OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
CALCULATION COVER SHEET

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2. Calculation Title

Calculations of Acute and Chronic "Chi / Q" Dispersion Estimates for a Surface Release

3. Document Identifier (including Revision Number)

TDR-MGR-MM-000001, Rev 00

4. Total Attachments	5. Attachment Numbers – Number of pages in each
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9. Remarks

none

Revision History

10. Revision No.	11. Description of Revision
00	Initial issue as Rev 00. This calculation document was produced to revise the text (not to re-do the calculations) in the original calculation document BA0000000-01717-0210-000006, Rev 00, dated May 6, 1999. This revised text includes adding the TBV status identifier for input data descriptions to comply with AP-3.12Q, Attachment 2, item #6 and to resolve DR LVMO-99-D-098. Other minor wording changes were made for clarification purposes. The new document also adds a Document Input Reference Sheet (DIRS) as Attachment V to comply with AP-2.13Q.

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1.0 PURPOSE

The objective of this calculation is to determine downwind normalized concentration, "Chi/Q" (χ/Q), estimates at the surface for acute (short-term) and chronic (long-term) exposures of an airborne material released from a surfaced-based point release. This calculation was requested by the Safety Analysis Department to support repository design in the Site Recommendation and possible future License Application activities. Attachment IV, item 1 displays this request. The χ/Q dispersion estimates will be calculated at twenty pre-determined distances from a surface release point. The acute exposure dispersion estimates will be calculated for five percentile, percentage of occurrences χ/Q values are not exceeded, values.

2.0 METHOD

The method used to calculate the χ/Q dispersion estimates is taken from the Nuclear Regulatory Commission (NRC) Regulatory Guideline 1.145, *Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants* (NRG-RG-1.145, NRC 1982). NRC-RG-1.145 specifically provides the method and mathematical equations to determine the appropriate χ/Q dispersion estimates for an acute release of material into the atmosphere. χ/Q dispersion estimates from chronic exposure are calculated as an annual average. NRC-RG-1.145 briefly discusses the procedure and refers to NRC Regulatory Guide 1.111, *Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors* (NRC-RG-1.111, NRC 1977). NRC-RG-1.111 discusses the procedure and provides the mathematical equation to determine the appropriate χ/Q dispersion estimates for a chronic release of material into the atmosphere. NRC-RG-1.145 and the pertinent section of NRC-RG-1.111 are included as attachments to this document.

These calculations use actual site specific meteorological data from a representative meteorological observation location. The input data are comprised of hourly observations of wind speed, wind direction, and atmospheric stability for 1993 through and including 1997. Of the possible 43,800 hourly observations, 43,122 are valid (a favorable 98.45% data recovery rate) and used in these calculations. As indicated in the Document Input Reference Sheet (DIRS) in Attachment V to this calculation, the status of the input data at the time of the calculation was to be verified (TBV).

3.0 ASSUMPTIONS

The meteorological observation site most representative of the proposed release area is the Environmental Analysis Division's Site 1. Site 1 is located approximately 1500 meters south-southwest of the North Portal of the Exploratory Studies Facility. The wind speed and wind direction observations used in these calculations are taken at the 10-meter level. The atmospheric stability is determined by the standard deviation of the wind direction, wind speed, and day or night designation (EPA 1987).

Equation (1) in NRC-RG-1.145 incorporates building wake effects by considering the vertical cross-sectional area of the facility. Since no repository surface building could be referenced for this calculation, a building dimension of 0.0 square meters (m^2) is assumed. The building wake effect parameterization acts to decrease the final χ/Q dispersion estimate. Hence, an assumption of a 0.0 m^2 vertical cross-section yields a larger, more conservative, χ/Q value. This set of calculations is assumed to be from a point release occurring at the surface.

4.0 COMPUTER SOFTWARE AND MODELS USE

A software routine, XQ145, was developed and qualified in accordance with QAP-SI-0, *Computer Software Qualification* to calculate the χ/Q dispersion estimates from acute and chronic exposure according to NRC-RG-1.145 and NRC-RG-1.111.

4.1 Computer Software

Microsoft Access 97 was used in managing the database of input meteorological parameters. It was also used to view the results of the calculation. The software was installed and used on the following PCs for this set of calculations..

CPU Tag #	CPU Type	Location (at time of calculation)
111166	Gateway 2000, 200 MHz Pentium II	227F
112725	Dell Optiplex GXi, 200Mhz Pentium	227D

4.2 Software Routines

The following software routine was used in this calculation.

Name:	Version	CSCI ID	Document ID	Media ID	Activated
XQ145	1.0	30072 V1.0	30072-2999 Rev 00	30072-M04-001	03-31-1999

The only mathematical equations used in this calculation are in the XQ145 software routine. A detailed description of the software routine can be found in the *Software Routine Report for XQ145, Version 1.0* (CRWMS 1999). A detailed description of the calculation method is found in NRC-RG-1.145 (NRC 1982) and NRC-RG-1.111 (NRC 1977, pg. 9).

The use of the XQ145 software routine is generally simple to execute. Figure 1 shows the first pop-up window displayed when executing the routine, which includes the selection from two release type choices: vent (which can be a surface release), or an elevated stack release. This calculation is for a "Vent Release". Figure 2 shows the second pop-up window, where the user selects the meteorological database, and appropriate input parameters. In addition, the user selects the diffusion method and the type of calculation to be done (Exclusion Area Boundary, outer LPZ boundary, Overall Site value, or user defined). The case in this calculation will be user selected, with the distances and percentile values listed below as input. The "START" button is selected to execute the routine.

Acute and chronic calculations were requested for the following twenty distances: 100, 200, 300, 400, 500, 750, 1,000, 2,000, 3,000, 4,000, 5,000, 7,500, 10,000, 20,000, 25,000, 50,000, 75,000, 100,000, 150,000, and 200,000 meters. Acute dispersion estimates were calculated for requested percentile levels of 50, 90, 95, 99, and 99.5 percent at each of the twenty distances. Figure 2 illustrates the proper set-up of XQ145 to generate acute exposure χ/Q values for the first five distances and the five percentiles. Figure 3 illustrates the proper set-up of XQ145 to generate chronic exposure χ/Q values. Chronic dispersion estimates are calculated by selecting the "Outer LPZ Boundary" option and entering in 8760 hours (hours in a year). The output files are generated as a table in the MS Access97 meteorological database.

4.3 Models

No models are used in this calculation.

5.0 CALCULATIONS

The input data consist of hourly observations of wind speed, wind direction, and atmospheric stability from Site 1, as described in section 3.0 for the years 1993 through and including 1997. The input data are included on the disk included with this documentation. As indicated in the Document Input Reference Sheet (DIRS) in Attachment V to this calculation, the status of the input data at the time of the calculation was to be verified (TBV).

The output from the dispersion estimate calculations is summarized in the Results section. The raw output file data generated by the software routine are included in Attachment I.

5.1 Acute Exposure Dispersion Estimate (χ/Q) Calculation

Following the XQ145 software (CRWMS 1999) and NRC-RG-1.145 (NRC 1982), the following three equations are used to calculate the χ/Q dispersion estimates for a surface release.

$$\frac{\chi}{Q} = \frac{1}{U_{10}(\pi\sigma_y\sigma_z + A/2)} \quad (1)$$

$$\frac{\chi}{Q} = \frac{1}{U_{10}(3\pi\sigma_y\sigma_z)} \quad (2)$$

$$\frac{\chi}{Q} = \frac{1}{U_{10}(\pi\Sigma_y\sigma_z)} \quad (3)$$

where,

A is the smallest vertical-plane cross-sectional area of the building in meters^2; A is zero in this case. (Other structures may be justified when appropriate.)

χ/Q is the normalized concentration in seconds/meters^3,

π is 3.14159,

σ_y is lateral plume spread, in meters, (a function of atmospheric stability and distance),
σ_z is vertical plume spread, in meters, (a function of atmospheric stability and distance),
Σ_y is lateral plume spread with meander and building wake effects, in meters, (a function of atmospheric stability wind speed U_{10}, and distance), and
U_{10} is the wind speed at 10 meters above plant grade, in meters/second.

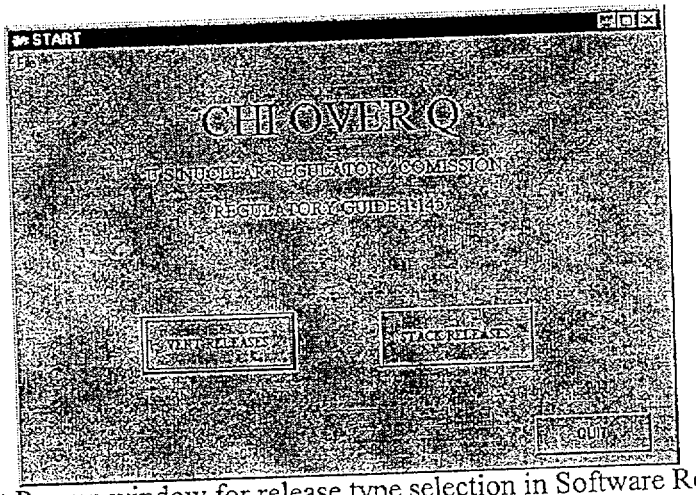

Figure 1. First Pop-up window for release type selection in Software Routine XQ145.

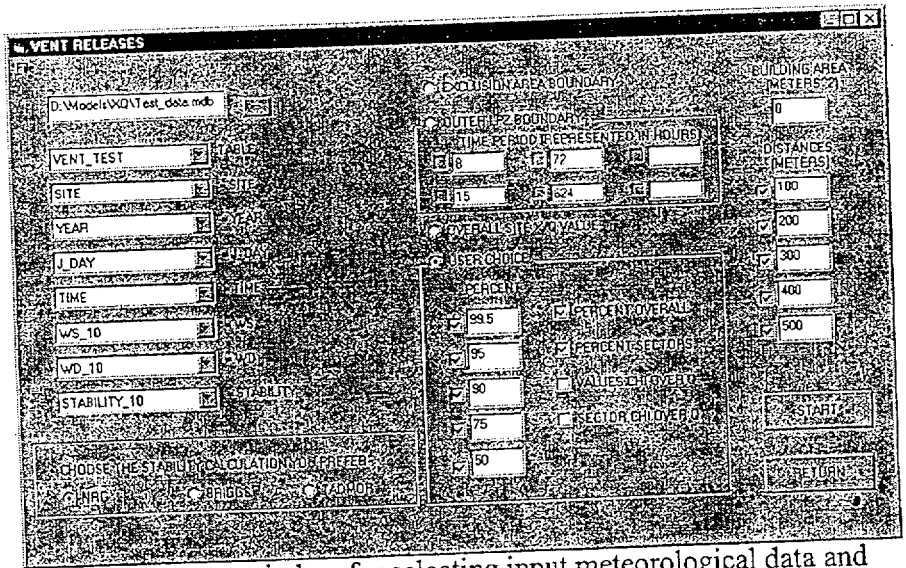

Figure 2. Pop-up window for selecting input meteorological data and calculation input values for the acute exposure χ/Q calculation.

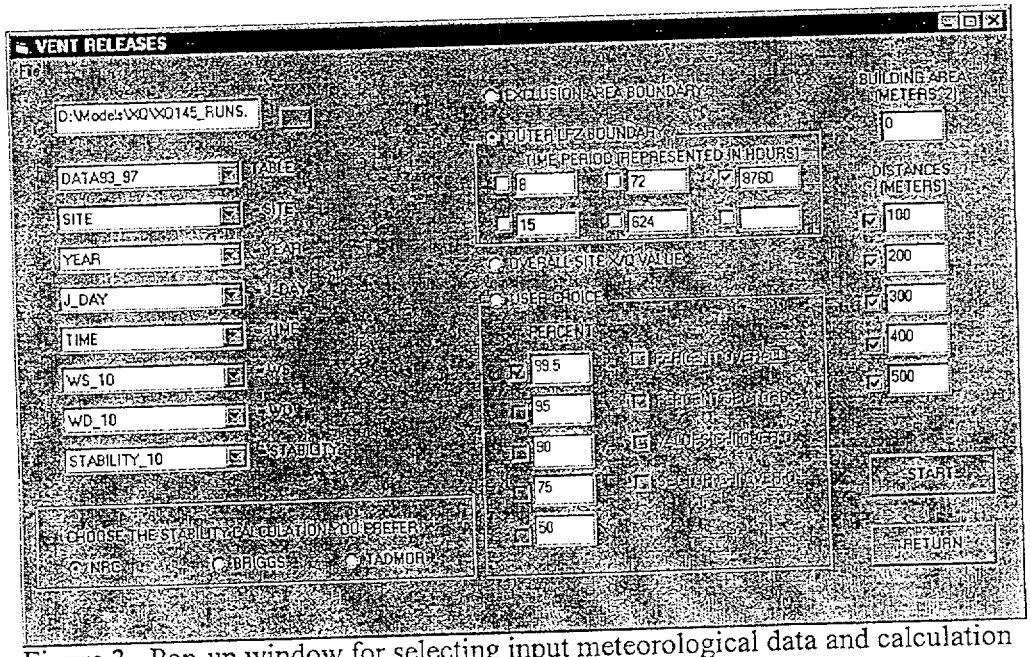

Figure 3. Pop-up window for selecting input meteorological data and calculation input values for the chronic exposure χ/Q calculation.

NRC-RG-1.145 (NRC 1982) uses graphs to determine the horizontal and vertical diffusion coefficients. These curves have been approximated as equations and defined as the "NRC Method" (Allwine and Bian 1995, pp. 2.55 – 2.56). The diffusion coefficients are atmospheric stability and transport distance dependent. The "NRC Method" is used in these calculations.

The appropriate χ/Q for each meteorological observation is determined as follows.

For each unstable atmospheric stability case,

I) Equations 1 and 2 are evaluated.
II) Determine appropriate χ/Q value as the larger of the of the results calculated by equations 1 and 2.

For each neutral and stable stability case, the

I) Equations 1, 2, and 3 are evaluated.
II) Determine the larger of the values calculated by equations 1 and 2.
III) Determine appropriate χ/Q value as the smaller of the result from equation 3 and the result of step II.

The appropriate χ/Q values, once determined for all the input meteorological data, are sorted in ascending order. Each χ/Q value is assigned a cumulative probability. This method assigns the first χ/Q value a cumulative probability of 0.0, and every other χ/Q value is assigned a cumulative probability according to equation (4):

$$\text{Cumulative Probability} = \frac{i - 1}{n - 1} \qquad (4)$$

where,

i is the ordered number of the χ/Q value, and

n is the total number of χ/Q values.

The percentile is related to the cumulative probability as follows:

$$\text{Percentile} = 1.0 - (\text{Cumulative Probability}).$$

The percentile values for cumulative probabilities of 0.995 (99.5%), 0.99 (99%), 0.95 (95%), 0.90 (90%), and 0.50 (50%) were calculated from the above relation. The χ/Q values associated with these cumulative probabilities were then determined (separately for the overall site values and the individual wind sector values). To calculate the overall site value, the sorted list of χ/Q values was examined to determine whether a χ/Q value existed at the desired cumulative probability. If so, that was the appropriate χ/Q value. If not, the list was examined to find the closest larger and the closest smaller cumulative probability. A simple linear interpolation was computed to determine the χ/Q value at the desired cumulative probability.

The χ/Q values were then sorted into the 16 cardinal wind direction sectors according to the input meteorological data. For each sector, cumulative probability values are assigned and a percentile value was determined as described above using only χ/Q values within that sector. The maximum sector value was then determined by selecting the largest of the 16 χ/Q sector values.

5.2 Chronic Exposure Dispersion Estimate (χ/Q) Calculation

The method for computing the χ/Q dispersion estimates from chronic exposure is taken from RG-1.111 (NRC 1977). This method allows for the use of site-specific meteorological data. The following equation from RG-1.111 (NRC 1977, pg. 9) is used to calculate the χ/Q dispersion estimates for a surface release ($h_e = 0$).

$$\left(\frac{\chi}{Q}\right)_S = 2.032 \sum \frac{n}{NXU_{10}\sigma_z} \exp\left(\frac{-h_e^2}{2\sigma_z^2}\right) \qquad (5)$$

where,

$(\chi/Q)_S$ is the normalized concentration in wind sector S in seconds/meters^3,

h_e is the effective stack height, in meters ($h_e = h_s - h_t$),

h_s is the physical height of the release point, in meters,

h_t is the maximum terrain height between the release point and the point for which the calculation is made, in meters,

n	number of hours current data is valid,
N	total number of hours of valid data,
σ_z	is vertical plume spread, in meters, a function of atmospheric stability and distance,
U_{10}	is the wind speed at 10 meters above plant grade, in meters/second, and
X	distance in meters from the source release point to the receptor location.

Prior to applying equation 5, the meteorological data were sorted into the 16 cardinal wind direction categories. The χ/Q values computed with this method are annual average values for each wind sector.

RG-1.111 (NRC 1977, pg. 9) uses graphs to determine the vertical diffusion coefficient. These curves have been approximated as equations and defined as the "NRC Method" (Allwine and Bian 1995, pp. 2.55 – 2.56). The diffusion coefficient is atmospheric stability and transport distance dependent. The "NRC Method" is used in these calculations.

6.0 RESULTS

Summary results are presented in this section. The calculation output tables are shown in Attachment I. This document and its conclusions may be affected by technical product input information that requires confirmation. Any changes to the document or its conclusions that may occur as a result of completing the confirmation activities will be reflected in subsequent revisions. The status of the input information quality may be confirmed by review of the Document Input Reference System database.

Table 1 relates the wind sector numbers to the 16 cardinal wind directions. Tables 2 through 6 refer to wind direction sectors by number.

Table 1. Wind Sector Numbers Related to Cardinal Wind Directions

Wind Sector	1	2	3	4	5	6	7	8
Wind Direction	N	NNE	NE	ENE	E	ESE	SE	SSE
Wind Sector	9	10	11	12	13	14	15	16
Wind Direction	S	SSW	SW	WSW	W	WNW	NW	NNW

6.1 Acute Exposure Dispersion Estimate (χ/Q) Calculations

The acute dispersion estimate (χ/Q) calculations are presented in this section. Table 2 shows the "Overall Site Acute χ/Q" values for the 20 distances and 5 percentile values. Table 3 lists the "Maximum Sector Acute χ/Q" values for the 16 cardinal wind direction sectors, 20 distances and 5 percentiles. The number of observations and the fraction of the total observations per sector are listed in Table 4. Table 5a through 5t show the "Acute χ/Q Sector" values for the 16 cardinal

wind direction sectors and 5 percentiles at each of the twenty distances. The χ/Q values are listed in seconds per cubic meter (s/m^3).

Table 2. Overall Site Acute χ/Q (s/m^3) Maximums at Various Percentile Levels

DISTANCE (meters)	PERCENTILES				
	50%	90%	95%	99%	99.5%
	PERCENT EXCEEDED				
	50%	10%	5%	1%	0.50%
100	1.40E-03	4.22E-03	5.18E-03	7.23E-03	8.15E-03
200	3.94E-04	1.27E-03	1.56E-03	2.18E-03	2.46E-03
300	1.93E-04	6.38E-04	7.84E-04	1.09E-03	1.23E-03
400	1.18E-04	3.93E-04	4.83E-04	6.74E-04	7.60E-04
500	8.04E-05	2.70E-04	3.32E-04	4.63E-04	5.23E-04
750	4.05E-05	1.37E-04	1.69E-04	2.35E-04	2.65E-04
1000	2.59E-05	9.84E-05	1.21E-04	1.69E-04	1.91E-04
2000	9.20E-06	4.90E-05	6.03E-05	8.42E-05	9.50E-05
3000	5.04E-06	3.31E-05	4.08E-05	5.70E-05	6.43E-05
4000	3.31E-06	2.50E-05	3.08E-05	4.30E-05	4.85E-05
5000	2.39E-06	2.00E-05	2.47E-05	3.44E-05	3.89E-05
7500	1.32E-06	1.32E-05	1.63E-05	2.28E-05	2.57E-05
10000	8.70E-07	9.77E-06	1.21E-05	1.68E-05	1.90E-05
20000	3.19E-07	4.61E-06	5.69E-06	7.93E-06	8.96E-06
25000	2.31E-07	3.60E-06	4.44E-06	6.19E-06	6.99E-06
50000	8.53E-08	1.65E-06	2.03E-06	2.84E-06	3.20E-06
75000	4.77E-08	1.04E-06	1.28E-06	1.79E-06	2.02E-06
100000	3.16E-08	7.47E-07	9.24E-07	1.29E-06	1.45E-06
150000	1.77E-08	4.70E-07	5.81E-07	8.10E-07	9.15E-07
200000	1.17E-08	3.39E-07	4.18E-07	5.83E-07	6.59E-07

Table 3. Maximum Acute Sector χ/Q (s/m^3) Values

	PERCENTILE									
	50.0%		90.0%		95.0%		99.0%		99.5%	
	PERCENT EXCEEDED									
Distance (meters)	50%	Wind Sector	10%	Wind Sector	5.0%	Wind Sector	1.0%	Wind Sector	0.50%	Wind Sector
100	3.02E-03	14	6.03E-03	13	6.72E-03	13	8.79E-03	14	9.83E-03	14
200	8.76E-04	14	1.82E-03	13	2.03E-03	13	2.65E-03	14	2.96E-03	14
300	4.40E-04	14	9.13E-04	13	1.02E-03	13	1.33E-03	14	1.49E-03	14
400	2.72E-04	14	5.62E-04	13	6.26E-04	13	8.19E-04	14	9.16E-04	14
500	1.88E-04	14	3.87E-04	13	4.31E-04	13	5.63E-04	14	6.30E-04	14
750	9.67E-05	14	1.96E-04	13	2.19E-04	13	2.86E-04	14	3.20E-04	14
1000	6.90E-05	14	1.41E-04	13	1.57E-04	13	2.05E-04	14	2.30E-04	14
2000	3.24E-05	14	7.03E-05	13	7.83E-05	13	1.02E-04	14	1.15E-04	14
3000	2.08E-05	14	4.76E-05	13	5.30E-05	13	6.93E-05	14	7.75E-05	14
4000	1.51E-05	14	3.59E-05	13	4.00E-05	13	5.23E-05	14	5.85E-05	14
5000	1.17E-05	14	2.88E-05	13	3.20E-05	13	4.19E-05	14	4.68E-05	14
7500	7.31E-06	14	1.90E-05	13	2.12E-05	13	2.77E-05	14	3.10E-05	14
10000	5.21E-06	14	1.41E-05	13	1.57E-05	13	2.05E-05	14	2.29E-05	14
20000	2.26E-06	14	6.63E-06	13	7.39E-06	13	9.66E-06	14	1.08E-05	14
25000	1.72E-06	14	5.18E-06	13	5.77E-06	13	7.54E-06	14	8.43E-06	14
50000	7.32E-07	14	2.37E-06	13	2.64E-06	13	3.45E-06	14	3.86E-06	14
75000	4.43E-07	14	1.49E-06	13	1.67E-06	13	2.18E-06	14	2.43E-06	14
100000	3.10E-07	14	1.08E-06	13	1.20E-06	13	1.57E-06	14	1.75E-06	14
150000	1.88E-07	14	6.77E-07	13	7.55E-07	13	9.87E-07	14	1.10E-06	14
200000	1.31E-07	14	4.88E-07	13	5.43E-07	13	7.10E-07	14	7.94E-07	14

Table 4. Number of Observations per Sector & Percentage of Total

WIND SECTOR	NUMBER OF OBSERVATIONS	FRACTION OF TOTAL OBSERVATIONS
1	3462	0.08
2	1618	0.038
3	927	0.021
4	705	0.016
5	639	0.015
6	786	0.018
7	1413	0.033
8	3303	0.077
9	7845	0.182
10	2633	0.061
11	1700	0.039
12	1321	0.031
13	1112	0.026
14	1659	0.038
15	6368	0.148
16	7631	0.177
TOTAL OBSERVATIONS = 43122		

Table 5a. Acute χ/Q (s/m^3) Values for 100 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	1.41E-03	4.15E-03	5.21E-03	7.32E-03	8.34E-03
2	1.25E-03	4.00E-03	4.77E-03	7.24E-03	8.50E-03
3	8.37E-04	3.80E-03	4.23E-03	7.16E-03	7.71E-03
4	7.73E-04	1.66E-03	4.10E-03	8.06E-03	8.76E-03
5	7.11E-04	2.03E-03	4.76E-03	8.15E-03	9.02E-03
6	6.49E-04	1.74E-03	4.03E-03	7.16E-03	8.81E-03
7	5.73E-04	1.58E-03	3.90E-03	6.72E-03	8.35E-03
8	6.26E-04	1.48E-03	2.27E-03	5.89E-03	6.92E-03
9	8.47E-04	1.53E-03	2.27E-03	4.79E-03	5.50E-03
10	1.29E-03	3.93E-03	4.46E-03	6.97E-03	7.98E-03
11	1.48E-03	4.59E-03	5.64E-03	7.89E-03	9.07E-03
12	1.73E-03	5.29E-03	6.39E-03	8.35E-03	8.73E-03
13	2.27E-03	6.03E-03	6.72E-03	8.78E-03	9.11E-03
14	3.02E-03	5.89E-03	6.61E-03	8.79E-03	9.83E-03
15	2.27E-03	4.68E-03	5.51E-03	7.30E-03	8.33E-03
16	2.27E-03	4.56E-03	5.29E-03	6.72E-03	7.59E-03

Table 5b. Acute χ/Q (s/m^3) Values for 200 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	3.98E-04	1.25E-03	1.57E-03	2.21E-03	2.51E-03
2	3.53E-04	1.20E-03	1.44E-03	2.18E-03	2.56E-03
3	2.28E-04	1.13E-03	1.27E-03	2.16E-03	2.32E-03
4	2.10E-04	4.56E-04	1.23E-03	2.43E-03	2.64E-03
5	1.93E-04	5.81E-04	1.43E-03	2.46E-03	2.72E-03
6	1.74E-04	4.85E-04	1.21E-03	2.16E-03	2.65E-03
7	1.56E-04	4.43E-04	1.18E-03	2.02E-03	2.52E-03
8	1.75E-04	4.18E-04	6.66E-04	1.78E-03	2.08E-03
9	2.39E-04	4.31E-04	6.66E-04	1.44E-03	1.66E-03
10	3.64E-04	1.19E-03	1.34E-03	2.10E-03	2.41E-03
11	4.18E-04	1.38E-03	1.70E-03	2.38E-03	2.73E-03
12	4.89E-04	1.59E-03	1.92E-03	2.52E-03	2.63E-03
13	6.66E-04	1.82E-03	2.03E-03	2.65E-03	2.75E-03
14	8.76E-04	1.78E-03	1.99E-03	2.65E-03	2.96E-03
15	6.66E-04	1.41E-03	1.66E-03	2.20E-03	2.51E-03
16	6.66E-04	1.37E-03	1.59E-03	2.03E-03	2.29E-03

Table 5c. Acute χ/Q (s/m^3)Values for 300 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	1.96E-04	6.28E-04	7.88E-04	1.11E-03	1.26E-03
2	1.73E-04	6.05E-04	7.21E-04	1.10E-03	1.29E-03
3	9.67E-05	5.65E-04	6.40E-04	1.08E-03	1.17E-03
4	8.36E-05	2.18E-04	6.20E-04	1.22E-03	1.33E-03
5	7.59E-05	2.79E-04	7.20E-04	1.23E-03	1.36E-03
6	7.00E-05	2.39E-04	6.10E-04	1.08E-03	1.33E-03
7	6.46E-05	2.18E-04	5.91E-04	1.02E-03	1.26E-03
8	7.85E-05	2.04E-04	3.34E-04	8.92E-04	1.05E-03
9	1.16E-04	2.12E-04	3.34E-04	7.26E-04	8.33E-04
10	1.78E-04	5.95E-04	6.74E-04	1.05E-03	1.21E-03
11	2.06E-04	6.95E-04	8.53E-04	1.19E-03	1.37E-03
12	2.40E-04	8.00E-04	9.66E-04	1.26E-03	1.32E-03
13	3.34E-04	9.13E-04	1.02E-03	1.33E-03	1.38E-03
14	4.40E-04	8.92E-04	1.00E-03	1.33E-03	1.49E-03
15	3.34E-04	7.09E-04	8.34E-04	1.10E-03	1.26E-03
16	3.34E-04	6.90E-04	8.00E-04	1.02E-03	1.15E-03

Table 5d. Acute χ/Q (s/m^3) Values for 400 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	1.20E-04	3.87E-04	4.85E-04	6.82E-04	7.77E-04
2	1.05E-04	3.72E-04	4.44E-04	6.74E-04	7.92E-04
3	5.24E-05	3.49E-04	3.94E-04	6.67E-04	7.19E-04
4	4.10E-05	1.30E-04	3.82E-04	7.51E-04	8.17E-04
5	3.84E-05	1.65E-04	4.44E-04	7.60E-04	8.40E-04
6	3.60E-05	1.46E-04	3.75E-04	6.68E-04	8.21E-04
7	3.30E-05	1.32E-04	3.64E-04	6.26E-04	7.79E-04
8	4.37E-05	1.24E-04	2.07E-04	5.49E-04	6.45E-04
9	7.05E-05	1.29E-04	2.07E-04	4.47E-04	5.13E-04
10	1.09E-04	3.67E-04	4.15E-04	6.49E-04	7.44E-04
11	1.25E-04	4.28E-04	5.26E-04	7.35E-04	8.45E-04
12	1.47E-04	4.93E-04	5.95E-04	7.78E-04	8.14E-04
13	2.07E-04	5.62E-04	6.26E-04	8.18E-04	8.49E-04
14	2.72E-04	5.49E-04	6.16E-04	8.19E-04	9.16E-04
15	2.07E-04	4.36E-04	5.14E-04	6.80E-04	7.76E-04
16	2.07E-04	4.25E-04	4.93E-04	6.26E-04	7.07E-04

Table 5e. Acute χ/Q (s/m^3) Values for 500 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	8.18E-05	2.66E-04	3.34E-04	4.69E-04	5.34E-04
2	7.20E-05	2.56E-04	3.05E-04	4.64E-04	5.45E-04
3	3.29E-05	2.41E-04	2.71E-04	4.59E-04	4.94E-04
4	2.38E-05	8.69E-05	2.63E-04	5.17E-04	5.62E-04
5	2.19E-05	1.10E-04	3.05E-04	5.23E-04	5.78E-04
6	2.06E-05	9.97E-05	2.58E-04	4.59E-04	5.65E-04
7	1.82E-05	9.03E-05	2.50E-04	4.30E-04	5.35E-04
8	2.75E-05	8.46E-05	1.43E-04	3.78E-04	4.43E-04
9	4.78E-05	8.85E-05	1.43E-04	3.07E-04	3.53E-04
10	7.44E-05	2.52E-04	2.86E-04	4.47E-04	5.12E-04
11	8.58E-05	2.94E-04	3.61E-04	5.05E-04	5.81E-04
12	1.00E-04	3.39E-04	4.09E-04	5.35E-04	5.60E-04
13	1.43E-04	3.87E-04	4.31E-04	5.63E-04	5.84E-04
14	1.88E-04	3.78E-04	4.23E-04	5.63E-04	6.30E-04
15	1.43E-04	3.00E-04	3.53E-04	4.68E-04	5.34E-04
16	1.43E-04	2.92E-04	3.39E-04	4.31E-04	4.86E-04

Table 5f. Acute χ/Q (s/m^3) Values for 750 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	4.13E-05	1.35E-04	1.70E-04	2.38E-04	2.71E-04
2	3.63E-05	1.30E-04	1.55E-04	2.36E-04	2.77E-04
3	1.49E-05	1.23E-04	1.38E-04	2.33E-04	2.51E-04
4	8.38E-06	4.32E-05	1.33E-04	2.62E-04	2.85E-04
5	7.42E-06	5.28E-05	1.55E-04	2.65E-04	2.94E-04
6	6.77E-06	4.95E-05	1.31E-04	2.33E-04	2.87E-04
7	6.00E-06	4.54E-05	1.27E-04	2.19E-04	2.72E-04
8	1.20E-05	4.26E-05	7.35E-05	1.92E-04	2.25E-04
9	2.39E-05	4.46E-05	7.35E-05	1.56E-04	1.79E-04
10	3.76E-05	1.28E-04	1.45E-04	2.27E-04	2.60E-04
11	4.33E-05	1.49E-04	1.84E-04	2.57E-04	2.95E-04
12	5.06E-05	1.72E-04	2.08E-04	2.72E-04	2.84E-04
13	7.35E-05	1.96E-04	2.19E-04	2.86E-04	2.97E-04
14	9.67E-05	1.92E-04	2.15E-04	2.86E-04	3.20E-04
15	7.35E-05	1.52E-04	1.80E-04	2.38E-04	2.71E-04
16	7.35E-05	1.49E-04	1.72E-04	2.19E-04	2.47E-04

Table 5g. Acute χ/Q (s/m^3) Values for 1,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	2.65E-05	9.51E-05	1.22E-04	1.71E-04	1.95E-04
2	2.25E-05	9.25E-05	1.11E-04	1.69E-04	1.99E-04
3	8.76E-06	8.81E-05	9.86E-05	1.67E-04	1.80E-04
4	3.75E-06	2.81E-05	9.42E-05	1.88E-04	2.05E-04
5	3.32E-06	3.36E-05	1.11E-04	1.91E-04	2.11E-04
6	3.03E-06	3.31E-05	9.36E-05	1.67E-04	2.06E-04
7	2.69E-06	2.96E-05	9.08E-05	1.57E-04	1.95E-04
8	6.74E-06	2.75E-05	5.17E-05	1.38E-04	1.62E-04
9	1.46E-05	2.92E-05	4.91E-05	1.12E-04	1.29E-04
10	2.33E-05	9.13E-05	1.04E-04	1.63E-04	1.87E-04
11	2.81E-05	1.07E-04	1.32E-04	1.84E-04	2.12E-04
12	3.40E-05	1.24E-04	1.49E-04	1.95E-04	2.04E-04
13	5.22E-05	1.41E-04	1.57E-04	2.05E-04	2.13E-04
14	6.90E-05	1.38E-04	1.54E-04	2.05E-04	2.30E-04
15	5.07E-05	1.09E-04	1.29E-04	1.71E-04	1.95E-04
16	5.03E-05	1.07E-04	1.24E-04	1.57E-04	1.77E-04

Table 5h. Acute χ/Q (s/m^3) Values for 2,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	9.57E-06	4.65E-05	6.07E-05	8.53E-05	9.72E-05
2	7.48E-06	4.43E-05	5.55E-05	8.43E-05	9.91E-05
3	2.41E-06	4.18E-05	4.92E-05	8.34E-05	8.99E-05
4	4.61E-07	1.04E-05	4.52E-05	9.39E-05	1.02E-04
5	4.08E-07	1.29E-05	5.55E-05	9.50E-05	1.05E-04
6	3.72E-07	1.33E-05	4.50E-05	8.35E-05	1.03E-04
7	3.30E-07	1.10E-05	4.38E-05	7.83E-05	9.74E-05
8	1.70E-06	9.96E-06	2.33E-05	6.87E-05	8.06E-05
9	4.78E-06	1.10E-05	1.92E-05	5.58E-05	6.38E-05
10	7.92E-06	4.40E-05	5.19E-05	8.12E-05	9.30E-05
11	1.04E-05	5.35E-05	6.57E-05	9.19E-05	1.06E-04
12	1.38E-05	6.16E-05	7.44E-05	9.73E-05	1.02E-04
13	2.42E-05	7.03E-05	7.83E-05	1.02E-04	1.06E-04
14	3.24E-05	6.87E-05	7.70E-05	1.02E-04	1.15E-04
15	2.15E-05	5.46E-05	6.43E-05	8.51E-05	9.71E-05
16	2.09E-05	5.32E-05	6.16E-05	7.83E-05	8.84E-05

Table 5i. Acute χ/Q (s/m^3) Values for 3,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	5.30E-06	3.15E-05	4.11E-05	5.77E-05	6.57E-05
2	3.98E-06	2.95E-05	3.76E-05	5.71E-05	6.70E-05
3	1.15E-06	2.67E-05	3.33E-05	5.65E-05	6.08E-05
4	1.36E-07	5.79E-06	3.06E-05	6.35E-05	6.91E-05
5	1.21E-07	7.41E-06	3.75E-05	6.43E-05	7.11E-05
6	1.10E-07	7.69E-06	3.04E-05	5.65E-05	6.95E-05
7	9.77E-08	6.16E-06	2.85E-05	5.29E-05	6.59E-05
8	7.58E-07	5.52E-06	1.46E-05	4.65E-05	5.46E-05
9	2.54E-06	6.23E-06	1.12E-05	3.77E-05	4.32E-05
10	4.28E-06	2.89E-05	3.51E-05	5.49E-05	6.29E-05
11	5.81E-06	3.62E-05	4.45E-05	6.22E-05	7.15E-05
12	8.04E-06	4.17E-05	5.04E-05	6.59E-05	6.88E-05
13	1.53E-05	4.76E-05	5.30E-05	6.92E-05	7.19E-05
14	2.08E-05	4.65E-05	5.21E-05	6.93E-05	7.75E-05
15	1.31E-05	3.69E-05	4.35E-05	5.76E-05	6.57E-05
16	1.26E-05	3.60E-05	4.17E-05	5.30E-05	5.98E-05

Table 5j. Acute χ/Q (s/m^3) Values for 4,000 meters from Source

	Percentiles				
	50%	90%	95%	99%	99.5%
WIND SECTOR	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	3.48E-06	2.38E-05	3.10E-05	4.36E-05	4.96E-05
2	2.58E-06	2.20E-05	2.84E-05	4.31E-05	5.06E-05
3	6.78E-07	1.94E-05	2.51E-05	4.26E-05	4.59E-05
4	5.75E-08	3.83E-06	2.31E-05	4.80E-05	5.22E-05
5	5.10E-08	4.98E-06	2.83E-05	4.85E-05	5.37E-05
6	4.65E-08	5.19E-06	2.28E-05	4.26E-05	5.24E-05
7	4.12E-08	4.09E-06	2.10E-05	4.00E-05	4.97E-05
8	4.27E-07	3.63E-06	1.04E-05	3.51E-05	4.12E-05
9	1.64E-06	4.14E-06	7.66E-06	2.85E-05	3.26E-05
10	2.78E-06	2.13E-05	2.65E-05	4.15E-05	4.75E-05
11	3.84E-06	2.73E-05	3.36E-05	4.69E-05	5.40E-05
12	5.44E-06	3.15E-05	3.80E-05	4.97E-05	5.20E-05
13	1.10E-05	3.59E-05	4.00E-05	5.23E-05	5.42E-05
14	1.51E-05	3.51E-05	3.93E-05	5.23E-05	5.85E-05
15	9.16E-06	2.79E-05	3.28E-05	4.35E-05	4.96E-05
16	8.74E-06	2.72E-05	3.15E-05	4.00E-05	4.52E-05

Table 5k. Acute χ/Q (s/m^3) Values for 5,000 meters from Source

	Percentiles				
	50%	90%	95%	99%	99.5%
WIND SECTOR	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	2.52E-06	1.90E-05	2.48E-05	3.49E-05	3.97E-05
2	1.84E-06	1.74E-05	2.27E-05	3.45E-05	4.05E-05
3	4.49E-07	1.51E-05	2.01E-05	3.41E-05	3.68E-05
4	2.95E-08	2.78E-06	1.85E-05	3.84E-05	4.18E-05
5	2.61E-08	3.65E-06	2.27E-05	3.89E-05	4.30E-05
6	2.38E-08	3.81E-06	1.83E-05	3.42E-05	4.20E-05
7	2.11E-08	2.98E-06	1.65E-05	3.20E-05	3.98E-05
8	2.73E-07	2.63E-06	8.02E-06	2.81E-05	3.27E-05
9	1.17E-06	3.01E-06	5.72E-06	2.28E-05	2.61E-05
10	1.99E-06	1.68E-05	2.12E-05	3.32E-05	3.81E-05
11	2.79E-06	2.19E-05	2.69E-05	3.76E-05	4.32E-05
12	4.00E-06	2.52E-05	3.04E-05	3.98E-05	4.16E-05
13	8.53E-06	2.88E-05	3.20E-05	4.18E-05	4.34E-05
14	1.17E-05	2.81E-05	3.15E-05	4.19E-05	4.68E-05
15	6.94E-06	2.23E-05	2.63E-05	3.48E-05	3.97E-05
16	6.59E-06	2.17E-05	2.52E-05	3.20E-05	3.62E-05

Table 5l. Acute χ/Q (s/m^3) Values for 7,500 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	1.40E-06	1.26E-05	1.64E-05	2.31E-05	2.63E-05
2	1.00E-06	1.13E-05	1.50E-05	2.28E-05	2.68E-05
3	2.15E-07	9.47E-06	1.33E-05	2.26E-05	2.43E-05
4	8.73E-09	1.55E-06	1.22E-05	2.54E-05	2.76E-05
5	7.74E-09	2.07E-06	1.50E-05	2.57E-05	2.84E-05
6	7.06E-09	2.16E-06	1.21E-05	2.26E-05	2.78E-05
7	6.26E-09	1.67E-06	1.05E-05	2.12E-05	2.63E-05
8	1.22E-07	1.46E-06	4.93E-06	1.85E-05	2.16E-05
9	6.39E-07	1.69E-06	3.35E-06	1.51E-05	1.73E-05
10	1.10E-06	1.08E-05	1.40E-05	2.20E-05	2.52E-05
11	1.56E-06	1.45E-05	1.78E-05	2.49E-05	2.86E-05
12	2.28E-06	1.67E-05	2.01E-05	2.63E-05	2.75E-05
13	5.27E-06	1.90E-05	2.12E-05	2.77E-05	2.87E-05
14	7.31E-06	1.86E-05	2.08E-05	2.77E-05	3.10E-05
15	4.18E-06	1.48E-05	1.74E-05	2.30E-05	2.63E-05
16	3.95E-06	1.44E-05	1.67E-05	2.12E-05	2.39E-05

Table 5m. Acute χ/Q (s/m^3) Values for 10,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	9.22E-07	9.30E-06	1.21E-05	1.71E-05	1.94E-05
2	6.53E-07	8.28E-06	1.11E-05	1.69E-05	1.98E-05
3	1.26E-07	6.77E-06	9.83E-06	1.67E-05	1.80E-05
4	3.69E-09	1.02E-06	9.03E-06	1.88E-05	2.04E-05
5	3.27E-09	1.38E-06	1.11E-05	1.90E-05	2.10E-05
6	2.98E-09	1.45E-06	8.93E-06	1.67E-05	2.05E-05
7	2.64E-09	1.10E-06	7.65E-06	1.56E-05	1.95E-05
8	6.84E-08	9.67E-07	3.48E-06	1.34E-05	1.60E-05
9	4.17E-07	1.12E-06	2.30E-06	1.12E-05	1.28E-05
10	7.18E-07	7.87E-06	1.04E-05	1.62E-05	1.86E-05
11	1.03E-06	1.07E-05	1.31E-05	1.84E-05	2.11E-05
12	1.53E-06	1.23E-05	1.49E-05	1.95E-05	2.03E-05
13	3.73E-06	1.41E-05	1.57E-05	2.05E-05	2.12E-05
14	5.21E-06	1.37E-05	1.54E-05	2.05E-05	2.29E-05
15	2.92E-06	1.09E-05	1.28E-05	1.70E-05	1.94E-05
16	2.74E-06	1.06E-05	1.23E-05	1.57E-05	1.77E-05

Table 5n. Acute χ/Q (s/m^3) Values for 20,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	3.39E-07	4.39E-06	5.72E-06	8.05E-06	9.16E-06
2	2.37E-07	3.84E-06	5.23E-06	7.95E-06	9.34E-06
3	3.27E-08	2.98E-06	4.64E-06	7.87E-06	8.47E-06
4	4.62E-10	3.78E-07	4.26E-06	8.86E-06	9.63E-06
5	4.09E-10	5.17E-07	5.23E-06	8.96E-06	9.91E-06
6	3.73E-10	5.42E-07	4.21E-06	7.87E-06	9.68E-06
7	3.31E-10	4.09E-07	3.48E-06	7.38E-06	9.18E-06
8	1.71E-08	3.56E-07	1.48E-06	6.33E-06	7.55E-06
9	1.52E-07	4.15E-07	9.21E-07	5.26E-06	6.02E-06
10	2.62E-07	3.61E-06	4.90E-06	7.66E-06	8.77E-06
11	3.80E-07	5.04E-06	6.20E-06	8.66E-06	9.97E-06
12	5.74E-07	5.81E-06	7.02E-06	9.18E-06	9.59E-06
13	1.61E-06	6.63E-06	7.39E-06	9.65E-06	1.00E-05
14	2.26E-06	6.48E-06	7.26E-06	9.66E-06	1.08E-05
15	1.22E-06	5.15E-06	6.06E-06	8.02E-06	9.16E-06
16	1.14E-06	5.01E-06	5.81E-06	7.39E-06	8.34E-06

Table 5o. Acute χ/Q (s/m^3) Values for 25,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	2.46E-07	3.42E-06	4.47E-06	6.28E-06	7.15E-06
2	1.72E-07	2.98E-06	4.08E-06	6.21E-06	7.29E-06
3	2.09E-08	2.28E-06	3.62E-06	6.14E-06	6.61E-06
4	2.37E-10	2.75E-07	3.32E-06	6.91E-06	7.52E-06
5	2.10E-10	3.76E-07	4.08E-06	6.99E-06	7.73E-06
6	1.91E-10	3.95E-07	3.29E-06	6.15E-06	7.56E-06
7	1.69E-10	2.97E-07	2.70E-06	5.76E-06	7.17E-06
8	1.09E-08	2.58E-07	1.12E-06	4.94E-06	5.89E-06
9	1.10E-07	3.01E-07	6.92E-07	4.11E-06	4.70E-06
10	1.89E-07	2.79E-06	3.82E-06	5.98E-06	6.85E-06
11	2.76E-07	3.94E-06	4.84E-06	6.76E-06	7.78E-06
12	4.18E-07	4.53E-06	5.48E-06	7.16E-06	7.49E-06
13	1.22E-06	5.18E-06	5.77E-06	7.53E-06	7.82E-06
14	1.72E-06	5.06E-06	5.67E-06	7.54E-06	8.43E-06
15	9.20E-07	4.02E-06	4.73E-06	6.26E-06	7.15E-06
16	8.59E-07	3.91E-06	4.53E-06	5.77E-06	6.51E-06

Table 5p. Acute χ/Q (s/m^3) Values for 50,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	9.08E-08	1.57E-06	2.05E-06	2.88E-06	3.28E-06
2	6.31E-08	1.35E-06	1.87E-06	2.84E-06	3.34E-06
3	5.23E-09	9.91E-07	1.66E-06	2.81E-06	3.03E-06
4	2.96E-11	1.02E-07	1.52E-06	3.17E-06	3.44E-06
5	2.63E-11	1.40E-07	1.87E-06	3.20E-06	3.54E-06
6	2.39E-11	1.47E-07	1.51E-06	2.82E-06	3.46E-06
7	2.12E-11	1.10E-07	1.21E-06	2.64E-06	3.28E-06
8	2.73E-09	9.55E-08	4.74E-07	2.26E-06	2.70E-06
9	4.03E-08	1.12E-07	2.86E-07	1.88E-06	2.15E-06
10	6.96E-08	1.26E-06	1.75E-06	2.74E-06	3.14E-06
11	1.02E-07	1.80E-06	2.22E-06	3.10E-06	3.56E-06
12	1.56E-07	2.08E-06	2.51E-06	3.28E-06	3.43E-06
13	5.17E-07	2.37E-06	2.64E-06	3.45E-06	3.58E-06
14	7.32E-07	2.32E-06	2.60E-06	3.45E-06	3.86E-06
15	3.84E-07	1.84E-06	2.17E-06	2.87E-06	3.27E-06
16	3.58E-07	1.79E-06	2.08E-06	2.64E-06	2.98E-06

Table 5q. Acute χ/Q (s/m^3) Values for 75,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	5.08E-08	9.89E-07	1.29E-06	1.81E-06	2.06E-06
2	3.52E-08	8.50E-07	1.18E-06	1.79E-06	2.11E-06
3	2.32E-09	6.08E-07	1.05E-06	1.77E-06	1.91E-06
4	8.79E-12	5.69E-08	9.60E-07	2.00E-06	2.17E-06
5	7.79E-12	7.85E-08	1.18E-06	2.02E-06	2.23E-06
6	7.10E-12	8.26E-08	9.49E-07	1.77E-06	2.18E-06
7	6.30E-12	6.16E-08	7.59E-07	1.66E-06	2.07E-06
8	1.21E-09	5.34E-08	2.86E-07	1.43E-06	1.70E-06
9	2.25E-08	6.25E-08	1.71E-07	1.19E-06	1.36E-06
10	3.89E-08	7.90E-07	1.10E-06	1.73E-06	1.98E-06
11	5.71E-08	1.14E-06	1.40E-06	1.95E-06	2.25E-06
12	8.77E-08	1.31E-06	1.58E-06	2.07E-06	2.16E-06
13	3.12E-07	1.49E-06	1.67E-06	2.17E-06	2.26E-06
14	4.43E-07	1.46E-06	1.64E-06	2.18E-06	2.43E-06
15	2.31E-07	1.16E-06	1.37E-06	1.81E-06	2.06E-06
16	2.15E-07	1.13E-06	1.31E-06	1.67E-06	1.88E-06

Table 5r. Acute χ/Q (s/m^3) Values for 100,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	3.36E-08	7.12E-07	9.29E-07	1.31E-06	1.49E-06
2	2.33E-08	6.11E-07	8.49E-07	1.29E-06	1.52E-06
3	1.31E-09	4.30E-07	7.53E-07	1.28E-06	1.38E-06
4	3.71E-12	3.77E-08	6.91E-07	1.44E-06	1.56E-06
5	3.29E-12	5.21E-08	8.49E-07	1.45E-06	1.61E-06
6	3.00E-12	5.48E-08	6.83E-07	1.28E-06	1.57E-06
7	2.66E-12	4.09E-08	5.45E-07	1.20E-06	1.49E-06
8	6.83E-10	3.54E-08	2.00E-07	1.03E-06	1.22E-06
9	1.49E-08	4.14E-08	1.19E-07	8.54E-07	9.76E-07
10	2.57E-08	5.67E-07	7.95E-07	1.24E-06	1.42E-06
11	3.78E-08	8.19E-07	1.01E-06	1.41E-06	1.62E-06
12	5.82E-08	9.43E-07	1.14E-06	1.49E-06	1.56E-06
13	2.19E-07	1.08E-06	1.20E-06	1.57E-06	1.63E-06
14	3.10E-07	1.05E-06	1.18E-06	1.57E-06	1.75E-06
15	1.61E-07	8.35E-07	9.83E-07	1.30E-06	1.49E-06
16	1.50E-07	8.14E-07	9.43E-07	1.20E-06	1.35E-06

Table 5s. Acute χ/Q (s/m^3) Values for 150,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	1.88E-08	4.48E-07	5.85E-07	8.22E-07	9.36E-07
2	1.30E-08	3.83E-07	5.34E-07	8.12E-07	9.54E-07
3	5.80E-10	2.64E-07	4.74E-07	8.04E-07	8.66E-07
4	1.10E-12	2.11E-08	4.35E-07	9.05E-07	9.83E-07
5	9.75E-13	2.92E-08	5.34E-07	9.15E-07	1.01E-06
6	8.90E-13	3.07E-08	4.30E-07	8.04E-07	9.89E-07
7	7.89E-13	2.29E-08	3.42E-07	7.54E-07	9.38E-07
8	3.04E-10	1.98E-08	1.21E-07	6.47E-07	7.71E-07
9	8.33E-09	2.32E-08	7.18E-08	5.37E-07	6.14E-07
10	1.44E-08	3.56E-07	5.00E-07	7.82E-07	8.96E-07
11	2.12E-08	5.15E-07	6.33E-07	8.85E-07	1.02E-06
12	3.27E-08	5.93E-07	7.17E-07	9.37E-07	9.80E-07
13	1.32E-07	6.77E-07	7.55E-07	9.85E-07	1.02E-06
14	1.88E-07	6.62E-07	7.42E-07	9.87E-07	1.10E-06
15	9.71E-08	5.26E-07	6.19E-07	8.20E-07	9.35E-07
16	9.02E-08	5.12E-07	5.93E-07	7.55E-07	8.52E-07

Table 5t. Acute χ/Q (s/m^3) Values for 200,000 meters from Source

WIND SECTOR	Percentiles				
	50%	90%	95%	99%	99.5%
	Percent Exceeded				
	50%	10%	5%	1%	0.50%
1	1.25E-08	3.23E-07	4.21E-07	5.92E-07	6.74E-07
2	8.64E-09	2.76E-07	3.85E-07	5.85E-07	6.87E-07
3	3.26E-10	1.87E-07	3.41E-07	5.79E-07	6.23E-07
4	4.65E-13	1.40E-08	3.13E-07	6.51E-07	7.08E-07
5	4.12E-13	1.94E-08	3.85E-07	6.59E-07	7.29E-07
6	3.76E-13	2.04E-08	3.10E-07	5.79E-07	7.12E-07
7	3.33E-13	1.52E-08	2.45E-07	5.43E-07	6.75E-07
8	1.71E-10	1.31E-08	8.45E-08	4.66E-07	5.55E-07
9	5.52E-09	1.54E-08	5.00E-08	3.87E-07	4.42E-07
10	9.55E-09	2.56E-07	3.60E-07	5.63E-07	6.45E-07
11	1.41E-08	3.71E-07	4.56E-07	6.37E-07	7.33E-07
12	2.17E-08	4.27E-07	5.16E-07	6.75E-07	7.06E-07
13	9.25E-08	4.88E-07	5.43E-07	7.09E-07	7.36E-07
14	1.31E-07	4.76E-07	5.34E-07	7.10E-07	7.94E-07
15	6.78E-08	3.78E-07	4.46E-07	5.90E-07	6.73E-07
16	6.30E-08	3.69E-07	4.27E-07	5.43E-07	6.13E-07

6.2 Chronic Exposure Dispersion Estimate (χ/Q) Calculations

The chronic dispersion estimate (χ/Q) calculations are presented. Tables 6a through 6d show the chronic χ/Q values for the 16 cardinal wind directions at the twenty distances. The χ/Q values are listed in seconds per cubic meter (s/m^3).

Table 6a. Chronic χ/Q (s/m^3) Values at 100, 200, 300, 400, and 500 meters from Source

Wind Sector	χ/Q (seconds / meter^3)				
	100 m	200 m	300 m	400 m	500 m
1	1.4958E-04	4.0932E-05	1.9434E-05	1.1517E-05	7.6993E-06
2	6.0372E-05	1.6406E-05	7.6672E-06	4.4881E-06	2.9729E-06
3	3.0675E-05	8.2138E-06	3.6626E-06	2.0623E-06	1.3265E-06
4	2.2955E-05	6.0543E-06	2.5736E-06	1.3889E-06	8.6357E-07
5	2.1937E-05	5.7896E-06	2.4616E-06	1.3294E-06	8.2745E-07
6	2.4919E-05	6.5705E-06	2.8053E-06	1.5212E-06	9.5010E-07
7	3.8954E-05	1.0275E-05	4.3903E-06	2.3807E-06	1.4860E-06
8	7.5017E-05	1.9968E-05	8.8760E-06	4.9815E-06	3.1932E-06
9	1.5891E-04	4.2491E-05	1.9712E-05	1.1475E-05	7.5657E-06
10	9.5652E-05	2.6040E-05	1.2276E-05	7.2346E-06	4.8154E-06
11	8.1655E-05	2.2403E-05	1.0631E-05	6.2948E-06	4.2039E-06
12	8.2095E-05	2.2654E-05	1.0794E-05	6.4104E-06	4.2909E-06
13	8.9893E-05	2.4984E-05	1.1953E-05	7.1171E-06	4.7721E-06
14	1.4624E-04	4.0688E-05	1.9515E-05	1.1641E-05	7.8159E-06
15	4.2852E-04	1.1863E-04	5.6973E-05	3.4045E-05	2.2895E-05
16	4.7658E-04	1.3195E-04	6.3265E-05	3.7751E-05	2.5356E-05
Maximum Sector	16	16	16	16	16

Table 6b. Chronic χ/Q (s/m^3) Values at 750, 1,000, 2,000, 3,000, and 4,000 meters from Source

Wind Sector	χ/Q (seconds / meter^3)				
	750 m	1,000 m	2,000 m	3,000 m	4,000 m
1	3.7264E-06	2.2358E-06	6.9068E-07	3.6423E-07	2.3454E-07
2	1.4183E-06	8.4381E-07	2.5610E-07	1.3391E-07	8.5776E-08
3	6.0358E-07	3.4935E-07	1.0049E-07	5.1622E-08	3.2793E-08
4	3.7103E-07	2.0743E-07	5.5763E-08	2.8128E-08	1.7754E-08
5	3.5667E-07	2.0006E-07	5.4361E-08	2.7680E-08	1.7593E-08
6	4.1205E-07	2.3202E-07	6.3525E-08	3.2310E-08	2.0486E-08
7	6.4250E-07	3.6052E-07	9.7333E-08	4.8916E-08	3.0748E-08
8	1.4411E-06	8.2823E-07	2.3269E-07	1.1675E-07	7.2814E-08
9	3.5758E-06	2.1125E-06	6.2684E-07	3.1882E-07	1.9963E-07
10	2.3136E-06	1.3817E-06	4.2103E-07	2.1981E-07	1.4055E-07
11	2.0305E-06	1.2163E-06	3.7329E-07	1.9634E-07	1.2628E-07
12	2.0807E-06	1.2497E-06	3.8622E-07	2.0460E-07	1.3232E-07
13	2.3196E-06	1.3948E-06	4.3264E-07	2.3046E-07	1.4973E-07
14	3.8062E-06	2.2909E-06	7.1209E-07	3.7961E-07	2.4671E-07
15	1.1185E-05	6.7487E-06	2.1026E-06	1.1178E-06	7.2446E-07
16	1.2361E-05	7.4466E-06	2.3168E-06	1.2317E-06	7.9837E-07
Maximum Sector	16	16	16	16	16

Table 6c. Chronic χ/Q (s/m^3) Values at 5,000, 7,500, 10,000, 20,000, and 25,000 meters from Source

Wind Sector	χ/Q (seconds / meter^3)				
	5,000 m	7,500 m	10,000 m	20,000 m	25,000 m
1	1.6777E-07	9.2364E-08	6.0957E-08	2.2891E-08	1.6793E-08
2	6.1132E-08	3.3460E-08	2.2004E-08	8.2076E-09	6.0112E-09
3	2.3265E-08	1.2671E-08	8.3203E-09	3.1079E-09	2.2798E-09
4	1.2568E-08	6.8470E-09	4.5080E-09	1.7021E-09	1.2538E-09
5	1.2519E-08	6.8804E-09	4.5551E-09	1.7387E-09	1.2843E-09
6	1.4541E-08	7.9479E-09	5.2387E-09	1.9768E-09	1.4548E-09
7	2.1685E-08	1.1727E-08	7.6785E-09	2.8618E-09	2.0997E-09
8	5.0906E-08	2.6996E-08	1.7404E-08	6.2364E-09	4.5186E-09
9	1.3962E-07	7.3736E-08	4.7241E-08	1.6534E-08	1.1865E-08
10	1.0000E-07	5.4549E-08	3.5782E-08	1.3262E-08	9.6927E-09
11	9.0280E-08	4.9691E-08	3.2807E-08	1.2349E-08	9.0700E-09
12	9.5020E-08	5.2721E-08	3.5001E-08	1.3342E-08	9.8367E-09
13	1.0792E-07	6.0297E-08	4.0234E-08	1.5524E-08	1.1489E-08
14	1.7785E-07	9.9386E-08	6.6321E-08	2.5591E-08	1.8939E-08
15	5.2097E-07	2.8967E-07	1.9254E-07	7.3535E-08	5.4232E-08
16	5.7420E-07	3.1938E-07	2.1236E-07	8.1201E-08	5.9915E-08
Maximum Sector	16	16	16	16	16

Table 6d. Chronic χ/Q (s/m^3) Values at 50,000, 75,000, 100,000, 150,000, and 200,000 meters from Source

Wind Sector	χ/Q (seconds / meter^3)				
	50,000 m	75,000 m	100,000 m	150,000 m	200,000 m
1	6.5093E-09	3.7721E-09	2.5701E-09	1.5033E-09	1.0305E-09
2	2.3205E-09	1.3425E-09	9.1386E-10	5.3398E-10	3.6585E-10
3	8.8640E-10	5.1553E-10	3.5238E-10	2.0715E-10	1.4255E-10
4	4.9424E-10	2.8978E-10	1.9918E-10	1.1799E-10	8.1613E-11
5	5.0974E-10	2.9974E-10	2.0637E-10	1.2247E-10	8.4807E-11
6	5.7084E-10	3.3352E-10	2.2863E-10	1.3488E-10	9.3029E-11
7	8.1818E-10	4.7678E-10	3.2638E-10	1.9229E-10	1.3253E-10
8	1.6965E-09	9.6891E-10	6.5441E-10	3.7876E-10	2.5799E-10
9	4.3035E-09	2.4031E-09	1.5962E-09	9.0185E-10	6.0373E-10
10	3.7176E-09	2.1426E-09	1.4546E-09	8.4672E-10	5.7856E-10
11	3.5303E-09	2.0514E-09	1.4005E-09	8.2146E-10	5.6420E-10
12	3.8705E-09	2.2619E-09	1.5501E-09	9.1373E-10	6.2963E-10
13	4.5731E-09	2.6897E-09	1.8514E-09	1.0979E-09	7.5961E-10
14	7.5383E-09	4.4338E-09	3.0520E-09	1.8099E-09	1.2524E-09
15	2.1346E-08	1.2472E-08	8.5445E-09	5.0334E-09	3.4664E-09
16	2.3626E-08	1.3822E-08	9.4788E-09	5.5923E-09	3.8559E-09
Maximum Sector	16	16	16	16	16

7.0 REFERENCES

Allwine, K.J. and Bian, X. 1995. *PGEMS2.0 – An Atmospheric Dispersion Model for Routine Air Quality Assessments and Emergency Response Applications.* Battelle, Pacific Northwest Laboratories, Richland, Washington. pages 2.53 to 2.56. TIC: 242649.

CRWMS M&O. (Civilian Radioactive Waste Management System Management and Operating Contractor) 1999. *Software Routine Report for XQ145.* CSCI: 30072 V1.0. DI: 30072-2999, Revision 00. Las Vegas, Nevada. ACC: MOL.19990409.0123.

EPA(Environmental Protection Agency), 1987. *On-Site Meteorological Program Guidance For Regulatory Modeling Applications.* EPA-450/4-87-013. Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC. TIC: 210292.

U.S. NRC Regulatory Guide 1.111. July 1977. *Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors.* U.S. Nuclear Regulatory Commission Office of Nuclear Regulatory Research. Page 1.111-9. TIC: 222639.

U.S. NRC Regulatory Guide 1.145. November 1982. *Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants.* U.S. Nuclear Regulatory Commission Office of Nuclear Regulatory Research. TIC: 222640.

8.0 DATA TRACKING NUMBERS

	Year/Quarter	Data Tracking Number	Data Status
Wind Direction, Wind Speed	93Q1 & 93Q2	TM0000000000001.050	TBV 974
	93Q3	TM0000000000001.051	TBV 975
	93Q4	TM0000000000001.052	TBV 976
	94Q1	TM0000000000001.054	TBV 977
	94Q2	TM0000000000001.056	TBV 978
	94Q3	TM0000000000001.058	TBV 979
	94Q4	TM0000000000001.060	TBV 980
	95Q1	TM0000000000001.065	TBV 0
	95Q2	TM0000000000001.068	TBV 0
	95Q3	TM0000000000001.071	TBV 0
	95Q4	TM0000000000001.077	TBV 0
	96Q1	TM0000000000001.085	TBV 997
	96Q2	TM0000000000001.088	TBV 985
	96Q3	TM0000000000001.090	TBV 986
	96Q4	TM0000000000001.094	TBV 987
	97Q1	TM0000000000001.100	TBV 0
	97Q2	TM0000000000001.104	TBV 0
	97Q3	TM0000000000001.107	TBV 0
	97Q4	MO98METDATA110.000	TBV 0
Atmospheric Stability	1993-1997	MO9903SITE1MET.000	TBV 0

ATTACHMENT I

OUTPUT FILE FROM XQ145

I.1 OVERALL SITE ACUTE EXPOSURE χ/Q VALUES

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	100	8.1525E-03	ALL	43122
1	99	NRC	100	7.2282E-03	ALL	43122
1	95	NRC	100	5.1779E-03	ALL	43122
1	90	NRC	100	4.2156E-03	ALL	43122
1	50	NRC	100	1.3972E-03	ALL	43122
1	99.5	NRC	200	2.4566E-03	ALL	43122
1	99	NRC	200	2.1781E-03	ALL	43122
1	95	NRC	200	1.5603E-03	ALL	43122
1	90	NRC	200	1.2703E-03	ALL	43122
1	50	NRC	200	3.9396E-04	ALL	43122
1	99.5	NRC	300	1.2338E-03	ALL	43122
1	99	NRC	300	1.0939E-03	ALL	43122
1	95	NRC	300	7.8361E-04	ALL	43122
1	90	NRC	300	6.3797E-04	ALL	43122
1	50	NRC	300	1.9306E-04	ALL	43122
1	99.5	NRC	400	7.5978E-04	ALL	43122
1	99	NRC	400	6.7363E-04	ALL	43122
1	95	NRC	400	4.8256E-04	ALL	43122
1	90	NRC	400	3.9287E-04	ALL	43122
1	50	NRC	400	1.1776E-04	ALL	43122
1	99.5	NRC	500	5.2253E-04	ALL	43122
1	99	NRC	500	4.6328E-04	ALL	43122
1	95	NRC	500	3.3188E-04	ALL	43122
1	90	NRC	500	2.7019E-04	ALL	43122
1	50	NRC	500	8.0424E-05	ALL	43122
1	99.5	NRC	750	2.6546E-04	ALL	43122
1	99	NRC	750	2.3536E-04	ALL	43122
1	95	NRC	750	1.6860E-04	ALL	43122
1	90	NRC	750	1.3726E-04	ALL	43122
1	50	NRC	750	4.0544E-05	ALL	43122
1	99.5	NRC	1000	1.9056E-04	ALL	43122
1	99	NRC	1000	1.6883E-04	ALL	43122
1	95	NRC	1000	1.2103E-04	ALL	43122
1	90	NRC	1000	9.8369E-05	ALL	43122
1	50	NRC	1000	2.5883E-05	ALL	43122
1	99.5	NRC	2000	9.5014E-05	ALL	43122
1	99	NRC	2000	8.4179E-05	ALL	43122
1	95	NRC	2000	6.0347E-05	ALL	43122
1	90	NRC	2000	4.9017E-05	ALL	43122
1	50	NRC	2000	9.1951E-06	ALL	43122
1	99.5	NRC	3000	6.4283E-05	ALL	43122
1	99	NRC	3000	5.6952E-05	ALL	43122
1	95	NRC	3000	4.0828E-05	ALL	43122
1	90	NRC	3000	3.3108E-05	ALL	43122
1	50	NRC	3000	5.0443E-06	ALL	43122
1	99.5	NRC	4000	4.8529E-05	ALL	43122
1	99	NRC	4000	4.2994E-05	ALL	43122
1	95	NRC	4000	3.0822E-05	ALL	43122
1	90	NRC	4000	2.4982E-05	ALL	43122
1	50	NRC	4000	3.3082E-06	ALL	43122

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	5000	3.8866E-05	ALL	43122
1	99	NRC	5000	3.4420E-05	ALL	43122
1	95	NRC	5000	2.4685E-05	ALL	43122
1	90	NRC	5000	2.0007E-05	ALL	43122
1	50	NRC	5000	2.3872E-06	ALL	43122
1	99.5	NRC	7500	2.5693E-05	ALL	43122
1	99	NRC	7500	2.2754E-05	ALL	43122
1	95	NRC	7500	1.6319E-05	ALL	43122
1	90	NRC	7500	1.3219E-05	ALL	43122
1	50	NRC	7500	1.3218E-06	ALL	43122
1	99.5	NRC	10000	1.8998E-05	ALL	43122
1	99	NRC	10000	1.6824E-05	ALL	43122
1	95	NRC	10000	1.2066E-05	ALL	43122
1	90	NRC	10000	9.7743E-06	ALL	43122
1	50	NRC	10000	8.6973E-07	ALL	43122
1	99.5	NRC	20000	8.9588E-06	ALL	43122
1	99	NRC	20000	7.9339E-06	ALL	43122
1	95	NRC	20000	5.6900E-06	ALL	43122
1	90	NRC	20000	4.6093E-06	ALL	43122
1	50	NRC	20000	3.1897E-07	ALL	43122
1	99.5	NRC	25000	6.9931E-06	ALL	43122
1	99	NRC	25000	6.1931E-06	ALL	43122
1	95	NRC	25000	4.4415E-06	ALL	43122
1	90	NRC	25000	3.5958E-06	ALL	43122
1	50	NRC	25000	2.3119E-07	ALL	43122
1	99.5	NRC	50000	3.2035E-06	ALL	43122
1	99	NRC	50000	2.8370E-06	ALL	43122
1	95	NRC	50000	2.0347E-06	ALL	43122
1	90	NRC	50000	1.6464E-06	ALL	43122
1	50	NRC	50000	8.5309E-08	ALL	43122
1	99.5	NRC	75000	2.0195E-06	ALL	43122
1	99	NRC	75000	1.7885E-06	ALL	43122
1	95	NRC	75000	1.2827E-06	ALL	43122
1	90	NRC	75000	1.0379E-06	ALL	43122
1	50	NRC	75000	4.7693E-08	ALL	43122
1	99.5	NRC	100000	1.4543E-06	ALL	43122
1	99	NRC	100000	1.2879E-06	ALL	43122
1	95	NRC	100000	9.2368E-07	ALL	43122
1	90	NRC	100000	7.4743E-07	ALL	43122
1	50	NRC	100000	3.1589E-08	ALL	43122
1	99.5	NRC	150000	9.1511E-07	ALL	43122
1	99	NRC	150000	8.1043E-07	ALL	43122
1	95	NRC	150000	5.8122E-07	ALL	43122
1	90	NRC	150000	4.7032E-07	ALL	43122
1	50	NRC	150000	1.7689E-08	ALL	43122
1	99.5	NRC	200000	6.5882E-07	ALL	43122
1	99	NRC	200000	5.8345E-07	ALL	43122
1	95	NRC	200000	4.1844E-07	ALL	43122
1	90	NRC	200000	3.3859E-07	ALL	43122
1	50	NRC	200000	1.1719E-08	ALL	43122

I.2 ACUTE χ/Q SECTOR VALUES

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	100	8.3360E-03	1	3462
1	99	NRC	100	7.3218E-03	1	3462
1	95	NRC	100	5.2080E-03	1	3462
1	90	NRC	100	4.1475E-03	1	3462
1	50	NRC	100	1.4131E-03	1	3462
1	99.5	NRC	100	8.4991E-03	2	1618
1	99	NRC	100	7.2374E-03	2	1618
1	95	NRC	100	4.7657E-03	2	1618
1	90	NRC	100	3.9969E-03	2	1618
1	50	NRC	100	1.2514E-03	2	1618
1	99.5	NRC	100	7.7114E-03	3	927
1	99	NRC	100	7.1594E-03	3	927
1	95	NRC	100	4.2261E-03	3	927
1	90	NRC	100	3.7968E-03	3	927
1	50	NRC	100	8.3730E-04	3	927
1	99.5	NRC	100	8.7616E-03	4	705
1	99	NRC	100	8.0594E-03	4	705
1	95	NRC	100	4.0965E-03	4	705
1	90	NRC	100	1.6578E-03	4	705
1	50	NRC	100	7.7299E-04	4	705
1	99.5	NRC	100	9.0157E-03	5	639
1	99	NRC	100	8.1525E-03	5	639
1	95	NRC	100	4.7599E-03	5	639
1	90	NRC	100	2.0314E-03	5	639
1	50	NRC	100	7.1060E-04	5	639
1	99.5	NRC	100	8.8085E-03	6	786
1	99	NRC	100	7.1642E-03	6	786
1	95	NRC	100	4.0287E-03	6	786
1	90	NRC	100	1.7393E-03	6	786
1	50	NRC	100	6.4878E-04	6	786
1	99.5	NRC	100	8.3544E-03	7	1413
1	99	NRC	100	6.7152E-03	7	1413
1	95	NRC	100	3.9036E-03	7	1413
1	90	NRC	100	1.5800E-03	7	1413
1	50	NRC	100	5.7310E-04	7	1413
1	99.5	NRC	100	6.9189E-03	8	3303
1	99	NRC	100	5.8923E-03	8	3303
1	95	NRC	100	2.2709E-03	8	3303
1	90	NRC	100	1.4826E-03	8	3303
1	50	NRC	100	6.2607E-04	8	3303
1	99.5	NRC	100	5.5046E-03	9	7845
1	99	NRC	100	4.7946E-03	9	7845
1	95	NRC	100	2.2709E-03	9	7845
1	90	NRC	100	1.5300E-03	9	7845
1	50	NRC	100	8.4698E-04	9	7845
1	99.5	NRC	100	7.9827E-03	10	2633
1	99	NRC	100	6.9667E-03	10	2633
1	95	NRC	100	4.4554E-03	10	2633
1	90	NRC	100	3.9331E-03	10	2633
1	50	NRC	100	1.2939E-03	10	2633
1	99.5	NRC	100	9.0699E-03	11	1700

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99	NRC	100	7.8851E-03	11	1700
1	95	NRC	100	5.6390E-03	11	1700
1	90	NRC	100	4.5891E-03	11	1700
1	50	NRC	100	1.4811E-03	11	1700
1	99.5	NRC	100	8.7307E-03	12	1321
1	99	NRC	100	8.3515E-03	12	1321
1	95	NRC	100	6.3861E-03	12	1321
1	90	NRC	100	5.2851E-03	12	1321
1	50	NRC	100	1.7345E-03	12	1321
1	99.5	NRC	100	9.1124E-03	13	1112
1	99	NRC	100	8.7777E-03	13	1112
1	95	NRC	100	6.7223E-03	13	1112
1	90	NRC	100	6.0341E-03	13	1112
1	50	NRC	100	2.2709E-03	13	1112
1	99.5	NRC	100	9.8259E-03	14	1659
1	99	NRC	100	8.7909E-03	14	1659
1	95	NRC	100	6.6064E-03	14	1659
1	90	NRC	100	5.8949E-03	14	1659
1	50	NRC	100	3.0161E-03	14	1659
1	99.5	NRC	100	8.3312E-03	15	6368
1	99	NRC	100	7.3007E-03	15	6368
1	95	NRC	100	5.5132E-03	15	6368
1	90	NRC	100	4.6822E-03	15	6368
1	50	NRC	100	2.2709E-03	15	6368
1	99.5	NRC	100	7.5875E-03	16	7631
1	99	NRC	100	6.7223E-03	16	7631
1	95	NRC	100	5.2851E-03	16	7631
1	90	NRC	100	4.5615E-03	16	7631
1	50	NRC	100	2.2709E-03	16	7631
1	99.5	NRC	200	2.5119E-03	1	3462
1	99	NRC	200	2.2063E-03	1	3462
1	95	NRC	200	1.5694E-03	1	3462
1	90	NRC	200	1.2498E-03	1	3462
1	50	NRC	200	3.9844E-04	1	3462
1	99.5	NRC	200	2.5611E-03	2	1618
1	99	NRC	200	2.1809E-03	2	1618
1	95	NRC	200	1.4361E-03	2	1618
1	90	NRC	200	1.2044E-03	2	1618
1	50	NRC	200	3.5285E-04	2	1618
1	99.5	NRC	200	2.3237E-03	3	927
1	99	NRC	200	2.1574E-03	3	927
1	95	NRC	200	1.2735E-03	3	927
1	90	NRC	200	1.1258E-03	3	927
1	50	NRC	200	2.2812E-04	3	927
1	99.5	NRC	200	2.6402E-03	4	705
1	99	NRC	200	2.4286E-03	4	705
1	95	NRC	200	1.2344E-03	4	705
1	90	NRC	200	4.5637E-04	4	705
1	50	NRC	200	2.1021E-04	4	705
1	99.5	NRC	200	2.7168E-03	5	639
1	99	NRC	200	2.4566E-03	5	639
1	95	NRC	200	1.4343E-03	5	639
1	90	NRC	200	5.8128E-04	5	639

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	50	NRC	200	1.9269E-04	5	639
1	99.5	NRC	200	2.6543E-03	6	786
1	99	NRC	200	2.1588E-03	6	786
1	95	NRC	200	1.2140E-03	6	786
1	90	NRC	200	4.8544E-04	6	786
1	50	NRC	200	1.7356E-04	6	786
1	99.5	NRC	200	2.5175E-03	7	1413
1	99	NRC	200	2.0235E-03	7	1413
1	95	NRC	200	1.1763E-03	7	1413
1	90	NRC	200	4.4268E-04	7	1413
1	50	NRC	200	1.5643E-04	7	1413
1	99.5	NRC	200	2.0849E-03	8	3303
1	99	NRC	200	1.7755E-03	8	3303
1	95	NRC	200	6.6596E-04	8	3303
1	90	NRC	200	4.1805E-04	8	3303
1	50	NRC	200	1.7458E-04	8	3303
1	99.5	NRC	200	1.6587E-03	9	7845
1	99	NRC	200	1.4448E-03	9	7845
1	95	NRC	200	6.6596E-04	9	7845
1	90	NRC	200	4.3141E-04	9	7845
1	50	NRC	200	2.3882E-04	9	7845
1	99.5	NRC	200	2.4055E-03	10	2633
1	99	NRC	200	2.0993E-03	10	2633
1	95	NRC	200	1.3426E-03	10	2633
1	90	NRC	200	1.1852E-03	10	2633
1	50	NRC	200	3.6433E-04	10	2633
1	99.5	NRC	200	2.7331E-03	11	1700
1	99	NRC	200	2.3761E-03	11	1700
1	95	NRC	200	1.6992E-03	11	1700
1	90	NRC	200	1.3829E-03	11	1700
1	50	NRC	200	4.1763E-04	11	1700
1	99.5	NRC	200	2.6309E-03	12	1321
1	99	NRC	200	2.5166E-03	12	1321
1	95	NRC	200	1.9244E-03	12	1321
1	90	NRC	200	1.5926E-03	12	1321
1	50	NRC	200	4.8907E-04	12	1321
1	99.5	NRC	200	2.7459E-03	13	1112
1	99	NRC	200	2.6450E-03	13	1112
1	95	NRC	200	2.0257E-03	13	1112
1	90	NRC	200	1.8183E-03	13	1112
1	50	NRC	200	6.6596E-04	13	1112
1	99.5	NRC	200	2.9609E-03	14	1659
1	99	NRC	200	2.6490E-03	14	1659
1	95	NRC	200	1.9907E-03	14	1659
1	90	NRC	200	1.7763E-03	14	1659
1	50	NRC	200	8.7630E-04	14	1659
1	99.5	NRC	200	2.5105E-03	15	6368
1	99	NRC	200	2.2000E-03	15	6368
1	95	NRC	200	1.6613E-03	15	6368
1	90	NRC	200	1.4109E-03	15	6368
1	50	NRC	200	6.6596E-04	15	6368
1	99.5	NRC	200	2.2864E-03	16	7631
1	99	NRC	200	2.0257E-03	16	7631

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	95	NRC	200	1.5926E-03	16	7631
1	90	NRC	200	1.3745E-03	16	7631
1	50	NRC	200	6.6596E-04	16	7631
1	99.5	NRC	300	1.2615E-03	1	3462
1	99	NRC	300	1.1081E-03	1	3462
1	95	NRC	300	7.8817E-04	1	3462
1	90	NRC	300	6.2768E-04	1	3462
1	50	NRC	300	1.9608E-04	1	3462
1	99.5	NRC	300	1.2862E-03	2	1618
1	99	NRC	300	1.0953E-03	2	1618
1	95	NRC	300	7.2122E-04	2	1618
1	90	NRC	300	6.0488E-04	2	1618
1	50	NRC	300	1.7263E-04	2	1618
1	99.5	NRC	300	1.1670E-03	3	927
1	99	NRC	300	1.0835E-03	3	927
1	95	NRC	300	6.3956E-04	3	927
1	90	NRC	300	5.6532E-04	3	927
1	50	NRC	300	9.6738E-05	3	927
1	99.5	NRC	300	1.3259E-03	4	705
1	99	NRC	300	1.2197E-03	4	705
1	95	NRC	300	6.1996E-04	4	705
1	90	NRC	300	2.1817E-04	4	705
1	50	NRC	300	8.3630E-05	4	705
1	99.5	NRC	300	1.3644E-03	5	639
1	99	NRC	300	1.2338E-03	5	639
1	95	NRC	300	7.2034E-04	5	639
1	90	NRC	300	2.7857E-04	5	639
1	50	NRC	300	7.5855E-05	5	639
1	99.5	NRC	300	1.3330E-03	6	786
1	99	NRC	300	1.0842E-03	6	786
1	95	NRC	300	6.0968E-04	6	786
1	90	NRC	300	2.3890E-04	6	786
1	50	NRC	300	7.0027E-05	6	786
1	99.5	NRC	300	1.2643E-03	7	1413
1	99	NRC	300	1.0163E-03	7	1413
1	95	NRC	300	5.9076E-04	7	1413
1	90	NRC	300	2.1775E-04	7	1413
1	50	NRC	300	6.4605E-05	7	1413
1	99.5	NRC	300	1.0471E-03	8	3303
1	99	NRC	300	8.9171E-04	8	3303
1	95	NRC	300	3.3436E-04	8	3303
1	90	NRC	300	2.0354E-04	8	3303
1	50	NRC	300	7.8501E-05	8	3303
1	99.5	NRC	300	8.3304E-04	9	7845
1	99	NRC	300	7.2561E-04	9	7845
1	95	NRC	300	3.3436E-04	9	7845
1	90	NRC	300	2.1231E-04	9	7845
1	50	NRC	300	1.1644E-04	9	7845
1	99.5	NRC	300	1.2081E-03	10	2633
1	99	NRC	300	1.0543E-03	10	2633
1	95	NRC	300	6.7427E-04	10	2633
1	90	NRC	300	5.9522E-04	10	2633
1	50	NRC	300	1.7850E-04	10	2633

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	300	1.3726E-03	11	1700
1	99	NRC	300	1.1933E-03	11	1700
1	95	NRC	300	8.5339E-04	11	1700
1	90	NRC	300	6.9450E-04	11	1700
1	50	NRC	300	2.0552E-04	11	1700
1	99.5	NRC	300	1.3213E-03	12	1321
1	99	NRC	300	1.2639E-03	12	1321
1	95	NRC	300	9.6646E-04	12	1321
1	90	NRC	300	7.9983E-04	12	1321
1	50	NRC	300	2.4028E-04	12	1321
1	99.5	NRC	300	1.3790E-03	13	1112
1	99	NRC	300	1.3284E-03	13	1112
1	95	NRC	300	1.0173E-03	13	1112
1	90	NRC	300	9.1319E-04	13	1112
1	50	NRC	300	3.3436E-04	13	1112
1	99.5	NRC	300	1.4870E-03	14	1659
1	99	NRC	300	1.3304E-03	14	1659
1	95	NRC	300	9.9978E-04	14	1659
1	90	NRC	300	8.9211E-04	14	1659
1	50	NRC	300	4.3996E-04	14	1659
1	99.5	NRC	300	1.2608E-03	15	6368
1	99	NRC	300	1.1049E-03	15	6368
1	95	NRC	300	8.3435E-04	15	6368
1	90	NRC	300	7.0859E-04	15	6368
1	50	NRC	300	3.3436E-04	15	6368
1	99.5	NRC	300	1.1483E-03	16	7631
1	99	NRC	300	1.0173E-03	16	7631
1	95	NRC	300	7.9983E-04	16	7631
1	90	NRC	300	6.9033E-04	16	7631
1	50	NRC	300	3.3436E-04	16	7631
1	99.5	NRC	400	7.7688E-04	1	3462
1	99	NRC	400	6.8236E-04	1	3462
1	95	NRC	400	4.8537E-04	1	3462
1	90	NRC	400	3.8653E-04	1	3462
1	50	NRC	400	1.1961E-04	1	3462
1	99.5	NRC	400	7.9208E-04	2	1618
1	99	NRC	400	6.7450E-04	2	1618
1	95	NRC	400	4.4414E-04	2	1618
1	90	NRC	400	3.7249E-04	2	1618
1	50	NRC	400	1.0521E-04	2	1618
1	99.5	NRC	400	7.1867E-04	3	927
1	99	NRC	400	6.6723E-04	3	927
1	95	NRC	400	3.9385E-04	3	927
1	90	NRC	400	3.4897E-04	3	927
1	50	NRC	400	5.2360E-05	3	927
1	99.5	NRC	400	8.1654E-04	4	705
1	99	NRC	400	7.5110E-04	4	705
1	95	NRC	400	3.8178E-04	4	705
1	90	NRC	400	1.2978E-04	4	705
1	50	NRC	400	4.1036E-05	4	705
1	99.5	NRC	400	8.4023E-04	5	639
1	99	NRC	400	7.5978E-04	5	639
1	95	NRC	400	4.4360E-04	5	639

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	90	NRC	400	1.6531E-04	5	639
1	50	NRC	400	3.8449E-05	5	639
1	99.5	NRC	400	8.2091E-04	6	786
1	99	NRC	400	6.6767E-04	6	786
1	95	NRC	400	3.7545E-04	6	786
1	90	NRC	400	1.4572E-04	6	786
1	50	NRC	400	3.5970E-05	6	786
1	99.5	NRC	400	7.7859E-04	7	1413
1	99	NRC	400	6.2583E-04	7	1413
1	95	NRC	400	3.6380E-04	7	1413
1	90	NRC	400	1.3208E-04	7	1413
1	50	NRC	400	3.2956E-05	7	1413
1	99.5	NRC	400	6.4481E-04	8	3303
1	99	NRC	400	5.4913E-04	8	3303
1	95	NRC	400	2.0674E-04	8	3303
1	90	NRC	400	1.2386E-04	8	3303
1	50	NRC	400	4.3710E-05	8	3303
1	99.5	NRC	400	5.1300E-04	9	7845
1	99	NRC	400	4.4684E-04	9	7845
1	95	NRC	400	2.0674E-04	9	7845
1	90	NRC	400	1.2947E-04	9	7845
1	50	NRC	400	7.0483E-05	9	7845
1	99.5	NRC	400	7.4395E-04	10	2633
1	99	NRC	400	6.4927E-04	10	2633
1	95	NRC	400	4.1523E-04	10	2633
1	90	NRC	400	3.6655E-04	10	2633
1	50	NRC	400	1.0888E-04	10	2633
1	99.5	NRC	400	8.4528E-04	11	1700
1	99	NRC	400	7.3486E-04	11	1700
1	95	NRC	400	5.2553E-04	11	1700
1	90	NRC	400	4.2769E-04	11	1700
1	50	NRC	400	1.2537E-04	11	1700
1	99.5	NRC	400	8.1366E-04	12	1321
1	99	NRC	400	7.7833E-04	12	1321
1	95	NRC	400	5.9516E-04	12	1321
1	90	NRC	400	4.9255E-04	12	1321
1	50	NRC	400	1.4657E-04	12	1321
1	99.5	NRC	400	8.4924E-04	13	1112
1	99	NRC	400	8.1804E-04	13	1112
1	95	NRC	400	6.2648E-04	13	1112
1	90	NRC	400	5.6236E-04	13	1112
1	50	NRC	400	2.0674E-04	13	1112
1	99.5	NRC	400	9.1573E-04	14	1659
1	99	NRC	400	8.1927E-04	14	1659
1	95	NRC	400	6.1568E-04	14	1659
1	90	NRC	400	5.4938E-04	14	1659
1	50	NRC	400	2.7204E-04	14	1659
1	99.5	NRC	400	7.7644E-04	15	6368
1	99	NRC	400	6.8040E-04	15	6368
1	95	NRC	400	5.1381E-04	15	6368
1	90	NRC	400	4.3636E-04	15	6368
1	50	NRC	400	2.0674E-04	15	6368
1	99.5	NRC	400	7.0712E-04	16	7631

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99	NRC	400	6.2648E-04	16	7631
1	95	NRC	400	4.9255E-04	16	7631
1	90	NRC	400	4.2511E-04	16	7631
1	50	NRC	400	2.0674E-04	16	7631
1	99.5	NRC	500	5.3429E-04	1	3462
1	99	NRC	500	4.6929E-04	1	3462
1	95	NRC	500	3.3381E-04	1	3462
1	90	NRC	500	2.6583E-04	1	3462
1	50	NRC	500	8.1823E-05	1	3462
1	99.5	NRC	500	5.4475E-04	2	1618
1	99	NRC	500	4.6388E-04	2	1618
1	95	NRC	500	3.0545E-04	2	1618
1	90	NRC	500	2.5618E-04	2	1618
1	50	NRC	500	7.1959E-05	2	1618
1	99.5	NRC	500	4.9426E-04	3	927
1	99	NRC	500	4.5888E-04	3	927
1	95	NRC	500	2.7087E-04	3	927
1	90	NRC	500	2.4071E-04	3	927
1	50	NRC	500	3.2870E-05	3	927
1	99.5	NRC	500	5.6157E-04	4	705
1	99	NRC	500	5.1656E-04	4	705
1	95	NRC	500	2.6257E-04	4	705
1	90	NRC	500	8.6925E-05	4	705
1	.50	NRC	500	2.3760E-05	4	705
1	99.5	NRC	500	5.7786E-04	5	639
1	99	NRC	500	5.2253E-04	5	639
1	95	NRC	500	3.0508E-04	5	639
1	90	NRC	500	1.1028E-04	5	639
1	50	NRC	500	2.1861E-05	5	639
1	99.5	NRC	500	5.6457E-04	6	786
1	99	NRC	500	4.5918E-04	6	786
1	95	NRC	500	2.5821E-04	6	786
1	90	NRC	500	9.9689E-05	6	786
1	50	NRC	500	2.0566E-05	6	786
1	99.5	NRC	500	5.3547E-04	7	1413
1	99	NRC	500	4.3041E-04	7	1413
1	95	NRC	500	2.5020E-04	7	1413
1	90	NRC	500	9.0261E-05	7	1413
1	50	NRC	500	1.8233E-05	7	1413
1	99.5	NRC	500	4.4346E-04	8	3303
1	99	NRC	500	3.7766E-04	8	3303
1	95	NRC	500	1.4290E-04	8	3303
1	90	NRC	500	8.4639E-05	8	3303
1	50	NRC	500	2.7537E-05	8	3303
1	99.5	NRC	500	3.5281E-04	9	7845
1	99	NRC	500	3.0731E-04	9	7845
1	95	NRC	500	1.4290E-04	9	7845
1	90	NRC	500	8.8545E-05	9	7845
1	50	NRC	500	4.7835E-05	9	7845
1	99.5	NRC	500	5.1164E-04	10	2633
1	99	NRC	500	4.4653E-04	10	2633
1	95	NRC	500	2.8557E-04	10	2633
1	90	NRC	500	2.5209E-04	10	2633

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	50	NRC	500	7.4392E-05	10	2633
1	99.5	NRC	500	5.8133E-04	11	1700
1	99	NRC	500	5.0539E-04	11	1700
1	95	NRC	500	3.6143E-04	11	1700
1	90	NRC	500	2.9414E-04	11	1700
1	50	NRC	500	8.5763E-05	11	1700
1	99.5	NRC	500	5.5959E-04	12	1321
1	99	NRC	500	5.3529E-04	12	1321
1	95	NRC	500	4.0932E-04	12	1321
1	90	NRC	500	3.3874E-04	12	1321
1	50	NRC	500	1.0026E-04	12	1321
1	99.5	NRC	500	5.8405E-04	13	1112
1	99	NRC	500	5.6260E-04	13	1112
1	95	NRC	500	4.3086E-04	13	1112
1	90	NRC	500	3.8675E-04	13	1112
1	50	NRC	500	1.4290E-04	13	1112
1	99.5	NRC	500	6.2978E-04	14	1659
1	99	NRC	500	5.6345E-04	14	1659
1	95	NRC	500	4.2343E-04	14	1659
1	90	NRC	500	3.7783E-04	14	1659
1	50	NRC	500	1.8803E-04	14	1659
1	99.5	NRC	500	5.3399E-04	15	6368
1	99	NRC	500	4.6794E-04	15	6368
1	95	NRC	500	3.5337E-04	15	6368
1	90	NRC	500	3.0010E-04	15	6368
1	50	NRC	500	1.4290E-04	15	6368
1	99.5	NRC	500	4.8632E-04	16	7631
1	99	NRC	500	4.3086E-04	16	7631
1	95	NRC	500	3.3874E-04	16	7631
1	90	NRC	500	2.9237E-04	16	7631
1	50	NRC	500	1.4290E-04	16	7631
1	99.5	NRC	750	2.7143E-04	1	3462
1	99	NRC	750	2.3841E-04	1	3462
1	95	NRC	750	1.6958E-04	1	3462
1	90	NRC	750	1.3505E-04	1	3462
1	50	NRC	750	4.1312E-05	1	3462
1	99.5	NRC	750	2.7674E-04	2	1618
1	99	NRC	750	2.3566E-04	2	1618
1	95	NRC	750	1.5518E-04	2	1618
1	90	NRC	750	1.3014E-04	2	1618
1	50	NRC	750	3.6316E-05	2	1618
1	99.5	NRC	750	2.5109E-04	3	927
1	99	NRC	750	2.3312E-04	3	927
1	95	NRC	750	1.3761E-04	3	927
1	90	NRC	750	1.2318E-04	3	927
1	50	NRC	750	1.4868E-05	3	927
1	99.5	NRC	750	2.8529E-04	4	705
1	99	NRC	750	2.6243E-04	4	705
1	95	NRC	750	1.3339E-04	4	705
1	90	NRC	750	4.3238E-05	4	705
1	50	NRC	750	8.3761E-06	4	705
1	99.5	NRC	750	2.9356E-04	5	639
1	99	NRC	750	2.6546E-04	5	639

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	95	NRC	750	1.5499E-04	5	639
1	90	NRC	750	5.2849E-05	5	639
1	50	NRC	750	7.4209E-06	5	639
1	99.5	NRC	750	2.8682E-04	6	786
1	99	NRC	750	2.3328E-04	6	786
1	95	NRC	750	1.3118E-04	6	786
1	90	NRC	750	4.9490E-05	6	786
1	50	NRC	750	6.7679E-06	6	786
1	99.5	NRC	750	2.7203E-04	7	1413
1	99	NRC	750	2.1866E-04	7	1413
1	95	NRC	750	1.2711E-04	7	1413
1	90	NRC	750	4.5447E-05	7	1413
1	50	NRC	750	5.9999E-06	7	1413
1	99.5	NRC	750	2.2529E-04	8	3303
1	99	NRC	750	1.9186E-04	8	3303
1	95	NRC	750	7.3497E-05	8	3303
1	90	NRC	750	4.2609E-05	8	3303
1	50	NRC	750	1.2029E-05	8	3303
1	99.5	NRC	750	1.7924E-04	9	7845
1	99	NRC	750	1.5612E-04	9	7845
1	95	NRC	750	7.3497E-05	9	7845
1	90	NRC	750	4.4631E-05	9	7845
1	50	NRC	750	2.3915E-05	9	7845
1	99.5	NRC	750	2.5993E-04	10	2633
1	99	NRC	750	2.2685E-04	10	2633
1	95	NRC	750	1.4508E-04	10	2633
1	90	NRC	750	1.2807E-04	10	2633
1	50	NRC	750	3.7560E-05	10	2633
1	99.5	NRC	750	2.9533E-04	11	1700
1	99	NRC	750	2.5675E-04	11	1700
1	95	NRC	750	1.8361E-04	11	1700
1	90	NRC	750	1.4943E-04	11	1700
1	50	NRC	750	4.3258E-05	11	1700
1	99.5	NRC	750	2.8428E-04	12	1321
1	99	NRC	750	2.7194E-04	12	1321
1	95	NRC	750	2.0794E-04	12	1321
1	90	NRC	750	1.7209E-04	12	1321
1	50	NRC	750	5.0623E-05	12	1321
1	99.5	NRC	750	2.9671E-04	13	1112
1	99	NRC	750	2.8581E-04	13	1112
1	95	NRC	750	2.1889E-04	13	1112
1	90	NRC	750	1.9648E-04	13	1112
1	50	NRC	750	7.3497E-05	13	1112
1	99.5	NRC	750	3.1994E-04	14	1659
1	99	NRC	750	2.8624E-04	14	1659
1	95	NRC	750	2.1511E-04	14	1659
1	90	NRC	750	1.9195E-04	14	1659
1	50	NRC	750	9.6711E-05	14	1659
1	99.5	NRC	750	2.7128E-04	15	6368
1	99	NRC	750	2.3772E-04	15	6368
1	95	NRC	750	1.7952E-04	15	6368
1	90	NRC	750	1.5246E-04	15	6368
1	50	NRC	750	7.3497E-05	15	6368

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	750	2.4706E-04	16	7631
1	99	NRC	750	2.1889E-04	16	7631
1	95	NRC	750	1.7209E-04	16	7631
1	90	NRC	750	1.4853E-04	16	7631
1	50	NRC	750	7.3497E-05	16	7631
1	99.5	NRC	1000	1.9485E-04	1	3462
1	99	NRC	1000	1.7115E-04	1	3462
1	95	NRC	1000	1.2174E-04	1	3462
1	90	NRC	1000	9.5148E-05	1	3462
1	50	NRC	1000	2.6517E-05	1	3462
1	99.5	NRC	1000	1.9867E-04	2	1618
1	99	NRC	1000	1.6917E-04	2	1618
1	95	NRC	1000	1.1140E-04	2	1618
1	90	NRC	1000	9.2508E-05	2	1618
1	50	NRC	1000	2.2482E-05	2	1618
1	99.5	NRC	1000	1.8025E-04	3	927
1	99	NRC	1000	1.6735E-04	3	927
1	95	NRC	1000	9.8643E-05	3	927
1	90	NRC	1000	8.8062E-05	3	927
1	50	NRC	1000	8.7591E-06	3	927
1	99.5	NRC	1000	2.0480E-04	4	705
1	99	NRC	1000	1.8839E-04	4	705
1	95	NRC	1000	9.4232E-05	4	705
1	90	NRC	1000	2.8080E-05	4	705
1	50	NRC	1000	3.7529E-06	4	705
1	99.5	NRC	1000	2.1074E-04	5	639
1	99	NRC	1000	1.9056E-04	5	639
1	95	NRC	1000	1.1126E-04	5	639
1	90	NRC	1000	3.3610E-05	5	639
1	50	NRC	1000	3.3249E-06	5	639
1	99.5	NRC	1000	2.0590E-04	6	786
1	99	NRC	1000	1.6746E-04	6	786
1	95	NRC	1000	9.3593E-05	6	786
1	90	NRC	1000	3.3104E-05	6	786
1	50	NRC	1000	3.0324E-06	6	786
1	99.5	NRC	1000	1.9528E-04	7	1413
1	99	NRC	1000	1.5697E-04	7	1413
1	95	NRC	1000	9.0796E-05	7	1413
1	90	NRC	1000	2.9595E-05	7	1413
1	50	NRC	1000	2.6883E-06	7	1413
1	99.5	NRC	1000	1.6173E-04	8	3303
1	99	NRC	1000	1.3773E-04	8	3303
1	95	NRC	1000	5.1729E-05	8	3303
1	90	NRC	1000	2.7488E-05	8	3303
1	50	NRC	1000	6.7441E-06	8	3303
1	99.5	NRC	1000	1.2867E-04	9	7845
1	99	NRC	1000	1.1207E-04	9	7845
1	95	NRC	1000	4.9149E-05	9	7845
1	90	NRC	1000	2.9165E-05	9	7845
1	50	NRC	1000	1.4639E-05	9	7845
1	99.5	NRC	1000	1.8659E-04	10	2633
1	99	NRC	1000	1.6285E-04	10	2633
1	95	NRC	1000	1.0415E-04	10	2633

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	90	NRC	1000	9.1288E-05	10	2633
1	50	NRC	1000	2.3346E-05	10	2633
1	99.5	NRC	1000	2.1201E-04	11	1700
1	99	NRC	1000	1.8431E-04	11	1700
1	95	NRC	1000	1.3181E-04	11	1700
1	90	NRC	1000	1.0727E-04	11	1700
1	50	NRC	1000	2.8063E-05	11	1700
1	99.5	NRC	1000	2.0408E-04	12	1321
1	99	NRC	1000	1.9522E-04	12	1321
1	95	NRC	1000	1.4928E-04	12	1321
1	90	NRC	1000	1.2354E-04	12	1321
1	50	NRC	1000	3.4011E-05	12	1321
1	99.5	NRC	1000	2.1300E-04	13	1112
1	99	NRC	1000	2.0518E-04	13	1112
1	95	NRC	1000	1.5713E-04	13	1112
1	90	NRC	1000	1.4105E-04	13	1112
1	50	NRC	1000	5.2195E-05	13	1112
1	99.5	NRC	1000	2.2968E-04	14	1659
1	99	NRC	1000	2.0549E-04	14	1659
1	95	NRC	1000	1.5442E-04	14	1659
1	90	NRC	1000	1.3779E-04	14	1659
1	50	NRC	1000	6.8959E-05	14	1659
1	99.5	NRC	1000	1.9474E-04	15	6368
1	99	NRC	1000	1.7065E-04	15	6368
1	95	NRC	1000	1.2887E-04	15	6368
1	90	NRC	1000	1.0945E-04	15	6368
1	50	NRC	1000	5.0704E-05	15	6368
1	99.5	NRC	1000	1.7736E-04	16	7631
1	99	NRC	1000	1.5713E-04	16	7631
1	95	NRC	1000	1.2354E-04	16	7631
1	90	NRC	1000	1.0663E-04	16	7631
1	50	NRC	1000	5.0316E-05	16	7631
1	99.5	NRC	2000	9.7153E-05	1	3462
1	99	NRC	2000	8.5333E-05	1	3462
1	95	NRC	2000	6.0698E-05	1	3462
1	90	NRC	2000	4.6517E-05	1	3462
1	50	NRC	2000	9.5704E-06	1	3462
1	99.5	NRC	2000	9.9054E-05	2	1618
1	99	NRC	2000	8.4349E-05	2	1618
1	95	NRC	2000	5.5542E-05	2	1618
1	90	NRC	2000	4.4340E-05	2	1618
1	50	NRC	2000	7.4839E-06	2	1618
1	99.5	NRC	2000	8.9873E-05	3	927
1	99	NRC	2000	8.3440E-05	3	927
1	95	NRC	2000	4.9183E-05	3	927
1	90	NRC	2000	4.1793E-05	3	927
1	50	NRC	2000	2.4120E-06	3	927
1	99.5	NRC	2000	1.0211E-04	4	705
1	99	NRC	2000	9.3929E-05	4	705
1	95	NRC	2000	4.5216E-05	4	705
1	90	NRC	2000	1.0446E-05	4	705
1	50	NRC	2000	4.6099E-07	4	705
1	99.5	NRC	2000	1.0507E-04	5	639

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99	NRC	2000	9.5014E-05	5	639
1	95	NRC	2000	5.5474E-05	5	639
1	90	NRC	2000	1.2860E-05	5	639
1	50	NRC	2000	4.0842E-07	5	639
1	99.5	NRC	2000	1.0266E-04	6	786
1	99	NRC	2000	8.3496E-05	6	786
1	95	NRC	2000	4.4995E-05	6	786
1	90	NRC	2000	1.3290E-05	6	786
1	50	NRC	2000	3.7248E-07	6	786
1	99.5	NRC	2000	9.7367E-05	7	1413
1	99	NRC	2000	7.8263E-05	7	1413
1	95	NRC	2000	4.3783E-05	7	1413
1	90	NRC	2000	1.0960E-05	7	1413
1	50	NRC	2000	3.3021E-07	7	1413
1	99.5	NRC	2000	8.0637E-05	8	3303
1	99	NRC	2000	6.8672E-05	8	3303
1	95	NRC	2000	2.3343E-05	8	3303
1	90	NRC	2000	9.9611E-06	8	3303
1	50	NRC	2000	1.7010E-06	8	3303
1	99.5	NRC	2000	6.3795E-05	9	7845
1	99	NRC	2000	5.5775E-05	9	7845
1	95	NRC	2000	1.9172E-05	9	7845
1	90	NRC	2000	1.1046E-05	9	7845
1	50	NRC	2000	4.7757E-06	9	7845
1	99.5	NRC	2000	9.3035E-05	10	2633
1	99	NRC	2000	8.1194E-05	10	2633
1	95	NRC	2000	5.1926E-05	10	2633
1	90	NRC	2000	4.4037E-05	10	2633
1	50	NRC	2000	7.9191E-06	10	2633
1	99.5	NRC	2000	1.0571E-04	11	1700
1	99	NRC	2000	9.1898E-05	11	1700
1	95	NRC	2000	6.5721E-05	11	1700
1	90	NRC	2000	5.3485E-05	11	1700
1	50	NRC	2000	1.0381E-05	11	1700
1	99.5	NRC	2000	1.0175E-04	12	1321
1	99	NRC	2000	9.7334E-05	12	1321
1	95	NRC	2000	7.4428E-05	12	1321
1	90	NRC	2000	6.1596E-05	12	1321
1	50	NRC	2000	1.3819E-05	12	1321
1	99.5	NRC	2000	1.0620E-04	13	1112
1	99	NRC	2000	1.0230E-04	13	1112
1	95	NRC	2000	7.8345E-05	13	1112
1	90	NRC	2000	7.0326E-05	13	1112
1	50	NRC	2000	2.4154E-05	13	1112
1	99.5	NRC	2000	1.1452E-04	14	1659
1	99	NRC	2000	1.0245E-04	14	1659
1	95	NRC	2000	7.6994E-05	14	1659
1	90	NRC	2000	6.8703E-05	14	1659
1	50	NRC	2000	3.2377E-05	14	1659
1	99.5	NRC	2000	9.7097E-05	15	6368
1	99	NRC	2000	8.5087E-05	15	6368
1	95	NRC	2000	6.4254E-05	15	6368
1	90	NRC	2000	5.4569E-05	15	6368

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	50	NRC	2000	2.1534E-05	15	6368
1	99.5	NRC	2000	8.8429E-05	16	7631
1	99	NRC	2000	7.8345E-05	16	7631
1	95	NRC	2000	6.1596E-05	16	7631
1	90	NRC	2000	5.3163E-05	16	7631
1	50	NRC	2000	2.0904E-05	16	7631
1	99.5	NRC	3000	6.5730E-05	1	3462
1	99	NRC	3000	5.7733E-05	1	3462
1	95	NRC	3000	4.1066E-05	1	3462
1	90	NRC	3000	3.1472E-05	1	3462
1	50	NRC	3000	5.2956E-06	1	3462
1	99.5	NRC	3000	6.7016E-05	2	1618
1	99	NRC	3000	5.7067E-05	2	1618
1	95	NRC	3000	3.7578E-05	2	1618
1	90	NRC	3000	2.9467E-05	2	1618
1	50	NRC	3000	3.9838E-06	2	1618
1	99.5	NRC	3000	6.0805E-05	3	927
1	99	NRC	3000	5.6452E-05	3	927
1	95	NRC	3000	3.3275E-05	3	927
1	90	NRC	3000	2.6738E-05	3	927
1	50	NRC	3000	1.1523E-06	3	927
1	99.5	NRC	3000	6.9085E-05	4	705
1	99	NRC	3000	6.3549E-05	4	705
1	95	NRC	3000	3.0585E-05	4	705
1	90	NRC	3000	5.7872E-06	4	705
1	50	NRC	3000	1.3637E-07	4	705
1	99.5	NRC	3000	7.1089E-05	5	639
1	99	NRC	3000	6.4283E-05	5	639
1	95	NRC	3000	3.7532E-05	5	639
1	90	NRC	3000	7.4055E-06	5	639
1	50	NRC	3000	1.2081E-07	5	639
1	99.5	NRC	3000	6.9455E-05	6	786
1	99	NRC	3000	5.6490E-05	6	786
1	95	NRC	3000	3.0435E-05	6	786
1	90	NRC	3000	7.6882E-06	6	786
1	50	NRC	3000	1.1018E-07	6	786
1	99.5	NRC	3000	6.5875E-05	7	1413
1	99	NRC	3000	5.2950E-05	7	1413
1	95	NRC	3000	2.8496E-05	7	1413
1	90	NRC	3000	6.1600E-06	7	1413
1	50	NRC	3000	9.7680E-08	7	1413
1	99.5	NRC	3000	5.4556E-05	8	3303
1	99	NRC	3000	4.6461E-05	8	3303
1	95	NRC	3000	1.4618E-05	8	3303
1	90	NRC	3000	5.5198E-06	8	3303
1	50	NRC	3000	7.5799E-07	8	3303
1	99.5	NRC	3000	4.3161E-05	9	7845
1	99	NRC	3000	3.7735E-05	9	7845
1	95	NRC	3000	1.1184E-05	9	7845
1	90	NRC	3000	6.2284E-06	9	7845
1	50	NRC	3000	2.5444E-06	9	7845
1	99.5	NRC	3000	6.2944E-05	10	2633
1	99	NRC	3000	5.4933E-05	10	2633

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	95	NRC	3000	3.5131E-05	10	2633
1	90	NRC	3000	2.8910E-05	10	2633
1	50	NRC	3000	4.2800E-06	10	2633
1	99.5	NRC	3000	7.1517E-05	11	1700
1	99	NRC	3000	6.2174E-05	11	1700
1	95	NRC	3000	4.4464E-05	11	1700
1	90	NRC	3000	3.6186E-05	11	1700
1	50	NRC	3000	5.8056E-06	11	1700
1	99.5	NRC	3000	6.8842E-05	12	1321
1	99	NRC	3000	6.5852E-05	12	1321
1	95	NRC	3000	5.0355E-05	12	1321
1	90	NRC	3000	4.1673E-05	12	1321
1	50	NRC	3000	8.0392E-06	12	1321
1	99.5	NRC	3000	7.1852E-05	13	1112
1	99	NRC	3000	6.9213E-05	13	1112
1	95	NRC	3000	5.3005E-05	13	1112
1	90	NRC	3000	4.7580E-05	13	1112
1	50	NRC	3000	1.5318E-05	13	1112
1	99.5	NRC	3000	7.7478E-05	14	1659
1	99	NRC	3000	6.9317E-05	14	1659
1	95	NRC	3000	5.2091E-05	14	1659
1	90	NRC	3000	4.6482E-05	14	1659
1	50	NRC	3000	2.0760E-05	14	1659
1	99.5	NRC	3000	6.5692E-05	15	6368
1	99	NRC	3000	5.7567E-05	15	6368
1	95	NRC	3000	4.3472E-05	15	6368
1	90	NRC	3000	3.6919E-05	15	6368
1	50	NRC	3000	1.3068E-05	15	6368
1	99.5	NRC	3000	5.9828E-05	16	7631
1	99	NRC	3000	5.3005E-05	16	7631
1	95	NRC	3000	4.1673E-05	16	7631
1	90	NRC	3000	3.5968E-05	16	7631
1	50	NRC	3000	1.2551E-05	16	7631
1	99.5	NRC	4000	4.9621E-05	1	3462
1	99	NRC	4000	4.3584E-05	1	3462
1	95	NRC	4000	3.1001E-05	1	3462
1	90	NRC	4000	2.3759E-05	1	3462
1	50	NRC	4000	3.4833E-06	1	3462
1	99.5	NRC	4000	5.0592E-05	2	1618
1	99	NRC	4000	4.3081E-05	2	1618
1	95	NRC	4000	2.8368E-05	2	1618
1	90	NRC	4000	2.1971E-05	2	1618
1	50	NRC	4000	2.5779E-06	2	1618
1	99.5	NRC	4000	4.5903E-05	3	927
1	99	NRC	4000	4.2617E-05	3	927
1	95	NRC	4000	2.5120E-05	3	927
1	90	NRC	4000	1.9399E-05	3	927
1	50	NRC	4000	6.7789E-07	3	927
1	99.5	NRC	4000	5.2154E-05	4	705
1	99	NRC	4000	4.7974E-05	4	705
1	95	NRC	4000	2.3086E-05	4	705
1	90	NRC	4000	3.8280E-06	4	705
1	50	NRC	4000	5.7523E-08	4	705

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	4000	5.3667E-05	5	639
1	99	NRC	4000	4.8529E-05	5	639
1	95	NRC	4000	2.8334E-05	5	639
1	90	NRC	4000	4.9811E-06	5	639
1	50	NRC	4000	5.0963E-08	5	639
1	99.5	NRC	4000	5.2433E-05	6	786
1	99	NRC	4000	4.2646E-05	6	786
1	95	NRC	4000	2.2807E-05	6	786
1	90	NRC	4000	5.1851E-06	6	786
1	50	NRC	4000	4.6478E-08	6	786
1	99.5	NRC	4000	4.9730E-05	7	1413
1	99	NRC	4000	3.9973E-05	7	1413
1	95	NRC	4000	2.0953E-05	7	1413
1	90	NRC	4000	4.0912E-06	7	1413
1	50	NRC	4000	4.1204E-08	7	1413
1	99.5	NRC	4000	4.1185E-05	8	3303
1	99	NRC	4000	3.5074E-05	8	3303
1	95	NRC	4000	1.0442E-05	8	3303
1	90	NRC	4000	3.6345E-06	8	3303
1	50	NRC	4000	4.2687E-07	8	3303
1	99.5	NRC	4000	3.2584E-05	9	7845
1	99	NRC	4000	2.8487E-05	9	7845
1	95	NRC	4000	7.6568E-06	9	7845
1	90	NRC	4000	4.1397E-06	9	7845
1	50	NRC	4000	1.6395E-06	9	7845
1	99.5	NRC	4000	4.7518E-05	10	2633
1	99	NRC	4000	4.1470E-05	10	2633
1	95	NRC	4000	2.6521E-05	10	2633
1	90	NRC	4000	2.1308E-05	10	2633
1	50	NRC	4000	2.7802E-06	10	2633
1	99.5	NRC	4000	5.3990E-05	11	1700
1	99	NRC	4000	4.6937E-05	11	1700
1	95	NRC	4000	3.3567E-05	11	1700
1	90	NRC	4000	2.7317E-05	11	1700
1	50	NRC	4000	3.8410E-06	11	1700
1	99.5	NRC	4000	5.1970E-05	12	1321
1	99	NRC	4000	4.9713E-05	12	1321
1	95	NRC	4000	3.8014E-05	12	1321
1	90	NRC	4000	3.1460E-05	12	1321
1	50	NRC	4000	5.4395E-06	12	1321
1	99.5	NRC	4000	5.4243E-05	13	1112
1	99	NRC	4000	5.2250E-05	13	1112
1	95	NRC	4000	4.0015E-05	13	1112
1	90	NRC	4000	3.5919E-05	13	1112
1	50	NRC	4000	1.1041E-05	13	1112
1	99.5	NRC	4000	5.8490E-05	14	1659
1	99	NRC	4000	5.2329E-05	14	1659
1	95	NRC	4000	3.9325E-05	14	1659
1	90	NRC	4000	3.5090E-05	14	1659
1	50	NRC	4000	1.5059E-05	14	1659
1	99.5	NRC	4000	4.9593E-05	15	6368
1	99	NRC	4000	4.3458E-05	15	6368
1	95	NRC	4000	3.2818E-05	15	6368

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	90	NRC	4000	2.7871E-05	15	6368
1	50	NRC	4000	9.1562E-06	15	6368
1	99.5	NRC	4000	4.5165E-05	16	7631
1	99	NRC	4000	4.0015E-05	16	7631
1	95	NRC	4000	3.1460E-05	16	7631
1	90	NRC	4000	2.7153E-05	16	7631
1	50	NRC	4000	8.7375E-06	16	7631
1	99.5	NRC	5000	3.9741E-05	1	3462
1	99	NRC	5000	3.4906E-05	1	3462
1	95	NRC	5000	2.4829E-05	1	3462
1	90	NRC	5000	1.9028E-05	1	3462
1	50	NRC	5000	2.5183E-06	1	3462
1	99.5	NRC	5000	4.0518E-05	2	1618
1	99	NRC	5000	3.4503E-05	2	1618
1	95	NRC	5000	2.2720E-05	2	1618
1	90	NRC	5000	1.7436E-05	2	1618
1	50	NRC	5000	1.8389E-06	2	1618
1	99.5	NRC	5000	3.6763E-05	3	927
1	99	NRC	5000	3.4131E-05	3	927
1	95	NRC	5000	2.0118E-05	3	927
1	90	NRC	5000	1.5077E-05	3	927
1	50	NRC	5000	4.4867E-07	3	927
1	99.5	NRC	5000	4.1769E-05	4	705
1	99	NRC	5000	3.8422E-05	4	705
1	95	NRC	5000	1.8487E-05	4	705
1	90	NRC	5000	2.7773E-06	4	705
1	50	NRC	5000	2.9458E-08	4	705
1	99.5	NRC	5000	4.2981E-05	5	639
1	99	NRC	5000	3.8866E-05	5	639
1	95	NRC	5000	2.2692E-05	5	639
1	90	NRC	5000	3.6532E-06	5	639
1	50	NRC	5000	2.6099E-08	5	639
1	99.5	NRC	5000	4.1993E-05	6	786
1	99	NRC	5000	3.4154E-05	6	786
1	95	NRC	5000	1.8265E-05	6	786
1	90	NRC	5000	3.8095E-06	6	786
1	50	NRC	5000	2.3802E-08	6	786
1	99.5	NRC	5000	3.9828E-05	7	1413
1	99	NRC	5000	3.2014E-05	7	1413
1	95	NRC	5000	1.6461E-05	7	1413
1	90	NRC	5000	2.9760E-06	7	1413
1	50	NRC	5000	2.1101E-08	7	1413
1	99.5	NRC	5000	3.2736E-05	8	3303
1	99	NRC	5000	2.8090E-05	8	3303
1	95	NRC	5000	8.0206E-06	8	3303
1	90	NRC	5000	2.6317E-06	8	3303
1	50	NRC	5000	2.7337E-07	8	3303
1	99.5	NRC	5000	2.6096E-05	9	7845
1	99	NRC	5000	2.2815E-05	9	7845
1	95	NRC	5000	5.7152E-06	9	7845
1	90	NRC	5000	3.0127E-06	9	7845
1	50	NRC	5000	1.1720E-06	9	7845
1	99.5	NRC	5000	3.8056E-05	10	2633

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99	NRC	5000	3.3213E-05	10	2633
1	95	NRC	5000	2.1241E-05	10	2633
1	90	NRC	5000	1.6793E-05	10	2633
1	50	NRC	5000	1.9943E-06	10	2633
1	99.5	NRC	5000	4.3240E-05	11	1700
1	99	NRC	5000	3.7591E-05	11	1700
1	95	NRC	5000	2.6883E-05	11	1700
1	90	NRC	5000	2.1878E-05	11	1700
1	50	NRC	5000	2.7871E-06	11	1700
1	99.5	NRC	5000	4.1622E-05	12	1321
1	99	NRC	5000	3.9815E-05	12	1321
1	95	NRC	5000	3.0445E-05	12	1321
1	90	NRC	5000	2.5196E-05	12	1321
1	50	NRC	5000	4.0050E-06	12	1321
1	99.5	NRC	5000	4.3442E-05	13	1112
1	99	NRC	5000	4.1846E-05	13	1112
1	95	NRC	5000	3.2047E-05	13	1112
1	90	NRC	5000	2.8767E-05	13	1112
1	50	NRC	5000	8.5335E-06	13	1112
1	99.5	NRC	5000	4.6844E-05	14	1659
1	99	NRC	5000	4.1909E-05	14	1659
1	95	NRC	5000	3.1495E-05	14	1659
1	90	NRC	5000	2.8103E-05	14	1659
1	50	NRC	5000	1.1692E-05	14	1659
1	99.5	NRC	5000	3.9718E-05	15	6368
1	99	NRC	5000	3.4805E-05	15	6368
1	95	NRC	5000	2.6283E-05	15	6368
1	90	NRC	5000	2.2322E-05	15	6368
1	50	NRC	5000	6.9396E-06	15	6368
1	99.5	NRC	5000	3.6172E-05	16	7631
1	99	NRC	5000	3.2047E-05	16	7631
1	95	NRC	5000	2.5196E-05	16	7631
1	90	NRC	5000	2.1746E-05	16	7631
1	50	NRC	5000	6.5939E-06	16	7631
1	99.5	NRC	7500	2.6272E-05	1	3462
1	99	NRC	7500	2.3075E-05	1	3462
1	95	NRC	7500	1.6414E-05	1	3462
1	90	NRC	7500	1.2579E-05	1	3462
1	50	NRC	7500	1.3982E-06	1	3462
1	99.5	NRC	7500	2.6786E-05	2	1618
1	99	NRC	7500	2.2809E-05	2	1618
1	95	NRC	7500	1.5019E-05	2	1618
1	90	NRC	7500	1.1315E-05	2	1618
1	50	NRC	7500	1.0010E-06	2	1618
1	99.5	NRC	7500	2.4303E-05	3	927
1	99	NRC	7500	2.2563E-05	3	927
1	95	NRC	7500	1.3300E-05	3	927
1	90	NRC	7500	9.4683E-06	3	927
1	50	NRC	7500	2.1488E-07	3	927
1	99.5	NRC	7500	2.7613E-05	4	705
1	99	NRC	7500	2.5400E-05	4	705
1	95	NRC	7500	1.2219E-05	4	705
1	90	NRC	7500	1.5498E-06	4	705

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	50	NRC	7500	8.7350E-09	4	705
1	99.5	NRC	7500	2.8414E-05	5	639
1	99	NRC	7500	2.5693E-05	5	639
1	95	NRC	7500	1.5001E-05	5	639
1	90	NRC	7500	2.0706E-06	5	639
1	50	NRC	7500	7.7389E-09	5	639
1	99.5	NRC	7500	2.7761E-05	6	786
1	99	NRC	7500	2.2578E-05	6	786
1	95	NRC	7500	1.2074E-05	6	786
1	90	NRC	7500	2.1647E-06	6	786
1	50	NRC	7500	7.0579E-09	6	786
1	99.5	NRC	7500	2.6330E-05	7	1413
1	99	NRC	7500	2.1164E-05	7	1413
1	95	NRC	7500	1.0546E-05	7	1413
1	90	NRC	7500	1.6669E-06	7	1413
1	50	NRC	7500	6.2570E-09	7	1413
1	99.5	NRC	7500	2.1641E-05	8	3303
1	99	NRC	7500	1.8473E-05	8	3303
1	95	NRC	7500	4.9333E-06	8	3303
1	90	NRC	7500	1.4645E-06	8	3303
1	50	NRC	7500	1.2158E-07	8	3303
1	99.5	NRC	7500	1.7251E-05	9	7845
1	99	NRC	7500	1.5082E-05	9	7845
1	95	NRC	7500	3.3496E-06	9	7845
1	90	NRC	7500	1.6886E-06	9	7845
1	50	NRC	7500	6.3884E-07	9	7845
1	99.5	NRC	7500	2.5158E-05	10	2633
1	99	NRC	7500	2.1956E-05	10	2633
1	95	NRC	7500	1.4042E-05	10	2633
1	90	NRC	7500	1.0816E-05	10	2633
1	50	NRC	7500	1.0953E-06	10	2633
1	99.5	NRC	7500	2.8585E-05	11	1700
1	99	NRC	7500	2.4851E-05	11	1700
1	95	NRC	7500	1.7772E-05	11	1700
1	90	NRC	7500	1.4463E-05	11	1700
1	50	NRC	7500	1.5556E-06	11	1700
1	99.5	NRC	7500	2.7515E-05	12	1321
1	99	NRC	7500	2.6321E-05	12	1321
1	95	NRC	7500	2.0126E-05	12	1321
1	90	NRC	7500	1.6656E-05	12	1321
1	50	NRC	7500	2.2829E-06	12	1321
1	99.5	NRC	7500	2.8718E-05	13	1112
1	99	NRC	7500	2.7664E-05	13	1112
1	95	NRC	7500	2.1186E-05	13	1112
1	90	NRC	7500	1.9017E-05	13	1112
1	50	NRC	7500	5.2661E-06	13	1112
1	99.5	NRC	7500	3.0967E-05	14	1659
1	99	NRC	7500	2.7705E-05	14	1659
1	95	NRC	7500	2.0820E-05	14	1659
1	90	NRC	7500	1.8578E-05	14	1659
1	50	NRC	7500	7.3149E-06	14	1659
1	99.5	NRC	7500	2.6257E-05	15	6368
1	99	NRC	7500	2.3009E-05	15	6368

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	95	NRC	7500	1.7375E-05	15	6368
1	90	NRC	7500	1.4756E-05	15	6368
1	50	NRC	7500	4.1827E-06	15	6368
1	99.5	NRC	7500	2.3913E-05	16	7631
1	99	NRC	7500	2.1186E-05	16	7631
1	95	NRC	7500	1.6656E-05	16	7631
1	90	NRC	7500	1.4376E-05	16	7631
1	50	NRC	7500	3.9490E-06	16	7631
1	99.5	NRC	10000	1.9425E-05	1	3462
1	99	NRC	10000	1.7062E-05	1	3462
1	95	NRC	10000	1.2136E-05	1	3462
1	90	NRC	10000	9.3009E-06	1	3462
1	50	NRC	10000	9.2185E-07	1	3462
1	99.5	NRC	10000	1.9805E-05	2	1618
1	99	NRC	10000	1.6865E-05	2	1618
1	95	NRC	10000	1.1105E-05	2	1618
1	90	NRC	10000	8.2849E-06	2	1618
1	50	NRC	10000	6.5328E-07	2	1618
1	99.5	NRC	10000	1.7970E-05	3	927
1	99	NRC	10000	1.6683E-05	3	927
1	95	NRC	10000	9.8338E-06	3	927
1	90	NRC	10000	6.7710E-06	3	927
1	50	NRC	10000	1.2622E-07	3	927
1	99.5	NRC	10000	2.0417E-05	4	705
1	99	NRC	10000	1.8781E-05	4	705
1	95	NRC	10000	9.0337E-06	4	705
1	90	NRC	10000	1.0245E-06	4	705
1	50	NRC	10000	3.6876E-09	4	705
1	99.5	NRC	10000	2.1009E-05	5	639
1	99	NRC	10000	1.8998E-05	5	639
1	95	NRC	10000	1.1092E-05	5	639
1	90	NRC	10000	1.3803E-06	5	639
1	50	NRC	10000	3.2671E-09	5	639
1	99.5	NRC	10000	2.0526E-05	6	786
1	99	NRC	10000	1.6694E-05	6	786
1	95	NRC	10000	8.9275E-06	6	786
1	90	NRC	10000	1.4450E-06	6	786
1	50	NRC	10000	2.9796E-09	6	786
1	99.5	NRC	10000	1.9468E-05	7	1413
1	99	NRC	10000	1.5648E-05	7	1413
1	95	NRC	10000	7.6505E-06	7	1413
1	90	NRC	10000	1.1041E-06	7	1413
1	50	NRC	10000	2.6415E-09	7	1413
1	99.5	NRC	10000	1.6001E-05	8	3303
1	99	NRC	10000	1.3425E-05	8	3303
1	95	NRC	10000	3.4787E-06	8	3303
1	90	NRC	10000	9.6667E-07	8	3303
1	50	NRC	10000	6.8404E-08	8	3303
1	99.5	NRC	10000	1.2755E-05	9	7845
1	99	NRC	10000	1.1152E-05	9	7845
1	95	NRC	10000	2.3043E-06	9	7845
1	90	NRC	10000	1.1189E-06	9	7845
1	50	NRC	10000	4.1719E-07	9	7845

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	10000	1.8602E-05	10	2633
1	99	NRC	10000	1.6234E-05	10	2633
1	95	NRC	10000	1.0382E-05	10	2633
1	90	NRC	10000	7.8717E-06	10	2633
1	50	NRC	10000	7.1797E-07	10	2633
1	99.5	NRC	10000	2.1135E-05	11	1700
1	99	NRC	10000	1.8374E-05	11	1700
1	95	NRC	10000	1.3140E-05	11	1700
1	90	NRC	10000	1.0694E-05	11	1700
1	50	NRC	10000	1.0284E-06	11	1700
1	99.5	NRC	10000	2.0345E-05	12	1321
1	99	NRC	10000	1.9461E-05	12	1321
1	95	NRC	10000	1.4881E-05	12	1321
1	90	NRC	10000	1.2316E-05	12	1321
1	50	NRC	10000	1.5266E-06	12	1321
1	99.5	NRC	10000	2.1234E-05	13	1112
1	99	NRC	10000	2.0454E-05	13	1112
1	95	NRC	10000	1.5665E-05	13	1112
1	90	NRC	10000	1.4061E-05	13	1112
1	50	NRC	10000	3.7326E-06	13	1112
1	99.5	NRC	10000	2.2897E-05	14	1659
1	99	NRC	10000	2.0485E-05	14	1659
1	95	NRC	10000	1.5395E-05	14	1659
1	90	NRC	10000	1.3737E-05	14	1659
1	50	NRC	10000	5.2097E-06	14	1659
1	99.5	NRC	10000	1.9414E-05	15	6368
1	99	NRC	10000	1.7013E-05	15	6368
1	95	NRC	10000	1.2847E-05	15	6368
1	90	NRC	10000	1.0911E-05	15	6368
1	50	NRC	10000	2.9156E-06	15	6368
1	99.5	NRC	10000	1.7681E-05	16	7631
1	99	NRC	10000	1.5665E-05	16	7631
1	95	NRC	10000	1.2316E-05	16	7631
1	90	NRC	10000	1.0630E-05	16	7631
1	50	NRC	10000	2.7429E-06	16	7631
1	99.5	NRC	20000	9.1604E-06	1	3462
1	99	NRC	20000	8.0459E-06	1	3462
1	95	NRC	20000	5.7231E-06	1	3462
1	90	NRC	20000	4.3861E-06	1	3462
1	50	NRC	20000	3.3884E-07	1	3462
1	99.5	NRC	20000	9.3396E-06	2	1618
1	99	NRC	20000	7.9532E-06	2	1618
1	95	NRC	20000	5.2306E-06	2	1618
1	90	NRC	20000	3.8366E-06	2	1618
1	50	NRC	20000	2.3732E-07	2	1618
1	99.5	NRC	20000	8.4740E-06	3	927
1	99	NRC	20000	7.8674E-06	3	927
1	95	NRC	20000	4.6374E-06	3	927
1	90	NRC	20000	2.9788E-06	3	927
1	50	NRC	20000	3.2697E-08	3	927
1	99.5	NRC	20000	9.6280E-06	4	705
1	99	NRC	20000	8.8564E-06	4	705
1	95	NRC	20000	4.2592E-06	4	705

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	90	NRC	20000	3.7820E-07	4	705
1	50	NRC	20000	4.6182E-10	4	705
1	99.5	NRC	20000	9.9073E-06	5	639
1	99	NRC	20000	8.9588E-06	5	639
1	95	NRC	20000	5.2306E-06	5	639
1	90	NRC	20000	5.1653E-07	5	639
1	50	NRC	20000	4.0916E-10	5	639
1	99.5	NRC	20000	9.6796E-06	6	786
1	99	NRC	20000	7.8727E-06	6	786
1	95	NRC	20000	4.2098E-06	6	786
1	90	NRC	20000	5.4201E-07	6	786
1	50	NRC	20000	3.7315E-10	6	786
1	99.5	NRC	20000	9.1806E-06	7	1413
1	99	NRC	20000	7.3793E-06	7	1413
1	95	NRC	20000	3.4840E-06	7	1413
1	90	NRC	20000	4.0887E-07	7	1413
1	50	NRC	20000	3.3081E-10	7	1413
1	99.5	NRC	20000	7.5458E-06	8	3303
1	99	NRC	20000	6.3308E-06	8	3303
1	95	NRC	20000	1.4827E-06	8	3303
1	90	NRC	20000	3.5599E-07	8	3303
1	50	NRC	20000	1.7101E-08	8	3303
1	99.5	NRC	20000	6.0152E-06	9	7845
1	99	NRC	20000	5.2589E-06	9	7845
1	95	NRC	20000	9.2110E-07	9	7845
1	90	NRC	20000	4.1458E-07	9	7845
1	50	NRC	20000	1.5155E-07	9	7845
1	99.5	NRC	20000	8.7721E-06	10	2633
1	99	NRC	20000	7.6557E-06	10	2633
1	95	NRC	20000	4.8961E-06	10	2633
1	90	NRC	20000	3.6053E-06	10	2633
1	50	NRC	20000	2.6151E-07	10	2633
1	99.5	NRC	20000	9.9669E-06	11	1700
1	99	NRC	20000	8.6649E-06	11	1700
1	95	NRC	20000	6.1967E-06	11	1700
1	90	NRC	20000	5.0430E-06	11	1700
1	50	NRC	20000	3.7969E-07	11	1700
1	99.5	NRC	20000	9.5941E-06	12	1321
1	99	NRC	20000	9.1775E-06	12	1321
1	95	NRC	20000	7.0177E-06	12	1321
1	90	NRC	20000	5.8077E-06	12	1321
1	50	NRC	20000	5.7425E-07	12	1321
1	99.5	NRC	20000	1.0014E-05	13	1112
1	99	NRC	20000	9.6458E-06	13	1112
1	95	NRC	20000	7.3870E-06	13	1112
1	90	NRC	20000	6.6309E-06	13	1112
1	50	NRC	20000	1.6054E-06	13	1112
1	99.5	NRC	20000	1.0798E-05	14	1659
1	99	NRC	20000	9.6603E-06	14	1659
1	95	NRC	20000	7.2597E-06	14	1659
1	90	NRC	20000	6.4779E-06	14	1659
1	50	NRC	20000	2.2598E-06	14	1659
1	99.5	NRC	20000	9.1552E-06	15	6368

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99	NRC	20000	8.0227E-06	15	6368
1	95	NRC	20000	6.0584E-06	15	6368
1	90	NRC	20000	5.1452E-06	15	6368
1	50	NRC	20000	1.2184E-06	15	6368
1	99.5	NRC	20000	8.3379E-06	16	7631
1	99	NRC	20000	7.3870E-06	16	7631
1	95	NRC	20000	5.8077E-06	16	7631
1	90	NRC	20000	5.0126E-06	16	7631
1	50	NRC	20000	1.1393E-06	16	7631
1	99.5	NRC	25000	7.1505E-06	1	3462
1	99	NRC	25000	6.2805E-06	1	3462
1	95	NRC	25000	4.4673E-06	1	3462
1	90	NRC	25000	3.4237E-06	1	3462
1	50	NRC	25000	2.4571E-07	1	3462
1	99.5	NRC	25000	7.2904E-06	2	1618
1	99	NRC	25000	6.2081E-06	2	1618
1	95	NRC	25000	4.0829E-06	2	1618
1	90	NRC	25000	2.9819E-06	2	1618
1	50	NRC	25000	1.7166E-07	2	1618
1	99.5	NRC	25000	6.6147E-06	3	927
1	99	NRC	25000	6.1412E-06	3	927
1	95	NRC	25000	3.6198E-06	3	927
1	90	NRC	25000	2.2807E-06	3	927
1	50	NRC	25000	2.0924E-08	3	927
1	99.5	NRC	25000	7.5155E-06	4	705
1	99	NRC	25000	6.9132E-06	4	705
1	95	NRC	25000	3.3245E-06	4	705
1	90	NRC	25000	2.7450E-07	4	705
1	50	NRC	25000	2.3660E-10	4	705
1	99.5	NRC	25000	7.7335E-06	5	639
1	99	NRC	25000	6.9931E-06	5	639
1	95	NRC	25000	4.0829E-06	5	639
1	90	NRC	25000	3.7601E-07	5	639
1	50	NRC	25000	2.0962E-10	5	639
1	99.5	NRC	25000	7.5557E-06	6	786
1	99	NRC	25000	6.1453E-06	6	786
1	95	NRC	25000	3.2861E-06	6	786
1	90	NRC	25000	3.9476E-07	6	786
1	50	NRC	25000	1.9117E-10	6	786
1	99.5	NRC	25000	7.1662E-06	7	1413
1	99	NRC	25000	5.7602E-06	7	1413
1	95	NRC	25000	2.6972E-06	7	1413
1	90	NRC	25000	2.9697E-07	7	1413
1	50	NRC	25000	1.6948E-10	7	1413
1	99.5	NRC	25000	5.8901E-06	8	3303
1	99	NRC	25000	4.9417E-06	8	3303
1	95	NRC	25000	1.1242E-06	8	3303
1	90	NRC	25000	2.5825E-07	8	3303
1	50	NRC	25000	1.0944E-08	8	3303
1	99.5	NRC	25000	4.6953E-06	9	7845
1	99	NRC	25000	4.1050E-06	9	7845
1	95	NRC	25000	6.9189E-07	9	7845
1	90	NRC	25000	3.0115E-07	9	7845

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	50	NRC	25000	1.0962E-07	9	7845
1	99.5	NRC	25000	6.8474E-06	10	2633
1	99	NRC	25000	5.9759E-06	10	2633
1	95	NRC	25000	3.8218E-06	10	2633
1	90	NRC	25000	2.7948E-06	10	2633
1	50	NRC	25000	1.8927E-07	10	2633
1	99.5	NRC	25000	7.7800E-06	11	1700
1	99	NRC	25000	6.7637E-06	11	1700
1	95	NRC	25000	4.8370E-06	11	1700
1	90	NRC	25000	3.9365E-06	11	1700
1	50	NRC	25000	2.7560E-07	11	1700
1	99.5	NRC	25000	7.4890E-06	12	1321
1	99	NRC	25000	7.1638E-06	12	1321
1	95	NRC	25000	5.4779E-06	12	1321
1	90	NRC	25000	4.5334E-06	12	1321
1	50	NRC	25000	4.1850E-07	12	1321
1	99.5	NRC	25000	7.8164E-06	13	1112
1	99	NRC	25000	7.5293E-06	13	1112
1	95	NRC	25000	5.7662E-06	13	1112
1	90	NRC	25000	5.1760E-06	13	1112
1	50	NRC	25000	1.2198E-06	13	1112
1	99.5	NRC	25000	8.4285E-06	14	1659
1	99	NRC	25000	7.5407E-06	14	1659
1	95	NRC	25000	5.6668E-06	14	1659
1	90	NRC	25000	5.0565E-06	14	1659
1	50	NRC	25000	1.7204E-06	14	1659
1	99.5	NRC	25000	7.1464E-06	15	6368
1	99	NRC	25000	6.2624E-06	15	6368
1	95	NRC	25000	4.7291E-06	15	6368
1	90	NRC	25000	4.0163E-06	15	6368
1	50	NRC	25000	9.1973E-07	15	6368
1	99.5	NRC	25000	6.5084E-06	16	7631
1	99	NRC	25000	5.7662E-06	16	7631
1	95	NRC	25000	4.5334E-06	16	7631
1	90	NRC	25000	3.9128E-06	16	7631
1	50	NRC	25000	8.5895E-07	16	7631
1	99.5	NRC	50000	3.2756E-06	1	3462
1	99	NRC	50000	2.8771E-06	1	3462
1	95	NRC	50000	2.0465E-06	1	3462
1	90	NRC	50000	1.5684E-06	1	3462
1	50	NRC	50000	9.0759E-08	1	3462
1	99.5	NRC	50000	3.3397E-06	2	1618
1	99	NRC	50000	2.8439E-06	2	1618
1	95	NRC	50000	1.8704E-06	2	1618
1	90	NRC	50000	1.3527E-06	2	1618
1	50	NRC	50000	6.3078E-08	2	1618
1	99.5	NRC	50000	3.0302E-06	3	927
1	99	NRC	50000	2.8133E-06	3	927
1	95	NRC	50000	1.6582E-06	3	927
1	90	NRC	50000	9.9106E-07	3	927
1	50	NRC	50000	5.2286E-09	3	927
1	99.5	NRC	50000	3.4428E-06	4	705
1	99	NRC	50000	3.1669E-06	4	705

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	95	NRC	50000	1.5228E-06	4	705
1	90	NRC	50000	1.0159E-07	4	705
1	50	NRC	50000	2.9634E-11	4	705
1	99.5	NRC	50000	3.5427E-06	5	639
1	99	NRC	50000	3.2035E-06	5	639
1	95	NRC	50000	1.8704E-06	5	639
1	90	NRC	50000	1.4002E-07	5	639
1	50	NRC	50000	2.6255E-11	5	639
1	99.5	NRC	50000	3.4613E-06	6	786
1	99	NRC	50000	2.8151E-06	6	786
1	95	NRC	50000	1.5053E-06	6	786
1	90	NRC	50000	1.4716E-07	6	786
1	50	NRC	50000	2.3944E-11	6	786
1	99.5	NRC	50000	3.2828E-06	7	1413
1	99	NRC	50000	2.6387E-06	7	1413
1	95	NRC	50000	1.2130E-06	7	1413
1	90	NRC	50000	1.1006E-07	7	1413
1	50	NRC	50000	2.1227E-11	7	1413
1	99.5	NRC	50000	2.6982E-06	8	3303
1	99	NRC	50000	2.2638E-06	8	3303
1	95	NRC	50000	4.7444E-07	8	3303
1	90	NRC	50000	9.5471E-08	8	3303
1	50	NRC	50000	2.7347E-09	8	3303
1	99.5	NRC	50000	2.1509E-06	9	7845
1	99	NRC	50000	1.8805E-06	9	7845
1	95	NRC	50000	2.8616E-07	9	7845
1	90	NRC	50000	1.1164E-07	9	7845
1	50	NRC	50000	4.0282E-08	9	7845
1	99.5	NRC	50000	3.1368E-06	10	2633
1	99	NRC	50000	2.7375E-06	10	2633
1	95	NRC	50000	1.7508E-06	10	2633
1	90	NRC	50000	1.2606E-06	10	2633
1	50	NRC	50000	6.9631E-08	10	2633
1	99.5	NRC	50000	3.5640E-06	11	1700
1	99	NRC	50000	3.0984E-06	11	1700
1	95	NRC	50000	2.2158E-06	11	1700
1	90	NRC	50000	1.8033E-06	11	1700
1	50	NRC	50000	1.0200E-07	11	1700
1	99.5	NRC	50000	3.4307E-06	12	1321
1	99	NRC	50000	3.2817E-06	12	1321
1	95	NRC	50000	2.5094E-06	12	1321
1	90	NRC	50000	2.0768E-06	12	1321
1	50	NRC	50000	1.5622E-07	12	1321
1	99.5	NRC	50000	3.5807E-06	13	1112
1	99	NRC	50000	3.4492E-06	13	1112
1	95	NRC	50000	2.6415E-06	13	1112
1	90	NRC	50000	2.3711E-06	13	1112
1	50	NRC	50000	5.1709E-07	13	1112
1	99.5	NRC	50000	3.8611E-06	14	1659
1	99	NRC	50000	3.4544E-06	14	1659
1	95	NRC	50000	2.5959E-06	14	1659
1	90	NRC	50000	2.3164E-06	14	1659
1	50	NRC	50000	7.3245E-07	14	1659

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	50000	3.2737E-06	15	6368
1	99	NRC	50000	2.8688E-06	15	6368
1	95	NRC	50000	2.1664E-06	15	6368
1	90	NRC	50000	1.8399E-06	15	6368
1	50	NRC	50000	3.8443E-07	15	6368
1	99.5	NRC	50000	2.9815E-06	16	7631
1	99	NRC	50000	2.6415E-06	16	7631
1	95	NRC	50000	2.0768E-06	16	7631
1	90	NRC	50000	1.7924E-06	16	7631
1	50	NRC	50000	3.5801E-07	16	7631
1	99.5	NRC	75000	2.0650E-06	1	3462
1	99	NRC	75000	1.8137E-06	1	3462
1	95	NRC	75000	1.2901E-06	1	3462
1	90	NRC	75000	9.8872E-07	1	3462
1	50	NRC	75000	5.0757E-08	1	3462
1	99.5	NRC	75000	2.1054E-06	2	1618
1	99	NRC	75000	1.7928E-06	2	1618
1	95	NRC	75000	1.1791E-06	2	1618
1	90	NRC	75000	8.4963E-07	2	1618
1	50	NRC	75000	3.5212E-08	2	1618
1	99.5	NRC	75000	1.9102E-06	3	927
1	99	NRC	75000	1.7735E-06	3	927
1	95	NRC	75000	1.0454E-06	3	927
1	90	NRC	75000	6.0815E-07	3	927
1	50	NRC	75000	2.3230E-09	3	927
1	99.5	NRC	75000	2.1704E-06	4	705
1	99	NRC	75000	1.9965E-06	4	705
1	95	NRC	75000	9.5991E-07	4	705
1	90	NRC	75000	5.6852E-08	4	705
1	50	NRC	75000	8.7908E-12	4	705
1	99.5	NRC	75000	2.2333E-06	5	639
1	99	NRC	75000	2.0195E-06	5	639
1	95	NRC	75000	1.1791E-06	5	639
1	90	NRC	75000	7.8537E-08	5	639
1	50	NRC	75000	7.7883E-12	5	639
1	99.5	NRC	75000	2.1820E-06	6	786
1	99	NRC	75000	1.7747E-06	6	786
1	95	NRC	75000	9.4895E-07	6	786
1	90	NRC	75000	8.2572E-08	6	786
1	50	NRC	75000	7.1030E-12	6	786
1	99.5	NRC	75000	2.0695E-06	7	1413
1	99	NRC	75000	1.6635E-06	7	1413
1	95	NRC	75000	7.5941E-07	7	1413
1	90	NRC	75000	6.1625E-08	7	1413
1	50	NRC	75000	6.2970E-12	7	1413
1	99.5	NRC	75000	1.7010E-06	8	3303
1	99	NRC	75000	1.4271E-06	8	3303
1	95	NRC	75000	2.8623E-07	8	3303
1	90	NRC	75000	5.3408E-08	8	3303
1	50	NRC	75000	1.2150E-09	8	3303
1	99.5	NRC	75000	1.3560E-06	9	7845
1	99	NRC	75000	1.1855E-06	9	7845
1	95	NRC	75000	1.7139E-07	9	7845

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	90	NRC	75000	6.2516E-08	9	7845
1	50	NRC	75000	2.2487E-08	9	7845
1	99.5	NRC	75000	1.9774E-06	10	2633
1	99	NRC	75000	1.7258E-06	10	2633
1	95	NRC	75000	1.1037E-06	10	2633
1	90	NRC	75000	7.9005E-07	10	2633
1	50	NRC	75000	3.8886E-08	10	2633
1	99.5	NRC	75000	2.2468E-06	11	1700
1	99	NRC	75000	1.9533E-06	11	1700
1	95	NRC	75000	1.3969E-06	11	1700
1	90	NRC	75000	1.1368E-06	11	1700
1	50	NRC	75000	5.7084E-08	11	1700
1	99.5	NRC	75000	2.1627E-06	12	1321
1	99	NRC	75000	2.0688E-06	12	1321
1	95	NRC	75000	1.5820E-06	12	1321
1	90	NRC	75000	1.3092E-06	12	1321
1	50	NRC	75000	8.7697E-08	12	1321
1	99.5	NRC	75000	2.2573E-06	13	1112
1	99	NRC	75000	2.1744E-06	13	1112
1	95	NRC	75000	1.6652E-06	13	1112
1	90	NRC	75000	1.4948E-06	13	1112
1	50	NRC	75000	3.1248E-07	13	1112
1	99.5	NRC	75000	2.4340E-06	14	1659
1	99	NRC	75000	2.1777E-06	14	1659
1	95	NRC	75000	1.6365E-06	14	1659
1	90	NRC	75000	1.4603E-06	14	1659
1	50	NRC	75000	4.4334E-07	14	1659
1	99.5	NRC	75000	2.0638E-06	15	6368
1	99	NRC	75000	1.8085E-06	15	6368
1	95	NRC	75000	1.3657E-06	15	6368
1	90	NRC	75000	1.1599E-06	15	6368
1	50	NRC	75000	2.3093E-07	15	6368
1	99.5	NRC	75000	1.8796E-06	16	7631
1	99	NRC	75000	1.6652E-06	16	7631
1	95	NRC	75000	1.3092E-06	16	7631
1	90	NRC	75000	1.1300E-06	16	7631
1	50	NRC	75000	2.1482E-07	16	7631
1	99.5	NRC	100000	1.4870E-06	1	3462
1	99	NRC	100000	1.3061E-06	1	3462
1	95	NRC	100000	9.2905E-07	1	3462
1	90	NRC	100000	7.1200E-07	1	3462
1	50	NRC	100000	3.3626E-08	1	3462
1	99.5	NRC	100000	1.5161E-06	2	1618
1	99	NRC	100000	1.2911E-06	2	1618
1	95	NRC	100000	8.4910E-07	2	1618
1	90	NRC	100000	6.1064E-07	2	1618
1	50	NRC	100000	2.3305E-08	2	1618
1	99.5	NRC	100000	1.3756E-06	3	927
1	99	NRC	100000	1.2771E-06	3	927
1	95	NRC	100000	7.5280E-07	3	927
1	90	NRC	100000	4.3019E-07	3	927
1	50	NRC	100000	1.3063E-09	3	927
1	99.5	NRC	100000	1.5630E-06	4	705

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99	NRC	100000	1.4377E-06	4	705
1	95	NRC	100000	6.9124E-07	4	705
1	90	NRC	100000	3.7676E-08	4	705
1	50	NRC	100000	3.7117E-12	4	705
1	99.5	NRC	100000	1.6083E-06	5	639
1	99	NRC	100000	1.4543E-06	5	639
1	95	NRC	100000	8.4910E-07	5	639
1	90	NRC	100000	5.2107E-08	5	639
1	50	NRC	100000	3.2884E-12	5	639
1	99.5	NRC	100000	1.5713E-06	6	786
1	99	NRC	100000	1.2780E-06	6	786
1	95	NRC	100000	6.8336E-07	6	786
1	90	NRC	100000	5.4795E-08	6	786
1	50	NRC	100000	2.9991E-12	6	786
1	99.5	NRC	100000	1.4903E-06	7	1413
1	99	NRC	100000	1.1979E-06	7	1413
1	95	NRC	100000	5.4486E-07	7	1413
1	90	NRC	100000	4.0851E-08	7	1413
1	50	NRC	100000	2.6587E-12	7	1413
1	99.5	NRC	100000	1.2249E-06	8	3303
1	99	NRC	100000	1.0277E-06	8	3303
1	95	NRC	100000	2.0003E-07	8	3303
1	90	NRC	100000	3.5387E-08	8	3303
1	50	NRC	100000	6.8324E-10	8	3303
1	99.5	NRC	100000	9.7646E-07	9	7845
1	99	NRC	100000	8.5370E-07	9	7845
1	95	NRC	100000	1.1932E-07	9	7845
1	90	NRC	100000	4.1443E-08	9	7845
1	50	NRC	100000	1.4883E-08	9	7845
1	99.5	NRC	100000	1.4240E-06	10	2633
1	99	NRC	100000	1.2428E-06	10	2633
1	95	NRC	100000	7.9479E-07	10	2633
1	90	NRC	100000	5.6717E-07	10	2633
1	50	NRC	100000	2.5742E-08	10	2633
1	99.5	NRC	100000	1.6180E-06	11	1700
1	99	NRC	100000	1.4066E-06	11	1700
1	95	NRC	100000	1.0059E-06	11	1700
1	90	NRC	100000	8.1864E-07	11	1700
1	50	NRC	100000	3.7831E-08	11	1700
1	99.5	NRC	100000	1.5574E-06	12	1321
1	99	NRC	100000	1.4898E-06	12	1321
1	95	NRC	100000	1.1392E-06	12	1321
1	90	NRC	100000	9.4279E-07	12	1321
1	50	NRC	100000	5.8211E-08	12	1321
1	99.5	NRC	100000	1.6255E-06	13	1112
1	99	NRC	100000	1.5658E-06	13	1112
1	95	NRC	100000	1.1992E-06	13	1112
1	90	NRC	100000	1.0764E-06	13	1112
1	50	NRC	100000	2.1857E-07	13	1112
1	99.5	NRC	100000	1.7528E-06	14	1659
1	99	NRC	100000	1.5682E-06	14	1659
1	95	NRC	100000	1.1785E-06	14	1659
1	90	NRC	100000	1.0516E-06	14	1659

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	50	NRC	100000	3.1036E-07	14	1659
1	99.5	NRC	100000	1.4862E-06	15	6368
1	99	NRC	100000	1.3024E-06	15	6368
1	95	NRC	100000	9.8349E-07	15	6368
1	90	NRC	100000	8.3525E-07	15	6368
1	50	NRC	100000	1.6109E-07	15	6368
1	99.5	NRC	100000	1.3535E-06	16	7631
1	99	NRC	100000	1.1992E-06	16	7631
1	95	NRC	100000	9.4279E-07	16	7631
1	90	NRC	100000	8.1372E-07	16	7631
1	50	NRC	100000	1.4977E-07	16	7631
1	99.5	NRC	150000	9.3571E-07	1	3462
1	99	NRC	150000	8.2187E-07	1	3462
1	95	NRC	150000	5.8460E-07	1	3462
1	90	NRC	150000	4.4802E-07	1	3462
1	50	NRC	150000	1.8833E-08	1	3462
1	99.5	NRC	150000	9.5402E-07	2	1618
1	99	NRC	150000	8.1239E-07	2	1618
1	95	NRC	150000	5.3429E-07	2	1618
1	90	NRC	150000	3.8344E-07	2	1618
1	50	NRC	150000	1.3040E-08	2	1618
1	99.5	NRC	150000	8.6560E-07	3	927
1	99	NRC	150000	8.0364E-07	3	927
1	95	NRC	150000	4.7369E-07	3	927
1	90	NRC	150000	2.6431E-07	3	927
1	50	NRC	150000	5.8035E-10	3	927
1	99.5	NRC	150000	9.8348E-07	4	705
1	99	NRC	150000	9.0466E-07	4	705
1	95	NRC	150000	4.3495E-07	4	705
1	90	NRC	150000	2.1110E-08	4	705
1	50	NRC	150000	1.1011E-12	4	705
1	99.5	NRC	150000	1.0120E-06	5	639
1	99	NRC	150000	9.1511E-07	5	639
1	95	NRC	150000	5.3429E-07	5	639
1	90	NRC	150000	2.9230E-08	5	639
1	50	NRC	150000	9.7550E-13	5	639
1	99.5	NRC	150000	9.8874E-07	6	786
1	99	NRC	150000	8.0417E-07	6	786
1	95	NRC	150000	4.3000E-07	6	786
1	90	NRC	150000	3.0745E-08	6	786
1	50	NRC	150000	8.8966E-13	6	786
1	99.5	NRC	150000	9.3778E-07	7	1413
1	99	NRC	150000	7.5378E-07	7	1413
1	95	NRC	150000	3.4152E-07	7	1413
1	90	NRC	150000	2.2895E-08	7	1413
1	50	NRC	150000	7.8870E-13	7	1413
1	99.5	NRC	150000	7.7078E-07	8	3303
1	99	NRC	150000	6.4668E-07	8	3303
1	95	NRC	150000	1.2079E-07	8	3303
1	90	NRC	150000	1.9823E-08	8	3303
1	50	NRC	150000	3.0354E-10	8	3303
1	99.5	NRC	150000	6.1443E-07	9	7845
1	99	NRC	150000	5.3719E-07	9	7845

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	95	NRC	150000	7.1763E-08	9	7845
1	90	NRC	150000	2.3228E-08	9	7845
1	50	NRC	150000	8.3274E-09	9	7845
1	99.5	NRC	150000	8.9605E-07	10	2633
1	99	NRC	150000	7.8201E-07	10	2633
1	95	NRC	150000	5.0012E-07	10	2633
1	90	NRC	150000	3.5572E-07	10	2633
1	50	NRC	150000	1.4407E-08	10	2633
1	99.5	NRC	150000	1.0181E-06	11	1700
1	99	NRC	150000	8.8510E-07	11	1700
1	95	NRC	150000	6.3298E-07	11	1700
1	90	NRC	150000	5.1513E-07	11	1700
1	50	NRC	150000	2.1197E-08	11	1700
1	99.5	NRC	150000	9.8001E-07	12	1321
1	99	NRC	150000	9.3745E-07	12	1321
1	95	NRC	150000	7.1684E-07	12	1321
1	90	NRC	150000	5.9325E-07	12	1321
1	50	NRC	150000	3.2670E-08	12	1321
1	99.5	NRC	150000	1.0229E-06	13	1112
1	99	NRC	150000	9.8529E-07	13	1112
1	95	NRC	150000	7.5457E-07	13	1112
1	90	NRC	150000	6.7733E-07	13	1112
1	50	NRC	150000	1.3210E-07	13	1112
1	99.5	NRC	150000	1.1029E-06	14	1659
1	99	NRC	150000	9.8677E-07	14	1659
1	95	NRC	150000	7.4156E-07	14	1659
1	90	NRC	150000	6.6170E-07	14	1659
1	50	NRC	150000	1.8775E-07	14	1659
1	99.5	NRC	150000	9.3518E-07	15	6368
1	99	NRC	150000	8.1950E-07	15	6368
1	95	NRC	150000	6.1885E-07	15	6368
1	90	NRC	150000	5.2557E-07	15	6368
1	50	NRC	150000	9.7088E-08	15	6368
1	99.5	NRC	150000	8.5169E-07	16	7631
1	99	NRC	150000	7.5457E-07	16	7631
1	95	NRC	150000	5.9325E-07	16	7631
1	90	NRC	150000	5.1203E-07	16	7631
1	50	NRC	150000	9.0216E-08	16	7631
1	99.5	NRC	200000	6.7365E-07	1	3462
1	99	NRC	200000	5.9169E-07	1	3462
1	95	NRC	200000	4.2087E-07	1	3462
1	90	NRC	200000	3.2255E-07	1	3462
1	50	NRC	200000	1.2488E-08	1	3462
1	99.5	NRC	200000	6.8683E-07	2	1618
1	99	NRC	200000	5.8487E-07	2	1618
1	95	NRC	200000	3.8465E-07	2	1618
1	90	NRC	200000	2.7575E-07	2	1618
1	50	NRC	200000	8.6423E-09	2	1618
1	99.5	NRC	200000	6.2317E-07	3	927
1	99	NRC	200000	5.7856E-07	3	927
1	95	NRC	200000	3.4103E-07	3	927
1	90	NRC	200000	1.8722E-07	3	927
1	50	NRC	200000	3.2635E-10	3	927

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	99.5	NRC	200000	7.0804E-07	4	705
1	99	NRC	200000	6.5129E-07	4	705
1	95	NRC	200000	3.1313E-07	4	705
1	90	NRC	200000	1.4000E-08	4	705
1	50	NRC	200000	4.6490E-13	4	705
1	99.5	NRC	200000	7.2857E-07	5	639
1	99	NRC	200000	6.5882E-07	5	639
1	95	NRC	200000	3.8465E-07	5	639
1	90	NRC	200000	1.9398E-08	5	639
1	50	NRC	200000	4.1188E-13	5	639
1	99.5	NRC	200000	7.1183E-07	6	786
1	99	NRC	200000	5.7895E-07	6	786
1	95	NRC	200000	3.0957E-07	6	786
1	90	NRC	200000	2.0405E-08	6	786
1	50	NRC	200000	3.7564E-13	6	786
1	99.5	NRC	200000	6.7513E-07	7	1413
1	99	NRC	200000	5.4267E-07	7	1413
1	95	NRC	200000	2.4537E-07	7	1413
1	90	NRC	200000	1.5186E-08	7	1413
1	50	NRC	200000	3.3301E-13	7	1413
1	99.5	NRC	200000	5.5491E-07	8	3303
1	99	NRC	200000	4.6556E-07	8	3303
1	95	NRC	200000	8.4498E-08	8	3303
1	90	NRC	200000	1.3146E-08	8	3303
1	50	NRC	200000	1.7069E-10	8	3303
1	99.5	NRC	200000	4.4235E-07	9	7845
1	99	NRC	200000	3.8674E-07	9	7845
1	95	NRC	200000	4.9970E-08	9	7845
1	90	NRC	200000	1.5408E-08	9	7845
1	50	NRC	200000	5.5190E-09	9	7845
1	99.5	NRC	200000	6.4509E-07	10	2633
1	99	NRC	200000	5.6299E-07	10	2633
1	95	NRC	200000	3.6005E-07	10	2633
1	90	NRC	200000	2.5566E-07	10	2633
1	50	NRC	200000	9.5492E-09	10	2633
1	99.5	NRC	200000	7.3295E-07	11	1700
1	99	NRC	200000	6.3721E-07	11	1700
1	95	NRC	200000	4.5570E-07	11	1700
1	90	NRC	200000	3.7085E-07	11	1700
1	50	NRC	200000	1.4058E-08	11	1700
1	99.5	NRC	200000	7.0554E-07	12	1321
1	99	NRC	200000	6.7490E-07	12	1321
1	95	NRC	200000	5.1607E-07	12	1321
1	90	NRC	200000	4.2710E-07	12	1321
1	50	NRC	200000	2.1686E-08	12	1321
1	99.5	NRC	200000	7.3639E-07	13	1112
1	99	NRC	200000	7.0934E-07	13	1112
1	95	NRC	200000	5.4324E-07	13	1112
1	90	NRC	200000	4.8763E-07	13	1112
1	50	NRC	200000	9.2456E-08	13	1112
1	99.5	NRC	200000	7.9405E-07	14	1659
1	99	NRC	200000	7.1041E-07	14	1659
1	95	NRC	200000	5.3387E-07	14	1659

SITE	PERCENT	STABILITY	DISTANCE	XQ	SECTOR	OBSERVATIONS
1	90	NRC	200000	4.7638E-07	14	1659
1	50	NRC	200000	1.3146E-07	14	1659
1	99.5	NRC	200000	6.7326E-07	15	6368
1	99	NRC	200000	5.8998E-07	15	6368
1	95	NRC	200000	4.4553E-07	15	6368
1	90	NRC	200000	3.7838E-07	15	6368
1	50	NRC	200000	6.7849E-08	15	6368
1	99.5	NRC	200000	6.1316E-07	16	7631
1	99	NRC	200000	5.4324E-07	16	7631
1	95	NRC	200000	4.2710E-07	16	7631
1	90	NRC	200000	3.6862E-07	16	7631
1	50	NRC	200000	6.3028E-08	16	7631

I.3 CHRONIC χ/Q VALUES

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	100	8760	1.4958E-04	1	3462	
1	99.5	NRC	100	8760	6.0372E-05	2	1618	
1	99.5	NRC	100	8760	3.0675E-05	3	927	
1	99.5	NRC	100	8760	2.2955E-05	4	705	
1	99.5	NRC	100	8760	2.1937E-05	5	639	
1	99.5	NRC	100	8760	2.4919E-05	6	786	
1	99.5	NRC	100	8760	3.8954E-05	7	1413	
1	99.5	NRC	100	8760	7.5017E-05	8	3303	
1	99.5	NRC	100	8760	1.5891E-04	9	7845	
1	99.5	NRC	100	8760	9.5652E-05	10	2633	
1	99.5	NRC	100	8760	8.1655E-05	11	1700	
1	99.5	NRC	100	8760	8.2095E-05	12	1321	
1	99.5	NRC	100	8760	8.9893E-05	13	1112	
1	99.5	NRC	100	8760	1.4624E-04	14	1659	
1	99.5	NRC	100	8760	4.2852E-04	15	6368	
1	99.5	NRC	100	8760	4.7658E-04	16	7631	MAX
1	99.5	NRC	200	8760	4.0932E-05	1	3462	
1	99.5	NRC	200	8760	1.6406E-05	2	1618	
1	99.5	NRC	200	8760	8.2138E-06	3	927	
1	99.5	NRC	200	8760	6.0543E-06	4	705	
1	99.5	NRC	200	8760	5.7896E-06	5	639	
1	99.5	NRC	200	8760	6.5705E-06	6	786	
1	99.5	NRC	200	8760	1.0275E-05	7	1413	
1	99.5	NRC	200	8760	1.9968E-05	8	3303	
1	99.5	NRC	200	8760	4.2491E-05	9	7845	
1	99.5	NRC	200	8760	2.6040E-05	10	2633	
1	99.5	NRC	200	8760	2.2403E-05	11	1700	
1	99.5	NRC	200	8760	2.2654E-05	12	1321	
1	99.5	NRC	200	8760	2.4984E-05	13	1112	
1	99.5	NRC	200	8760	4.0688E-05	14	1659	
1	99.5	NRC	200	8760	1.1863E-04	15	6368	
1	99.5	NRC	200	8760	1.3195E-04	16	7631	MAX
1	99.5	NRC	300	8760	1.9434E-05	1	3462	

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	300	8760	7.6672E-06	2	1618	
1	99.5	NRC	300	8760	3.6626E-06	3	927	
1	99.5	NRC	300	8760	2.5736E-06	4	705	
1	99.5	NRC	300	8760	2.4616E-06	5	639	
1	99.5	NRC	300	8760	2.8053E-06	6	786	
1	99.5	NRC	300	8760	4.3903E-06	7	1413	
1	99.5	NRC	300	8760	8.8760E-06	8	3303	
1	99.5	NRC	300	8760	1.9712E-05	9	7845	
1	99.5	NRC	300	8760	1.2276E-05	10	2633	
1	99.5	NRC	300	8760	1.0631E-05	11	1700	
1	99.5	NRC	300	8760	1.0794E-05	12	1321	
1	99.5	NRC	300	8760	1.1953E-05	13	1112	
1	99.5	NRC	300	8760	1.9515E-05	14	1659	
1	99.5	NRC	300	8760	5.6973E-05	15	6368	
1	99.5	NRC	300	8760	6.3265E-05	16	7631	MAX
1	99.5	NRC	400	8760	1.1517E-05	1	3462	
1	99.5	NRC	400	8760	4.4881E-06	2	1618	
1	99.5	NRC	400	8760	2.0623E-06	3	927	
1	99.5	NRC	400	8760	1.3889E-06	4	705	
1	99.5	NRC	400	8760	1.3294E-06	5	639	
1	99.5	NRC	400	8760	1.5212E-06	6	786	
1	99.5	NRC	400	8760	2.3807E-06	7	1413	
1	99.5	NRC	400	8760	4.9815E-06	8	3303	
1	99.5	NRC	400	8760	1.1475E-05	9	7845	
1	99.5	NRC	400	8760	7.2346E-06	10	2633	
1	99.5	NRC	400	8760	6.2948E-06	11	1700	
1	99.5	NRC	400	8760	6.4104E-06	12	1321	
1	99.5	NRC	400	8760	7.1171E-06	13	1112	
1	99.5	NRC	400	8760	1.1641E-05	14	1659	
1	99.5	NRC	400	8760	3.4045E-05	15	6368	
1	99.5	NRC	400	8760	3.7751E-05	16	7631	MAX
1	99.5	NRC	500	8760	7.6993E-06	1	3462	
1	99.5	NRC	500	8760	2.9729E-06	2	1618	
1	99.5	NRC	500	8760	1.3265E-06	3	927	
1	99.5	NRC	500	8760	8.6357E-07	4	705	
1	99.5	NRC	500	8760	8.2745E-07	5	639	
1	99.5	NRC	500	8760	9.5010E-07	6	786	
1	99.5	NRC	500	8760	1.4860E-06	7	1413	
1	99.5	NRC	500	8760	3.1932E-06	8	3303	
1	99.5	NRC	500	8760	7.5657E-06	9	7845	
1	99.5	NRC	500	8760	4.8154E-06	10	2633	
1	99.5	NRC	500	8760	4.2039E-06	11	1700	
1	99.5	NRC	500	8760	4.2909E-06	12	1321	
1	99.5	NRC	500	8760	4.7721E-06	13	1112	
1	99.5	NRC	500	8760	7.8159E-06	14	1659	
1	99.5	NRC	500	8760	2.2895E-05	15	6368	
1	99.5	NRC	500	8760	2.5356E-05	16	7631	MAX
1	99.5	NRC	750	8760	3.7264E-06	1	3462	
1	99.5	NRC	750	8760	1.4183E-06	2	1618	

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	750	8760	6.0358E-07	3	927	
1	99.5	NRC	750	8760	3.7103E-07	4	705	
1	99.5	NRC	750	8760	3.5667E-07	5	639	
1	99.5	NRC	750	8760	4.1205E-07	6	786	
1	99.5	NRC	750	8760	6.4250E-07	7	1413	
1	99.5	NRC	750	8760	1.4411E-06	8	3303	
1	99.5	NRC	750	8760	3.5758E-06	9	7845	
1	99.5	NRC	750	8760	2.3136E-06	10	2633	
1	99.5	NRC	750	8760	2.0305E-06	11	1700	
1	99.5	NRC	750	8760	2.0807E-06	12	1321	
1	99.5	NRC	750	8760	2.3196E-06	13	1112	
1	99.5	NRC	750	8760	3.8062E-06	14	1659	
1	99.5	NRC	750	8760	1.1185E-05	15	6368	
1	99.5	NRC	750	8760	1.2361E-05	16	7631	MAX
1	99.5	NRC	1000	8760	2.2358E-06	1	3462	
1	99.5	NRC	1000	8760	8.4381E-07	2	1618	
1	99.5	NRC	1000	8760	3.4935E-07	3	927	
1	99.5	NRC	1000	8760	2.0743E-07	4	705	
1	99.5	NRC	1000	8760	2.0006E-07	5	639	
1	99.5	NRC	1000	8760	2.3202E-07	6	786	
1	99.5	NRC	1000	8760	3.6052E-07	7	1413	
1	99.5	NRC	1000	8760	8.2823E-07	8	3303	
1	99.5	NRC	1000	8760	2.1125E-06	9	7845	
1	99.5	NRC	1000	8760	1.3817E-06	10	2633	
1	99.5	NRC	1000	8760	1.2163E-06	11	1700	
1	99.5	NRC	1000	8760	1.2497E-06	12	1321	
1	99.5	NRC	1000	8760	1.3948E-06	13	1112	
1	99.5	NRC	1000	8760	2.2909E-06	14	1659	
1	99.5	NRC	1000	8760	6.7487E-06	15	6368	
1	99.5	NRC	1000	8760	7.4466E-06	16	7631	MAX
1	99.5	NRC	2000	8760	6.9068E-07	1	3462	
1	99.5	NRC	2000	8760	2.5610E-07	2	1618	
1	99.5	NRC	2000	8760	1.0049E-07	3	927	
1	99.5	NRC	2000	8760	5.5763E-08	4	705	
1	99.5	NRC	2000	8760	5.4361E-08	5	639	
1	99.5	NRC	2000	8760	6.3525E-08	6	786	
1	99.5	NRC	2000	8760	9.7333E-08	7	1413	
1	99.5	NRC	2000	8760	2.3269E-07	8	3303	
1	99.5	NRC	2000	8760	6.2684E-07	9	7845	
1	99.5	NRC	2000	8760	4.2103E-07	10	2633	
1	99.5	NRC	2000	8760	3.7329E-07	11	1700	
1	99.5	NRC	2000	8760	3.8622E-07	12	1321	
1	99.5	NRC	2000	8760	4.3264E-07	13	1112	
1	99.5	NRC	2000	8760	7.1209E-07	14	1659	
1	99.5	NRC	2000	8760	2.1026E-06	15	6368	
1	99.5	NRC	2000	8760	2.3168E-06	16	7631	MAX
1	99.5	NRC	3000	8760	3.6423E-07	1	3462	
1	99.5	NRC	3000	8760	1.3391E-07	2	1618	
1	99.5	NRC	3000	8760	5.1622E-08	3	927	

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	3000	8760	2.8128E-08	4	705	
1	99.5	NRC	3000	8760	2.7680E-08	5	639	
1	99.5	NRC	3000	8760	3.2310E-08	6	786	
1	99.5	NRC	3000	8760	4.8916E-08	7	1413	
1	99.5	NRC	3000	8760	1.1675E-07	8	3303	
1	99.5	NRC	3000	8760	3.1882E-07	9	7845	
1	99.5	NRC	3000	8760	2.1981E-07	10	2633	
1	99.5	NRC	3000	8760	1.9634E-07	11	1700	
1	99.5	NRC	3000	8760	2.0460E-07	12	1321	
1	99.5	NRC	3000	8760	2.3046E-07	13	1112	
1	99.5	NRC	3000	8760	3.7961E-07	14	1659	
1	99.5	NRC	3000	8760	1.1178E-06	15	6368	
1	99.5	NRC	3000	8760	1.2317E-06	16	7631	MAX
1	99.5	NRC	4000	8760	2.3454E-07	1	3462	
1	99.5	NRC	4000	8760	8.5776E-08	2	1618	
1	99.5	NRC	4000	8760	3.2793E-08	3	927	
1	99.5	NRC	4000	8760	1.7754E-08	4	705	
1	99.5	NRC	4000	8760	1.7593E-08	5	639	
1	99.5	NRC	4000	8760	2.0486E-08	6	786	
1	99.5	NRC	4000	8760	3.0748E-08	7	1413	
1	99.5	NRC	4000	8760	7.2814E-08	8	3303	
1	99.5	NRC	4000	8760	1.9963E-07	9	7845	
1	99.5	NRC	4000	8760	1.4055E-07	10	2633	
1	99.5	NRC	4000	8760	1.2628E-07	11	1700	
1	99.5	NRC	4000	8760	1.3232E-07	12	1321	
1	99.5	NRC	4000	8760	1.4973E-07	13	1112	
1	99.5	NRC	4000	8760	2.4671E-07	14	1659	
1	99.5	NRC	4000	8760	7.2446E-07	15	6368	
1	99.5	NRC	4000	8760	7.9837E-07	16	7631	MAX
1	99.5	NRC	5000	8760	1.6777E-07	1	3462	
1	99.5	NRC	5000	8760	6.1132E-08	2	1618	
1	99.5	NRC	5000	8760	2.3265E-08	3	927	
1	99.5	NRC	5000	8760	1.2568E-08	4	705	
1	99.5	NRC	5000	8760	1.2519E-08	5	639	
1	99.5	NRC	5000	8760	1.4541E-08	6	786	
1	99.5	NRC	5000	8760	2.1685E-08	7	1413	
1	99.5	NRC	5000	8760	5.0906E-08	8	3303	
1	99.5	NRC	5000	8760	1.3962E-07	9	7845	
1	99.5	NRC	5000	8760	1.0000E-07	10	2633	
1	99.5	NRC	5000	8760	9.0280E-08	11	1700	
1	99.5	NRC	5000	8760	9.5020E-08	12	1321	
1	99.5	NRC	5000	8760	1.0792E-07	13	1112	
1	99.5	NRC	5000	8760	1.7785E-07	14	1659	
1	99.5	NRC	5000	8760	5.2097E-07	15	6368	
1	99.5	NRC	5000	8760	5.7420E-07	16	7631	MAX
1	99.5	NRC	7500	8760	9.2364E-08	1	3462	
1	99.5	NRC	7500	8760	3.3460E-08	2	1618	
1	99.5	NRC	7500	8760	1.2671E-08	3	927	
1	99.5	NRC	7500	8760	6.8470E-09	4	705	

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	7500	8760	6.8804E-09	5	639	
1	99.5	NRC	7500	8760	7.9479E-09	6	786	
1	99.5	NRC	7500	8760	1.1727E-08	7	1413	
1	99.5	NRC	7500	8760	2.6996E-08	8	3303	
1	99.5	NRC	7500	8760	7.3736E-08	9	7845	
1	99.5	NRC	7500	8760	5.4549E-08	10	2633	
1	99.5	NRC	7500	8760	4.9691E-08	11	1700	
1	99.5	NRC	7500	8760	5.2721E-08	12	1321	
1	99.5	NRC	7500	8760	6.0297E-08	13	1112	
1	99.5	NRC	7500	8760	9.9386E-08	14	1659	
1	99.5	NRC	7500	8760	2.8967E-07	15	6368	
1	99.5	NRC	7500	8760	3.1938E-07	16	7631	MAX
1	99.5	NRC	10000	8760	6.0957E-08	1	3462	
1	99.5	NRC	10000	8760	2.2004E-08	2	1618	
1	99.5	NRC	10000	8760	8.3203E-09	3	927	
1	99.5	NRC	10000	8760	4.5080E-09	4	705	
1	99.5	NRC	10000	8760	4.5551E-09	5	639	
1	99.5	NRC	10000	8760	5.2387E-09	6	786	
1	99.5	NRC	10000	8760	7.6785E-09	7	1413	
1	99.5	NRC	10000	8760	1.7404E-08	8	3303	
1	99.5	NRC	10000	8760	4.7241E-08	9	7845	
1	99.5	NRC	10000	8760	3.5782E-08	10	2633	
1	99.5	NRC	10000	8760	3.2807E-08	11	1700	
1	99.5	NRC	10000	8760	3.5001E-08	12	1321	
1	99.5	NRC	10000	8760	4.0234E-08	13	1112	
1	99.5	NRC	10000	8760	6.6321E-08	14	1659	
1	99.5	NRC	10000	8760	1.9254E-07	15	6368	
1	99.5	NRC	10000	8760	2.1236E-07	16	7631	MAX
1	99.5	NRC	20000	8760	2.2891E-08	1	3462	
1	99.5	NRC	20000	8760	8.2076E-09	2	1618	
1	99.5	NRC	20000	8760	3.1079E-09	3	927	
1	99.5	NRC	20000	8760	1.7021E-09	4	705	
1	99.5	NRC	20000	8760	1.7387E-09	5	639	
1	99.5	NRC	20000	8760	1.9768E-09	6	786	
1	99.5	NRC	20000	8760	2.8618E-09	7	1413	
1	99.5	NRC	20000	8760	6.2364E-09	8	3303	
1	99.5	NRC	20000	8760	1.6534E-08	9	7845	
1	99.5	NRC	20000	8760	1.3262E-08	10	2633	
1	99.5	NRC	20000	8760	1.2349E-08	11	1700	
1	99.5	NRC	20000	8760	1.3342E-08	12	1321	
1	99.5	NRC	20000	8760	1.5524E-08	13	1112	
1	99.5	NRC	20000	8760	2.5591E-08	14	1659	
1	99.5	NRC	20000	8760	7.3535E-08	15	6368	
1	99.5	NRC	20000	8760	8.1201E-08	16	7631	MAX
1	99.5	NRC	25000	8760	1.6793E-08	1	3462	
1	99.5	NRC	25000	8760	6.0112E-09	2	1618	
1	99.5	NRC	25000	8760	2.2798E-09	3	927	
1	99.5	NRC	25000	8760	1.2538E-09	4	705	
1	99.5	NRC	25000	8760	1.2843E-09	5	639	

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	25000	8760	1.4548E-09	6	786	
1	99.5	NRC	25000	8760	2.0997E-09	7	1413	
1	99.5	NRC	25000	8760	4.5186E-09	8	3303	
1	99.5	NRC	25000	8760	1.1865E-08	9	7845	
1	99.5	NRC	25000	8760	9.6927E-09	10	2633	
1	99.5	NRC	25000	8760	9.0700E-09	11	1700	
1	99.5	NRC	25000	8760	9.8367E-09	12	1321	
1	99.5	NRC	25000	8760	1.1489E-08	13	1112	
1	99.5	NRC	25000	8760	1.8939E-08	14	1659	
1	99.5	NRC	25000	8760	5.4232E-08	15	6368	
1	99.5	NRC	25000	8760	5.9915E-08	16	7631	MAX
1	99.5	NRC	50000	8760	6.5093E-09	1	3462	
1	99.5	NRC	50000	8760	2.3205E-09	2	1618	
1	99.5	NRC	50000	8760	8.8640E-10	3	927	
1	99.5	NRC	50000	8760	4.9424E-10	4	705	
1	99.5	NRC	50000	8760	5.0974E-10	5	639	
1	99.5	NRC	50000	8760	5.7084E-10	6	786	
1	99.5	NRC	50000	8760	8.1818E-10	7	1413	
1	99.5	NRC	50000	8760	1.6965E-09	8	3303	
1	99.5	NRC	50000	8760	4.3035E-09	9	7845	
1	99.5	NRC	50000	8760	3.7176E-09	10	2633	
1	99.5	NRC	50000	8760	3.5303E-09	11	1700	
1	99.5	NRC	50000	8760	3.8705E-09	12	1321	
1	99.5	NRC	50000	8760	4.5731E-09	13	1112	
1	99.5	NRC	50000	8760	7.5383E-09	14	1659	
1	99.5	NRC	50000	8760	2.1346E-08	15	6368	
1	99.5	NRC	50000	8760	2.3626E-08	16	7631	MAX
1	99.5	NRC	75000	8760	3.7721E-09	1	3462	
1	99.5	NRC	75000	8760	1.3425E-09	2	1618	
1	99.5	NRC	75000	8760	5.1553E-10	3	927	
1	99.5	NRC	75000	8760	2.8978E-10	4	705	
1	99.5	NRC	75000	8760	2.9974E-10	5	639	
1	99.5	NRC	75000	8760	3.3352E-10	6	786	
1	99.5	NRC	75000	8760	4.7678E-10	7	1413	
1	99.5	NRC	75000	8760	9.6891E-10	8	3303	
1	99.5	NRC	75000	8760	2.4031E-09	9	7845	
1	99.5	NRC	75000	8760	2.1426E-09	10	2633	
1	99.5	NRC	75000	8760	2.0514E-09	11	1700	
1	99.5	NRC	75000	8760	2.2619E-09	12	1321	
1	99.5	NRC	75000	8760	2.6897E-09	13	1112	
1	99.5	NRC	75000	8760	4.4338E-09	14	1659	
1	99.5	NRC	75000	8760	1.2472E-08	15	6368	
1	99.5	NRC	75000	8760	1.3822E-08	16	7631	MAX
1	99.5	NRC	100000	8760	2.5701E-09	1	3462	
1	99.5	NRC	100000	8760	9.1386E-10	2	1618	
1	99.5	NRC	100000	8760	3.5238E-10	3	927	
1	99.5	NRC	100000	8760	1.9918E-10	4	705	
1	99.5	NRC	100000	8760	2.0637E-10	5	639	
1	99.5	NRC	100000	8760	2.2863E-10	6	786	

SITE	PERCENT	STABILITY	DISTANCE	HOUR	XQ	SECTOR	OBSERVATIONS	MAX_SECTOR
1	99.5	NRC	100000	8760	3.2638E-10	7	1413	
1	99.5	NRC	100000	8760	6.5441E-10	8	3303	
1	99.5	NRC	100000	8760	1.5962E-09	9	7845	
1	99.5	NRC	100000	8760	1.4546E-09	10	2633	
1	99.5	NRC	100000	8760	1.4005E-09	11	1700	
1	99.5	NRC	100000	8760	1.5501E-09	12	1321	
1	99.5	NRC	100000	8760	1.8514E-09	13	1112	
1	99.5	NRC	100000	8760	3.0520E-09	14	1659	
1	99.5	NRC	100000	8760	8.5445E-09	15	6368	
1	99.5	NRC	100000	8760	9.4788E-09	16	7631	MAX
1	99.5	NRC	150000	8760	1.5033E-09	1	3462	
1	99.5	NRC	150000	8760	5.3398E-10	2	1618	
1	99.5	NRC	150000	8760	2.0715E-10	3	927	
1	99.5	NRC	150000	8760	1.1799E-10	4	705	
1	99.5	NRC	150000	8760	1.2247E-10	5	639	
1	99.5	NRC	150000	8760	1.3488E-10	6	786	
1	99.5	NRC	150000	8760	1.9229E-10	7	1413	
1	99.5	NRC	150000	8760	3.7876E-10	8	3303	
1	99.5	NRC	150000	8760	9.0185E-10	9	7845	
1	99.5	NRC	150000	8760	8.4672E-10	10	2633	
1	99.5	NRC	150000	8760	8.2146E-10	11	1700	
1	99.5	NRC	150000	8760	9.1373E-10	12	1321	
1	99.5	NRC	150000	8760	1.0979E-09	13	1112	
1	99.5	NRC	150000	8760	1.8099E-09	14	1659	
1	99.5	NRC	150000	8760	5.0334E-09	15	6368	
1	99.5	NRC	150000	8760	5.5923E-09	16	7631	MAX
1	99.5	NRC	200000	8760	1.0305E-09	1	3462	
1	99.5	NRC	200000	8760	3.6585E-10	2	1618	
1	99.5	NRC	200000	8760	1.4255E-10	3	927	
1	99.5	NRC	200000	8760	8.1613E-11	4	705	
1	99.5	NRC	200000	8760	8.4807E-11	5	639	
1	99.5	NRC	200000	8760	9.3029E-11	6	786	
1	99.5	NRC	200000	8760	1.3253E-10	7	1413	
1	99.5	NRC	200000	8760	2.5799E-10	8	3303	
1	99.5	NRC	200000	8760	6.0373E-10	9	7845	
1	99.5	NRC	200000	8760	5.7856E-10	10	2633	
1	99.5	NRC	200000	8760	5.6420E-10	11	1700	
1	99.5	NRC	200000	8760	6.2963E-10	12	1321	
1	99.5	NRC	200000	8760	7.5961E-10	13	1112	
1	99.5	NRC	200000	8760	1.2524E-09	14	1659	
1	99.5	NRC	200000	8760	3.4664E-09	15	6368	
1	99.5	NRC	200000	8760	3.8559E-09	16	7631	MAX

ATTACHMENT II

NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE

1.145

ATMOSPHERIC DISPERSION MODELS FOR POTENTIAL ACCIDENT CONSEQUENCE ASSESSMENTS AT NUCLEAR POWER PLANTS

U.S. NUCLEAR REGULATORY COMMISSION

Revision 1
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REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

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REGULATORY GUIDE 1.145

ATMOSPHERIC DISPERSION MODELS FOR POTENTIAL ACCIDENT CONSEQUENCE ASSESSMENTS AT NUCLEAR POWER PLANTS

A. INTRODUCTION

Section 100.10 of 10 CFR Part 100, "Reactor Site Criteria," states that meteorological conditions at the site and surrounding area should be considered in determining the acceptability of a site for a power reactor. Section 50.34 of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," requires that each applicant for a construction permit or operating license provide an analysis and evaluation of the design and performance of structures, systems, and components of the facility with the objective of assessing the risk to public health and safety resulting from the operation of the facility. Section 50.34 of 10 CFR Part 50 also states that special attention should be directed to the site evaluation factors identified in 10 CFR Part 100 in the assessment of the site.

The regulatory positions presented in this guide represent a substantial change from procedures previously used to determine relative concentrations for assessing the potential offsite radiological consequences for a range of postulated accidental releases of radioactive material to the atmosphere. These procedures now include consideration of plume meander, directional dependence of dispersion conditions, and wind frequencies for various locations around actual exclusion area and low population zone (LPZ) boundaries.[1]

The direction-dependent approach provides an improved basis for relating the Part 100-related review of a proposed reactor to specific site considerations. Accordingly, this guide provides an acceptable methodology for determining site-specific relative concentrations (χ/Q) and should be used in determining χ/Q values for the evaluations discussed in Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," and Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors." A number of other regulatory guides also include recommendations for or references to radiological analyses of potential accidents. The applicability of the specific criteria discussed herein to these other analyses will be considered on a case-by-case basis. Until such time as generic guidelines are developed for such analyses, the methodology provided in this guide is acceptable to the NRC staff.

The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

B. DISCUSSION

The atmospheric diffusion[2] models described in this guide reflect review of recent experimental data on diffusion from releases at ground level at open sites and from releases at various locations on reactor facility buildings during stable atmospheric conditions with low windspeeds (Refs. 1 through 6). These tests confirm the existence of effluent plume "meander" during low windspeed conditions and neutral (D) and stable (E, F, and G) atmospheric stability conditions (as defined by the temperature difference (ΔT) criteria in Regulatory Guide 1.23, "Onsite Meteorological Programs," and provide bases for quantifying the effects of plume meander on effluent concentrations. Effluent concentrations measured over a period of 1 hour under such conditions have been shown to be substantially lower than would be predicted using the traditional curves (Ref. 7) of lateral and vertical plume spread.

[1] For additional information concerning the bases for the regulatory positions presented in this guide, see NUREG/CR-2260, "Technical Basis for Regulatory Guide 1.145."

• Lines indicate substantive changes from previous issue.

[2] In discussions throughout this regulatory guide, *atmospheric dispersion* will be considered as consisting of two components: *atmospheric transport* due to organized or mean airflow within the atmosphere and *atmospheric diffusion* due to disorganized or random air motions. Plume depletion and surface deposition of airborne materials are not included in the dispersion models described in this guide.

The procedures in this guide also recognize that atmospheric dispersion conditions and wind frequencies are usually directionally dependent; that is, certain airflow directions can exhibit substantially more or less favorable diffusion conditions than others, and the wind can transport effluents in certain directions more frequently than in others. The procedures also allow evaluations of atmospheric dispersion for directionally variable distances such as a noncircular exclusion area boundary.

C. REGULATORY POSITION

This section identifies acceptable methods for (1) calculating atmospheric relative concentration (χ/Q) values, (2) determining χ/Q values on a directional basis, (3) determining χ/Q values on an overall site basis, and (4) choosing χ/Q values to be used in evaluations of the types of events described in Regulatory Guides 1.3 and 1.4.

Selection of conservative, less detailed site parameters for the evaluation may be sufficient to establish compliance with regulatory guidelines.

1. CALCULATION OF ATMOSPHERIC RELATIVE CONCENTRATION (χ/Q) VALUES

Equations and parameters presented in this section should be used unless unusual siting, meteorological, or terrain conditions dictate the use of other models or considerations. Site-specific atmospheric diffusion tests covering a full range of conditions may be used as a basis for modifying the equations and parameters.

1.1 Meteorological Data Input

The meteorological data needed for χ/Q calculations include windspeed, wind direction, and a measure of atmospheric stability. These data should represent hourly averages as defined in Regulatory Guide 1.23.

Wind direction should be classed into 16 compass directions (22.5-degree sectors centered on true north, north-northeast, etc.).

Atmospheric stability should be determined by vertical ΔT between the release height and the 10-meter level. Acceptable stability classes are given in Regulatory Guide 1.23. If other well-documented parameters are used to determine plume dispersion (with appropriate justification), the models described in this guide may require modification. A well-documented parameter is one that is substantiated by diffusion data collected in terrain conditions similar to those at the nuclear power plant site being considered.

Calms should be defined as hourly average windspeeds below the vane or anemometer starting speed, whichever is higher (to reflect limitations in instrumentation). If the instrumentation program conforms to the regulatory position in Regulatory Guide 1.23, calms should be assigned a windspeed equal to the vane or anemometer starting speed, whichever is higher. Otherwise, consideration of a conservative evaluation of calms, taking into account the limitations of the windspeed measurement system, will be necessary. Wind directions during calm conditions should be assigned in proportion to the directional distribution of noncalm winds with speeds less than 1.5 meters per second.[3]

1.2 Determination of Distances for χ/Q Calculations

For each wind direction sector, χ/Q values for each significant release point should be calculated at an appropriate exclusion area boundary distance and outer low population zone (LPZ) boundary distance. The following procedure should be used to determine these distances. The procedure takes into consideration the possibility of curved airflow trajectories, plume segmentation (particularly in low wind, stable conditions), and the potential for windspeed and wind direction frequency shifts from year to year.

For each of the 16 sectors, the distance for exclusion area boundary or outer LPZ boundary χ/Q calculation should be the minimum distance from the stack or, in the case of releases through vents or building penetrations, the nearest point on the building to the exclusion area boundary or outer LPZ boundary within a 45-degree sector centered on the compass direction of interest.

For stack releases, the maximum ground-level concentration in a sector may occur beyond the exclusion area boundary distance or outer LPZ boundary distance. Therefore, for stack releases, χ/Q calculations should be made in each sector at each minimum boundary distance and at various distances beyond the exclusion area boundary distance to determine the maximum relative concentration for consideration in subsequent calculations.

1.3 Calculation of χ/Q Values at Exclusion Area Boundary Distances

Relative concentrations that can be assumed to apply at the exclusion area boundary for 2 hours immediately following an accident should be determined.[4] Calculations based on meteorological data representing a 1-hour average should be assumed to apply for the entire 2-hour period. This assumption is reasonably conservative considering the small variation of χ/Q values with averaging time (Ref. 8). If releases associated with a postulated event are estimated to occur in a period of less than 20 minutes, the applicability of these models should be evaluated on a case-by-case basis.

Procedures for calculating "2-hour" χ/Q values depend on the mode of release. The procedures are described below.

[3] Staff experience has shown that noncalm windspeeds below 1.5 meters per second provide a reasonable range for defining the distribution of wind direction during light winds.

[4] See § 100.11 of 10 CFR Part 100.

1.3.1 Releases Through Vents or Other Building Penetrations

This class of release modes includes all release points or areas that are effectively lower than two and one-half times the height of adjacent solid structures (Ref. 9). Within this class, two sets of meteorological conditions are treated differently, as follows:

a. During neutral (D) or stable (E, F, or G) atmospheric stability conditions when the windspeed at the 10-meter level is less than 6 meters per second, horizontal plume meander may be considered. χ/Q values may be determined through selective use of the following set of equations for ground-level relative concentrations at the plume centerline:

$$\chi/Q = \frac{1}{\bar{U}_{10}(\pi\sigma_y\sigma_z + A/2)} \quad (1)$$

$$\chi/Q = \frac{1}{\bar{U}_{10}(3\pi\sigma_y\sigma_z)} \quad (2)$$

$$\chi/Q = \frac{1}{\bar{U}_{10}\pi\Sigma_y\sigma_z} \quad (3)$$

where

χ/Q is relative concentration, in sec/m^3,

π is 3.14159.

$\bar{U}_{10}$ is windspeed at 10 meters above plant grade,[5] in m/sec,

σ_y is lateral plume spread, in m, a function of atmospheric stability and distance (see Fig. 1),

σ_z is vertical plume spread, in m, a function of atmospheric stability and distance (see Fig. 2),

Σ_y is lateral plume spread with meander and building wake effects, in m, a function of atmospheric stability, windspeed $\bar{U}_{10}$, and distance [for distances of 800 meters or less, $\Sigma_y = M\sigma_y$, where M is determined from Fig. 3; for distances greater than 800 meters, $\Sigma_y = (M - 1)\,\sigma_{y800m} + \sigma_y$], and

A is the smallest vertical-plane cross-sectional area of the reactor building, in m^2. (Other structures or a directional consideration may be justified when appropriate.)

[5]The 10-meter level is considered to be representative of the layer through which the plume is mixed when subjected to building wake effects.

χ/Q values should be calculated using Equations 1, 2, and 3. The values from Equations 1 and 2 should be compared and the higher value selected. This value should be compared with the value from Equation 3, and the lower value of these two should then be selected as the appropriate χ/Q value. Examples and a detailed explanation of the rationale for determining the controlling conditions are given in Appendix A to this guide.

b. During all other meteorological conditions, plume meander should not be considered. The appropriate χ/Q value for these conditions is the higher value calculated from Equation 1 or 2.

1.3.2 Stack Releases

This class of release modes includes all release points at levels that are two and one-half times the height of adjacent solid structures or higher (Ref. 9). Nonfumigation conditions are treated separately.

a. For nonfumigation conditions, the equation for ground-level relative concentration at the plume centerline for stack releases is:

$$\chi/Q = \frac{1}{\pi\bar{U}_h\sigma_y\sigma_z}\exp\left[\frac{-h_e^2}{2\sigma_z^2}\right] \quad (4)$$

where

$\bar{U}_h$ is windspeed representing conditions at the release height, in m/sec,

h_e is effective stack height, in m: $h_e = h_s - h_t$,

h_s is the initial height of the plume (usually the stack height) above plant grade, in m, and

h_t is the maximum terrain height above plant grade between the release point and the point for which the calculation is made, in m. If h_t is greater than h_s, then $h_e = 0$.

For those cases in which the applicant can demonstrate that the vertical velocity of effluent plumes from the plant (because of either buoyancy or mechanical jet effects) will be maintained during the course of the accident, this additional velocity may be considered in the determination of the effective stack height (h_e) using the same procedures described in regulatory position 2.a of Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors."

b. For fumigation conditions, a "fumigation χ/Q" should be calculated for each sector as follows. The equation for ground-level relative concentration at the plume centerline for stack releases during fumigation conditions is:

$$\chi/Q = \frac{1}{(2\pi)^{1/2}\, \bar{U}_{h_e}\, \sigma_y h_e}, \quad h_e > 0 \qquad (5)$$

where

$\bar{U}_{h_e}$ is windspeed representative of the fumigation layer of depth h_e, in m/sec; in lieu of information to the contrary, the NRC staff considers a value of 2 meters per second as a reasonably conservative assumption for h_e of about 100 meters, and

σ_y is the lateral plume spread, in m, that is representative of the layer at a given distance; a moderately stable (F) atmospheric stability condition is usually assumed.

Equation 5 cannot be applied indiscriminately because the χ/Q values calculated, using this equation, become unrealistically large as h_e becomes small (on the order of 10 meters). The χ/Q values calculated using Equation 5 must therefore be limited by certain physical restrictions. The highest ground-level χ/Q values from elevated releases are expected to occur during stable conditions with low windspeeds when the effluent plume impacts on a terrain obstruction (i.e., $h_e = 0$). However, elevated plumes diffuse upward through the stable layer aloft as well as downward through the fumigation layer. Thus ground-level relative concentrations for elevated releases under fumigation conditions cannot be higher than those produced by nonfumigation, stable atmospheric conditions with $h_e = 0$. For the fumigation case that assumes F stability and a windspeed of 2 meters per second, Equation 4 should be used instead of Equation 5 at distances greater than the distance at which the χ/Q values determined using Equation 4 with $h_e = 0$ and Equation 5 are equal.

1.4 Calculation of χ/Q Values at Outer LPZ Boundary Distances

Two-hour χ/Q values should also be calculated at outer LPZ boundary distances. The procedures described above for exclusion area boundary distances (see regulatory position 1.3) should be used.

An annual average (8760-hour) χ/Q should be calculated for each sector at the outer LPZ boundary distance for that sector, using the method described in regulatory position 1.c of Regulatory Guide 1.111. For stack releases, h_e should be determined as described in regulatory position 1.3.2 above.

These calculated 2-hour and annual average values are used in regulatory position 2.2 to determine sector χ/Q values at outer LPZ boundary distances for various intermediate time periods.[6]

[6] See § 100.11 of 10 CFR Part 100.

2. DETERMINATION OF MAXIMUM SECTOR χ/Q VALUES

The χ/Q values calculated in regulatory position 1 are used to determine "sector χ/Q values" and "maximum sector χ/Q values" for the exclusion area boundary and the outer LPZ boundary.

2.1 Exclusion Area Boundary

2.1.1 General Method

Using the χ/Q values calculated for each hour of data according to regulatory position 1.3, a cumulative probability distribution of χ/Q values should be constructed for each of the 16 sectors. Each distribution should be described in terms of probabilities of given χ/Q values being exceeded in that sector during the total time. A plot of χ/Q versus probability of being exceeded should be made for each sector, and a smooth curve should be drawn to form an upper bound of the computed points. For each of the 16 curves, the χ/Q value that is exceeded 0.5 percent[7] of the total number of hours in the data set should be selected (Ref. 10). These are the sector χ/Q values. The highest of the 16 sector values is defined as the maximum sector χ/Q value.

2.1.2 Fumigation Conditions for Stack Releases

Regulatory position 1.3.2 describes procedures for calculating a fumigation χ/Q for each sector. These sector fumigation values, and the general (nonfumigation) sector values obtained in regulatory position 2.1.1, are used to determine appropriate sector fumigation χ/Qs. Conservative assumptions for fumigation conditions, which differ for inland and coastal sites, are described below. Modifications may be appropriate for specific sites.

a. Inland Sites: For stack releases at sites located 3.2 kilometers or more from large bodies of water (e.g., oceans or Great Lakes), a fumigation condition should be assumed to exist at the time of the accident and continue for 1/2 hour (Ref. 11). For each sector, if the sector fumigation χ/Q exceeds the sector nonfumigation χ/Q, use the fumigation value for the 0 to 1/2-hour time period and the nonfumigation value for the 1/2-hour to 2-hour time period. Otherwise, use the nonfumigation sector value for the entire 0 to 2-hour time period. The 16 (sets of) values thus determined should be used in dose assessments requiring time-integrated concentration considerations.

b. Coastal Sites: For stack releases at sites located less than 3.2 kilometers from large bodies of water, a fumigation condition should be assumed to exist at the exclusion area boundary at the time of the accident and continue for the entire 2-hour period. For each sector, the larger of the

[7] Selection of the 0.5 percent level is based on an equality, without consideration of plume meander, between the 5 percent directionally independent evaluation of χ/Q (the previous evaluation procedure) and the 0.5 percent directionally dependent evaluation of χ/Q averaged over a reasonably representative number of existing nuclear power plant sites. See NUREG/CR-2260 for additional information.

sector fumigation χ/Q and the sector nonfumigation χ/Q should be used for the 2-hour period. Of these 16 sector values, the highest is the maximum sector χ/Q value.

c. Modifications: These conservative assumptions do not consider frequency and duration of fumigation conditions as a function of airflow direction. If information can be presented to substantiate the likely directional occurrence and duration of fumigation conditions at a site, the assumptions of fumigation in all directions and of duration of 1/2 hour and 2 hours for the exclusion area boundary may be modified. Then fumigation need only be considered for airflow directions in which fumigation has been determined to occur and of a duration determined from the study of site conditions.[8]

2.2 Outer LPZ Boundary

2.2.1 General Method

Sector χ/Q values for the outer LPZ boundary should be determined for various time periods throughout the course of the postulated accident.[9] The time periods should represent appropriate meteorological regimes, e.g., 8 and 16 hours and 3 and 26 days as presented in Section 2.3.4 of Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants–LWR Edition," or other time periods appropriate to release durations.

For a given sector, the average χ/Q values for the various time periods may be approximated by a logarithmic interpolation between the 2-hour[10] sector χ/Q and the annual average (8760-hour) χ/Q for the same sector. The 2-hour sector χ/Q for the outer LPZ boundary is determined using the general method given for the exclusion area boundary in regulatory position 2.1. The annual average χ/Q for a given sector is determined as described in regulatory position 1.4.

The logarithmic interpolation procedure produces results that are consistent with studies of variations of average concentrations with time periods up to 100 hours (Ref. 8). Alternative methods should also be consistent with these studies and should produce results that provide a monotonic decrease in average χ/Q with time.

For each time period, the highest of the 16 sector χ/Q values should be identified. In most cases, these highest values will occur in the same sector for all time periods. These are then the maximum sector χ/Q values. However, if the highest sector χ/Qs do not all occur in the same sector, the 16 (sets of) values will be used in dose assessments requiring time-integrated concentration considerations. The set of χ/Q values resulting in the highest time-integrated dose within a sector should be considered the maximum sector χ/Q values.

2.2.2 Fumigation Conditions for Stack Releases

Determination of sector χ/Q values for fumigation conditions at the outer LPZ boundary involves the following assumptions concerning the duration of fumigation for inland and coastal sites:

a. Inland Sites: For stack releases at sites located 3.2 kilometers or more from large bodies of water, a fumigation condition should be assumed to exist at the outer LPZ boundary at the time of the accident and continue for 1/2 hour. Sector χ/Q values for fumigation should be determined as for the exclusion area boundary in regulatory position 2.1.2.

b. Coastal Sites: For stack releases at sites located less than 3.2 kilometers from large bodies of water, a fumigation condition should be assumed to exist at the outer LPZ boundary following the arrival of the plume and continue for a 4-hour period (Ref. 11). Sector χ/Q values for fumigation should be determined as for the exclusion area boundary in regulatory position 2.1.2.

c. The modifications discussed in regulatory position 2.1.2 may also be considered for the outer LPZ boundary.

3. DETERMINATION OF 5 PERCENT OVERALL SITE χ/Q VALUE

The χ/Q values that are exceeded no more than 5 percent of the total number of hours in the data set around the exclusion area boundary and around the outer LPZ boundary should be determined as follows (Ref. 10):

Using the χ/Q values calculated according to regulatory position 1, an overall cumulative probability distribution for all directions combined should be constructed. A plot of χ/Q versus probability of being exceeded should be made, and an upper bound curve should be drawn. The 2-hour χ/Q value that is exceeded 5 percent of the time should be selected from this curve as representing the dispersion condition indicative of the type of release being considered. In addition, for the outer LPZ boundary the maximum of the 16 annual average χ/Q values should be used along with the 5 percent 2-hour χ/Q value to determine χ/Q values for the intermediate time periods by logarithmic interpolation.

4. SELECTION OF χ/Q VALUES TO BE USED IN EVALUATIONS

The χ/Q value for exclusion area boundary or outer LPZ boundary evaluations should be the maximum sector χ/Q

[8] For example, examination of site-specific information at a location in a pronounced river valley may indicate that fumigation conditions occur only during the downvalley "drainage flow" regime and persist for durations of about 1/2 hour. Therefore, in this case, airflow directions other than the downvalley directions may be excluded from consideration of fumigation conditions, and the duration of fumigation would still be considered as 1/2 hour. On the other hand, data from sites in open terrain (noncoastal) may indicate no directional preference for fumigation conditions but may indicate durations much less than 1/2 hour. In this case, fumigation should be considered for all directions, but with durations of less than 1/2 hour.

[9] See § 100.11 of 10 CFR Part 100.

[10] The χ/Qs are based on 1-hour averaged data but are assumed to apply for 2 hours.

(regulatory position 2) or the 5 percent overall site χ/Q (regulatory position 3), whichever is higher. All direction-dependent sector values should be presented for consideration of the appropriateness of the exclusion area and outer LPZ boundaries. Where the basic meteorological data necessary for the analyses described herein substantially deviate from the regulatory position stated in Regulatory Guide 1.23, consideration should be given to the resulting uncertainties in dispersion estimates.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants regarding the NRC staff plans for using this regulatory guide.

Except in those cases in which an applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used in the evaluation of the following:

1. For early site review applications.

2. For construction permit applications (including those incorporating or referencing a duplicate plant design and those submitted under the replicate plant option of the Commission's standardization program).

3. Operating license applications.

For operating reactors, the licensee may use the method described in this guide or may continue to use the method previously contained or referenced in the FSAR for such facilities.

This guide does not apply to the following options specified in the Commission's standardization policy under the reference system concept:

1. Preliminary design approval applications.

2. Final design approval, Type 1, applications.

3. Final design approval, Type 2, applications.

4. Manufacturing license applications.

The implementation date for this guide is December 30, 1982.

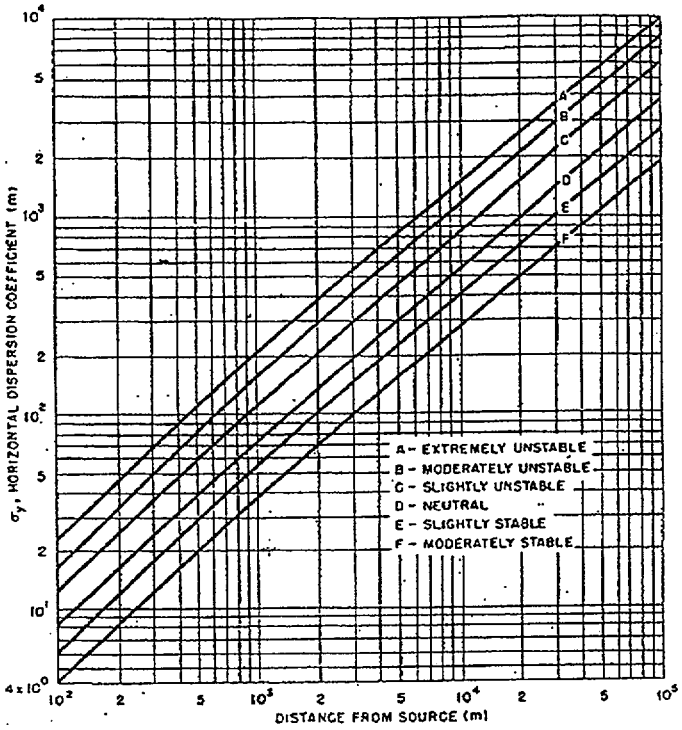

Figure 1. Lateral diffusion without meander and building wake effects, σ_y, vs. downwind distance from source for Pasquill's turbulence types (atmospheric stability) (Ref. 7).

The sigma values presented above are for unrestricted flow over relatively flat, uniform terrain. They may require modification before application in situations in which rough terrain or restricted flow conditions (e.g., within the confines of a narrow valley) must be considered or in coastal and desert areas. (See Ref. 12 for additional information.)

For purposes of estimating σ_y during extremely stable (G) atmospheric stability conditions, without plume meander or other lateral enhancement, the following approximation is appropriate:

$$\sigma_y(G) = \frac{2}{3}\sigma_y(F)$$

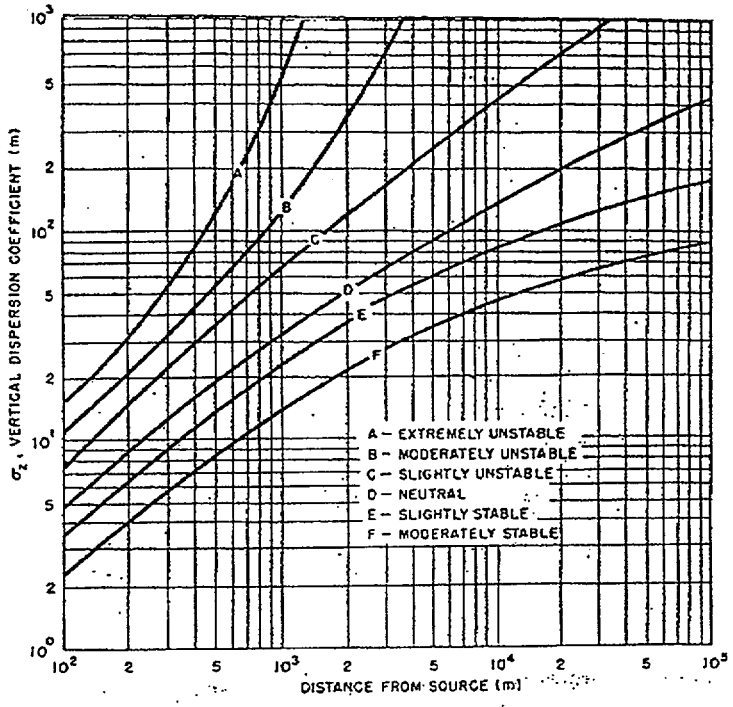

Figure 2. Vertical diffusion without meander and building wake effects, σ_z, vs. downwind distance from source for Pasquill's turbulence types (atmospheric stability) (Ref. 7).

The sigma values presented above are for unrestricted flow over relatively flat, uniform terrain. They may require modification before application in situations in which rough terrain or restricted flow conditions (e.g., within the confines of a narrow valley) must be considered or in coastal and desert areas. (See Ref. 12 for additional information.)

For purposes of estimating σ_z during extremely stable (G) atmospheric stability conditions, the following approximation is appropriate:

$$\sigma_z(G) = \frac{3}{5}\sigma_z(F)$$

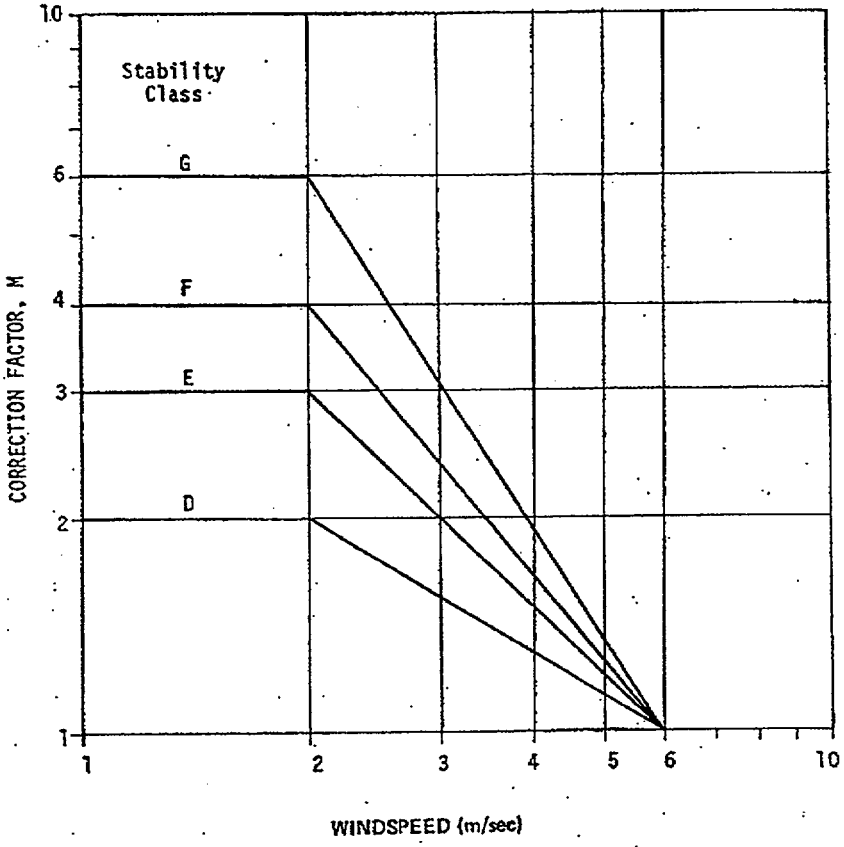

Figure 3. Correction factors for σ_y values by atmospheric stability class (see Appendix A to this guide).

APPENDIX A

ATMOSPHERIC DIFFUSION MODEL FOR RELEASE THROUGH VENTS AND BUILDING PENETRATIONS

Rationale

The effects of building wake mixing and ambient plume meander on atmospheric dispersion are expressed in this guide in terms of conditional use of Equations 1, 2, and 3.[1]

Equations 1 and 2 are formulations that have been acceptable for evaluating nuclear power plant sites over a period of many years (Ref. 7 and Regulatory Guides 1.3 and 1.4). The conditional use of Equations 1 and 2 provides an assessment of atmospheric diffusion, including only the effects of building wake mixing that occur during moderate windspeed conditions (>3 m/sec). These equations have recently been found to provide estimates of ground-level concentrations that are consistently too high during light wind and stable or neutral atmospheric conditions for 1-hour release durations (Refs. 1 through 6).

Equation 3 is an empirical formulation based on NRC staff analysis of atmospheric diffusion experiment results (Ref. 2). The NRC staff examined values of lateral plume spread with meander and building wake effects (Σ_y) by atmospheric stability class (based on ΔT), calculated from measured ground-level concentrations from the experimental results. Plots of the computed Σ_y values by atmospheric stability class and downwind distance were analyzed conservatively but within the scatter of the data points by virtually enveloping most test data. The resultant analysis is the basis for the correction factors applied to the σ_y values (see Fig. 3 of this guide). Thus, Equation 3 identifies conservatively the combined effects of increased plume meander and building wake on diffusion in the horizontal crosswind direction under light wind and stable or neutral atmospheric conditions, as quantified in Figure 3. These experiments also indicate that vertical building wake mixing during light wind and stable conditions is not as complete as during moderate wind, unstable conditions. In addition, vertical plume meander is shown to be virtually nonexistent during light wind, stable conditions. However, the experimental results for both situations could not be quantified for general application at this time.

The conditional use of Equations 1, 2, and 3 is considered appropriate because (1) horizontal plume meander tends to dominate dispersion during light wind and stable or neutral conditions and (2) building wake mixing becomes more effective in dispersing effluents than meander effects as the windspeed increases and the atmosphere becomes less stable.

Examples of Conditional Use of Diffusion Equations

Figures A-1, A-2, and A-3 show plots of $\chi\bar{U}_{10}/Q$ (χ/Q multiplied by the windspeed $\bar{U}_{10}$) versus downwind distance based on the conditional use (as described in regulatory position 1.3.1) of Equations 1, 2, and 3 during atmospheric stability class G. The variable M for Equation 3 equals 6, 3, and 2 respectively in Figures A-1, A-2, and A-3 (M is as defined in regulatory position 1.3.1).

In Figure A-1, the $\chi\bar{U}_{10}/Q$ from Equation 3 (M = 6) is less than the higher value from Equation 1 or 2 at all distances. Therefore, for M = 6, Equation 3 is used for all distances.

In Figure A-2, the $\chi\bar{U}_{10}/Q$ from Equation 3 (M = 3) is less than the higher value from Equation 1 or 2 beyond 0.8 km. Therefore, for M = 3, Equation 3 is used beyond 0.8 km. For distances less than 0.8 km, the value from Equation 3 equals that from Equation 2. Equation 2 is therefore used for distances less than 0.8 km.

In Figure A-3, the $\chi\bar{U}_{10}/Q$ from Equation 3 (M = 2) is never less than the higher value from Equation 1 or 2. Therefore, for M = 2, Equation 3 is not used at all. Instead, Equation 2 is used up to 0.8 km, and Equation 1 is used beyond 0.8 km.

[1] For additional information see NUREG/CR-2260.

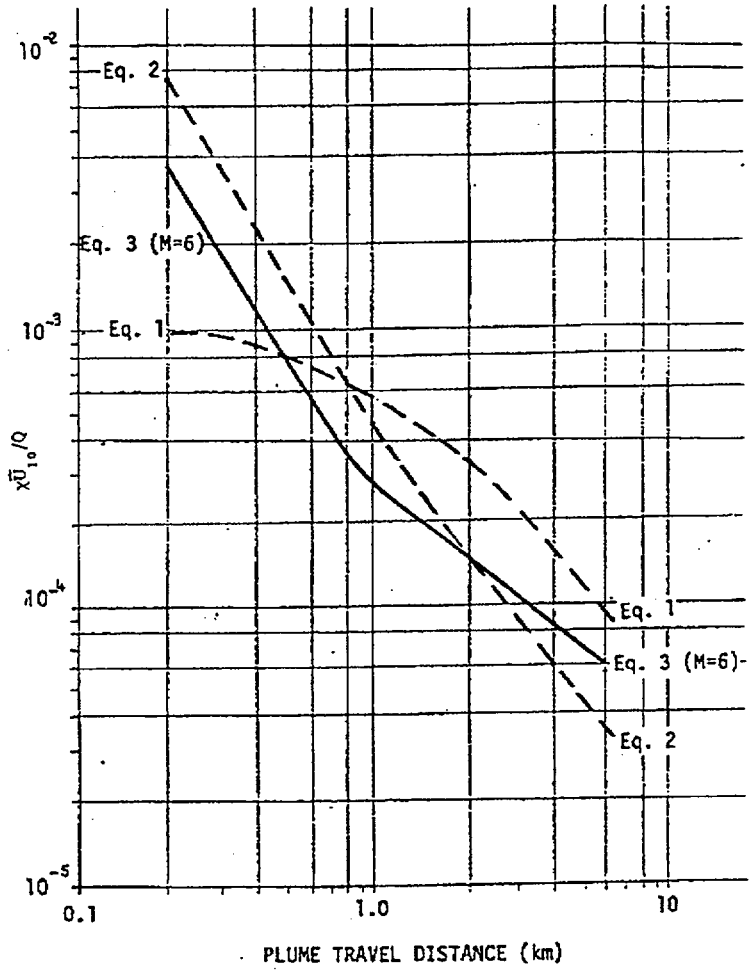

Figure A-1. $\chi\bar{U}_{10}/Q$ as a function of plume travel distance for G stability condition using Equations 1, 2, and 3 (M = 6).

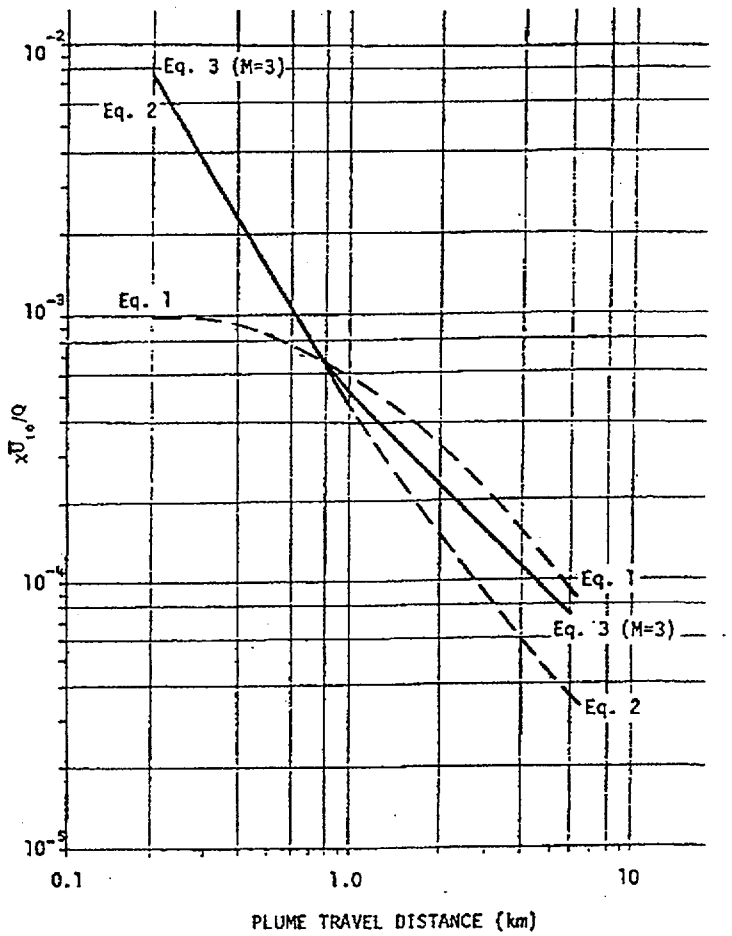

Figure A-2. $x\bar{U}_{10}/Q$ as a function of plume travel distance for G stability condition using Equations 1, 2, and 3 (M = 3).

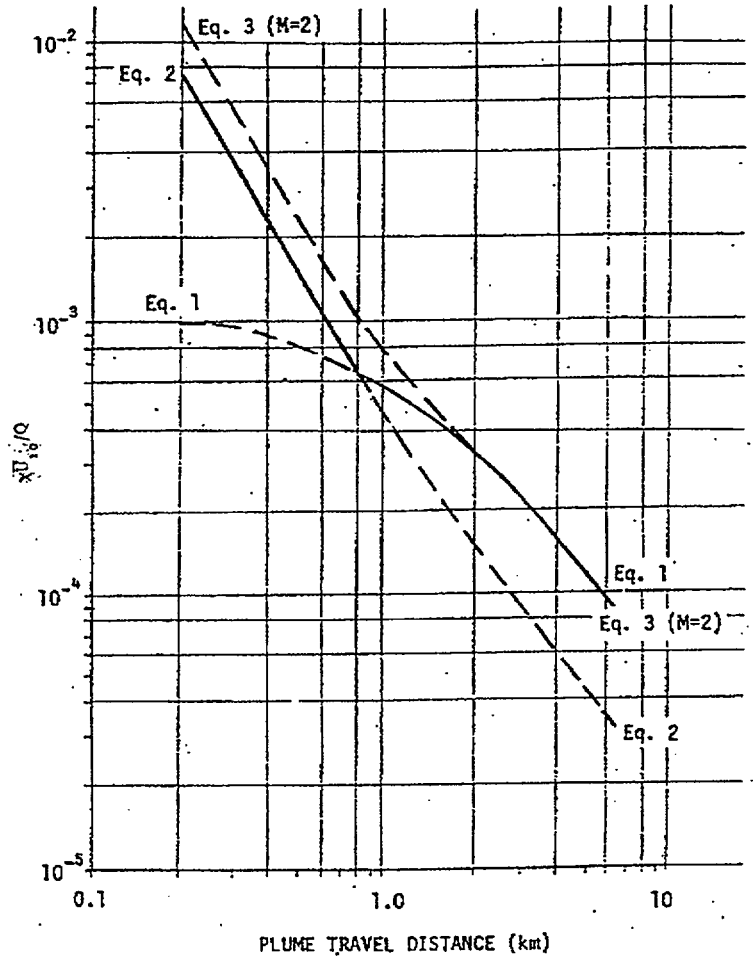

Figure A-3. $\chi\bar{U}_{10}/Q$ as a function of plume travel distance for G stability condition using Equations 1, 2, and 3 (M = 2).

REFERENCES

1. I. Van der Hoven, "A Survey of Field Measurements of Atmospheric Diffusion Under Low-Wind Speed Inversion Conditions," *Nuclear Safety*, Vol. 17, No. 4, March-April 1976.

2. G. E. Start et al., "Rancho Seco Building Wake Effects on Atmospheric Diffusion," NOAA Technical Memorandum ERL ARL-69, Air Resources Laboratory, Idaho Falls, Idaho, November 1977. Available from Publication Services, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, Boulder, Colorado 80302.

3. R. B. Wilson et al., "Diffusion Under Low Windspeed Conditions Near Oak Ridge, Tennessee," NOAA Technical Memorandum ERL ARL-61, Air Resources Laboratory, Idaho Falls, Idaho, 1976. Available from Publication Services, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, Boulder, Colorado 80302.

4. J. E. Sagendorf and C. R. Dickson, "Diffusion Under Low Windspeed, Inversion Conditions," NOAA Technical Memorandum ERL ARL-52, Air Resources Laboratory, Idaho Falls, Idaho, 1974. Available from Publication Services, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, Boulder, Colorado 80302.

5. Gulf States Utilities Company, "Dispersion of Tracer Gas at the Proposed River Bend Nuclear Power Station," Preliminary Safety Analysis Report, Amendment 24, Docket Numbers 50-458 and 50-459, 1974.

6. Metropolitan Edison Company, "Atmospheric Diffusion Experiments with SF_6 Tracer Gas at Three Mile Island Nuclear Station Under Low Wind Speed Inversion Conditions," Final Safety Analysis Report, Amendment 24, Docket Number 50-289, 1972.

7. F. A. Gifford, Jr., "An Outline of Theories of Diffusion in the Lower Layers of the Atmosphere," Chapter 3 in *Meteorology and Atomic Energy–1968* (D. H. Slade, Ed.). Available as TID-24190 from the National Technical Information Service, Springfield, Virginia 22151.

8. F. Gifford, "Atmospheric Dispersion Models for Environmental Pollution Applications," *Lectures on Air Pollution and Environmental Impact Analyses*, American Meteorological Society, pp. 35-38, 1975.

9. W. H. Snyder and R. E. Lawson, Jr., "Determination of a Necessary Height for a Stack Close to a Building - A Wind Tunnel Study," *Atmospheric Environment*, Vol. 10, pp. 683-691, Pergamon Press, 1976.

10. D. R. Muller memorandum to H. R. Denton, "Meteorological Model for Part 100 Evaluations," July 25, 1978, and August 2, 1978 reply.

11. I. Van der Hoven, "Atmospheric Transport and Diffusion at Coastal Sites," *Nuclear Safety*, Vol. 8, pp. 490-499, 1967.

12. International Atomic Energy Agency, "Atmospheric Dispersion in Nuclear Power Plant Siting–A Safety Guide," Safety Series No. 50-SG-S3, Vienna, Austria, 1980. Available from UNIPUB, 345 Park Avenue South, New York, N.Y. 10010.

ATTACHMENT III

NUCLEAR REGULATORY COMMISSION

REGULATORY GUIDE

1.111

METHODS FOR ESTIMATING ATMOSPHERIC TRANSPORT AND DISPERSION OF GASEOUS EFFLUENTS IN ROUTINE RELEASES FROM LIGHT-WATER-COOLED REACTORS

(CONSTANT MEAN WIND DIRECTION MODELS, Pages, 9 & 10)

U.S. NUCLEAR REGULATORY COMMISSION July 1977

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 1.111

METHODS FOR ESTIMATING ATMOSPHERIC TRANSPORT AND DISPERSION OF GASEOUS EFFLUENTS IN ROUTINE RELEASES FROM LIGHT-WATER-COOLED REACTORS

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

The guides are issued in the following ten broad divisions:

1. Power Reactors
2. Research and Test Reactors
3. Fuels and Materials Facilities
4. Environmental and Siting
5. Materials and Plant Protection
6. Products
7. Transportation
8. Occupational Health
9. Antitrust Review
10. General

Requests for single copies of issued guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Document Control.

The plume segment model uses spatial and temporal variations of wind direction, windspeed, and atmospheric stability as input parameters to define the transport and diffusion rate of each element. The effectiveness of the meteorological input data in defining atmospheric transport and diffusion conditions is dependent on the representativeness of these data and the complexity of the topography in the site region; therefore, a detailed discussion of the applicability and accuracy of the model and input data used should be provided.

c. Constant Mean Wind Direction Models

The equation for this model, as presented by Sagendorf (Ref. 4), is:

$$(\overline{\chi/Q'})_D = 2.032 \sum_{ij} n_{ij}[NX\bar{u}_i\Sigma_{zj}(X)]^{-1} \exp[-h_e^2/2\sigma_{zj}^2(X)] \qquad (3)$$

where

h_e is the effective release height (see regulatory position 2);

n_{ij} is the length of time (hours of valid data) weather conditions are observed to be at a given wind direction, windspeed class, i, and atmospheric stability class, j;

N is the total hours of valid data;

$\bar{u}_i$ is the midpoint of windspeed class, i, at a height representative of release;

X is the distance downwind of the source;

$\sigma_{zj}(X)$ is the vertical plume spread without volumetric correction at distance, X, for stability class, j (see Figure 1);

$\Sigma_{zj}(X)$ is the vertical plume spread with a volumetric correction (see regulatory position 2.c) for a release within the building wake cavity, at a distance, X, for stability class, j; otherwise $\Sigma_{zj}(X) = \sigma_{zj}(X)$;

$(\overline{\chi/Q'})_D$ is the average effluent concentration, χ, normalized by source strength, Q', at distance, X, in a given downwind direction, D; and

2.032 is $(2/\pi)^{1/2}$ divided by the width in radians of a 22.5° sector.

Effects of spatial and temporal variations in airflow in the region of the site are not described by the constant mean wind direction model. Unlike the variable trajectory models, the constant mean wind direction model can only use meteorological data from a single station to represent diffusion conditions within the region of interest. For Appendix I considerations, the region of interest can extend to a distance of 50 miles from the site. Therefore, if the constant mean wind direction model is to be used, airflow characteristics in the vicinity of any site should be examined to determine the spatial and temporal variations of atmospheric transport and diffusion conditions and the applicability of single station meteorological data to represent:

(1) Conditions between the site and the nearest receptors (generally within 5 miles) and

(2) Conditions out to a distance of 50 miles from the site.

Examples of spatial and temporal variations of airflow to consider for three basic categories of topography are:

(1) At inland sites in open terrain, including gently rolling hills, with airflow dominated almost entirely by large-scale weather patterns, recirculation of airflow and directional biases during periods of prolonged atmospheric stagnation;

(2) At sites in pronounced river valleys, with airflow patterns largely dominated by terrain, restrictions to lateral and vertical spread of the effluent plume, and the diurnal distributions of downvalley and upvalley circulation, with particular attention to the period of flow reversal; and

(3) At sites along and near coasts of large bodies of water, with significant land-water boundary layer effects on airflow, sea (or lake) land breeze circulation (including

distance of penetration, vertical development, temporal variations of wind direction, and conditions during periods of flow reversal), variation of the mixing layer height with time and distance from the shore (e.g., fumigation and plume trapping), and the effects of shoreline bluffs and dunes.

Therefore, adjustments to Equation (3) may be necessary to prevent misrepresentation of actual atmospheric transport and diffusion characteristics that could result in substantial underestimates of actual exposure to an individual or population. Adjustments to Equation (3) should be based on data (e.g., comparison to other sites in the region) or studies that characterize airflow patterns in the region of the site out to a distance of 50 miles.

For all sites, a detailed discussion of the applicability and accuracy of the model and input data should be provided. Use of Equation (3) will be acceptable only if a well-documented and substantiated discussion of the effects of spatial and temporal variations in airflow in the region of the site out to a distance of 50 miles is provided.

2. Source Configuration Considerations

The actual height above ground of the gaseous effluent plume should be considered in making estimates of average effluent concentrations downwind from the release points. An acceptable method to determine the effective plume height is described below. In addition, for effluent plumes traversing irregular terrain under stable or neutral atmospheric conditions, the model described by Egan (Ref. 5) may be used. On the other hand, the model described by Burt (Ref. 6) may be used when stable atmospheric conditions exist.

Source configuration evaluations may consider the effluent release point(s) and adjacent or nearby solid structure(s) in conjunction with the individual direction sector (as described in regulatory position 4) in which the downwind receptor of interest is located.

a. Elevated Releases

For effluents exhausted from release points that are higher than twice the height of adjacent solid structures, the effective release height (h_e) is determined (Ref. 4) from:

$$h_e = h_s + h_{pr} - h_t - c \qquad (4)$$

where

c is the correction for low relative exit velocity (see below);

h_e is the effective release height;

h_{pr} is the rise of the plume above the release point, according to Sagendorf (Ref. 4), whose treatment is based on Briggs (Ref. 7);

h_s is the physical height of the release point (the elevation of the stack base should be assumed to be zero); and

h_t is the maximum terrain height (above the stack base) between the release point and the point for which the calculation is made (h_t must be greater than or equal to zero).

Note that the effective release height is a function of the distance between the release point and the location where the concentration is being calculated.

When the vertical exit velocity is less than 1.5 times the horizontal windspeed, a correction for downwash is subtracted from Equation (4), according to Gifford (Ref. 8):

$$c = 3(1.5 - W_o/\bar{u})d \qquad (5)$$

where

c is the downwash correction;

d is the inside diameter of the stack or other release point;

$\bar{u}$ is the mean windspeed at the height of release; and

W_o is the vertical exit velocity of the plume.

ATTACHMENT IV

CALCULATION REQUEST

KELVIN MONTAGUE
10/21/98 09:08 AM

To: Walter Schalk/YM/RWDOE@CRWMS
cc: Thomas Dunn/YM/RWDOE@CRWMS
Subject: Re: X/Q values

Walt,

Per my commitment in our earlier meeting, here are the X/Q values that we would like calculated:

1) X/Qs for ground level releases using the array of distances and exceedance values contained in your note below.

2) X/Qs for Stack (elevated) releases using the array of distances and exceedance values contained in your note below.

You should contact surface design for the X/Qs needed for routine releases during normal ops. (i.e., RG 1.111). Mark Fortsch is probably the right person in surface design to call.

If you are unable to provide item # 1 per the schedule we discussed in our previous meeting (by 11/15) please call.

KJM
Walter Schalk

Walter Schalk
07/22/98 11:25 AM

To: Kelvin Montague@CRWMS, Timothy Smith@CRWMS, Robin Siskel@CRWMS, Jeff Tappen@CRWMS
cc: Dale Ambos/YM/RWDOE@CRWMS, Douglas Landwehr@CRWMS, Paul Fransioli/YM/RWDOE@CRWMS, Fredric Godshall/YM/RWDOE@CRWMS
Subject: X/Q values

Hello-

I am sending this message out to the people/groups that have shown an interest or need of X/Q values for one reason or another. I am seeking guidance on scenarios or criteria you are currently working, so that information can be distibuted when needed. In addition, any guidance on scenarios or criteria that may be needed in the future would allow us to be ready to provide that information when requested.

Based on earlier conversations and requests, the following is what I have come up with as a straw man. This covers a wide range of distances and more percentile (values exceeded) than the Reg. Guides require. Let me know if you think these calculations will fulfill your needs.

If additional calculations are necessary, please send your thoughts to me. We can also meet to discuss what is needed and how it can be accomplished.

Suggested X/Q calculations:

Percentiles:	50%	90%	95%	99%	99.5%
(exceeded %)	50%	10%	5%	1%	0.5%

for distances of (in meters):

100	5000
200	7500
300	10000
400	20000
500	25000
750	50000
1000	75000
2000	100000
3000	150000
4000	200000

Thank you for your time,

walt schalk (5-3778)

ATTACHMENT V

DOCUMENT INPUT REFERENCE SHEETS

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
DOCUMENT INPUT REFERENCE SHEET

1. Document Identifier No./Rev.:	Change:	Title:
TDR-MGR-MM-000001, REV00	NA	Calculations of Acute and Chronic "CHI/Q" Dispersion Estimates for a Surface Release

Input Document		3. Section	4. Input Status	5. Section Used in	6. Input Description	7. TBV/TBD Priority	8. TBV Due To		
	2. Technical Product Input Source Title and Identifier(s) with Version						Unqual.	From Uncontrolled Source	Un-confirmed
2a 1	Site 1 Wind Speed and Wind Direction DTN: 1993: TM0000000000001.50, TM0000000000001.51, TM0000000000001.52, 1994:TM0000000000001.54, TM0000000000001.56, TM0000000000001.58, TM0000000000001.60 1995 TM0000000000001.65, TM0000000000001.68, TM0000000000001.71, TM0000000000001.77 1996 TM0000000000001.85, TM0000000000001.88, TM0000000000001.90, TM0000000000001.94 1997: TM0000000000001.100, TM0000000000001.104, TM0000000000001.107, MO98METDATA110.000 All are Initial Use	TPD #: WS: 563 WD: 787	TBV #'s: 1993: 974, 975, 976, 1994: 977, 978, 979, 980 1995: 0 1996: 997, 985, 986, 987 1997: 0	5.0	Hourly Wind Speed (parameter 563) and Wind Direction (parameter 787)	1			CAR: LVMO--98-C-002
2	1993-1997 Site 1 stability data, DTN: MO9903SITE1MET.000 Initial Use	562	TBV: 0	5.0	Atmospheric Stability Index	1			CAR: LVMO--98-C-002

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
DOCUMENT INPUT REFERENCE SHEET

1. Document Identifier No./Rev.:	Change:	Title:
TDR-MGR-MM-000001, REV00	0	Calculations of Acute and Chronic "CHI/Q" Dispersion Estimates for a Surface Release

	Input Document: 2. Technical Product Input Source Title and Identifier(s) with Version	3. Section	4. Input Status	5. Section Used in	6. Input Description	7. TBV/TBD Priority	8. TBV Due To: Unqual.	From Uncontrolled Source	Un-confirmed
2a 3	Allwine, K.J. and Bian, X. 1995. PGEMS2.0 - An Atmospheric Dispersion Model for Routine Air Quality Assessments and Emergency response Applications. Battelle, Pacific Northwest Laboratories, Richland, Washington. TIC: 242649	Pages 2.53 to 2.56	N/A	5.0	Describes atmospheric dispersion modeling techniques.	N/A	N/A		
4	CRWMS-M&O. 1999. Software Routine Report for XQ145. CSCI: 30072 V1.0. DI: 30072-2999, Revision 00. Las Vegas, Nevada. ACC: MOL. 19990409.0123	N/A	N/A	5.0	Describes the software routine used to compute the calculations.	N/A	N/A		
5	EPA, 1987. On-Site Meteorological Program Guidance for Regulatory Modeling Applications. EPA-450/4-87-013. Office of Air and Radiation, Office of Air Quality Planning and Standars, Research Triangle Park, North Carolina. TIC: 210292.	N/A	N/A	5.0	Describes the methods of collecting meteorological data and the parameters needed to determine atmospheric stability: wind parameters and whether it is day or night.	N/A	N/A		

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
DOCUMENT INPUT REFERENCE SHEET

1. Document Identifier No./Rev.:	Change:	Title:
TDR-MGR-MM-000001, REV00	0	Calculations of Acute and Chronic "CHI/Q" Dispersion Estimates for a Surface Release

Input Document							8. TBV Due To		
	2. Technical Product Input Source Title and Identifier(s) with Version	3. Section	4. Input Status	5. Section Used In	6. Input Description	7. TBV/TBD Priority	Unqual.	From Uncontrolled Source	Un-confirmed
2a 6	U.S. NRC Regulatory Guide 1.111, July 1977. Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effulents in Routine Releases from Light-Water-Cooled Reactors. U.S. Regulatory Commission Office of Nuclear Regulatory Research. TIC: 222639	p. 1.111-9	N/A	5.0	Describes the calculation method along with NRC RG 1.145.	N/A	N/A		
7	U.S. NRC Regulatory Guide 1.145. November 1982. Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants. U.S. Nuclear Regulatory Commission Office of Nuclear Regulatory Research. TIC: 222640	p. 1.145-3	N/A	5.0	Lists the three equations used to calculate the "Chi/Q" dispersion estimates for a surface release.	N/A	N/A		