TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

October 16, 1984

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of	)	Docket Nos.	50-390
Tennessee Valley Authority	)		50-391

By your letter to H. G. Parris dated May 15, 1984, the NRC provided comments on the Watts Bar Nuclear Plant Offsite Dose Calculation Manual (ODCM) forwarded by L. M. Mills' letter to you dated February 8, 1984. Enclosed are responses to each of the NRC comments and a revised ODCM which reflects the requested clarification.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. H. Shell

R. H. Shell, Supervisor
Pressurized Water Reactors

Sworn to and subscribed before me
this 16th day of Oct. 1984

Paulette H. White
Notary Public
My Commission Expires 8-24-88

Enclosure
cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

A009
1/1

ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
RESPONSES TO NRC QUESTIONS ON THE ODCM

Question 1

Provide a title page which contains the date of the latest revision of the ODCM.

Response

A title page has been included for the Watts Bar ODCM. The title page will indicate the date of issuance and subsequent revisions. The ODCM will be issued upon receipt of an operating license and NRC issuance of Technical Specifications.

Question 2

Pages 1 and 2 of the ODCM contain a table of contents for the entire ODCM; however, the table of contents does not list the tables and figures for the entire ODCM. Provide a listing of tables and figures for the entire ODCM.

Response

The ODCM has been revised to include this information.

Question 3 Section 1.0, "Gaseous Effluents"

a. Section 1.1 of the ODCM incorrectly states that the dose rate limit of 1500 mrem/yr applies to radioiodines and particulates. Per 3/4 11.2.1 of the RETS, include I-131, I-133, H-3 and all radionuclides in particulate form with half lives greater than 8 days in estimating dose rates.

b. In Assumption 3 under A and B of Step 1 (pp. 1, 4) the mix of noble gases, iodine -131 and-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days provided in Table 1.1 may only be used on a limited basis, i.e., initially and if no detectable activity of these nuclides is found in a purge sample. Furthermore, to be complete, Table 1.1 should include tritium and releases from the service building ventilation exhaust. Normally noble gas activity monitor setpoints should be calculated and adjusted if necessary at least once per month. These calculations should be based on the mix of the above nuclides in samples obtained from releastes made during the previous month. In addition, prior to containment purge and venting, the monitor setpoint for the containment purge and exhaust system should be recalculated. However, the setpoint during purging should not be increased above the setpoint determined for continuous releases. Revise the ODCM to resolve the preceding comments.

c. In Step 2, the plant documentation (see p. 11) referred to should be identified. A methodology should be provided, as is provided for liquid effluent monitor setpoints, for considering the simultaneous releases from other release points in the setpoint determination for individual noble gas activity monitors. Provide a methodology to assure that the noble gas curie limit in each gas decay tank is not exceeded.

d. Figure 1.3 should show the entire gaseous radwaste treatment system, which includes both the ventilation exhaust treatment and the waste gas holdup system. The figure should locate and identify all monitors addressed in the technical specifications and all release points. Provide a legible foldout figure with the above information.

e. Provide the value(s) for X/Q and D/Q that are to be used in eqs. 1.1 through 1.8. Briefly state the basis for the value(s) and provide a reference for the value(s). The basis for the value(s) should include the years in which the data was gathered, the location by sector and distance, and the type of release (e.g., ground level, elevated, or mixed-mode, exit velocities, and cross-sectional areas used to determine building wake).

Use of a straight-line trajectory dispersion model without adjustments for temporal and spatial variations in airflow should be substantiated. The location of the Watts Bar Plant in a pronounced river valley makes the use of a straight-line trajectory model suspect because of diurnal variations in airflow (e.g., upvalley flow during the day and downvalley flow during the night), channeling, an other physical restrictions to airflow and dispersion. Also, stable atmospheric conditions accompanied by low wind speeds predominate at the Watts Bar site, and these conditions are also more like to result in airflow trajectories which are not straight lines.

f. Table 1.4 provides meteorological dispersion factors for numerous points of interest; however, it does not list the date of the land-use census, or provide references for the land-use census, and the meteorological dispersion factors. Provide the date of the land-use census that was used in identifying the controlling receptor locations, and the appropriate references.

g. Equation 1.6 provides a method for estimating doses to the thyroid from ground shine. This part of Section 1.1.1, while permissible, can be deleted (see NUREG-0133, Ch. 5).

h. Pages 8-19 and Tables 1.4 - 1.8 contain values for many parameters (e.g., r, λ_{Ei}, Y_v, H, B_{iv} UM); however, in many cases the bases for the parameters are not stated. Briefly state the basis for all parametrs. Presumably many generic values were taken from the Appendices in Regulatory Guide 1.109, Rev. 1 (October 1977). List all site-specific values used to estimate doses, and provide references.

i. On p. 12, it is stated that certain noble gases will be considered in estimating doses. Doses should be estimated using I-131, I-133, tritium and all particulates with half lives greater than 8 days. (See comments 3(a) and (b).)

j. On page 16, it is stated that only certain nuclides will be considered in estimating doses. Doses should be estimated using I-131, I-133, tritium and all particulates with half lives greater than 8 days (See comments 3(a) and (b).)

k. Table 1.6 incorrectly references (NUREG/CR-1004) as the bases for all values in Table 1.6. Provide references for specific values in this table.

l. Provide references for specific values in Table 1.7.

m. Provide a numbered and captioned figure showing the site boundary and the unrestricted area boundary for gaseous effluents.

Response

a. Section 1.1 has been reworded.

b. The source term mix listed in table 1.1 is based on the conservative assumptions used for licensing and is consistent with that given in the WBN-FSAR. The table has been revised to include the service building ventilation exhaust. When the release mix is known, setpoints are determined as per step 2b.

c. The WBN instruction used to calculate initial monitor setpoints is Technical Instruction (TI) 18.

Batch release Surveillance Instructions (SI) are:

Gas Decay Tank Release Activity Determinations -- SI 11.6
Containment Purge Release Activity Determinations -- SI 11.18
Instrument Room Purge Release Activity Determinations -- SI 11.21

The above SIs calculate monitor setpoints for each release.

Locations, I.D. numbers, detector types, ranges, scale outputs, seismic class, and quantities of each are documented in FSAR, Table 11.4-2.

SI 11.12, Waste Gas Decay Tank Activity During Filling, is performed once every 24 hours, as required in WBN Technical Specifications, to ensure the curie limit is not exceeded. The tank is sampled and analyzed by gamma spectroscopy for noble gas activity.

Implementation of the methodology in section 1.1 yields release rate limits for each nuclide and release point in the plant. These release rate limits are based on the dose rate limits of 10 CFR 20 for the total plant as indicated in the ODCM. Therefore, setpoints based on these release rate limits assume that simultaneous gaseous releases will be within the speficiation 3.11.2.1 dose rate limits.

NUREG-0133 does not require that the ODCM contain the gas decay tank curie limit methodology. It is, therefore, not provided.

d. Figure 1.3 providing the requested information has been added to the ODCM.

e. Table 1.4 of the ODCM contains the X/Q and D/Q values that are used in equations 1.1 through 1.8. Major assumptions used in the derivation of these values are detailed in section 1.1 and are consistent with Regulatory Guide 1.111 methodology.

The straight-line trajectory dispersion model is used in the Watts Bar Nuclear Plant ODCM to estimate long-term concentrations (and ultimately resultant doses) as a result of routine effluent releases from the plant. Concentrations are estimated for receptors which include a site boundary distance and a nearest residence in each of the 16 compass-point direction sectors surrounding the plant, as well as the nearest locations of milk-producing animals when they exist in a given sector. The maximum distance of concern for these estimates is about five miles from the plant. Meteorological data referred to in the following paragraphs are from the 10-meter (m) level of the Watts Bar meteorological tower. The data period is the same as that used in the FSAR, January 1, 1975 - December 31, 1978. A ground-level release is a conservative assumption in the model.

In the area of the Watts Bar Nuclear Plant, regional topographic features exert a rather strong influence on low-level flow, resulting in a wind direction distribution (see attached table 1) that tends to reflect the orientation of the valley. The data indicate the influence of channeling, but also show evidence of a diurnal variation in flow patterns (see attached tables 2 and 3). Some diurnal flow reversal may be expected to occur, especially during periods with relatively weak pressure gradients and surface-based nocturnal temperature inversions. However, the nighttime distribution in table 3 (attached) reveals a broad distribution of winds over most of the sectors. Thus, the periods of actual 180-degree flow reversal are not expected to be frequent, and occurrences are less likely in the winter and spring than in the summer and fall.

Effluents from Watts Bar may accumulate in the valley air to somewhat larger concentrations during the periods of flow reversal than the straight-line assumption would indicate. However, such periods are transitional, and usually both wind direction and stability conditions change. These periods typically occur diurnally, in the early morning and/or the evening.

Morning reversal involves a change from stable nighttime flow to neutral or unstable daytime flow. The increased mixing typically associated with daytime flow provides better dispersion of the effluents. Ambient concentrations from additional releases (given the same rate of release) would be smaller than from releases under nighttime conditions. Existing concentrations that resulted from nighttime releases would be even further diluted after flow reversal. The greatest combined impacts would be on or near the site where portions of the prereversal plume could return, cross previously impacted receptors, and/or mix with the new releases from the plant. While this mixed plume would have a slightly greater concentration than predicted by the straight-line model, the concentration would not be expected to be more than for a plume released under the earlier, more stable conditions.

Evening reversal involves a change from unstable or neutral flow to stable flow conditions. Following the time of reversal, portions of the plume from daytime releases could return to the plant locality, cross previously impacted receptors, and/or merge with the plume from new releases. Under the stable conditions, the combined concentrations could be expected to be larger than concentrations from post-reversal releases alone. However, daytime conditions would have diluted the prereversal plume considerably. Thus, the combined concentrations, whenever they did occur, would not be expected to be much larger than from the nighttime plume alone. As with morning reversal, the greatest combined impacts would be on or near the site.

The straight-line trajectory model cannot handle increases in concentration resulting from flow reversal. However, because of (1) the low frequency of such reversal periods, (2) the increased mixing that would occur after morning reversals, and (3) the small increases that would occur after evening reversals, and underestimation of concentrations by this conservative model would not be expected to be significant.

Stable, low wind speed (less than 3.5 mi/h) conditions occur frequently in the Watts Bar area (table 4 in the attachments). Wind directions under such conditions are likely to result in plume trajectories which are not approximately straight lines. While a straight-line trajectory model cannot accurately represent these trajectories, it can provide conservative estimates of average concentrations at receptors in all sectors. As discussed in the following paragraph, the primary reason this model can provide conservative concentration estimates is the general underestimation of mixing that would occur during stable, low wind speed conditions.

In a study of five sets of field measurements, Van der Hoven reported that measured plume concentrations under low wind speed inversion conditions were considerably lower than values calculated using the Pasquill stability curves. The primary reason for this difference appeared to be increased crosswind diffusion over that predicted by the Pasquill curves. Surface roughness also seemed to be a consideration as measurements in hilly forested terrain were lower than those in flat forested or smooth unforested terrain. The increased mechanical turbulence created by the terrain apparently effectively increased the mixing and thus provided better diffusion of effluents. Such increases in crosswind diffusion and mixing are not accounted for in the model, with the result that estimated concentrations are higher (more conservative) than expected actual concentrations.

Summary

Although the straight-line trajectory model has shortcomings, particularly in representing effluent travel during stable, light wind speed conditions and during period of flow reversal, its use is believed to be reasonable for application in the ODCM for Watts Bar Nuclear Plant. Factors compensating for the weaknesses of the straight-line trajectory dispersion model are (1) the conservative ground-level release assumption, (2) the apparent overestimation of concentrations under stable, low wind speed conditions, (3) the low frequency of occurrence of the diurnal flow reversal periods, and (4) increased mixing during morning flow reversal periods.

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1. Van der Hoven, I., "A Survey of Field Measurements of Atmospheric Diffusion Under Low-Wind-Speed Inversion Conditions, "Nuclear Safety, Vol. 17, No. 2 March-April 1976.

f. The reference for the land-use census is from internal TVA correspondence "Milk Animal Survey - Watts Bar Nuclear Plant," dated May 3, 1977. See response "e." above for meteorological data references.

g. For completion, equation 1.6 will be retained.

h. The value for H, the absolute humidity, which is a TVA region-specific value and is within the range of the values reported in the WBN-FSAR, section 2.3. All other parameter values listed in the ODCM are consistent with Regulatory Guide 1.109 and 1.111 and NUREG/CR-1004.

i,j. Monthly gaseous dose calculations are performed using nuclides that are projected to contribute the majority (at least 90 percent) of the total dose. Quarterly gaseous dose calculations are performed using all nuclides that are reported to be released for that quarter. At least once a year, the monthly methodology of using selected nuclides will be compared with the quarterly methodology of using all nuclides to determine what changes, if any, are necessary for the monthly nuclide mix.

k. Table 1.6 has been revised to include correct references

l. The internal dose factors listed in table 1.7 are simply the Regulatory Guide 1.109 dose factors (in mrem/pCi) normalized either to an air concentration (for inhalation) or deposition rate (for milk ingestion) using Regulatory Guide 1.109 methodology.

m. A map of the site with the specified boundaries is included in the RETS.

<u>Question 4 Section 2.0, "Liquid Effluents"</u>

a. Eq. 2.1 on p. 21 is missing a dividing sign. Correct this typographical error in eq. 2.1.

b. Provide a reference for the minimum dilution flow rate used in eq. 2.3 on p. 21.

c. Identify the plant instructions and documentation referred to on p. 22 of Section 2.2.1.

d. Although p. 23 of Section 2.3.1 refers to Fig. 2.2.2-1, no figures are provided in Section 2 of the ODCM. Provide all appropirate figures in the ODCM. Figure 2.1.1-1 should show the entire liquid radwaste treatment system. The figure shouls locate and identify all monitors addressed in the technical specifications, all pathways to the final release points including all dilution flows, and all release points.

e. On p. 24, it is stated that only 11 nuclides will be considered in estimating doses. Doses should be estimated using all of the radionuclides in liquid effluents released from the plant, and the ODCM should explicitly state this.

f. Provide the basis for the correction factor of 0.95 used in eq. 2.11.

g. Provide a reference for the dilution factor of 1/5 used in eqs. 2.12 and 2.14.

h. Section 2.3.2.3 provides a method for estimating doses to individuals from exposure to radionuclides deposited on the shoreline and from swimming. Since doses from these pathways are typically negligible, this section (while permissible) can be deleted (see NUREG-0133, Ch. 4).

i. Tables 2.4 a, b, and c are not necessary since doses to the population do not have to be completed.

j. Provide a numbered and captioned figure showing the site boundary and the unrestricted area boundary for liquid effluents.

Response

4a. Equation 2.1 has been corrected.

b. Reference for the minimum dilution flow rate is the "Draft Environmental Statement," NUREG-0352, Page 3-3, June 1978.

c. Plant instructions used to calculate liquid effluent radiation monitor setpoints are:

TI 18 -- Radiation Monitoring
SI 11.1 -- Batch Radioactive Liquid Effluents
SI 11.2 -- Steam Generator Blowdown Radioactive Liquid Releases
SI 11.3 -- Turbine Building Sump Radioactive Liquid Releases

d. This figure was initially intended to reference the RETS figure showing site boundaries. Information concerning details of the liquid radwaste system are included in the FSAR. This reference has been deleted from the ODCM.

e. See 4f.

f. Annual evaluations are performed based on actual releases from SQN to ensure that the nuclides in the nuclide mix account for over 95 percent of the dose. This same procedure will be used for WBN. The nuclide mix has been expanded to include 22 nuclides for WBN, further ensuring that it will acount for over 95 percent of the dose.

g. Although the value of 1/5 is appropriate for some release conditions, a value of 6 percent is more appropriate for the worst case. This value was determined by TVA's Water Systems Development Branch. The reference to this fraction in the ODCM has been changed from 1/5 to 0.06.

h. Based on calculations for SQN and BFN using Regulatory Guide 1.109 methodology recreation (shoreline) doses account for over 10 percent of the total dose. To ensure that doses are accurately estimated, we will maintain this calculation.

i. These tables refer to the quarterly dose calculation sections (2.3.3). For these calculations, populations doses are required to be reported.

j. See response to question 3m.

Question 5 Section 3.0 "Radiological Environmental Monitoring"

a. Table 3.1 lists the number of samples but does not provide the specific location of all samples. The table should contain the following colums: (1) exposure pathway and or sample; (2) criteria for selection of number of samples and location (see Branch Technical Position, Table 1); (3) sampling and collection frequency; (4) sample location number (the number should be keyed to a figure in the ODCM); (5) location (distance and direction); (6) type and frequency of analysis.

b. Figures 3.1, 3.2, and 3.3 do not contain compass headings which are needed for locating sampling sites. Provide the 16 compass sectors, the unrestricted area boundary, and concentric circles to locate sampling sites.

Response

a. Table 3.1 is in the format of the Branch Technical Position except for some deficiencies in the cross-referencing of sample locations with the figure in the ODCM. This table has been revised to include location references for appropriate samples.

b. Figures 3.1, 3.2, and 3.3 have been updated to include the 16 compass sectors and distance rings.

Question 6

Provide a methodology to estimate total dose for showing compliance with RETS 3/4.11.4 (see NUREG-0133, pp. 10, 11). Include in this section the methodology that will be used to estimate doses from direct radiation.

Response

See the new ODCM section 4.0.

Question 7

Provide a brief section that describes implementation of the methodology in the ODCM. Presumably the methodology described in the ODCM will be implemented via computer codes. The computer codes should be verified. After the codes are verified, provide a reference (individual or company name, title of document, and date) in the ODCM to document the validation of the codes.

Response

a. ODCM implementation procedures are contained in an internal QA controlled document called Radiological Assessment Procedures (RAP) Manual. RAP's for WBN have been drafted and are currently undergoing approval.

b. Gaseous ODCM methodology is based on the "Gaseous Effluent Licensing Code (GELC) Documentation," Revision 1, R. M. Nicoll, January 1984, TVA.

   Liquid ODCM methodology is based on the "QWATA Documentation," Revision 1, M. D. Matheny, January 1984, TVA.

Table 1

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

WATTS BAR NUCLEAR PLANT

JAN 1, 75 - DEC 31, 78

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.76	1.53	1.81	1.66	1.53	0.05	0.0	0.0	7.34
NNE	0.63	1.53	1.98	1.80	1.89	0.09	0.0	0.0	7.92
NE	0.66	2.00	1.65	1.04	0.68	0.01	0.0	0.0	6.04
ENE	1.10	2.99	1.43	0.53	0.21	0.01	0.0	0.0	6.27
E	0.83	2.22	1.03	0.25	0.06	0.01	0.0	0.0	4.40
ESE	0.30	0.59	0.31	0.02	0.01	0.0	0.0	0.0	1.23
SE	0.49	0.96	0.48	0.10	0.07	0.01	0.0	0.0	2.11
SSE	0.58	1.84	0.79	0.21	0.16	0.04	0.01	0.0	3.63
S	0.67	2.58	1.94	0.82	0.73	0.15	0.04	0.0	6.93
SSW	0.68	3.05	3.86	3.20	3.62	0.99	0.12	0.0	15.52
SW	0.81	2.29	1.78	0.97	0.77	0.11	0.0	0.0	6.73
WSW	1.05	2.30	0.69	0.34	0.35	0.17	0.01	0.0	4.91
W	1.52	2.59	0.76	0.64	0.77	0.17	0.01	0.01	6.47
WNW	1.46	1.94	0.67	0.63	0.80	0.12	0.01	0.0	5.63
NW	1.92	2.92	0.82	0.92	1.12	0.14	0.01	0.0	7.85
NNW	1.34	2.02	0.97	0.84	1.26	0.07	0.0	0.0	6.50
SUBTOTAL	14.80	33.35	20.97	13.97	14.03	2.14	0.21	0.01	99.48

TOTAL HOURS OF VALID WIND OBSERVATIONS	33783
TOTAL HOURS OF OBSERVATIONS	35064
RECOVEABILITY PERCENTAGE	96.3
TOTAL HOURS CALM	186

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY: LOCATED ABOUT 0.8 KM SW OF THE REACTOR BUILDING
WIND SPEED AND DIRECTION MEASURED AT THE 10.00 METER LEVEL

DATE PRINTED: 11/29/79

MEAN WIND SPEED = 4.4 MPH

Table 2

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

DAY TIME 759- 1959 HOURS

WATTS BAR NUCLEAR PLANT

JAN 1, 75 - DEC 31, 78

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.20	0.91	1.71	1.61	1.59	0.08	0.0	0.0	6.10
NNE	0.25	1.10	2.51	2.31	2.60	0.15	0.0	0.0	8.92
NE	0.14	1.53	2.32	1.59	1.12	0.01	0.01	0.0	6.72
ENE	0.34	2.10	1.92	0.96	0.37	0.01	0.0	0.0	5.70
E	0.27	2.53	1.84	0.43	0.07	0.01	0.0	0.0	5.15
ESE	0.17	0.68	0.58	0.04	0.01	0.0	0.0	0.0	1.48
SE	0.10	1.11	0.87	0.16	0.10	0.01	0.0	0.0	2.35
SSE	0.18	1.69	1.29	0.35	0.25	0.05	0.02	0.0	3.83
S	0.19	2.15	2.70	1.28	1.25	0.19	0.05	0.0	7.81
SSW	0.14	2.52	5.22	4.77	5.55	1.56	0.14	0.0	19.90
SW	0.26	1.93	2.90	1.64	1.20	0.16	0.0	0.01	8.10
WSW	0.25	1.42	0.96	0.47	0.55	0.27	0.01	0.0	3.93
W	0.36	1.40	0.91	0.95	1.24	0.23	0.02	0.02	5.13
WNW	0.37	1.04	0.76	0.94	1.29	0.19	0.01	0.0	4.60
NW	0.41	1.20	0.76	1.12	1.62	0.15	0.01	0.0	5.27
NNW	0.32	0.88	0.97	1.10	1.58	0.10	0.0	0.0	4.95
SUBTOTAL	3.95	24.19	28.22	19.72	20.39	3.17	0.27	0.03	99.94

TOTAL HOURS OF VALID WIND OBSERVATIONS 16940
TOTAL HOURS OF OBSERVATIONS 17532
RECOVERABILITY PERCENTAGE 96.6
TOTAL HOURS CALM 10

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY: WATTS BAR NUCLEAR PLANT
WIND SPEED AND DIRECTION MEASURED AT THE 9.72 METER LEVEL

DC000250

DATE PRINTED: 05/14/84

MEAN WIND SPEED = 5.6 MPH

Table 3

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

NIGHT TIME 0100- 759 - 1959-2400 HOURS

WATTS BAR NUCLEAR PLANT

JAN 1, 75 - DEC 31, 78

WIND DIRECTION	WIND SPEED(MPH) 0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	1.33	2.16	1.92	1.71	1.47	0.02	0.0	0.0	8.61
NNE	1.02	1.96	1.44	1.29	1.17	0.02	0.0	0.0	6.90
NE	1.18	2.46	0.97	0.49	0.23	0.0	0.0	0.0	5.33
ENE	1.86	3.88	0.94	0.10	0.05	0.01	0.0	0.0	6.84
E	1.40	1.91	0.22	0.07	0.04	0.0	0.0	0.0	3.64
ESE	0.43	0.50	0.04	0.01	0.02	0.0	0.0	0.0	1.00
SE	0.87	0.81	0.08	0.04	0.04	0.01	0.0	0.0	1.85
SSE	0.99	1.98	0.29	0.08	0.07	0.02	0.0	0.0	3.43
S	1.16	3.00	1.18	0.36	0.20	0.10	0.02	0.01	6.03
SSW	1.22	3.59	2.49	1.62	1.67	0.41	0.09	0.0	11.09
SW	1.37	2.65	0.65	0.30	0.33	0.06	0.0	0.0	5.36
WSW	1.86	3.18	0.42	0.21	0.15	0.08	0.01	0.0	5.91
W	2.68	3.78	0.61	0.33	0.30	0.11	0.01	0.0	7.82
WNW	2.56	2.83	0.58	0.33	0.31	0.06	0.01	0.0	6.68
NW	3.44	4.64	0.88	0.71	0.62	0.12	0.0	0.0	10.41
NNW	2.37	3.16	0.96	0.58	0.94	0.05	0.0	0.0	8.06
SUBTOTAL	25.74	42.49	13.67	8.23	7.61	1.07	0.14	0.01	98.96

TOTAL HOURS OF VALID WIND OBSERVATIONS	16843
TOTAL HOURS OF OBSERVATIONS	17532
RECOVERABILITY PERCENTAGE	96.1
TOTAL HOURS CALM	176

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY: WATTS BAR NUCLEAR PLANT C0000250
WIND SPEED AND DIRECTION MEASURED AT THE 9.72 METER LEVEL

DATE PRINTED: 05/14/84

MEAN WIND SPEED = 3.2 MPH

Table 4

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY STABILITY CLASS

WATTS BAR NUCLEAR PLANT

JAN 1, 75 - DEC 31, 78

WIND SPEED (MPH)	STABILITY CLASS A	B	C	D	E	F	G
CALM	0.0	0.0	0.0	0.0	0.08	0.25	0.16
0.6- 1.4	0.0	0.0	0.0	0.69	3.98	6.16	3.71
1.5- 3.4	0.12	0.16	0.94	8.21	12.12	8.51	3.27
3.5- 5.4	0.44	0.62	2.97	10.73	5.51	0.72	0.10
5.5- 7.4	0.81	0.81	2.43	6.92	2.84	0.18	0.0
7.5-12.4	1.54	0.93	2.26	7.33	2.02	0.05	0.0
12.5-18.4	0.35	0.14	0.28	0.95	0.39	0.0	0.0
18.5-24.4	0.01	0.01	0.0	0.09	0.06	0.0	0.0
>=24.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	3.27	2.67	8.88	34.92	27.00	15.87	7.24

TOTAL HOURS OF VALID STABILITY OBSERVATIONS	32550
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED STABILITY OBSERVATIONS	31863
TOTAL HOURS OF OBSERVATIONS	35064
JOINT RECOVERABILITY PERCENTAGE	90.9

METEOROLOGICAL FACILITY: LOCATED ABOUT 0.8 KM SW OF THE REACTOR BUILDING
STABILITY BASED ON LAPSE RATE MEASURED BETWEEN 9.72 AND 46.36 METERS
WIND SPEED AND DIRECTION MEASURED AT THE 10.00 METER LEVEL

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