

Enclosure 21 to
LTR-RAC-20-94
Date: December 18, 2020

Enclosure 21

Response to Request for Additional Information

Westinghouse Nuclear Fuel Columbia Site Evaluation Report
March 1975 Appendix 2.E

APPENDIX 2.E
METEOROLOGY AND CLIMATOLOGY

Tables 2.E-1 through 2.E-7 contain climatological and severe weather data for Columbia, South Carolina. Tables 2.E-8, 2.E-9 and 2.E-10 contain heating and air conditioning design data and hydrometeorological information, respectively. Tables 2.E-11 through 2.E-20 and Figure 2.E-1 contain on-site diffusion climatology information. Table 2.E-21 contains short-term accident estimates of χ/Q up to 30 days and Table 2.E-22 contains a summary of assumptions for these estimates. Table 2.E-23 contains reduction factors due to building wake effect on χ/Q values. Tables 2.E-24 through 2.E-27 contain estimates of atmospheric dilution factors for the four seasons, winter through fall.

TABLE 2.E-1

MONTHLY TEMPERATURE SUMMARIES IN °F - COLUMBIA, SOUTH CAROLINA⁽¹⁾

	<u>No. of Years Recorded</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
Maximum, °F	30	56.9	59.7	66.5	76.9	84.5	90.3	92.0	91.0	85.4	77.1	66.9	57.9	75.4
Minimum, °F	30	33.9	35.5	41.9	51.3	59.6	67.2	70.3	69.4	63.5	51.3	40.6	34.1	51.5
Monthly, °F	30	45.4	47.6	54.2	64.1	72.1	78.8	81.2	80.2	74.5	64.2	53.8	46.0	63.5
Record High, °F	7	79	81	88	94	95	104	103	106	97	90	85	83	106
Year		1970	1972	1973	1970	1970	1970	1970	1968	1970	1973*	1973	1971	Aug. 1968
Record Low, °F	7	5	5	20	29	36	46	59	53	40	29	12	17	5
Year		1970	1973	1967	1972	1971	1972	1972*	1969	1967	1967	1970	1972*	Feb. 1973*

Highest Temperature 107 °F in June 1954 +

Lowest Temperature -2 °F in February 1899

* Also in earlier months or years.

TABLE 2.E-2
 RAINFALL DATA IN INCHES - COLUMBIA, SOUTH CAROLINA⁽¹⁾

<u>No. of Years Recorded</u>	<u>Parameter</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Total</u>
30	Mean Total	3.44	3.67	4.67	3.51	3.35	3.82	5.65	5.63	4.32	2.58	2.34	3.38	46.36
26	Maximum Monthly	7.62	8.68	10.89	5.89	8.85	14.81	13.87	16.72	8.78	12.09	7.20	7.43	
	Year of Occurrence	1972	1961	1973	1958	1967	1973	1959	1949	1953	1959	1957	1953	
26	Minimum Monthly	0.97	1.12	1.25	0.91	0.29	1.26	1.15	1.11	0.76	T	0.41	0.32	
	Year of Occurrence	1949	1950	1949	1970	1951	1955	1957	1968	1958	1963	1973	1955	
26	Maximum 24 Hour	2.82	3.69	3.59	3.66	5.57	5.44	5.81	7.66	6.23	5.46	2.30	3.18	
	Year of Occurrence	1968	1962	1960	1956	1967	1973	1959	1949	1953	1964	1963	1970	

T - Trace, an amount too small to measure.

2.E-3

TABLE 2.E-3

SNOW AND ICE PELLETS DATA IN INCHES - COLUMBIA, SOUTH CAROLINA⁽¹⁾

<u>No. of Years Recorded</u>	<u>Parameter</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Total</u>
26	Mean Total	0.4	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.4	1.9
26	Maximum Monthly	2.2	16.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	9.1	
	Year of Occurrence	1973	1973	1960								1968*	1958	
26	Maximum 24 Hour	2.2	15.7	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	8.8	
	Year of Occurrence	1973	1973	1960								1968*	1958	

* Also in earlier months or years.

T - Trace, an amount too small to measure

TABLE 2.E-4
 RELATIVE HUMIDITY IN PERCENT, DIURNAL VARIATION AND MONTHLY AVERAGE IN PERCENT⁽¹⁾
 COLUMBIA, SOUTH CAROLINA

<u>No. of Years Recorded</u>	<u>Local Time</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year Average</u>
7	1:00 am	80	74	74	77	84	88	89	91	92	89	84	80	84
7	7:00 am	83	80	83	84	88	90	91	93	94	92	88	85	88
7	1:00 pm	55	48	48	45	49	54	57	59	56	54	49	55	53
7	7:00 pm	66	57	54	50	61	64	72	74	75	76	71	71	66
Monthly Average		71	65	65	64	71	74	77	79	79	78	73	73	73

2.E-5

TABLE 2.E-5
 MONTHLY MEAN NUMBER OF FOG DAYS - COLUMBIA, SOUTH CAROLINA⁽¹⁾
 (25 YEARS OF RECORD)

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
Mean Fog Days	2	2	2	1	1	2	2	2	3	3	3	3	27

TABLE 2.E-6

MONTHLY WIND DATA - COLUMBIA, SOUTH CAROLINA⁽¹⁾

	<u>No. of Years Recorded</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Year</u>
Average Hourly Speed, mph	25	7.1	7.7	8.4	8.5	7.1	6.8	6.6	6.1	6.2	6.2	6.5	6.7	7.0
Prevailing Direction	14	SW	SW	SW	SW	SW	SW	SW	SW	NE	NE	SW	WSW	SW

TABLE 2.E-7
 MONTHLY AVERAGE OF SEVERE WEATHER OCCURRENCE - COLUMBIA, SOUTH CAROLINA⁽¹⁾
 (26 YEARS OF RECORD)

<u>Monthly Occurrence</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Total</u>
Snow, Ice Pellets, Hail 1.0 inch or more	*	*	*	0	0	0	0	0	0	0	0	*	1
Thunderstorms	1	1	3	4	6	9	13	10	4	1	1	*	54

* Less than one-half

2.E-8

TABLE 2.E-8

HEATING AND AIR CONDITIONING DESIGN DATA⁽²⁾-COLUMBIA, S. C.*Parameter

Winter Design Data

Minimum dry bulb temperature equalled or exceeded 99% of time	23°F
Minimum dry bulb temperature equalled or exceeded 97.5% of time	26°F

Air Conditioning Design Data

Dry Bulb

Equalled or exceeded 1% of time	98°F
Equalled or exceeded 2.5% of time	95°F
Equalled or exceeded 5% of time	93°F
Equalled or exceeded 10% of time	90°F

Wet Bulb

Equalled or exceeded 1% of time	79°F
Equalled or exceeded 2.5% of time	79°F
Equalled or exceeded 5% of time	78°F
Equalled or exceeded 10% of time	77°F

Number of hours, on the average, that the following temperatures are exceeded during the months of May through October

Dry Bulb 93°F	172
80°F	1359
Wet Bulb 73°F	1285
66°F	2807

* Data based on at least 5 years of record

TABLE 2.E-9

MAXIMUM POINT RAINFALL VALUES AT COLUMBIA METROPOLITAN
AIRPORT IN INCHES FOR DURATION FROM 30 MINUTES
TO 24 HOURS AND RETURN PERIODS OF 25 AND 50 YEARS⁽³⁾

Return. Period (years)	<u>30 min</u>	<u>1 hr</u>	<u>2 hr</u>	<u>3 hr</u>	<u>6 hr</u>	<u>12 hr</u>	<u>24 hr</u>
25	2.32	2.99	3.65	3.99	4.90	5.71	6.61
50	2.58	3.31	40.5	4.4	5.4	6.41	7.42

TABLE 2.E-10

MAXIMUM RECORDED POINT RAINFALL IN INCHES
FOR 5 MINUTES TO 24 HOURS, COLUMBIA AREA⁽⁴⁾

<u>Minutes</u>					<u>Hours</u>				
<u>5</u>	<u>10</u>	<u>15</u>	<u>30</u>	<u>60</u>	<u>2</u>	<u>3</u>	<u>6</u>	<u>12</u>	<u>24</u>
.074	1.05	1.39	2.40	3.90	5.03	5.03	5.03	6.77	7.40

TABLE 2.E-11

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
 OF WIND SPEED AND DIRECTION FOR ALL STABILITY CLASSES ⁽⁵⁾
 (NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots*						Total
	<u>0-3</u>	<u>4-6</u>	<u>7-10</u>	<u>11-16</u>	<u>17-21</u>	<u>21</u>	
N	0.01827	0.00852	0.00392	0.00104	0.00000	0.00000	0.03175
NNE	0.02185	0.01598	0.01051	0.00322	0.00000	0.00000	0.05156
NE	0.02663	0.02639	0.02157	0.00384	0.00021	0.00000	0.07864
ENE	0.02684	0.02398	0.02232	0.00500	0.00000	0.00000	0.07814
E	0.03006	0.02792	0.01592	0.00235	0.00003	0.00000	0.07628
ESE	0.02625	0.02071	0.00894	0.00101	0.00000	0.00000	0.05691
SE	0.02843	0.02194	0.00935	0.00135	0.00010	0.00000	0.06120
SSE	0.02440	0.01673	0.00568	0.00028	0.00000	0.00000	0.04709
S	0.02632	0.01438	0.00576	0.00055	0.00000	0.00000	0.04701
SSW	0.02577	0.01857	0.00751	0.00198	0.00000	0.00000	0.05383
SW	0.04109	0.03418	0.01518	0.00194	0.00003	0.00000	0.09242
WSW	0.03513	0.02064	0.01823	0.01008	0.00090	0.00003	0.08501
W	0.03099	0.02406	0.02367	0.01188	0.00146	0.00006	0.09212
WNW	0.02747	0.02247	0.01175	0.00455	0.00014	0.00000	0.06638
NW	0.02295	0.01477	0.00717	0.00111	0.00000	0.00000	0.04600
NNW	0.02059	0.01082	0.00378	0.00024	0.00000	0.00000	0.03543
Total	0.43304	0.33206	0.19126	0.05042	0.00287	0.00009	0.99977

* 1 Knot - 0.515 m/sec; 1 Knot = 1.16 mph.

TABLE 2.E-12

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
OF WIND SPEED AND DIRECTION STABILITY CLASS A*
(NFCS, August 1, 1972 - July 31, 1972)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
NNE	0.00008	0.00000	0.00000	0.00000	0.00000	0.00000	0.00008
NE	0.00011	0.00000	0.00000	0.00000	0.00000	0.00000	0.00011
ENE	0.00008	0.00010	0.00007	0.00000	0.00000	0.00000	0.00025
E	0.00011	0.00021	0.00021	0.00003	0.00000	0.00000	0.00056
ESE	0.00004	0.00014	0.00007	0.00000	0.00000	0.00000	0.00025
SE	0.00001	0.00003	0.00017	0.00000	0.00000	0.00000	0.00022
SSE	0.00008	0.00010	0.00018	0.00000	0.00000	0.00000	0.00029
S	0.00077	0.00045	0.00021	0.00000	0.00000	0.00000	0.00143
SSW	0.00015	0.00003	0.00003	0.00000	0.00000	0.00000	0.00022
SW	0.00022	0.00007	0.00000	0.00000	0.00000	0.00000	0.00029
WSW	0.00011	0.00000	0.00003	0.00000	0.00000	0.00000	0.00015
W	0.00001	0.00000	0.00000	0.00003	0.00000	0.00000	0.00004
WNW	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
NW	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
NNW	0.00015	0.00000	0.00000	0.00000	0.00000	0.00000	0.00015
TOTAL:	0.00194	0.00114	0.00090	0.00007	0.00000	0.00000	0.00405

* The total percentage of calms for this stability is 0.00010.

TABLE 2.E-13

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
OF WIND SPEED AND DIRECTION STABILITY CLASS B*
(NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00007	0.00000	0.00000	0.00000	0.00000	0.00000	0.00007
NNE	0.00007	0.00007	0.00003	0.00000	0.00000	0.00000	0.00017
NE	0.00017	0.00017	0.00000	0.00000	0.00000	0.00000	0.00035
ENE	0.00014	0.00021	0.00003	0.00000	0.00000	0.00000	0.00038
E	0.00000	0.00007	0.00000	0.00000	0.00000	0.00000	0.00007
ESE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SE	0.00010	0.00024	0.00003	0.00010	0.00007	0.00000	0.00055
SSE	0.00003	0.00024	0.00000	0.00007	0.00000	0.00000	0.00035
S	0.00024	0.00007	0.00038	0.00003	0.00000	0.00000	0.00069
SSW	0.00017	0.00017	0.00024	0.00021	0.00000	0.00000	0.00080
SW	0.00017	0.00021	0.00003	0.00000	0.00000	0.00000	0.00042
WSW	0.00007	0.00007	0.00003	0.00000	0.00000	0.00000	0.00017
W	0.00010	0.00003	0.00003	0.00000	0.00000	0.00000	0.00017
WNW	0.00007	0.00021	0.00000	0.00000	0.00000	0.00000	0.00028
NW	0.00007	0.00003	0.00000	0.00000	0.00000	0.00000	0.00010
NNW	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TOTAL:	0.00156	0.00180	0.00080	0.00042	0.00007	0.00000	0.00465

* The total percentage of calms for this stability is 0.00007.

TABLE 2.E-14

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
 OF WIND SPEED AND DIRECTION STABILITY CLASS C*
 (NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00052	0.00055	0.00021	0.00007	0.00000	0.00000	0.00135
NNE	0.00097	0.00139	0.00042	0.00024	0.00000	0.00000	0.00291
NE	0.00118	0.00121	0.00028	0.00003	0.00000	0.00000	0.00270
ENE	0.00083	0.00062	0.00021	0.00000	0.00000	0.00000	0.00166
E	0.00083	0.00146	0.00014	0.00000	0.00000	0.00000	0.00243
ESE	0.00094	0.00073	0.00003	0.00000	0.00000	0.00000	0.00170
SE	0.00097	0.00107	0.00031	0.00021	0.00003	0.00000	0.00260
SSE	0.00076	0.00142	0.00086	0.00014	0.00000	0.00000	0.00298
S	0.00222	0.00624	0.00423	0.00049	0.00000	0.00000	0.01318
SSW	0.00288	0.00971	0.00628	0.00177	0.00000	0.00000	0.02063
SW	0.00163	0.00908	0.00822	0.00118	0.00000	0.00000	0.02011
WSW	0.00128	0.00146	0.00163	0.00208	0.00035	0.00000	0.00680
W	0.00114	0.00180	0.00073	0.00052	0.00035	0.00003	0.00458
WNW	0.00125	0.00170	0.00194	0.00087	0.00007	0.00000	0.00583
NW	0.00069	0.00118	0.00062	0.00024	0.00000	0.00000	0.00274
NNW	0.00055	0.00035	0.00024	0.00003	0.00000	0.00000	0.00118
TOTAL:	0.01858	0.03998	0.02614	0.00787	0.00080	0.00003	0.09341

* The total percentage of calms for this stability is 0.00003.

TABLE 2.E-15

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
OF WIND SPEED AND DIRECTION STABILITY CLASS D*
(NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00414	0.00718	0.00368	0.00097	0.00000	0.00000	0.01596
NNE	0.00438	0.01172	0.00985	0.00298	0.00000	0.00000	0.02893
NE	0.00431	0.01540	0.01921	0.00371	0.00021	0.00000	0.04283
ENE	0.00320	0.00808	0.01137	0.00347	0.00000	0.00000	0.02612
E	0.00358	0.00714	0.00520	0.00107	0.00000	0.00000	0.01700
ESE	0.00383	0.00635	0.00444	0.00052	0.00000	0.00000	0.01513
SE	0.00559	0.01186	0.00659	0.00062	0.00000	0.00000	0.02466
SSE	0.00639	0.01293	0.00479	0.00007	0.00000	0.00000	0.02418
S	0.00813	0.00714	0.00094	0.00003	0.00000	0.00000	0.01624
SSW	0.00719	0.00759	0.00083	0.00000	0.00000	0.00000	0.01561
SW	0.00653	0.01553	0.00517	0.00038	0.00000	0.00000	0.02761
WSW	0.00480	0.01203	0.01356	0.00777	0.00055	0.00003	0.03874
W	0.00438	0.01512	0.02243	0.01130	0.00111	0.00003	0.05438
WNW	0.00490	0.01633	0.00971	0.00368	0.00007	0.00000	0.03469
NW	0.00563	0.01186	0.00648	0.00087	0.00000	0.00000	0.02484
NNW	0.00521	0.00888	0.00354	0.00021	0.00000	0.00000	0.01783
TOTAL:	0.08218	0.17514	0.12777	0.03768	0.00194	0.00007	0.42475

* The total percentage of calms for this stability is 0.00239.

TABLE 2.E-16

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
OF WIND SPEED AND DIRECTION STABILITY CLASS E*
(NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00397	0.00076	0.00003	0.00000	0.00000	0.00000	0.00467
NNE	0.00474	0.00225	0.00021	0.00000	0.00000	0.00000	0.00720
NE	0.00439	0.00673	0.00201	0.00010	0.00000	0.00000	0.01323
ENE	0.00439	0.01099	0.01054	0.00153	0.00000	0.00000	0.02745
E	0.00502	0.01186	0.00974	0.00125	0.00003	0.00000	0.02790
ESE	0.00356	0.00915	0.00416	0.00049	0.00000	0.00000	0.01736
SE	0.00727	0.00687	0.00212	0.00042	0.00000	0.00000	0.01667
SSE	0.00816	0.00163	0.00018	0.00000	0.00000	0.00000	0.00789
S	0.00477	0.00038	0.00000	0.00000	0.00000	0.00000	0.00516
SSW	0.00384	0.00073	0.00003	0.00000	0.00000	0.00000	0.00460
SW	0.00529	0.00135	0.00000	0.00003	0.00000	0.00000	0.00668
WSW	0.00495	0.00340	0.00010	0.00003	0.00000	0.00000	0.00848
W	0.00543	0.00431	0.00000	0.00000	0.00000	0.00000	0.00956
WNW	0.00554	0.00322	0.00010	0.00000	0.00000	0.00000	0.00887
NW	0.00512	0.00125	0.00007	0.00000	0.00000	0.00000	0.00644
NNW	0.00487	0.00104	0.00000	0.00000	0.00000	0.00000	0.00571
TOTAL:	0.07398	0.06574	0.02923	0.00385	0.00003	0.00000	0.17784

* The total percentage of calms for this stability is 0.00589.

TABLE 2.E-17

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
OF WIND SPEED AND DIRECTION STABILITY CLASS F*
(NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00532	0.00003	0.00000	0.00000	0.00000	0.00000	0.00536
NNE	0.00643	0.00052	0.00000	0.00000	0.00000	0.00000	0.00695
NE	0.00907	0.00274	0.00007	0.00000	0.00000	0.00000	0.01188
ENE	0.00886	0.00343	0.00010	0.00000	0.00000	0.00000	0.01240
E	0.01101	0.00593	0.00042	0.00000	0.00000	0.00000	0.01735
ESE	0.01052	0.00385	0.00010	0.00000	0.00000	0.00000	0.01448
SE	0.00872	0.00135	0.00003	0.00000	0.00000	0.00000	0.01011
SSE	0.00650	0.00017	0.00000	0.00000	0.00000	0.00000	0.00667
S	0.00595	0.00007	0.00000	0.00000	0.00000	0.00000	0.00602
SSW	0.00626	0.00024	0.00010	0.00000	0.00000	0.00000	0.00681
SW	0.01129	0.00458	0.00055	0.00014	0.00003	0.00000	0.01659
WSW	0.01139	0.00170	0.00076	0.00003	0.00000	0.00000	0.01389
W	0.00997	0.00208	0.00031	0.00000	0.00000	0.00000	0.01236
WNW	0.00931	0.00087	0.00000	0.00000	0.00000	0.00000	0.01018
NW	0.00709	0.00038	0.00000	0.00000	0.00000	0.00000	0.00747
NNW	0.00570	0.00055	0.00000	0.00000	0.00000	0.00000	0.00626
TOTAL:	0.13339	0.02850	0.00248	0.00017	0.00003	0.00000	0.16457

* The total percentage of calms for this stability is 0.02913.

TABLE 2.E-18

ANNUAL AVERAGE JOINT FREQUENCY DISTRIBUTION
 OF WIND SPEED AND DIRECTION STABILITY CLASS G*
 (NFCS, August 1, 1972 - July 31, 1973)

Direction	Wind Speed, knots						Total
	0 - 3	4 - 6	7 - 10	11 - 16	17 - 21	> 21	
N	0.00431	0.00000	0.00000	0.00000	0.00000	0.00000	0.00431
NNE	0.00528	0.00003	0.00000	0.00000	0.00000	0.00000	0.00532
NE	0.00740	0.00014	0.00000	0.00000	0.00000	0.00000	0.00753
ENE	0.00934	0.00055	0.00000	0.00000	0.00000	0.00000	0.00989
E	0.00951	0.00125	0.00021	0.00000	0.00000	0.00000	0.01097
ESE	0.00736	0.00049	0.00014	0.00000	0.00000	0.00000	0.00799
SE	0.00577	0.00052	0.00010	0.00000	0.00000	0.00000	0.00639
SSE	0.00443	0.00024	0.00003	0.00000	0.00000	0.00000	0.00476
S	0.00424	0.00003	0.00003	0.00000	0.00000	0.00000	0.00431
SSW	0.00528	0.00010	0.00000	0.00000	0.00000	0.00000	0.00538
SW	0.01596	0.00336	0.00121	0.00021	0.00000	0.00000	0.02075
WSW	0.01253	0.00198	0.00212	0.00017	0.00000	0.00000	0.01679
W	0.00996	0.00090	0.00017	0.00003	0.00000	0.00000	0.01107
WNW	0.00639	0.00014	0.00000	0.00000	0.00000	0.00000	0.00653
NW	0.00434	0.00007	0.00000	0.00000	0.00000	0.00000	0.00441
NNW	0.00431	0.00000	0.00000	0.00000	0.00000	0.00000	0.00431
TOTAL:	0.11647	0.00981	0.00402	0.00042	0.00000	0.00000	0.13072

* The total percentage of calms for this stability is 0.05121.

TABLE 2.E-19

RELATIVE FREQUENCY OF OCCURENCES OF VARIOUS STABILITY CLASSES
(NFCS, August 1, 1972 - July 31, 1973)

	Stability Classes							Total
	A	B	C	D	E	F	G	
Winter	0.00184	0.00711	0.08271	0.47797	0.16739	0.14972	0.11326	1.00000
Spring	0.00015	0.00485	0.13647	0.43544	0.18794	0.15162	0.08353	1.00000
Summer	0.02004	0.00635	0.0726	0.30754	0.14405	0.22440	0.22500	1.00000
Fall	0.00000	0.00163	0.09680	0.47308	0.17342	0.13844	0.11664	1.00000
Annual	0.00405	0.00465	0.09341	0.42475	0.17784	0.16457	0.13072	0.99999

TABLE 2.E-20
SHORT-TERM METEOROLOGICAL DATA*

A. Maximum Hourly Persistence of Individual Stability Classes:

	<u>50 Foot Level</u>
Stability G	12 Hours
Stability F	7 Hours
Stability E	6 Hours
Stability D	20 Hours
Stability C	8 Hours
Stability B	3 Hours
Stability A	4 Hours

B. Maximum Frequency of Wind in any Sector:

	<u>50 Foot Level</u>
Frequency	9.24%
	From the Southwest

C. Maximum Hourly Persistence of Wind in Any Sector:

	<u>50 Foot Level</u>
Duration	20 Hours
	From the West

D. Total Frequency Distribution of Stability Classes:

	<u>50 Foot Level</u>
Type G	13.07%
Type F	4.54%
Type E	17.78%
Type D	42.48%
Type C	9.34%
Type B	0.46%
Type A	0.40%

* Data collected at NFCS from the meteorological tower during the period of August 1, 1972 through July 31, 1973.

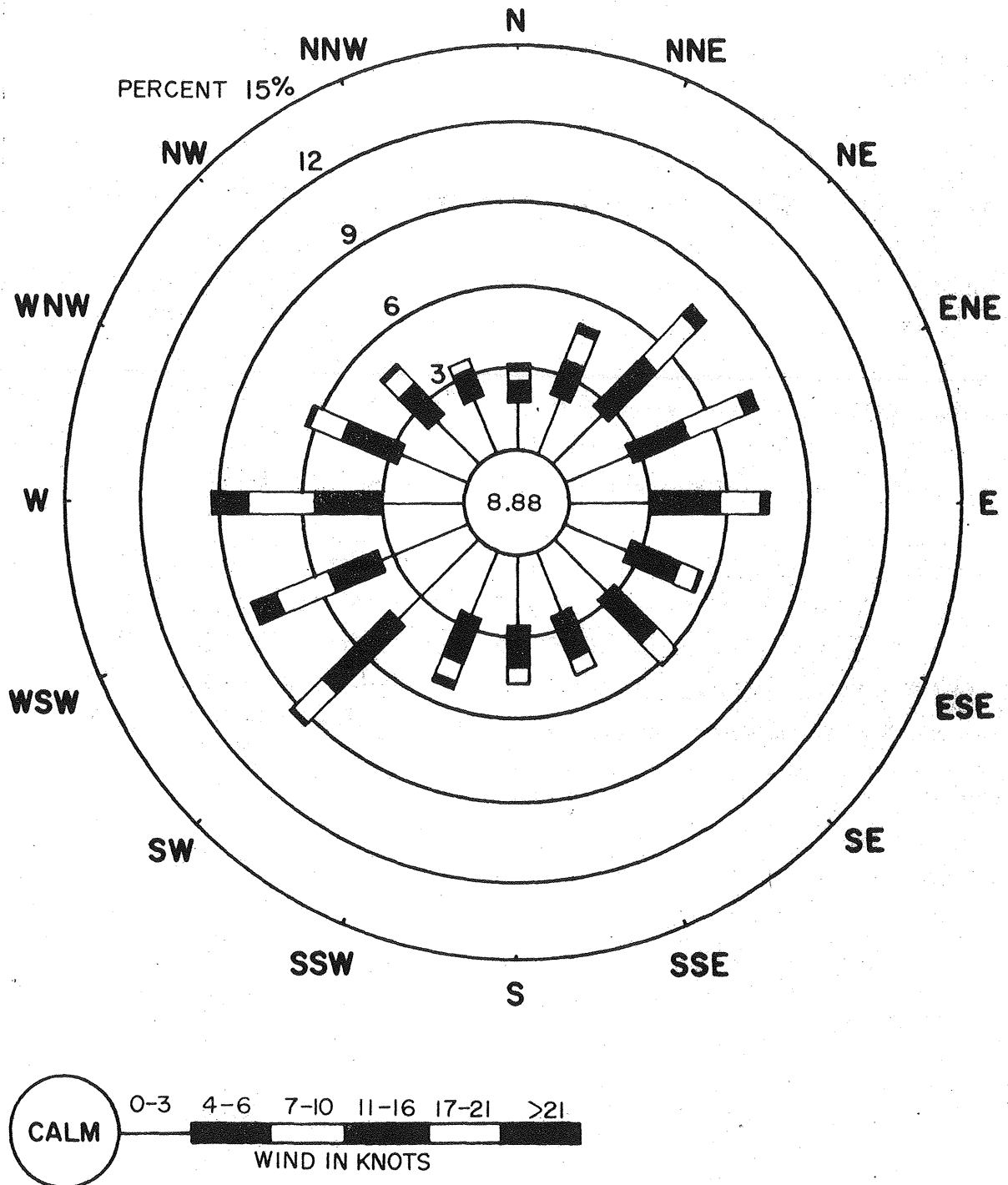


Figure 2.E-1. Annual Wind Rose From NFCS, August 1, 1972 - July 31, 1973.

SHORT-TERM (ACCIDENT) DIFFUSION ESTIMATES

CALCULATIONS

Atmospheric dilution factors (χ/Q) applicable to discrete time intervals up to 30 days following the postulated release were estimated for downwind distances as far as 20 miles from the reactor plant and are presented in Table 2.E-21. The time intervals selected for this analysis were the same four periods specified in AEC Regulatory Guide No. 1.4⁽⁶⁾: 0 to 8 hours, 8 to 24 hours, 1 to 4 days and 4 to 30 days. Data obtained from the meteorological tower on the site were utilized to define climatological parameters representing conservative dispersion conditions based on measured persistence data on wind direction and atmospheric stability.

Persistence and frequency data for the period August 1, 1972 through July 31, 1973 were selected for this purpose since that particular period of record provided the latest available data. The wind speed used in these analyses was the median wind speed at the 50-foot level. A summary of assumptions for the short-term accident estimates is presented in Table 2.E-22.

TABLE 2.E-21

 ATMOSPHERIC DILUTION FACTORS
 χ/Q FOR ACCIDENT CONDITIONS*
Data in sec/m^3

Distance In Miles	Hours		Days	
	0.8**	8-24	1-4	4-30
0.07†	4.539×10^{-2}	4.55×10^{-3}	1.940×10^{-3}	2.320×10^{-4}
0.1	1.255×10^{-2}	3.429×10^{-3}	1.479×10^{-3}	1.802×10^{-4}
0.2	3.760×10^{-3}	1.099×10^{-3}	4.190×10^{-4}	5.538×10^{-5}
0.3	1.916×10^{-3}	5.287×10^{-4}	2.020×10^{-4}	2.662×10^{-5}
0.5	8.400×10^{-4}	2.163×10^{-4}	8.290×10^{-5}	1.089×10^{-5}
.568	7.71×10^{-4}	1.816×10^{-4}	6.910×10^{-5}	8.880×10^{-6}
0.7	5.74×10^{-4}	1.251×10^{-4}	4.798×10^{-5}	6.273×10^{-6}
1.0	4.23×10^{-4}	6.926×10^{-5}	2.655×10^{-5}	3.467×10^{-6}
2.0	2.07×10^{-4}	2.329×10^{-5}	8.790×10^{-6}	1.149×10^{-6}
5.0	7.48×10^{-5}	6.146×10^{-6}	2.310×10^{-6}	3.171×10^{-7}
10.0	3.28×10^{-5}	2.314×10^{-6}	8.670×10^{-7}	1.101×10^{-7}
20.0	1.509×10^{-5}	9.351×10^{-7}	3.488×10^{-7}	4.378×10^{-8}

* Data taken at NFCS from August 1, 1972 through July 31, 1973

** Includes building wake factors given in Table 2.6-24

† Exclusion Distance (114 M or 374 Feet)

TABLE 2.E-22

SUMMARY OF ASSUMPTIONS FOR SHORT-TERM (ACCIDENT) χ/Q ESTIMATES

<u>Period</u>	<u>Pasquill Stability Class</u>	<u>Frequency Percent</u>	<u>Median Wind Speed (m/sec)</u>	<u>Wind Condition</u>	<u>Joint Frequency Percent</u>
0-8 Hours	Extremely Stable	100	0.87	Steady	100
8-24 Hours	Extremely Stable	25	0.87	Uniformly Averaged Over 22.5° Sector with 100% Frequency	25
	Very Stable	44	0.95		44
	Moderately Stable	31	1.90		31
1-4 days	Extremely Stable	26	0.87	Uniformly Averaged Over 22.5° Sector with 50% Frequency	13
	Very Stable	17	0.95		9
	Moderately Stable	13	1.90		6
	Neutral	44	2.55		22
4-30 Days	Extremely Stable	13.07	0.87	Uniformly Averaged Over 22.5° Sector with 9.24% Frequency	1.21
	Very Stable	16.46	0.95		1.52
	Moderately Stable	17.78	1.90		1.64
	Neutral	42.48	2.55		3.93
	Slightly Unstable	9.34	2.47		0.86
	Moderately Unstable	0.46	2.14		0.04
	Extremely Unstable	0.40	2.03		0.04

2.E-24

Calculation of atmospheric dilution factors was performed using the Gaussian diffusion equation for ground level concentration from a continuously emitting source released at ground level:

$$x/Q = \frac{1}{\pi \bar{u} \sigma_y \sigma_z} \exp -1/2 (y^2/\sigma_y^2) \quad (1)$$

where,

- x = Activity concentration, curies/m³
- Q = Activity release rate, curies/sec
- \bar{u} = Mean wind speed, meters/sec
- y = Crosswind distance, meters
- σ_y = Crosswind dispersion parameter, meters
- σ_z = Vertical dispersion parameter, meters

The dispersion parameters σ_y and σ_z were evaluated in accordance with the Pasquill-Gifford curves⁽⁷⁾ except for stability class G which was obtained from the AEC Licensing Staff, Site Analysis Branch, Directorate of Licensing.⁽⁸⁾

Atmospheric dispersion models and assumptions employed for each of the post-release time intervals are described in more detail below.

Time Interval: 0 to 8 Hours

A review of the record revealed that extremely stable diffusion conditions have persisted for a maximum of 12 hours: therefore, atmospheric dispersion during the first 8 hours following a postulated release was assumed to proceed under extremely stable (Pasquill Type G) diffusion conditions.

It was further assumed that the wind was steady (constant direction) over the entire period.

Atmospheric dilution factors for this time interval consisted of center-line concentrations from a ground level release based on the Gaussian diffusion equation:

$$\chi/Q = \frac{1}{\pi \bar{u} \Sigma_y \Sigma_z} \quad (2)$$

The effect of turbulent wake on the distribution of airborne activity in the vicinity of the reactor building was taken into account by making the following corrections to the dispersion parameters:

$$\Sigma_y = (\sigma_y^2 + CA/\pi)^{1/2} \quad (3)$$

$$\Sigma_z = (\sigma_z^2 + CA/\pi)^{1/2}$$

substituting for Σ_y and Σ_z from equation (3),

$$\chi = \frac{1}{Q \pi \bar{u} \sigma_y \sigma_z} \cdot W \quad (4)$$

where

$$W = 1 / \left[1 + \frac{CA}{\pi} \left(\frac{1}{\sigma_y^2} + \frac{1}{\sigma_z^2} \right) + \left(\frac{CA}{\pi} \right)^2 \frac{1}{\sigma_y^2 \sigma_z^2} \right]^{1/2}$$

is a reduction factor due to the effect of turbulent wake in the vicinity of the reactor building. Reduction factors for F and G stabilities are computed for downwind distances up to 20 miles and are presented in Table 2.E-23.

C = 2.0 and A is the minimum cross-sectional area of the reactor building in accordance with AEC Regulatory Guide 1.4. The area of the reactor containment, 506 square meters, was used for this purpose. A maximum reduction factor of 3, in accordance with AEC Regulatory Guide 1.4, was used to correct the χ/Q values although the wake correction model did yield higher values at close-in distances.

TABLE 2.E-23
BUILDING WAKE EFFECT ON χ/Q VALUES

<u>Miles</u>	<u>Reduction Factor Type F (50%)</u>	<u>Reduction Factor Type G (95%)</u>	<u>Reduction Factor Type G (0-8 Hours)</u>
0.1	0.33	0.33	0.33
0.2	0.33	0.33	0.33
0.3	0.33	0.33	0.33
0.5	0.47	0.33	0.33
0.7	0.58	0.37	0.37
1.0	0.69	0.49	0.49
2.0	0.82	0.68	0.68
5.0	0.92	0.82	0.82
10.0	0.95	0.88	0.88
20.0	0.97	0.92	0.92

Time Interval: 8 to 24 Hours

Stability conditions determining atmospheric dispersion during this time interval were also derived from the stability persistence data of the site. In this instance, the portion of the maximum persistence for the Extremely Stable diffusion class (12 hours) not accounted for in the prior 0 to 8 hours time interval was applied to this post-release period (4 hours). For the balance of the time remaining in this interval (12 hours) it was assumed that diffusion conditions shifted to the next most stable class in the Pasquill-Gifford stability classification scheme until the time period contained the appropriate number of hours.

It was further assumed that the wind remained in a single 22.5 degree sector but meandered uniformly over this sector. The time averaged atmospheric dilution factor for a wind that meanders uniformly without a single 22.5 degree sector for a mixture of stability and wind speed conditions was calculated from the equation:

$$\frac{\chi}{Q} = \left(\frac{2}{\pi}\right)^{1/2} \sum_s \sum_j \frac{F(\theta, s, j)}{\sigma_{zs} \bar{u}_j \left(\frac{2\pi x}{16}\right)} \quad (5)$$

where,

χ = Activity concentration, curies/m³

Q = Activity release rate, curies/sec

$F(\theta, s, j)$ = The frequency during the period of interest that the wind is from the direction θ , for the stability condition s and wind speed class j

σ_{zs} = The vertical dispersion parameter evaluated at the distance x for the stability condition s , meters

\bar{u}_j = The representative wind speed for class j , meters/sec

x = Distance downwind, meters.

Time Interval: 1 to 4 Days

A sufficient time lapse occurs during this interval that a recurrence of the prolonged stability conditions which were assumed to have taken place in the two earlier time periods is considered to be feasible. It was, therefore, postulated that diffusion conditions in the 1 to 4 days interval following a postulated release would comprise Extremely Stable (Pasquill G), Very Stable (Pasquill F), Moderately Stable (Pasquill E) and Neutral (Pasquill D) conditions with the same relative distribution as the maximum hourly persistence data of the site during the period August 1, 1972 through July 31, 1973. The sum of the hours of maximum persistence for these four stability categories is 45 hours. Accordingly, it was assumed that the frequency of the Extremely Stable condition (which lasted a maximum of 12 hours) during this time interval would be 26 percent (12/45). Corresponding frequencies used for the Very Stable, Moderately Stable and Neutral conditions were 17 percent, 13 percent and 44 percent, respectively.

On the basis that the maximum hourly persistence of wind from any direction was 20 hours and that the maximum frequency on a monthly basis was approximately 42 percent (12.6 days equivalent), a wind direction frequency of 50 percent (6.3 days equivalent) was assumed for this time interval.

Calculation of atmospheric dilution factors was accomplished with the same basic expression used for obtaining the time-averaged factor in the 8 to 24 hour time interval.

Time Interval: 4 to 30 Days

The distribution of atmospheric stability and wind direction frequencies for this extended time interval was derived from frequency data. The maximum frequency of wind in a single sector over the period was approximately 9 percent. Distribution of atmospheric stability conditions used for this time period was based on the Site record of August 1, 1972 to July 31, 1973. The time-averaged expression for ground level concentration was used to obtain estimated values of atmospheric dilution factors.

LONG-TERM (ROUTINE) DIFFUSION ESTIMATES

χ/Q ESTIMATES

Estimates of atmospheric dilution factors (χ/Q) for seasonal releases at downwind distances up to 50 miles in 16 compass directions for the 50-foot level are presented in Tables 2.E-24 through 2.E-27. On a seasonal basis the southern sectors experience the lowest ground level concentration in winter and spring, while the sector with the highest concentration is the western sector. In summer, the lowest concentration occurs in the southern sector and highest in the N-E sector. In fall, the lowest concentrations occur in the northern sector and highest in the S-W sector.

TABLE 2.E-24

ESTIMATES OF ATMOSPHERIC DILUTION FACTORS FOR NFCS WINTER AVERAGE X/Q VALUES

Distance Downwind Miles	Sec/m ³															
	Direction From Plant Location															
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.07*			2.48E-4													
0.1	1.21E-4	1.32E-4	1.76E-4	1.62E-4	1.50E-4	1.53E-4	1.21E-4	1.14E-4	1.04E-4	1.14E-4	1.42E-4	1.80E-4	2.03E-4	1.56E-4	1.36E-4	1.07E-4
0.2	3.48E-5	3.77E-5	5.03E-5	4.64E-5	4.29E-5	4.40E-5	3.48E-5	3.30E-5	3.01E-5	3.29E-5	4.10E-5	5.23E-5	5.90E-5	4.54E-5	3.94E-5	3.08E-5
0.3	1.69E-5	1.82E-5	2.43E-5	2.25E-5	2.08E-5	2.14E-5	1.69E-5	1.60E-5	1.46E-5	1.60E-5	1.99E-5	2.54E-5	2.87E-5	2.21E-5	1.92E-5	1.50E-5
0.5	6.87E-6	7.38E-6	7.38E-6	9.82E-6	8.46E-6	8.68E-6	6.88E-6	6.54E-6	5.95E-6	6.49E-6	8.06E-6	1.03E-5	1.17E-5	9.01E-6	7.82E-6	6.11E-6
0.8	3.05E-6	3.27E-6	4.36E-6	4.07E-6	3.76E-6	3.86E-6	3.06E-6	2.91E-6	2.65E-6	2.88E-6	3.59E-6	4.60E-6	5.21E-6	4.02E-6	3.48E-6	2.72E-6
1.0	2.10E-6	2.25E-6	3.00E-6	2.80E-6	2.59E-6	2.66E-6	2.11E-6	2.01E-6	1.83E-6	1.99E-6	2.47E-6	3.17E-6	3.59E-6	2.77E-6	2.40E-6	1.87E-6
1.5	1.09E-6	1.17E-6	1.56E-6	1.46E-6	1.35E-6	1.38E-6	1.09E-6	1.04E-6	9.52E-7	1.03E-6	1.29E-6	1.66E-6	1.88E-6	1.45E-6	1.25E-6	9.76E-7
2.5	4.94E-7	5.28E-7	7.06E-7	6.64E-7	6.11E-7	6.27E-7	4.96E-7	4.75E-7	4.33E-7	4.68E-7	5.87E-7	7.61E-7	8.61E-7	6.64E-7	5.72E-7	4.44E-7
3.5	2.97E-7	3.17E-7	4.25E-7	4.01E-7	3.68E-7	3.78E-7	2.98E-7	2.86E-7	2.61E-7	2.82E-7	3.55E-7	4.62E-7	5.22E-7	4.03E-7	3.46E-7	2.68E-7
4.5	2.05E-7	2.18E-7	2.93E-7	2.77E-7	2.54E-7	2.61E-7	2.05E-7	1.97E-7	1.80E-7	1.94E-7	2.45E-7	3.20E-7	3.62E-7	2.79E-7	2.39E-7	1.85E-7
7.5	9.80E-8	1.05E-7	1.41E-7	1.33E-7	1.22E-7	1.25E-7	9.79E-8	9.47E-8	8.68E-8	9.32E-8	1.19E-7	1.56E-7	1.76E-7	1.36E-7	1.16E-7	8.91E-8
10.0	6.53E-8	6.97E-8	9.40E-8	8.90E-8	8.13E-8	8.34E-8	6.51E-8	6.32E-8	5.80E-8	6.22E-8	7.96E-8	1.05E-7	1.19E-7	9.12E-8	7.76E-8	5.96E-8
15.0	3.59E-8	3.81E-8	5.14E-8	4.90E-8	4.47E-8	4.58E-8	3.58E-8	3.47E-8	3.19E-8	3.41E-8	4.36E-8	5.79E-8	6.54E-8	5.02E-8	4.27E-8	3.29E-8
20.0	2.50E-8	2.67E-8	3.62E-8	3.43E-8	3.21E-8	3.19E-8	2.47E-8	2.42E-8	2.23E-8	2.39E-8	3.09E-8	4.14E-8	4.66E-8	3.56E-8	3.01E-8	2.29E-8
25.0	1.89E-8	2.03E-8	2.77E-8	2.61E-8	2.37E-8	2.42E-8	1.86E-8	1.84E-8	1.70E-8	1.82E-8	2.38E-8	3.20E-8	3.60E-8	2.74E-8	2.30E-8	1.73E-8
30.0	1.50E-8	1.63E-8	2.22E-8	2.09E-8	1.90E-8	1.93E-8	1.48E-8	1.47E-8	1.36E-8	1.45E-8	1.92E-8	2.60E-8	2.91E-8	2.21E-8	1.84E-8	1.38E-8
35.0	1.24E-8	1.35E-8	1.85E-8	1.73E-8	1.57E-8	1.60E-8	1.22E-8	1.21E-8	1.13E-8	1.21E-8	1.60E-8	2.18E-8	2.44E-8	1.84E-8	1.53E-8	1.14E-8
40.0	1.05E-8	1.15E-8	1.58E-8	1.47E-8	1.34E-8	1.36E-8	1.03E-8	1.03E-8	9.59E-9	1.03E-8	1.37E-8	1.87E-8	2.09E-8	1.58E-8	1.31E-8	9.69E-9
45.0	9.10E-9	1.00E-8	1.37E-8	1.28E-8	1.16E-8	1.18E-8	8.89E-9	8.95E-9	8.32E-9	8.91E-9	1.20E-8	1.63E-8	1.83E-8	1.38E-8	1.14E-8	8.39E-9
50.0	8.00E-9	8.83E-9	1.21E-8	1.13E-8	1.02E-8	1.04E-8	7.80E-9	7.87E-9	7.33E-9	7.85E-9	1.06E-8	1.45E-8	1.62E-8	1.22E-8	1.00E-8	7.38E-9
.568			6.51E-6													

* Exclusion Distance (374 feet)

2.E-31

TABLE 2.E-25

ESTIMATES OF ATMOSPHERIC DILUTION FACTORS FOR NFCS SPRING AVERAGE X/Q VALUES

Distance Downwind Miles	Data in Sec/m ³															
	Direction From Plant Location															
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.07*			1.83E-4													
0.1	1.04E-4	1.15E-4	1.28E-4	1.29E-4	1.46E-4	1.15E-4	9.13E-5	7.26E-5	6.32E-5	8.52E-5	1.12E-4	1.49E-4	2.02E-4	1.76E-4	1.63E-4	1.18E-4
0.2	2.96E-5	3.27E-5	3.64E-5	3.68E-5	4.19E-5	3.31E-5	2.64E-5	2.10E-5	1.83E-5	2.47E-5	3.24E-5	4.32E-5	5.86E-5	5.11E-5	4.71E-5	3.38E-5
0.3	1.43E-5	1.58E-5	1.76E-5	1.78E-5	2.03E-5	1.61E-5	1.28E-5	1.02E-5	8.90E-6	1.20E-5	1.58E-5	2.10E-5	2.86E-5	2.49E-5	2.30E-5	1.64E-5
0.5	5.78E-6	6.36E-6	7.11E-6	7.24E-6	8.25E-6	6.55E-6	5.22E-6	4.16E-6	3.62E-6	4.88E-6	6.41E-6	8.56E-6	1.17E-5	1.02E-5	9.39E-6	6.68E-6
0.8	2.55E-6	2.80E-6	3.14E-6	3.21E-6	3.67E-6	2.91E-6	2.32E-6	1.85E-6	1.61E-6	2.18E-6	2.86E-6	3.82E-6	5.20E-6	4.54E-6	4.18E-6	2.97E-7
1.0	1.75E-6	1.92E-6	2.15E-6	2.21E-6	2.53E-6	2.01E-6	1.60E-6	1.28E-6	1.11E-6	1.50E-6	1.97E-6	2.63E-6	3.59E-6	3.13E-6	2.88E-6	2.04E-7
1.5	9.01E-7	9.88E-7	1.11E-6	1.15E-6	1.31E-6	1.04E-6	8.34E-7	6.65E-7	5.80E-7	7.84E-7	1.03E-6	1.38E-6	1.87E-6	1.63E-6	1.50E-6	1.06E-6
2.5	4.03E-7	4.42E-7	5.00E-7	5.19E-7	5.95E-7	4.74E-7	3.80E-7	3.02E-7	2.56E-7	3.59E-7	4.71E-7	6.30E-7	8.58E-7	7.46E-7	6.80E-7	4.79E-7
3.5	2.41E-7	2.64E-7	3.00E-7	3.12E-7	3.58E-7	2.86E-7	2.29E-7	1.82E-7	1.60E-7	2.17E-7	2.85E-7	3.83E-7	5.21E-7	4.52E-7	4.10E-7	2.87E-7
4.5	1.65E-7	1.81E-7	2.05E-7	2.15E-7	2.46E-7	1.98E-7	1.58E-7	1.26E-7	1.11E-7	1.51E-7	1.98E-7	2.65E-7	3.61E-7	3.12E-7	2.82E-7	1.97E-7
7.5	7.78E-8	8.58E-8	9.75E-8	1.02E-7	1.18E-7	9.49E-8	7.59E-8	6.05E-8	5.35E-8	7.31E-8	9.60E-8	1.29E-7	1.75E-7	1.51E-7	1.35E-7	3.38E-8
10.0	5.14E-8	5.69E-8	6.47E-8	6.80E-8	7.83E-8	6.34E-8	5.07E-8	4.04E-8	3.59E-8	4.91E-8	6.46E-8	8.68E-8	1.18E-7	1.01E-7	8.99E-8	6.22E-8
15.0	2.81E-8	3.11E-8	3.55E-8	3.74E-8	4.29E-8	3.49E-8	2.78E-8	2.22E-8	1.97E-8	2.70E-8	3.55E-8	4.78E-8	6.51E-8	5.59E-8	4.97E-8	3.41E-8
20.0	1.93E-8	2.15E-8	2.44E-8	2.58E-8	2.98E-8	2.44E-8	1.94E-8	1.55E-8	1.39E-8	1.9.E-8	2.52E-8	3.40E-8	4.58E-8	3.90E-8	3.42E-8	2.34E-8
25.0	1.45E-8	1.63E-8	1.84E-8	1.94E-8	2.25E-8	1.85E-8	1.47E-8	1.18E-8	1.07E-8	1.47E-8	1.94E-8	2.61E-8	3.50E-8	2.95E-8	2.56E-8	1.76E-8
30.0	1.15E-8	1.29E-8	1.46E-8	1.49E-8	1.79E-8	1.48E-8	1.18E-8	9.43E-9	8.58E-9	1.19E-8	1.57E-8	2.11E-8	2.81E-8	2.36E-8	2.03E-8	1.40E-8
35.0	9.48E-9	1.07E-8	1.20E-8	1.27E-8	1.48E-8	1.23E-8	9.76E-9	7.82E-9	7.15E-9	9.91E-9	1.31E-8	1.76E-8	2.34E-8	1.95E-8	1.67E-8	1.15E-8
40.0	8.01E-9	0.96E-8	1.02E-8	1.08E-8	1.26E-8	1.04E-8	8.30E-9	6.65E-9	6.10E-9	8.48E-9	1.12E-8	1.51E-8	1.99E-8	1.66E-8	1.41E-8	9.71E-9
45.0	6.91E-9	7.84E-9	8.77E-9	9.29E-9	1.09E-8	9.05E-9	5.76E-9	5.76E-9	5.31E-9	7.39E-9	9.78E-9	1.31E-8	1.73E-8	1.43E-8	1.21E-8	8.38E-9
50.0	6.06E-9	6.89E-9	7.69E-9	8.15E-9	9.54E-9	7.97E-9	6.33E-9	5.08E-9	4.70E-9	6.54E-9	8.66E-9	1.16E-8	1.53E-8	1.26E-8	1.06E-8	7.34E-9
.568			5.40E-6													

* Exclusion Distance (374 feet)

2.E-32

TABLE 2.E-26

ESTIMATES OF ATMOSPHERIC DILUTION FACTORS FOR NFCS SUMMER AVERAGE X/Q VALUES

Distance Downwind Miles	Data in Sec/m ³															
	Direction from Plant Location															
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.07*			2.15E-4													
0.1	8.16E-5	1.04E-5	1.53E-4	1.76E-4	1.59E-4	1.61E-4	9.94E-5	9.58E-5	9.70E-5	1.54E-4	2.40E-4	2.02E-4	1.63E-4	1.19E-4	1.09E-4	9.66E-5
0.2	2.33E-5	2.97E-5	4.38E-5	5.08E-5	4.57E-5	4.64E-5	2.86E-5	2.76E-5	2.80E-5	4.44E-5	6.91E-5	5.84E-5	4.76E-5	3.47E-5	3.16E-5	2.79E-5
0.3	1.12E-5	1.43E-5	2.11E-5	2.46E-5	2.22E-5	2.26E-5	1.39E-5	1.34E-5	1.36E-5	2.16E-5	3.36E-5	2.84E-5	2.31E-5	1.69E-5	1.53E-5	1.35E-5
0.5	4.54E-6	5.77E-6	8.54E-6	9.95E-6	9.01E-6	9.18E-6	5.66E-6	5.48E-6	5.55E-6	8.82E-6	1.37E-6	1.16E-6	9.42E-6	6.87E-6	6.24E-6	5.51E-6
0.8	2.01E-6	2.55E-6	3.79E-6	4.43E-6	4.01E-6	4.09E-6	2.52E-6	2.44E-6	2/47E-6	3.93E-6	6.09E-6	5.15E-6	4.20E-6	3.07E-6	2.78E-6	2.46E-6
1.0	1.38E-6	1.75E-6	2.61E-6	3.06E-6	2.76E-6	2.82E-6	1.73E-6	1.68E-6	1.70E-6	2.71E-6	4.20E-6	3.56E-6	2.90E-6	2.12E-6	1.92E-6	1.69E-6
1.5	7.13E-7	9.09E-7	1.36E-6	1.60E-6	1.44E-6	1.47E-6	9.01E-7	8.76E-7	8.87E-7	1.41E-6	2.19E-6	1.86E-6	1.52E-6	1.11E-6	1.00E-6	8.83E-7
2.5	3.22E-7	4.12E-7	6.18E-7	7.35E-7	6.66E-7	6.67E-7	4.08E-7	3.98E-7	4.03E-7	6.38E-7	9.93E-7	8.51E-7	6.98E-7	5.09E-7	4.59E-7	4.03E-7
3.5	1.93E-7	2.48E-7	3.74E-7	4.47E-7	3.96E-7	4.03E-7	2.46E-7	2.40E-7	2.54E-7	3.84E-7	6.00E-7	5.16E-7	4.24E-7	3.10E-7	2.78E-7	2.43E-7
4.5	1.33E-7	1.71E-7	2.58E-7	3.10E-7	2.73E-7	2.78E-7	1.69E-7	1.65E-7	1.68E-7	2.64E-7	4.13E-7	3.57E-7	2.95E-7	2.15E-7	1.92E-7	1.68E-7
7.5	6.33E-8	8.26E-8	1.25E-7	1.52E-7	1.32E-7	1.34E-7	8.08E-8	7.93E-8	8.06E-8	1.26E-7	1.98E-7	1.74E-7	1.44E-7	1.05E-7	9.34E-8	8.12E-8
10.0	4.22E-8	5.54E-8	8.42E-8	1.03E-7	8.81E-8	8.94E-8	5.38E-8	5.28E-8	5.38E-8	8.40E-8	1.32E-8	1.17E-7	9.71E-8	7.09E-8	6.28E-8	5.44E-8
15.0	2.30E-8	3.02E-8	4.60E-8	5.63E-8	4.84E-8	4.91E-8	2.95E-8	2.90E-8	2.95E-8	4.62E-8	7.26E-8	6.43E-8	5.34E-8	3.90E-8	3.43E-8	2.99E-8
20.0	1.61E-8	2.16E-8	3.29E-8	4.07E-8	3.40E-8	3.44E-8	2.04E-8	2.02E-8	2.06E-8	3.19E-8	5.05E-8	4.57E-8	3.83E-8	2.80E-8	2.45E-8	2.10E-8
25.0	1.23E-8	1.67E-8	2.54E-8	3.17E-8	2.59E-8	2.62E-8	1.54E-8	1.53E-8	1.57E-8	2.40E-8	3.82E-8	3.52E-8	2.96E-8	2.17E-8	1.89E-8	1.60E-8
30.0	9.90E-9	1.35E-8	2.06E-8	2.59E-8	2.08E-8	2.10E-8	1.23E-8	1.22E-8	1.25E-8	1.90E-8	3.05E-8	2.85E-8	2.40E-8	1.76E-8	1.52E-8	1.29E-8
35.0	8.23E-9	1.13E-8	1.73E-8	2.18E-8	1.73E-8	1.74E-8	1.01E-8	1.01E-8	1.04E-8	1.56E-8	2.52E-8	2.38E-8	2.02E-8	1.48E-8	1.27E-8	1.07E-8
40.0	7.02E-9	9.72E-9	1.49E-8	1.88E-8	1.48E-8	1.48E-8	8.57E-9	8.57E-9	8.82E-9	1.32E-8	2.14E-8	2.04E-8	1.73E-8	1.27E-8	1.09E-8	9.14E-9
45.0	6.11E-9	8.50E-9	1.30E-8	1.65E-8	1.28E-8	1.29E-8	7.41E-9	7.42E-9	7.65E-9	1.14E-9	1.86E-8	1.78E-8	1.52E-8	1.11E-8	9.52E-9	7.94E-9
50.0	5.39E-9	7.54E-9	1.15E-8	1.47E-8	1.13E-8	1.13E-8	6.50E-9	6.53E-9	6.74E-9	1.00E-8	1.63E-8	1.58E-8	1.34E-9	9.86E-9	8.43E-9	7.01E-9
.568			6.55E-6													

* Exclusion Distance (374 feet)

2.E-33

TABLE 2.E-27

ESTIMATION OF ATMOSPHERIC DILUTION FACTORS FOR NFCS FALL AVERAGE χ/Q VALUES

Distance Downwind Miles	Data in Sec/m ³																	
	N	NNE	NE	ENE	E	ESE	Direction from Plant Location									W	WNW	NW
							SE	SSE	S	SSW	SW	WSW						
.07*			10.51E-4															
0.1	1.15E-4	1.16E-4	7.58E-4	4.97E-4	3.33E-4	1.18E-4	1.01E-4	7.93E-5	7.27E-5	7.93E-5	1.05E-4	1.18E-4	1.45E-4	1.23E-4	1.47E-4	1.29E-4		
0.2	3.25E-5	3.29E-5	2.19E-4	1.43E-4	9.64E-5	3.39E-5	2.91E-5	2.29E-5	2.10E-5	2.29E-5	3.02E-5	3.42E-5	4.19E-5	3.54E-5	4.22E-5	3.69E-5		
0.3	1.57E-5	1.59E-5	1.06E-4	6.94E-4	4.67E-5	1.65E-5	1.42E-5	1.11E-5	1.02E-5	1.11E-5	1.47E-5	1.67E-5	2.04E-5	1.72E-5	2.05E-5	1.79E-5		
0.5	6.33E-6	6.43E-6	4.27E-5	2.81E-5	1.89E-5	6.71E-6	5.79E-6	4.53E-6	4.18E-6	4.51E-6	6.00E-6	6.81E-6	8.36E-6	7.02E-6	8.37E-6	7.28E-6		
0.8	2.81E-6	2.85E-6	1.90E-5	1.25E-5	8.44E-6	2.99E-6	2.58E-6	2.02E-6	1.86E-6	2.01E-6	2.67E-6	3.03E-6	3.72E-6	3.12E-6	3.72E-6	3.23E-6		
1.0	1.93E-6	1.95E-6	1.31E-5	8.65E-6	5.83E-6	2.06E-6	1.77E-6	1.39E-6	1.28E-6	1.38E-6	1.84E-6	2.09E-6	2.56E-6	2.15E-7	2.56E-6	2.22E-6		
1.5	9.95E-7	1.01E-6	6.88E-6	4.53E-6	3.05E-6	1.07E-6	9.23E-7	7.22E-7	6.70E-7	7.21E-7	9.55E-7	1.09E-6	1.33E-6	1.12E-6	1.33E-6	1.15E-6		
2.5	4.48E-7	4.54E-7	3.17E-6	2.08E-6	1.40E-6	4.85E-7	4.19E-7	3.29E-7	3.06E-7	3.28E-7	4.34E-7	4.94E-7	6.06E-7	5.07E-7	6.00E-7	5.20E-7		
3.5	2.68E-7	2.72E-7	1.93E-6	1.27E-7	8.55E-7	2.92E-7	2.53E-7	1.98E-7	1.85E-7	1.98E-7	2.61E-7	2.98E-7	3.65E-7	3.05E-7	3.61E-7	3.12E-7		
4.5	1.84E-7	1.87E-7	1.34E-6	8.81E-7	5.94E-7	2.01E-7	1.74E-7	1.37E-7	1.28E-7	1.37E-7	1.80E-7	2.06E-7	2.52E-7	2.10E-7	2.48E-7	2.14E-7		
7.5	8.76E-8	8.87E-8	6.60E-7	4.32E-7	2.91E-7	9.63E-8	8.32E-8	6.58E-8	6.20E-8	6.57E-8	8.63E-8	9.85E-8	1.21E-7	1.00E-7	1.18E-7	1.01E-7		
10.0	5.81E-8	5.88E-8	4.47E-7	2.93E-7	1.97E-7	6.41E-8	5.54E-8	4.40E-8	4.15E-8	4.39E-8	5.75E-8	6.56E-8	8.04E-8	6.70E-8	7.85E-8	6.71E-8		
15.0	3.18E-8	3.22E-8	2.45E-7	1.60E-7	1.08E-7	3.53E-8	3.05E-8	2.42E-8	2.29E-8	2.41E-8	3.17E-8	3.63E-8	4.45E-8	3.69E-8	4.32E-8	3.68E-8		
20.0	2.20E-8	2.22E-8	1.78E-7	1.16E-7	7.82E-8	2.44E-8	2.11E-8	1.69E-8	1.61E-8	1.69E-8	2.19E-8	2.50E-8	3.06E-8	2.55E-8	2.97E-8	2.52E-8		
25.0	1.65E-8	1.67E-8	1.40E-7	9.07E-8	6.09E-9	1.84E-8	1.58E-8	1.28E-8	1.23E-8	1.29E-8	1.65E-8	1.88E-8	2.30E-8	1.92E-8	2.22E-8	1.89E-8		
30.0	1.31E-8	1.32E-8	1.14E-7	7.41E-8	4.97E-8	1.47E-8	1.26E-8	1.02E-8	9.84E-9	1.03E-8	1.31E-8	1.49E-8	1.82E-8	1.53E-8	1.76E-8	1.49E-8		
35.0	1.08E-8	1.09E-8	9.66E-8	6.25E-8	4.19E-8	1.21E-8	1.04E-8	8.48E-9	8.18E-9	8.57E-9	1.08E-8	1.22E-8	1.50E-8	1.26E-8	1.44E-8	1.22E-8		
40.0	9.15E-9	9.18E-9	8.34E-8	5.40E-8	3.61E-8	1.03E-8	8.75E-9	7.21E-9	6.97E-9	7.30E-9	9.14E-9	1.03E-8	1.27E-8	1.07E-8	1.22E-8	1.03E-8		
45.0	7.90E-9	7.91E-9	7.34E-8	4.74E-8	3.17E-8	8.87E-9	7.55E-9	6.25E-9	6.06E-9	6.34E-9	7.89E-9	8.92E-9	1.09E-8	9.22E-9	1.05E-8	8.88E-9		
50.0	6.93E-9	6.93E-9	6.54E-9	4.22E-8	2.82E-8	7.79E-9	6.62E-9	5.50E-9	5.34E-9	5.60E-9	6.92E-9	7.81E-9	9.55E-9	8.10E-9	9.19E-9	7.77E-9		
.568			3.54E-5															

* Exclusion Distance (374 feet)

2.E-34

BASIS FOR ESTIMATES

Annual and seasonal χ/Q values were calculated from the equation

$$\frac{\chi}{Q} = \left(\frac{2}{\pi}\right)^{1/2} \sum_s \sum_j \frac{F(\theta, s, j)}{\sigma_{zs} \bar{u}_j \left(\frac{2\pi x}{16}\right)} \quad (1)$$

where

χ = activity concentration, curies/m³

Q = activity release rate, curies/sec

$F(\theta, s, j)$ = the frequency during the period of interest that the wind is from the direction θ , for the stability condition s , and wind speed class j

σ_{zs} = the vertical dispersion parameter evaluated at the distance x for the stability condition s , meters

\bar{u}_j = the representative wind speed for class j , meters/sec

x = distance downwind, meters

The equation was summed for all wind speed and stability classes with σ_z taking appropriate values according to the Pasquill-Gifford classification scheme. Meteorological data used to calculate these χ/Q estimates were obtained from on-site measurements made from August 1, 1972 through July 31, 1973.

REFERENCES APPENDIX 2.E

1. U. S. Department of Commerce, ESSA, "Climatological Summary, Columbia, South Carolina," in Climatology of the U. S., No. 60-38, 1973.
2. Army, Navy and Air Force Manual, Engineering Weather Data TM5-785, NAVDOCKS P-89, AFM88-8, Chapter 6, April 1963.
3. U. S. Department of Commerce, Weather Bureau, Rainfall Frequency Atlas of The United States, Technical Paper No. 40, May 1961.
4. U. S. Department of Commerce, Weather Bureau, Maximum Recorded United States Point Rainfall for 5-Minutes to 24-Hours at 296-First Order Stations; Technical Paper No. 2, Revised 1963.
5. STAR Program for On-site Data Diffusion Climatology, WESD, Monroeville, Pennsylvania.
6. U.S. Atomic Energy Commission, Division of Reactor Standards, Safety Guides for Water-Cooled Nuclear Power Plants, Safety Guide 1.4, "On-site Meteorological Programs," 1972.
7. Slade, D.H., ed., "Meteorology and Atomic Energy 1968," U.S. Atomic Energy Division of Technical Information, Springfield, Va. 22151.
8. Kornasiewicz, R., A.E.C., Personal Communication with Van Vleck, L. D., WESD, September 1973.