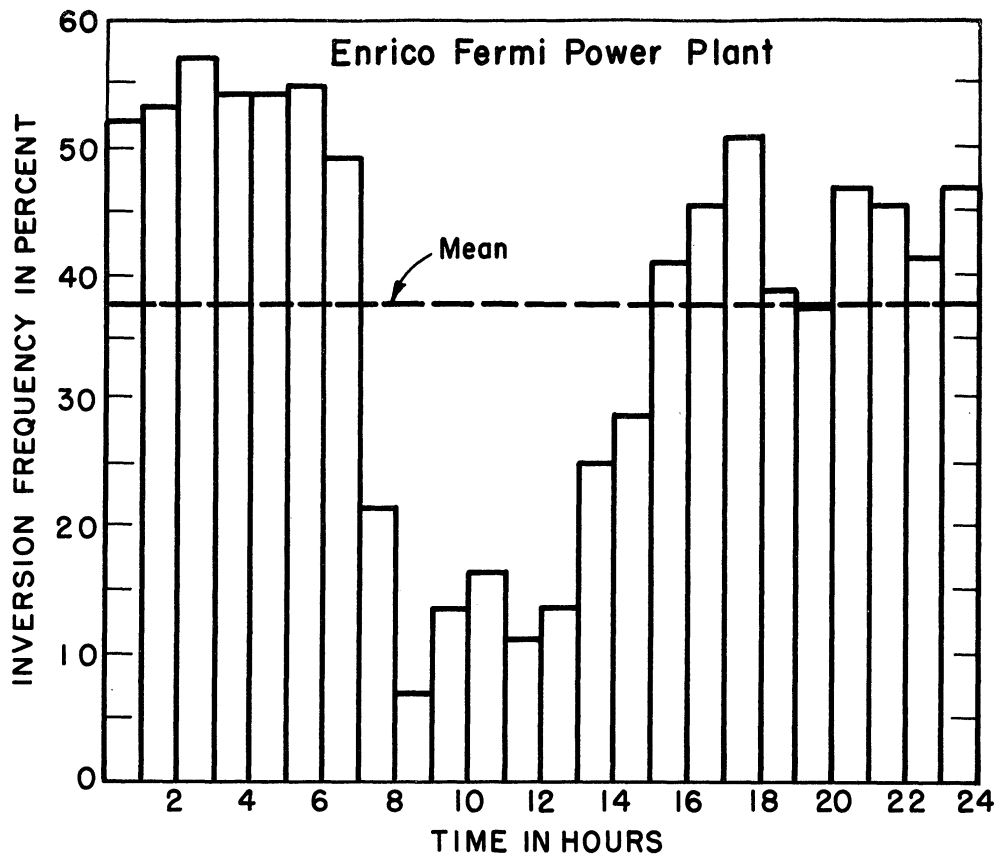


Fig. 9-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower: Summer, 1959.

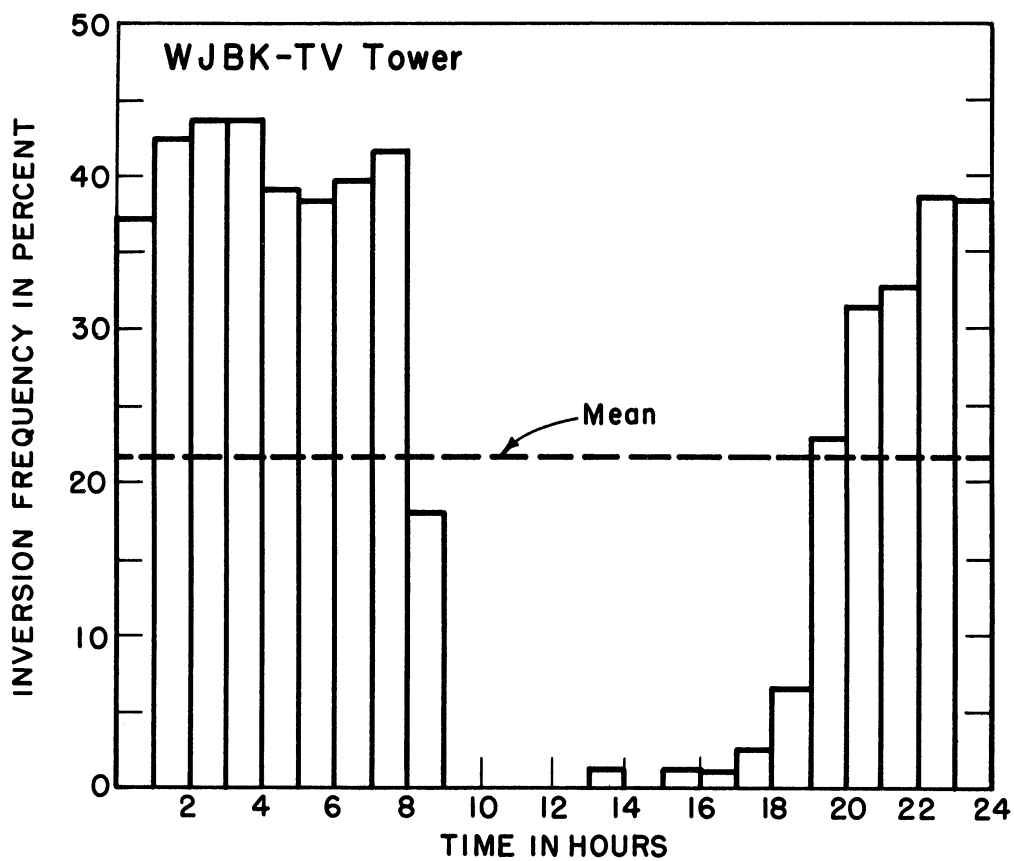
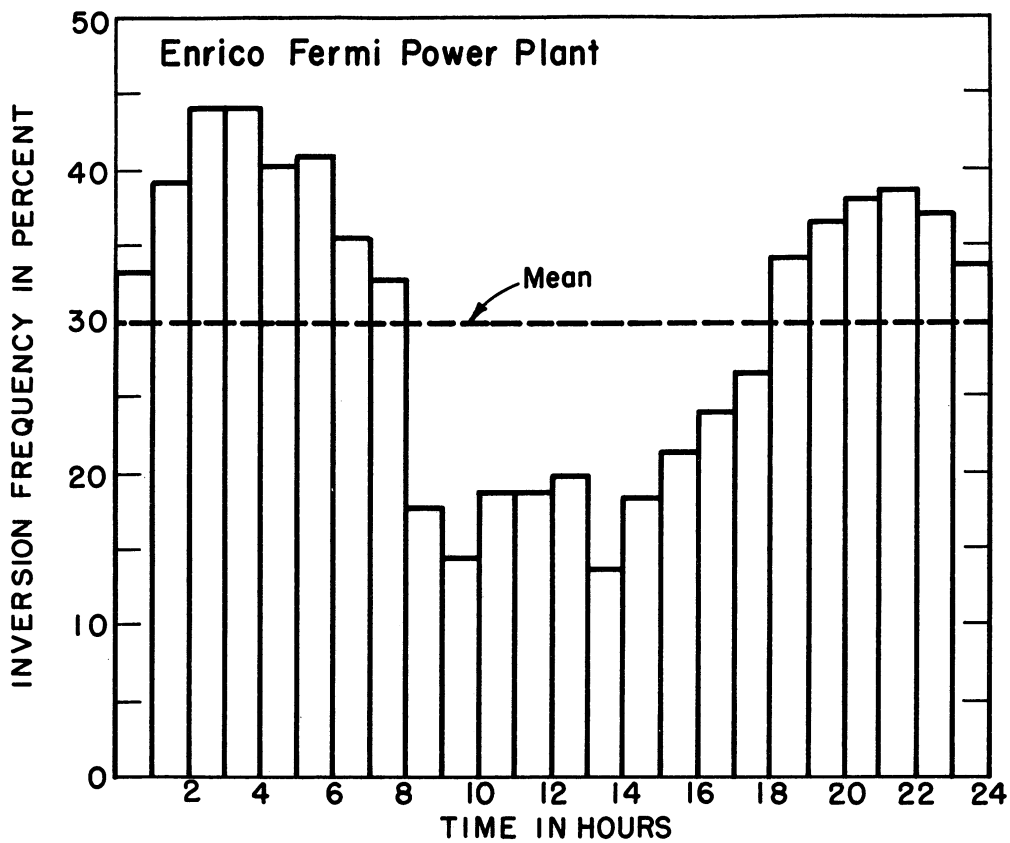


Fig. 10-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower: Fall, 1959.

TABLE XLI-B

HOURLY PERCENTAGE FREQUENCY OF INVERSIONS AT THE
ENRICO FERMI SITE

1 December 1956 - 30 November 1959

Hour Ending	Annual			3-Year Summary
	1957	1958	1959	
0100	22.4	36.8	39.1	32.8
0200	23.4	37.1	42.9	34.5
0300	22.4	36.5	43.0	34.0
0400	22.4	35.0	43.4	33.6
0500	22.9	35.1	40.5	32.8
0600	23.5	35.3	41.1	33.3
0700	21.7	33.9	39.0	31.5
0800	17.2	29.9	27.8	25.0
0900	17.6	23.5	17.0	19.4
1000	12.2	22.1	15.7	16.7
1100	12.6	21.1	18.6	17.4
1200	17.1	18.5	16.5	17.4
1300	16.8	19.0	20.5	36.1
1400	20.2	23.9	24.8	23.0
1500	22.0	31.3	27.1	26.8
1600	22.7	33.2	35.0	30.3
1700	19.0	36.5	36.0	30.5
1800	17.2	34.4	38.3	30.0
1900	15.5	37.3	36.3	29.7
2000	18.0	36.7	35.2	30.0
2100	18.8	35.7	41.0	31.8
2200	19.4	35.9	42.6	32.6
2300	20.4	33.4	39.7	31.2
2400	19.0	34.0	38.7	30.6
Average	19.4	31.5	33.3	28.1

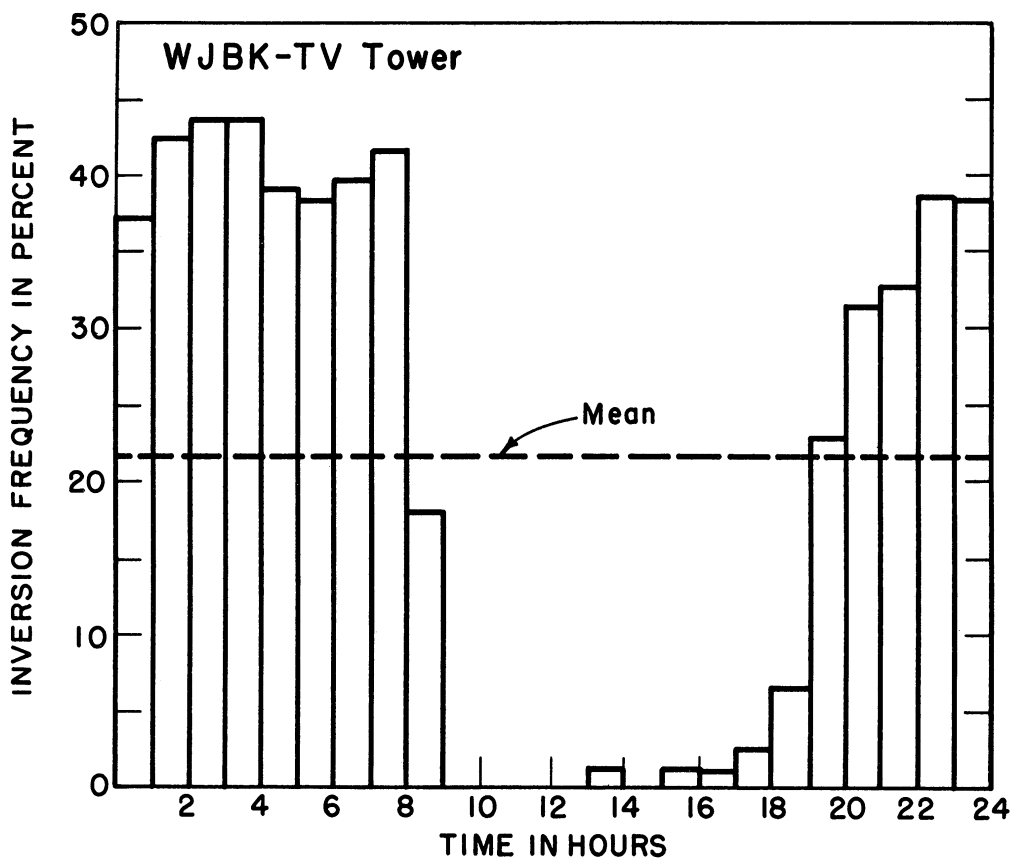
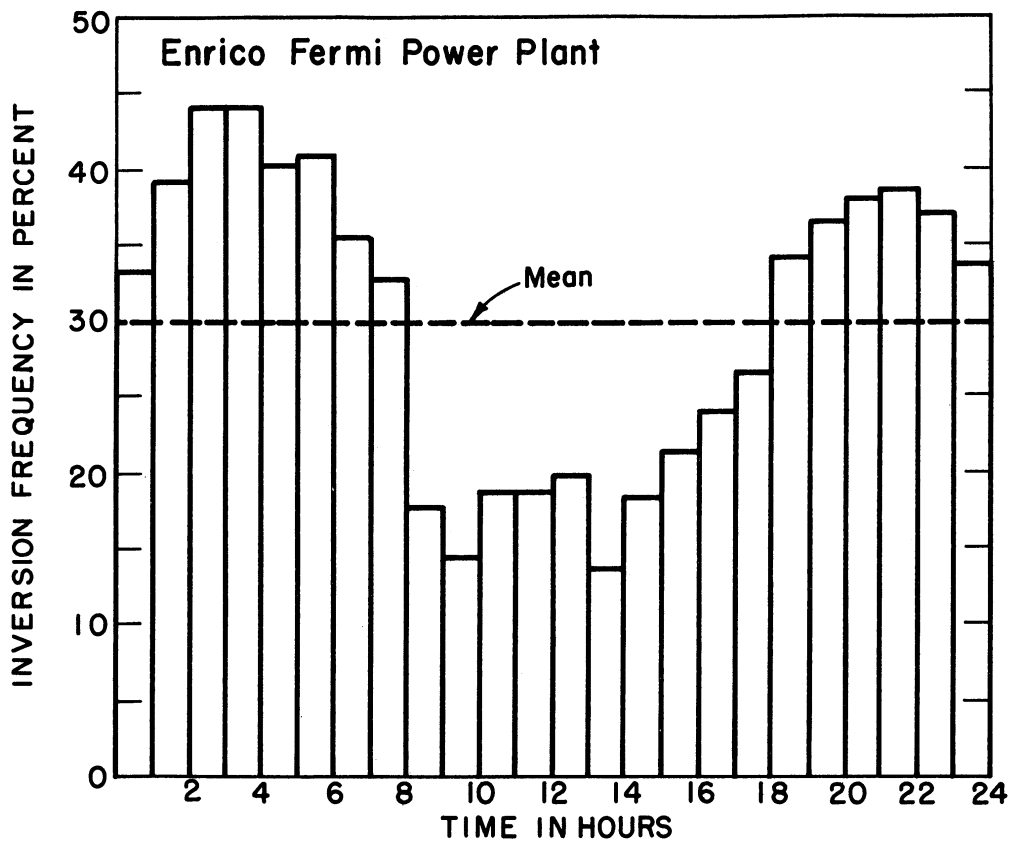


Fig. 10-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower: Fall, 1959.

TABLE XLI-B

HOURLY PERCENTAGE FREQUENCY OF INVERSIONS AT THE
ENRICO FERMI SITE

1 December 1956 - 30 November 1959

Hour Ending	Annual			3-Year Summary
	1957	1958	1959	
0100	22.4	36.8	39.1	32.8
0200	23.4	37.1	42.9	34.5
0300	22.4	36.5	43.0	34.0
0400	22.4	35.0	43.4	33.6
0500	22.9	35.1	40.5	32.8
0600	23.5	35.3	41.1	33.3
0700	21.7	33.9	39.0	31.5
0800	17.2	29.9	27.8	25.0
0900	17.6	23.5	17.0	19.4
1000	12.2	22.1	15.7	16.7
1100	12.6	21.1	18.6	17.4
1200	17.1	18.5	16.5	17.4
1300	16.8	19.0	20.5	36.1
1400	20.2	23.9	24.8	23.0
1500	22.0	31.3	27.1	26.8
1600	22.7	33.2	35.0	30.3
1700	19.0	36.5	36.0	30.5
1800	17.2	34.4	38.3	30.0
1900	15.5	37.3	36.3	29.7
2000	18.0	36.7	35.2	30.0
2100	18.8	35.7	41.0	31.8
2200	19.4	35.9	42.6	32.6
2300	20.4	33.4	39.7	31.2
2400	19.0	34.0	38.7	30.6
Average	19.4	31.5	33.3	28.1

TABLE XLII-B

HOURLY PERCENTAGE FREQUENCY OF INVERSIONS AT THE
WJBK-TV TOWER

1 December 1956 - 30 November 1959

Hour Ending	Annual			3-Year Summary
	1957	1958	1959	
0100	58.0	55.3	43.2	52.2
0200	54.1	54.4	46.4	51.6
0300	55.2	53.8	47.0	52.0
0400	55.7	53.3	47.0	52.0
0500	55.7	53.4	45.7	51.6
0600	55.5	53.8	45.7	51.7
0700	51.1	49.6	42.4	47.7
0800	41.1	40.7	34.0	38.6
0900	30.0	29.6	18.6	26.1
1000	15.4	16.5	8.7	13.5
1100	11.3	8.5	5.4	8.4
1200	7.7	7.7	3.8	6.4
1300	8.4	7.8	4.1	6.8
1400	7.3	8.0	5.3	6.9
1500	6.3	5.1	4.7	5.4
1600	5.3	3.7	3.8	4.3
1700	3.5	2.8	2.8	3.0
1800	4.9	6.0	3.7	4.9
1900	17.8	11.4	6.3	11.8
2000	33.2	27.0	15.0	25.1
2100	45.3	41.8	26.7	37.9
2200	45.3	41.8	34.3	44.1
2300	49.1	50.0	37.8	45.6
2400	54.8	53.7	41.3	49.9
Average	32.4	30.9	23.9	29.1

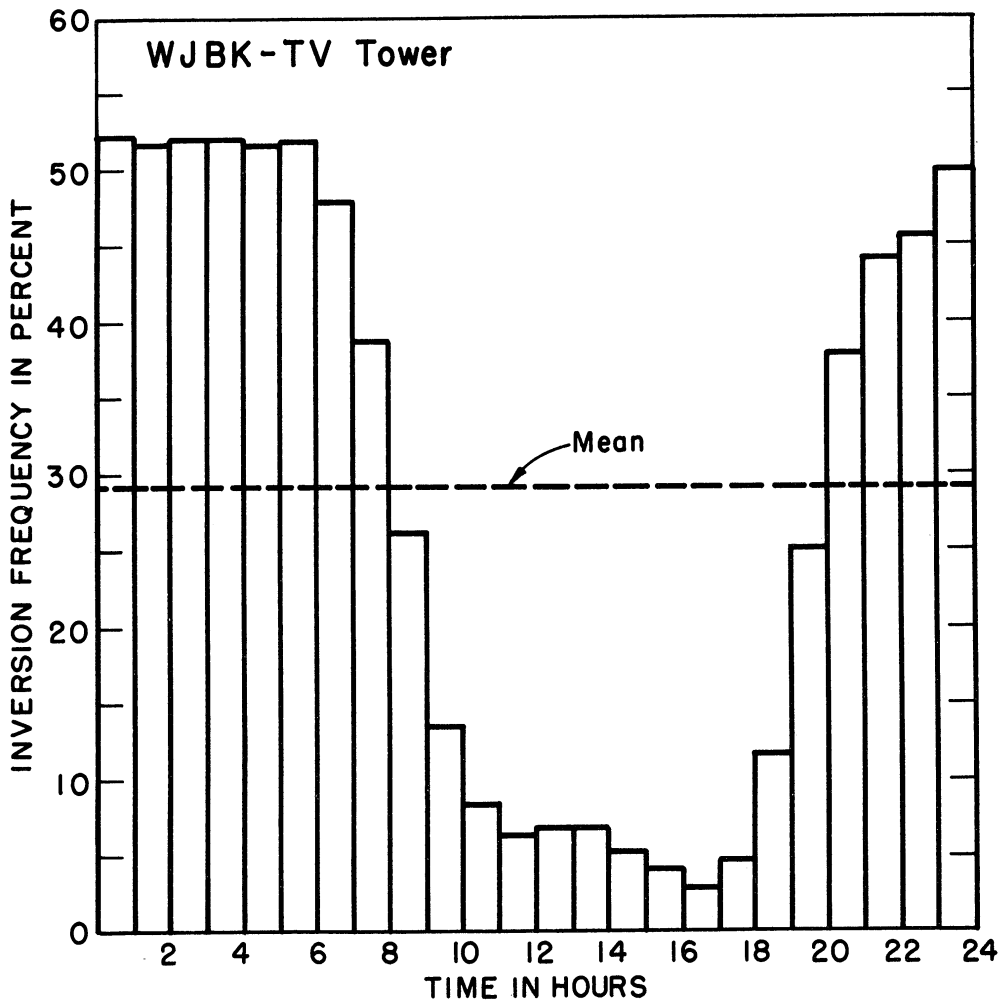
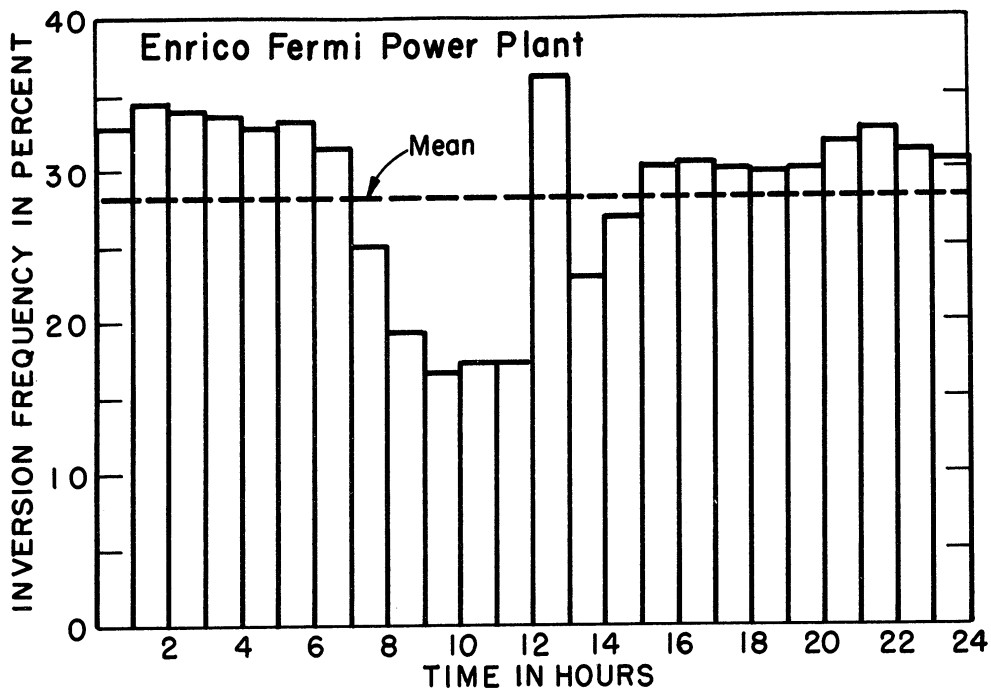


Fig. 11-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower: Annual Summary, 1958-1959.

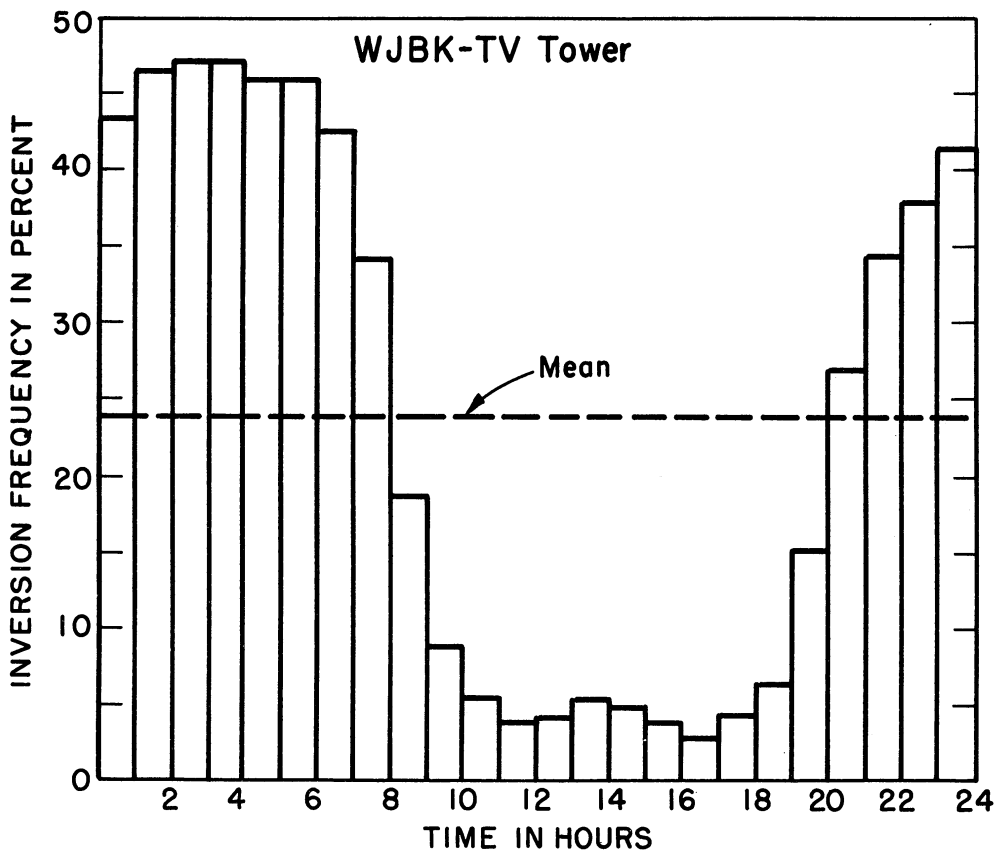
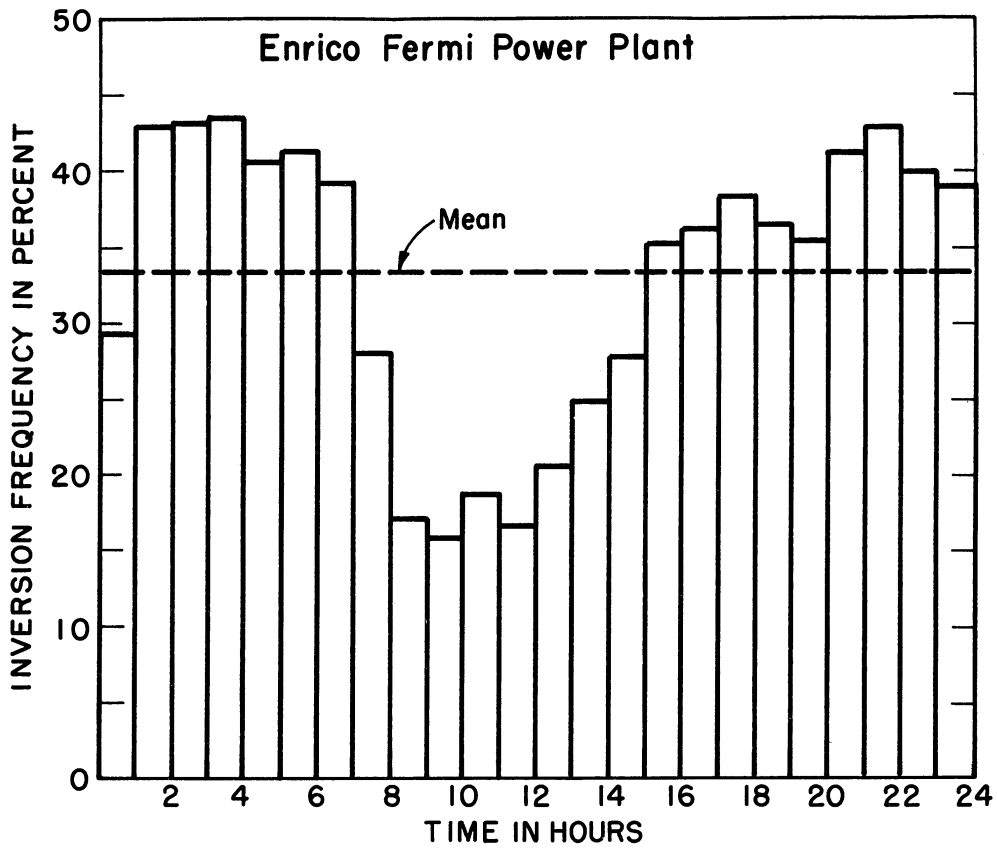


Fig. 12-B. Diurnal variation of inversions at the Enrico Fermi site and at WJBK-TV tower: Three-Year Summary, 1956-1959.

APPENDIX C

PRECIPITATION DATA

TABLE I-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
ENRICO FERMI SITE

1 December 1958 - 28 February 1959
(Winter)

Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	10.9	10.5	27	5.2	1.3
NNE	10.6	11.9	19	3.6	0.9
NE	14.7	17.3	16	3.1	0.7
ENE	12.3	13.1	7	1.3	0.3
E	15.7	15.5	10	1.9	0.5
ESE	12.3	12.9	10	1.9	0.5
SE	10.5	12.5	12	2.3	0.6
SSE	10.2	10.7	14	2.7	0.7
S	9.9	11.1	30	5.7	1.4
SSW	12.0	12.8	33	6.3	1.5
SW	13.0	13.2	29	5.5	1.4
WSW	14.3	15.8	111	21.2	5.2
W	13.6	14.1	78	14.9	3.6
WNW	12.0	13.6	47	9.0	2.2
NW	11.4	12.1	45	8.6	2.1
NNW	9.7	12.0	33	6.3	1.5
Calm	0.0	0.0	1	0.2	0.0
Totals			522	99.7	24.4
Average	12.4	13.3			

TABLE II-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
TOLEDO EXPRESS AIRPORT

1 December 1958 - 28 February 1959
(Winter)

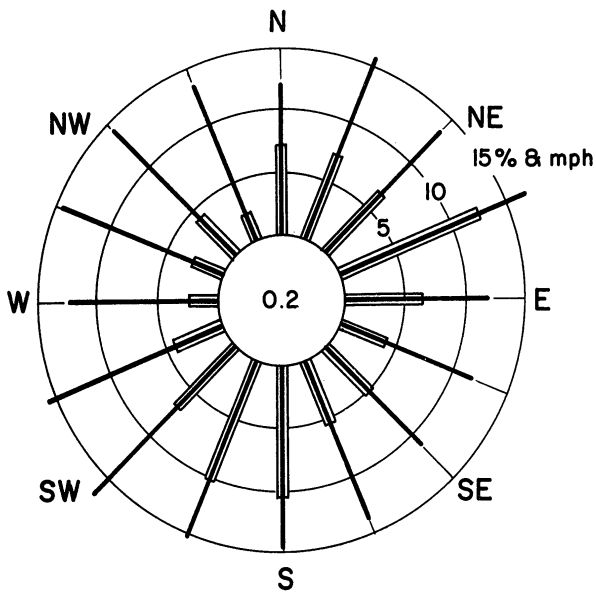
Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	11.0	12.4	34	5.8	1.6
NNE	10.0	10.5	20	3.4	0.9
NE	12.0	12.6	32	5.4	1.5
ENE	11.3	11.3	24	4.1	1.1
E	7.6	9.0	18	3.1	0.8
ESE	5.9	7.0	20	3.4	0.9
SE	6.8	7.3	12	2.0	0.6
SSE	8.6	9.3	26	4.4	1.2
S	9.5	9.3	35	5.9	1.6
SSW	11.3	10.8	50	8.5	2.3
SW	13.5	13.2	88	14.9	4.1
WSW	13.8	13.7	84	14.3	3.9
W	13.2	17.2	36	6.1	1.7
WNW	13.3	13.0	34	5.8	1.6
NW	12.0	11.0	27	4.6	1.2
NNW	11.6	12.2	49	8.3	2.3
Calm					
Totals			589	100.0	27.3
Average	11.6	12.0			

TABLE III-C

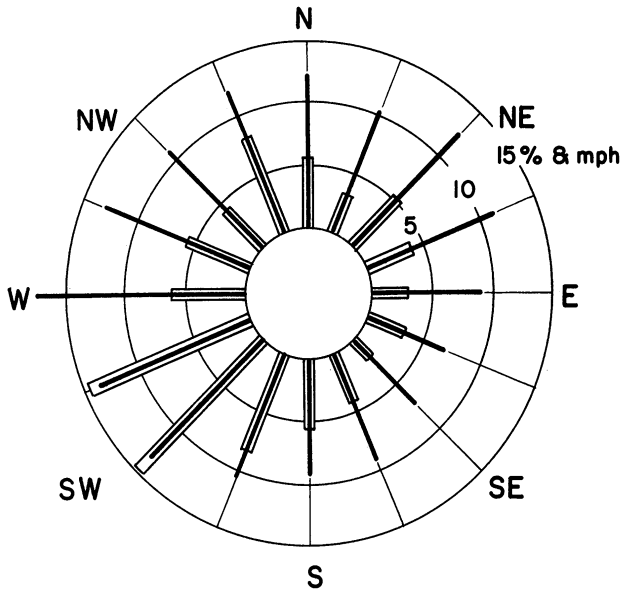
THE ASSOCIATION OF PRECIPITATION WITH WIND
AT THE TOLEDO MUNICIPAL AIRPORT

1 January 1950 - 31 December 1954
(Winter Seasons)

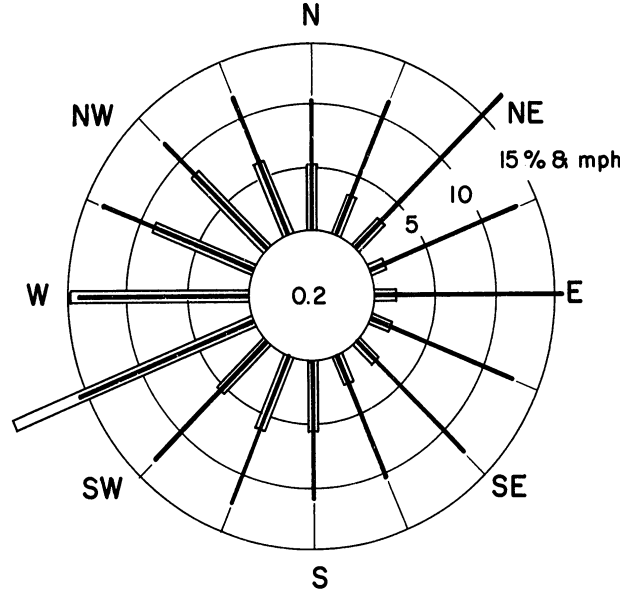
Wind Direction	Average Wind Speed, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
			Total Hours of Precipitation	Total Hours
N	12.1	78	7.1	0.7
NNE	15.9	81	7.4	0.7
NE	13.6	75	6.8	0.7
ENE	16.7	136	12.4	1.3
E	12.0	73	6.7	0.7
ESE	11.9	46	4.2	0.4
SE	11.1	57	5.2	0.5
SSE	13.9	60	5.5	0.6
S	14.6	116	10.6	1.1
SSW	15.2	114	10.4	1.1
SW	16.9	77	7.0	0.7
WSW	15.7	47	4.3	0.4
W	12.4	26	2.4	0.2
WNW	14.5	32	2.9	0.3
NW	14.3	47	4.3	0.4
NNW	13.5	29	2.6	0.3
Calm	<u>0.0</u>	<u>2</u>	<u>0.2</u>	<u>0.0</u>
Totals		1096	100.0	10.1
Average	14.3			



TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO
Winter (1 Dec. - 28 Feb.) 1950-54



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO
Winter (1 Dec. - 28 Feb.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN
Winter (1 Dec. - 28 Feb.) 1959

C-5

Fig. 1-C. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) with precipitation at Toledo Municipal Airport, Winter Seasons, 1950-1954, and at Toledo Express Airport, and the Enrico Fermi site, Winter, 1958-1959.

TABLE IV-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
ENRICO FERMI SITE

1 March 1959 - 31 May 1959
(Spring)

Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	8.9	8.3	7	1.8	0.3
NNE	12.9	12.9	31	8.1	1.4
NE	16.5	20.3	35	9.1	1.6
ENE	14.2	20.9	25	6.5	1.1
E	14.5	21.3	26	6.8	1.2
ESE	13.5	19.7	23	6.0	1.1
SE	10.5	15.6	9	2.3	0.4
SSE	11.3	14.4	17	4.4	0.8
S	11.4	12.0	22	5.7	1.0
SSW	13.6	12.8	25	6.5	1.1
SW	13.5	19.4	36	9.4	1.6
WSW	14.0	18.2	50	13.0	2.3
W	14.5	21.4	25	6.5	1.1
WNW	12.8	19.7	19	4.9	0.9
NW	13.6	15.4	24	6.2	1.1
NNW	12.7	15.5	10	2.6	0.5
Calm					
Totals			384	99.8	17.5
Average	13.3	17.5			

TABLE V-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
TOLEDO EXPRESS AIRPORT

1 March 1959 - 31 May 1959
(Spring)

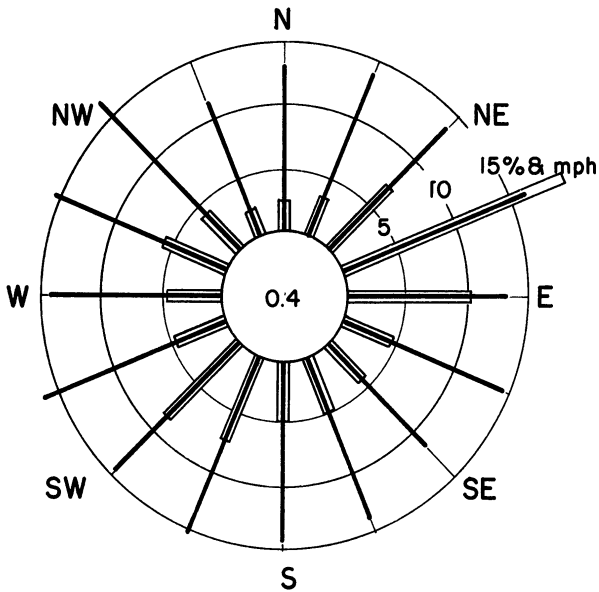
Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	8.9	9.9	16	3.7	0.7
NNE	9.7	11.5	43	10.0	1.9
NE	9.8	10.0	57	13.2	2.6
ENE	10.1	11.7	46	10.7	2.1
E	8.1	9.3	14	3.2	0.6
ESE	6.4	8.2	9	2.1	0.4
SE	7.0	10.0	15	3.5	0.7
SSE	9.0	9.3	27	6.3	1.2
S	9.1	9.5	33	7.7	1.5
SSW	10.6	14.7	46	10.7	2.1
SW	10.9	14.6	39	9.0	1.8
WSW	11.9	17.0	38	8.8	1.7
W	12.6	16.7	13	3.0	0.6
WNW	12.3	13.0	18	4.2	0.8
NW	10.4	8.6	13	3.0	0.6
NNW	8.9	8.4	3	0.7	0.1
Calm	0.0	0.0	1	0.2	0.0
Totals			431	100.0	19.4
Average	9.9	11.4			

TABLE VI-C

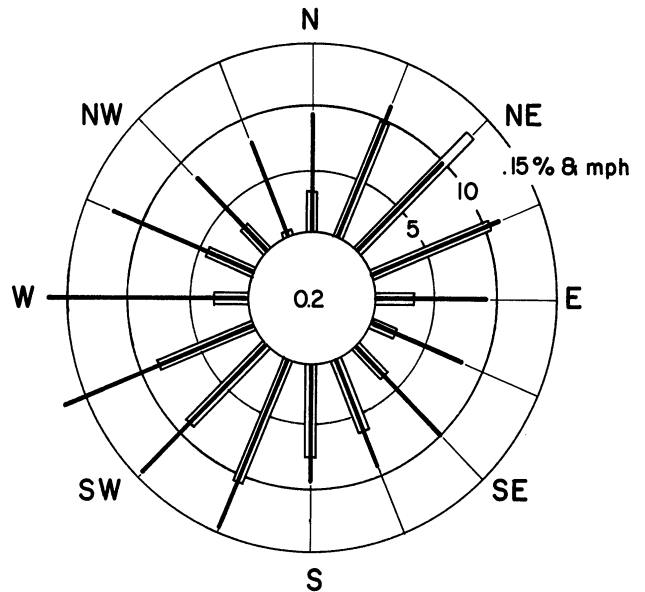
THE ASSOCIATION OF PRECIPITATION WITH WIND
AT THE TOLEDO MUNICIPAL AIRPORT

1 January 1950 - 31 December 1954
(Spring Seasons)

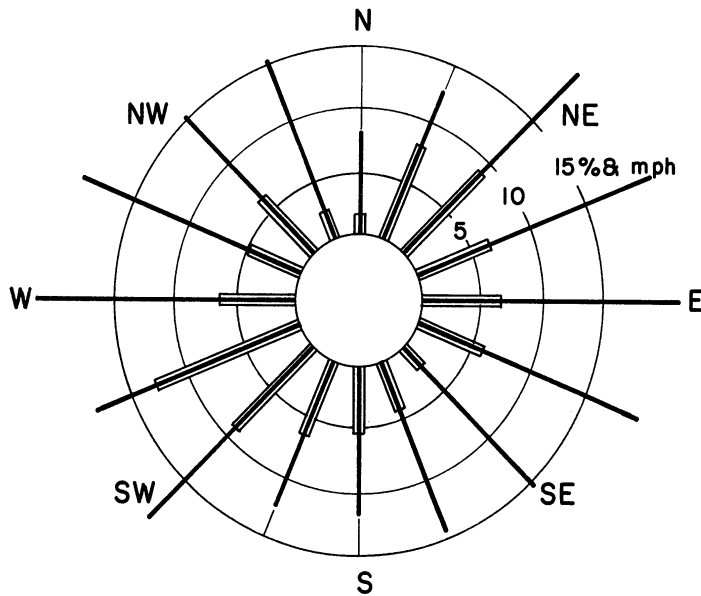
Wind Direction	Average Wind Speed, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
			Total Hours of Precipitation	Total Hours
N	13.3	26	2.7	0.2
NNE	14.0	34	3.5	0.3
NE	13.9	69	7.1	0.6
ENE	16.3	193	19.8	1.7
E	13.4	98	10.1	0.9
ESE	14.5	44	4.5	0.4
SE	11.6	40	4.1	0.4
SSE	14.0	49	5.0	0.4
S	14.6	49	5.0	0.4
SSW	15.4	73	7.5	0.7
SW	14.8	84	8.6	0.8
WSW	16.4	46	4.7	0.4
W	14.3	45	4.6	0.4
WNW	15.5	57	5.9	0.5
NW	16.6	40	4.1	0.4
NNW	11.5	23	2.4	0.2
Calm	<u>0.0</u>	<u>4</u>	<u>0.4</u>	<u>0.0</u>
Totals		974	100.0	8.8
Average	14.7			



TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO
Spring (1 Mar.-31 May) 1950-54



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO
Spring (1 Mar.-31 May) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN
Spring (1 Mar.-31 May) 1959

C-9

Fig. 2-C. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) with precipitation at Toledo Municipal Airport, Spring Seasons, 1950-1954, and at Toledo Express Airport, and the Enrico Fermi site, Spring, 1959.

TABLE VII-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
ENRICO FERMI SITE

1 June 1959 - 31 August 1959
(Summer)

Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	7.9	8.0	1	1.1	0.1
NNE	9.5	8.3	4	4.4	0.2
NE	12.3	10.8	4	4.4	0.2
ENE	12.9	20.6	5	5.5	0.3
E	11.4	13.3	4	4.4	0.2
ESE	12.6	16.5	4	4.4	0.2
SE	12.0	17.3	3	3.3	0.2
SSE	10.5	18.0	1	1.1	0.1
S	8.7	8.0	1	1.1	0.1
SSW	10.4	12.7	21	23.1	1.3
SW	10.8	12.4	16	17.6	1.0
WSW	9.8	12.7	9	9.9	0.6
W	8.5	7.8	5	5.5	0.3
WNW	10.6	11.3	4	4.4	0.2
NW	9.5	13.3	3	3.3	0.2
NNW	10.1	6.3	6	6.6	0.4
Calm					
Totals			91	100.1	5.6
Average	10.4	12.4			

TABLE VIII-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
TOLEDO EXPRESS AIRPORT

1 June 1959 - 31 August 1959
(Summer)

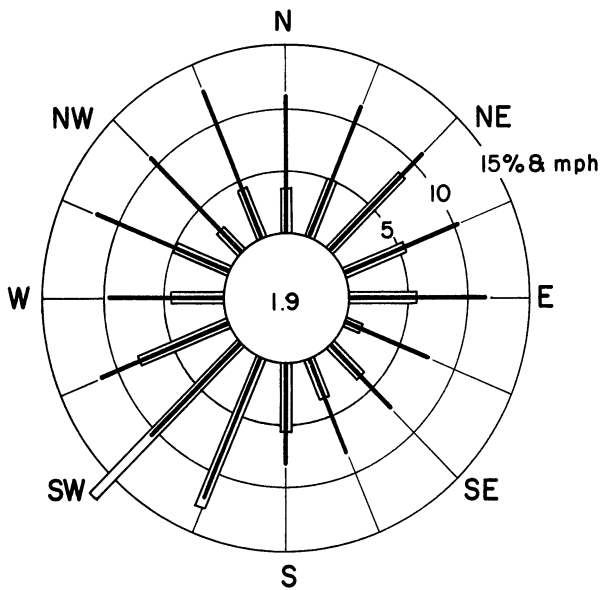
Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	8.1	9.9	5	3.2	0.2
NNE	7.7	7.4	8	5.1	0.4
NE	6.8	8.1	2	1.3	0.1
ENE	6.8	10.1	5	3.2	0.2
E	6.2	6.6	3	1.9	0.1
ESE	5.9	4.9	4	2.6	0.2
SE	5.0	5.8	4	2.6	0.2
SSE	5.8	4.9	15	9.6	0.7
S	7.0	6.6	15	9.6	0.7
SSW	7.4	6.9	23	14.7	1.0
SW	7.6	7.9	24	15.4	1.1
WSW	7.8	8.3	26	16.7	1.2
W	7.0	8.7	5	3.2	0.2
WNW	13.0	12.6	3	1.9	0.1
NW	8.1	9.1	8	5.1	0.4
NNW	8.5	9.4	5	3.2	0.2
Calm	0.0	0.0	1	0.6	0.0
Totals			156	99.9	7.0
Average	7.1	8.0			

TABLE IX-C

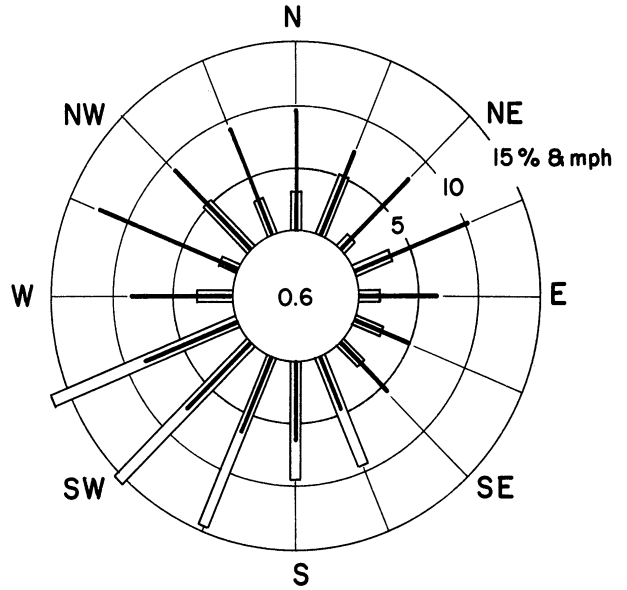
THE ASSOCIATION OF PRECIPITATION WITH WIND
AT THE TOLEDO MUNICIPAL AIRPORT

1 January 1950 - 31 December 1954
(Summer Seasons)

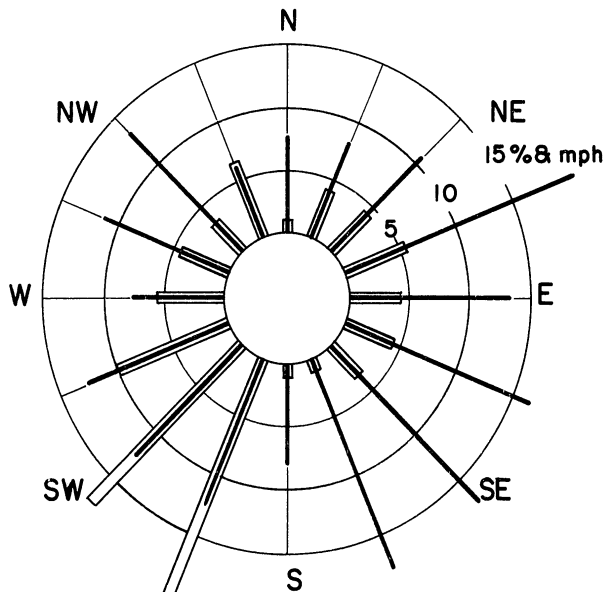
Wind Direction	Average Wind Speed, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
			Total Hours of Precipitation	Total Hours
N	11.2	18	3.8	0.2
NNE	11.5	24	5.0	0.2
NE	11.0	42	8.8	0.4
ENE	10.2	25	5.2	0.2
E	11.3	28	5.9	0.3
ESE	7.6	8	1.7	0.1
SE	7.3	18	3.8	0.2
SSE	8.2	17	3.6	0.2
S	8.2	27	5.7	0.2
SSW	12.4	62	13.0	0.6
SW	10.8	82	17.2	0.7
WSW	11.4	38	8.0	0.3
W	9.8	21	4.4	0.2
WNW	12.0	24	5.0	0.2
NW	10.9	13	2.7	0.1
NNW	13.0	21	4.4	0.2
Calm	<u>0.0</u>	<u>9</u>	<u>1.9</u>	<u>0.1</u>
Totals		477	100.0	4.3
Average	10.6			



TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO
Summer (1 June-31 Aug.) 1950-54



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO
Summer (1 June-31 Aug.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN
Summer (1 June-31 Aug.) 1959

C-13

Fig. 3-C. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) with precipitation at Toledo Municipal Airport, Summer Seasons, 1950-1954, and at Toledo Express Airport, and the Enrico Fermi site, Summer, 1959.

TABLE X-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
ENRICO FERMI SITE

1 September 1959 - 30 November 1959
(Fall)

Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	6.9	6.8	16	4.3	0.8
NNE	8.5	8.7	7	1.9	0.4
NE	13.6	13.7	30	8.1	1.5
ENE	13.0	11.2	13	3.5	0.7
E	11.5	10.5	13	3.5	0.7
ESE	11.7	14.4	10	2.7	0.5
SE	13.2	15.1	9	2.4	0.5
SSE	11.5	12.5	13	3.5	0.7
S	11.1	12.8	23	6.2	1.2
SSW	12.3	10.9	26	7.0	1.3
SW	11.5	10.9	51	13.8	2.6
WSW	11.9	11.9	37	10.0	1.9
W	13.0	15.3	37	10.0	1.9
WNW	10.6	11.3	41	11.1	2.1
NW	10.1	9.2	33	8.9	1.7
NNW	8.5	8.6	11	3.0	0.6
Calm					
Totals			370	99.9	19.1
Average	11.3	11.6			

TABLE XI-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
TOLEDO EXPRESS AIRPORT

1 September 1959 - 30 November 1959
(Fall)

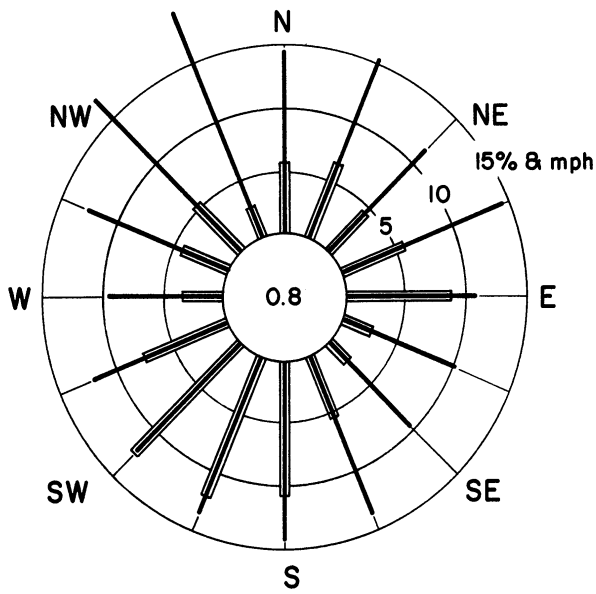
Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	7.1	6.3	14	3.8	0.6
NNE	7.5	6.8	17	4.6	0.8
NE	7.6	7.4	20	5.4	0.9
ENE	8.7	7.1	13	3.5	0.6
E	7.0	5.5	6	1.6	0.3
ESE	6.3	5.8	10	2.7	0.5
SE	6.4	6.0	17	4.6	0.8
SSE	7.3	7.5	17	4.6	0.8
S	8.1	9.0	29	7.9	1.3
SSW	9.4	9.0	37	10.1	1.7
SW	8.9	7.9	39	10.6	1.8
WSW	11.4	11.0	41	11.1	1.9
W	11.1	10.0	27	7.3	1.2
WNW	11.2	12.3	43	11.7	2.0
NW	8.7	7.5	20	5.4	0.9
NNW	9.7	10.0	10	2.7	0.5
Calm	0.0	0.0	8	2.2	0.4
Totals			368	99.8	17.0
Average	8.7	8.1			

TABLE XII-C

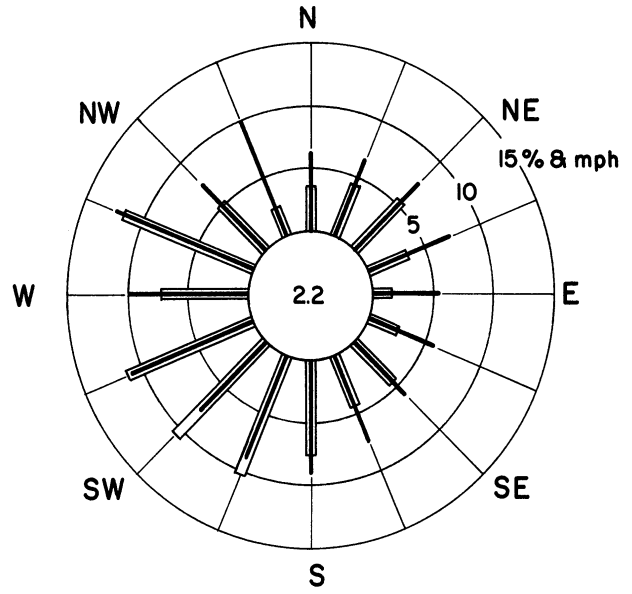
THE ASSOCIATION OF PRECIPITATION WITH WIND
AT THE TOLEDO MUNICIPAL AIRPORT

1 January 1950 - 31 December 1954
(Fall Seasons)

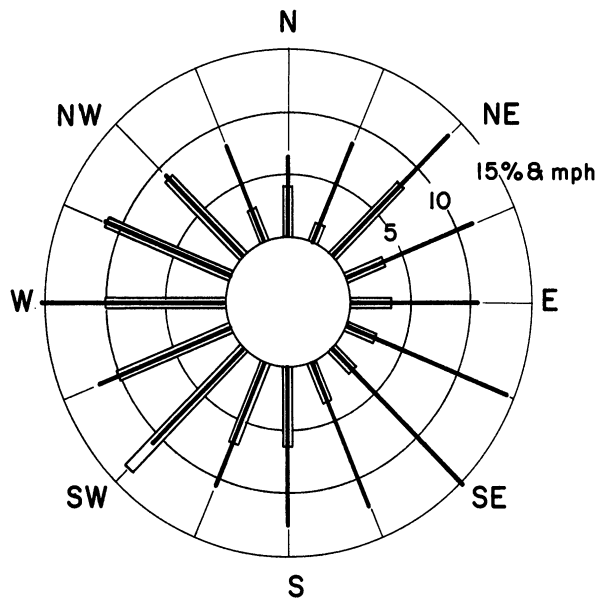
Wind Direction	Average Wind Speed, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
			Total Hours of Precipitation	Total Hours
N	14.6	36	5.7	0.3
NNE	15.2	40	6.3	0.4
NE	11.5	27	4.3	0.2
ENE	14.3	35	5.5	0.3
E	10.8	53	8.4	0.5
ESE	10.0	15	2.4	0.1
SE	9.4	14	2.2	0.1
SSE	13.6	35	5.5	0.3
S	14.3	69	10.9	0.6
SSW	13.6	77	12.1	0.7
SW	12.4	79	12.5	0.7
WSW	12.2	48	7.6	0.4
W	9.7	23	3.6	0.2
WNW	12.9	27	4.3	0.2
NW	17.1	33	5.2	0.3
NNW	19.2	18	2.8	0.2
Calm	<u>0.0</u>	<u>5</u>	<u>0.8</u>	<u>0.0</u>
Totals		634	100.0	5.8
Average	13.2			



TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO
Fall (1 Sep.-30 Nov.) 1950-54



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO
Fall (1 Sep.-30 Nov.) 1959



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN
Fall (1 Sep.-30 Nov.) 1959

C-17

Fig. 4-C. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) with precipitation at Toledo Municipal Airport, Fall Seasons, 1950-1954, and at Toledo Express Airport, and the Enrico Fermi site, Fall, 1959.

TABLE XIII-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
ENRICO FERMI SITE

1 December 1958 - 30 November 1959
(Annual)

Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	8.6	9.0	51	3.7	0.6
NNE	10.7	11.8	61	4.5	0.8
NE	14.6	16.9	85	6.2	1.1
ENE	13.3	17.3	50	3.7	0.6
E	13.4	17.0	53	3.9	0.7
ESE	12.9	16.9	47	3.4	0.6
SE	11.7	14.5	33	2.4	0.4
SSE	10.9	12.8	45	3.3	0.6
S	10.3	11.8	76	5.6	1.0
SSW	12.2	12.3	105	7.7	1.3
SW	12.3	13.9	132	9.7	1.7
WSW	13.1	15.5	207	15.1	2.6
W	12.9	14.8	145	10.6	1.8
WNW	11.6	13.7	111	8.1	1.4
NW	11.1	11.9	105	7.7	1.3
NNW	10.2	11.4	60	4.4	0.8
Calm	0.0	0.0	1	0.1	0.0
Totals			1367	100.1	17.7
Average	12.0	14.0			

TABLE XIV-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
TOLEDO EXPRESS AIRPORT

1 December 1958 - 30 November 1959
(Annual)

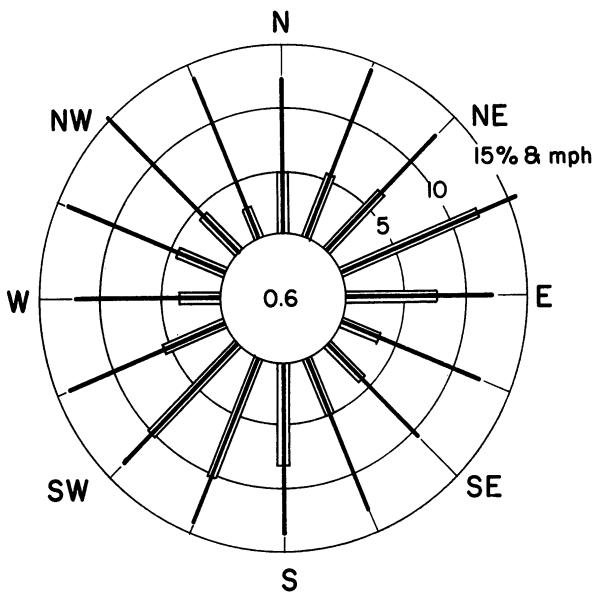
Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	8.7	10.4	69	4.5	0.8
NNE	8.5	9.9	88	5.7	1.0
NE	9.1	10.2	111	7.2	1.3
ENE	9.2	10.8	88	5.7	1.0
E	7.3	8.4	41	2.7	0.5
ESE	6.1	6.8	43	2.8	0.5
SE	6.3	7.5	48	3.1	0.5
SSE	7.8	8.8	85	5.5	1.0
S	8.5	9.0	112	7.3	1.3
SSW	9.8	10.9	157	10.2	1.8
SW	10.4	11.7	190	12.3	2.2
WSW	11.4	13.0	189	12.2	2.2
W	11.0	14.0	81	5.2	0.9
WNW	11.6	12.7	98	6.3	1.1
NW	9.7	9.3	68	4.4	0.8
NNW	9.7	11.5	67	4.3	0.8
Calm	0.0	0.0	10	0.6	0.1
Totals			1544	100.0	17.8
Average	9.3	10.8			

TABLE XV-C

**THE ASSOCIATION OF PRECIPITATION WITH WIND
AT THE TOLEDO MUNICIPAL AIRPORT**

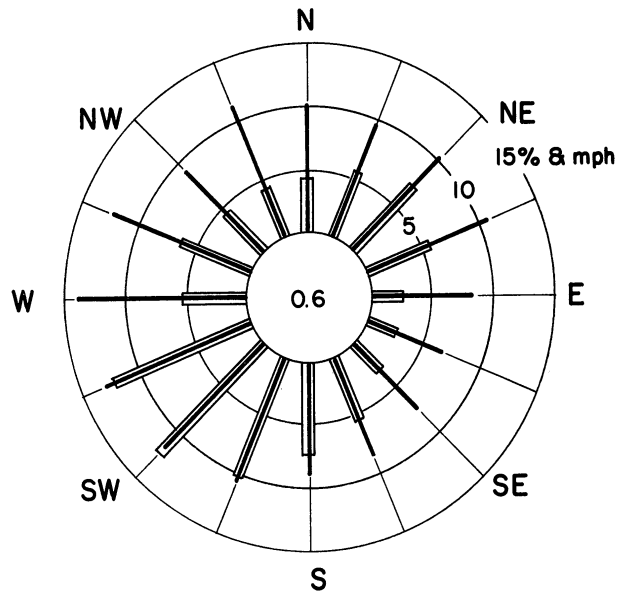
1 January 1950 - 31 December 1954
(5-Year Summary)

Wind Direction	Average Wind Speed, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
			Total Hours of Precipitation	Total Hours
N	12.7	158	5.0	0.4
NNE	14.8	179	5.6	0.4
NE	13.0	213	6.7	0.5
ENE	15.9	389	12.2	0.9
E	12.2	252	7.9	0.6
ESE	12.3	113	3.6	0.3
SE	10.6	129	4.1	0.3
SSE	13.2	161	5.1	0.4
S	13.8	261	8.2	0.6
SSW	14.3	326	10.2	0.7
SW	13.7	322	10.1	0.7
WSW	14.0	179	5.6	0.4
W	12.1	115	3.6	0.3
WNW	14.1	140	4.4	0.3
NW	15.4	133	4.2	0.3
NNW	14.0	91	2.9	0.2
Calm	<u>0.0</u>	<u>20</u>	<u>0.6</u>	<u>0.0</u>
Total		3181	100.0	7.3
Average	13.7			



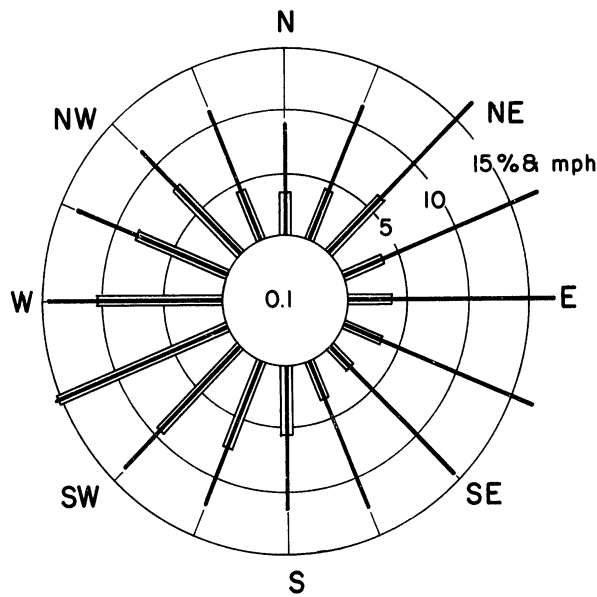
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Annual (1 Dec.- 30 Nov.) 1950-54



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

Annual (1 Dec.- 30 Nov.) 1958-59



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

Annual (1 Dec.- 30 Nov.) 1958-59

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Fig. 5-C. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) with precipitation at Toledo Municipal Airport, Five-Year Summary, 1950-1954, and at Toledo Express Airport, and the Enrico Fermi site, Annual Summary, 1958-1959.

TABLE XVI-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
ENRICO FERMI SITE

1 December 1959 - 30 November 1959
(3-Year Summary)

Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	10.1	11.2	105	3.3	0.4
NNE	12.6	12.5	128	4.0	0.5
NE	15.3	16.0	191	6.0	0.8
ENE	14.2	16.8	167	5.2	0.7
E	14.3	17.9	165	5.2	0.7
ESE	12.4	15.3	108	3.4	0.4
SE	12.0	14.4	101	3.2	0.4
SSE	10.8	3.3	123	3.8	0.5
S	10.7	12.5	166	5.2	0.7
SSW	12.3	12.6	229	7.2	0.9
SW	13.0	14.1	302	9.5	1.2
WSW	13.4	14.7	432	13.5	1.7
W	12.7	16.6	349	10.9	1.4
WNW	12.3	14.0	260	8.1	1.0
NW	11.9	12.5	200	6.3	0.8
NNW	10.9	12.9	161	5.0	0.6
Calm	0.0	0.0	7	0.2	0.0
Totals			3194	100.0	12.7
Average	12.4	14.4			

TABLE XVII-C

THE ASSOCIATION OF PRECIPITATION WITH WINDS AT THE
TOLEDO EXPRESS AIRPORT

1 December 1956 - 30 November 1959
(3-Year Summary)

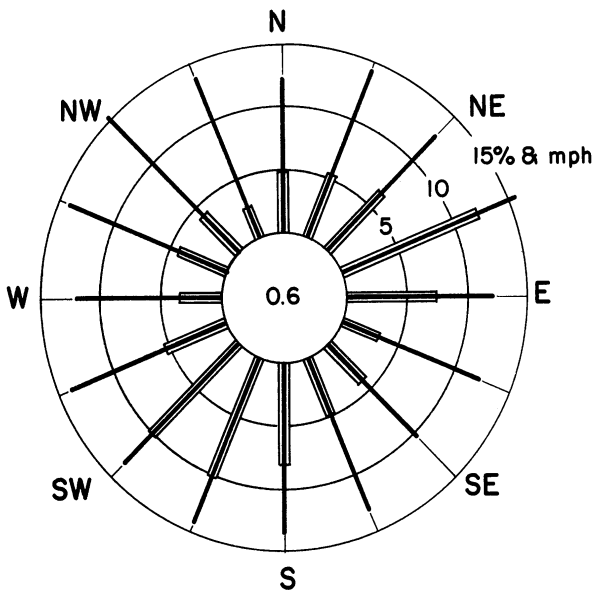
Wind Direction	Average Wind Speed, mph	Average Wind Speed During Precipitation, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
				Total Hours of Precipitation	Total Hours
N	9.6	11.5	190	5.0	0.7
NNE	9.5	10.8	184	4.9	0.7
NE	9.5	10.9	231	6.1	0.9
ENE	10.6	12.2	223	5.9	0.8
E	10.5	12.2	197	5.2	0.7
ESE	8.0	7.7	98	2.6	0.4
SE	7.4	8.6	121	3.2	0.5
SSE	8.9	10.7	189	5.0	0.7
S	9.6	10.9	283	7.5	1.1
SSW	11.0	12.2	300	8.0	1.1
SW	12.3	13.0	397	10.5	1.5
WSW	12.7	13.2	467	12.4	1.8
W	11.6	13.1	269	7.1	1.0
WNW	11.4	12.2	242	6.4	0.9
NW	10.0	12.7	194	5.1	0.7
NNW	10.0	12.0	170	4.5	0.6
Calm	0.0	0.0	15	0.4	0.1
Totals			3770	99.8	14.2
Average	10.5	11.7			

TABLE XVIII-C

THE ASSOCIATION OF PRECIPITATION WITH WIND
AT THE TOLEDO MUNICIPAL AIRPORT

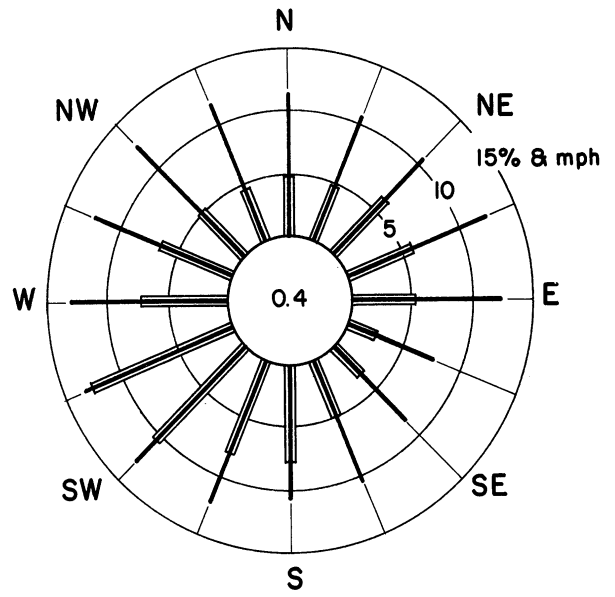
1 January 1950 - 31 December 1954
(5-Year Summary)

Wind Direction	Average Wind Speed, mph	No. of Observations During Precipitation	Hours of Precipitation as Percentage of	
			Total Hours of Precipitation	Total Hours
N	12.7	158	5.0	0.4
NNE	14.8	179	5.6	0.4
NE	13.0	213	6.7	0.5
ENE	15.9	389	12.2	0.9
E	12.2	252	7.9	0.6
ESE	12.3	113	3.6	0.3
SE	10.6	129	4.1	0.3
SSE	13.2	161	5.1	0.4
S	13.8	261	8.2	0.6
SSW	14.3	326	10.2	0.7
SW	13.7	322	10.1	0.7
WSW	14.0	179	5.6	0.4
W	12.1	115	3.6	0.3
WNW	14.1	140	4.4	0.3
NW	15.4	133	4.2	0.3
NNW	14.0	91	2.9	0.2
Calm	<u>0.0</u>	<u>20</u>	<u>0.6</u>	<u>0.0</u>
Total		3181	100.0	7.3
Average	13.7			



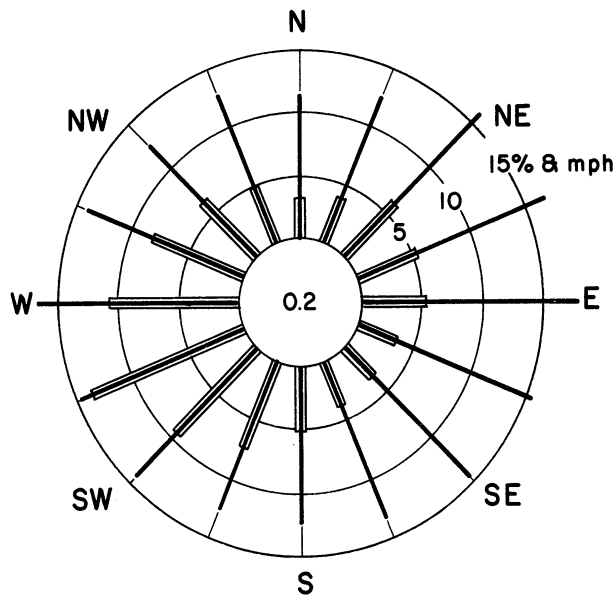
TOLEDO MUNICIPAL AIRPORT
TOLEDO, OHIO

Annual (1 Dec.-30 Nov.) 1950-54



TOLEDO EXPRESS AIRPORT
TOLEDO, OHIO

3yr. sum. (1 Dec.-30 Nov.) 1956-59



ENRICO FERMI POWER PLANT SITE
LAGOONA BEACH, MICHIGAN

3yr. sum. (1 Dec.-30 Nov.) 1956-59

C-25

Fig. 6-C. Percentage frequency of occurrence of winds from 16 directions (rectangles) and corresponding wind speed in mph (heavy lines) with precipitation at Toledo Municipal Airport, Five-Year Summary, 1950-1954, and at Toledo Express Airport, and the Enrico Fermi site, Three-Year Summary, 1956-1959.

APPENDIX D

CONTINUOUS INVERSIONS - 1957

TABLE I-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 Decmeber 1956 - 28 February 1957
(Winter)

Duration, hr					
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
8	13	18	9	58	17
6	6	14	9	43	14
12	3	16	12		
10	12	16	18		
6	7	18	9		
10	7	20	6		
8	13	17	5		

Total number of inversions over 5 hr in duration = 16
 Total hours of continuous inversion over 5 hr in duration = 280
 Average length of continuous inversions over 5 hr in duration = 17.5

TABLE II-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 December 1956 - 28 February 1957
(Winter)

Duration, hr		
6-12	13-24	25 and Over
7	16	
8	15	
6	17	
11	14	
7	13	
7	15	
7	20	
7	19	
10	19	
7	16	
9	15	
11		
10		

Total number of inversions over 5 hr in duration = 24
 Total hours of continuous inversions over 5 hr in duration = 286
 Average length of continuous inversions over 5 hr in duration = 11.9

TABLE III-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 March 1957 - 31 May 1957
(Spring)

		Duration, hr			
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
10	9	19	11	34	17
7	8	13	20	26	9
12	14	18	12		
8	16	19	16		
6	13	17	8		
6	14	15	7		
6	8	14	11		
6	10				
6	12				
6	13				
6	10				
6	6				
9	7				
9	10				
7	17				

Total number of inversions over 5 hr in duration = 24
 Total hours of continuous inversion over 5 hr in duration = 285
 Average length of continuous inversions over 5 hr in duration = 11.9

TABLE IV-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 March 1957 - 31 May 1957
(Spring)

		Duration, hr	
6-12		13-24	25 and Over
9		14	
7		13	
6		14	
12		14	
7		15	
11			
11			
7			
11			
9			
9			
11			
11			
11			
10			
11			
12			
6			
9			
8			
12			
9			
7			
9			
9			

Total number of inversions over 5 hr in duration = 30
 Total hours of continuous inversions over 5 hr in duration = 304
 Average length of continuous inversions over 5 hr in duration = 10.1

TABLE V-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 June 1957 - 31 August 1957
(Summer)

Duration, hr					
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
7	1	18	12	50	14
12	9	23	8		
8	9				
9	5				
8	7				
7	2				
7	7				
6	14				
8	4				

Total number of inversions over 5 hr in duration = 12
 Total hours of continuous inversion over 5 hr in duration = 163
 Average length of continuous inversions over 5 hr in duration = 13.6

TABLE VI-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 June 1957 - 31 August 1957
(Summer)

6-12	Duration, hr	
	13-24	25 and Over
6	13	
7	17	
9	13	
11	13	
12	13	
9	13	
9	15	
7	13	
12	13	
9	15	
12	13	
9	13	
8	13	
10		
10		
11		
12		
12		
11		
11		
12		
8		
12		
11		
12		
12		
9		

Total number of inversions over 5 hr in duration = 40
 Total hours of continuous inversions over 5 hr in duration = 450
 Average length of continuous inversions over 5 hr in duration = 11.3

TABLE VII-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 September 1957 - 30 November 1957
(Fall)

		Duration, hr			
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
9	8	19	13		
6	9	19	10		
6	9				
9	10	14	8		
9	8				
6	10	16	13		
6	8	20	11		
8	27				
11	13				
12	msg				
12	4				
7	7				
12	5				

Total number of inversions over 5 hr in duration = 18
 Total hours of continuous inversion over 5 hr in duration = 201
 Average length of continuous inversions over 5 hr in duration = 11.2

TABLE VIII-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 September 1957 - 30 November 1957
(Fall)

		Duration, hr	
6-12		13-24	25 and Over
6		16	
7		14	
9		14	
8		13	
6		14	
6		21	
11		21	
12		21	
9		12	
11		15	
6		14	
6		21	
12		14	
11		14	
6		16	
		13	
		16	
		14	
		14	
		15	
		18	
		14	
		16	
		13	
		15	
		14	
		15	
		13	
		13	
		13	
		13	
		15	
		15	
Total number of inversions over 5 hr in duration		=	47
Total hours of continuous inversions over 5 hr in duration		=	612
Average length of continuous inversions over 5 hr in duration		=	13.0

TABLE IX-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE ENRICO FERMI SITE

1 December 1956 - 30 November 1957
(Annual Summary)

		Duration, hr			
6-12		13-24		25 and Over	
Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph	Hr	Mean Wind Speed, mph
8	13	18	9	58	17
6	6	14	9	43	14
12	3	16	12	34	17
10	12	16	18	26	9
6	7	18	9	50	14
10	7	20	20		
8	13	17	5		
10	9	19	11		
7	8	13	20		
12	14	18	12		
8	16	19	16		
6	13	17	8		
6	14	15	7		
6	8	14	11		
6	10	18	12		
6	12	23	8		
6	13	19	13		
6	10	19	10		
6	6	14	8		
7	10	16	13		
9	10	20	12		
9	7				
7	1				
12	9				
8	9				
9	5				
8	7				
7	2				
7	7				
6	14				
8	4				
9	8				
6	9				
6	9				
9	10				
9	8				
6	10				
6	8				
8	27				
11	13				
12	msg				
12	4				
7	7				
12	5				

Total number of inversions over 5 hr in duration = 70
 Total hours of continuous inversion over 5 hr in duration = 929
 Average length of continuous inversions over 5 hr in duration = 13.3

TABLE X-D

FREQUENCY OF CONTINUOUS INVERSIONS AT THE WJBK-TV TOWER

1 December 1956 - 30 November 1957
(Annual Summary)

			Duration, hr		
6-12			13-24	25 and Over	
7	6	10	16	14	15
8	7	10	15	16	13
6	9	11	17	13	13
11	8	12	14	16	13
7	6	12	13	14	
7	6	11	15	14	
7	11	11	20	15	
7	12	12	19	18	
10	9	8	19	14	
7	11	12	16	16	
9	6	11	15	13	
11	6	12	13	15	
10	12	12	14	14	
9	11	9	14	15	
7	6	10	15	13	
6	6	11	16	13	
12	7	12	14	13	
7	9	6	14	15	
11	11	9	13	15	
11	12	8	14	13	
7	9	12	21	17	
11	9	9	21	13	
9	7	7	21	13	
9	12	9	14	13	
11	9	9	15	13	
11	12		14	15	
12	9		21	13	
11	8		14	13	

Total number of inversions over 5 hr in duration = 141
 Total hours of continuous inversions over 5 hr in duration = 1652
 Average length of continuous inversions over 5 hr in duration = 11.7

