APPENDIX G

PROJECTED AIR QUALITY MODELING EFFECTS AT NOAA'S WALKER BRANCH MONITORING TOWER

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G. PROJECTED AIR QUALITY MODELING EFFECTS AT NOAA'S WALKER BRANCH MONITORING TOWER

1.0 BACKGROUND

National Oceanic and Atmospheric Administration (NOAA) has an ongoing research program within the Walker Branch Watershed investigating the ramifications of global climate change. As part of this research program, NOAA has been collecting information on CO_2 and heat flux across the forest canopy for approximately 5 years. This research program is expected to continue for many years.

DOE is proposing to construct and operate the Spallation Neutron Source (SNS), on the preferred location, Chestnut Ridge, that is approximately 1.5 km west of the NOAA research tower. The SNS will have mechanical draft cooling towers to dissipate excess heat and will use natural gas as a fuel for general space heating. This study is designed to provide a preliminary assessment of the potential impacts that the SNS may have in the quality of the data from the NOAA research tower. The overall study is designed to provide information on the impacts associated with water vapor in the cooling plume, and CO_2 and NO_x released from the combustion of natural gas.

2.0 AIR QUALITY MODEL

EPA's backbone air quality model, the Industrial Source Complex Short Term (ISCST3, version 97363) model, was chosen to assess the effects from the sources of concern at the SNS. The ISCST3 model is a complex, straight-line, steady-state Gaussian plume model that can be used to model a number of sources that might be present at a typical industrial facility.

The ISCST3 model accepts hourly meteorological data to define the conditions for plume rise, transport, diffusion, and deposition. Output from the model can take many forms; but, it generally consists of an echo of the input runstream, summary of all modeling inputs, and modeling results summarized in several requestable formats (U.S.E.P.A., 1995).

2.1 Model Input

Input to the ISCST3 model is of two basic types: (1) the input runstream file, and (2) the meteorological data file.

2.1.1 Input Runstream

This file contains the selected modeling options, as well as source location and parameter data, receptor locations, meteorological data file specifications, and output options.

For this "Phase I" study two groups of sources were modeled: (1) the cooling towers for water vapor emissions, and (2) a group of ten (4 MW scenario) small boiler stacks located on various SNS structures for CO_2 and NO_x emissions.

The 13 adjacent cooling towers (cells) present were modeled as a single combined source with an overall water vapor emission rate of 350 gallons/minute and other stack parameters as supplied by Conventional Facilities Team personnel. The 10 boiler stacks were modeled as discrete point sources. Stack diameters and heights were provided as indicated previously, while exit velocities and temperatures were based upon an average value taken from boiler manufacture literature. Existing boiler emission rates were taken from AP42 (U.S.E.P.A., 1995) and are summarized below:

Combustion Products from Natural Gas-Fired Boilers at SNS		
Combustion Products	**Rate (lbs/mmcf)[1]**	**Rate (lbs/hr)[2]**
NO_x	100	3.48
CO_2	1.2E+05	4184

[1] Emission factors from EPA AP42 for commercial boilers (rating 0.3 to 10 mmBtu/hr)
[2] Based on cumulative output of 10 boilers at SNS with total heat load of 34,870,000 Btu/hr (0.0349 mmcf/hr).

Universal Traverse Mercator (UTM) coordinates, defining the location of each source in meters, were also provided to the model as well as source elevations. These locations along with source elevations were provided to the model. Input of source elevation data allows the model to perform intermediate and complex terrain calculations (via the incorporated COMPLEX I model). Complex terrain is defined as those receptor locations with elevations greater than a modeled stack top release elevation. For this study, only one receptor location was used (the NOAA monitoring tower location). This receptor also had a "flagpole" elevation (36 m) input that requests that the model provide concentrations 36 m from the ground elevation (where the instruments are located on the tower).

Building parameters were also input to the model to implement building downwash procedures. Other pertinent information input to the model included the use of "rural" wind profile exponents, vertical temperature gradients and mixing heights, and selection of the regulatory default option that sets a number of specific options to a selected default value.

2.1.2 Meteorological Data

Surface meteorological data supplied to the model consisted of one year (1991) of 15 minute averages for wind direction, mean wind speed, ambient temperature, solar radiation, and sigma-theta collected at NOAA's Walker Branch monitoring tower. Missing data were filled using data from additional nearby towers or by averaging surrounding period data for short missing periods. Solar radiation and sigma-theta are not used directly by the ISCST3 model but used (by the method indicated in Sect. 6.4.4.4. of U.S.E.P.A., 1987) to calculate stability category. This procedure was modified to reflect a surface roughness of 1.2 m and effective anemometer height of 9.1 m as suggested for the Walker Branch site by NOAA personnel.

A Fortran code was prepared to read these data, convert to the correct units when necessary, and write the values out to a new file in the correct format for ISCST3 use. Upper air data (mixing heights) were also taken from a preprocessed file of Knoxville/Nashville, TN 1991 surface/upper air data compiled from data downloaded from EPA's SCRAM bulletin board. Linear - interpolation was used to provide a mixing height for each 15-minute average from the 1-hour averages provided in the preprocessed file. All wind speeds less than 0.7 m/sec were considered a calm and set to zero (not processed by the model).

2.2 Model Output

Output from the ISCST3 model runs was somewhat different than normally expected in that the meteorological data utilized were 15-minute average data rather than 1-hour data. For this reason, while the model indicates 1 hour averages are output, the averages are actually 15-minute averages. The dates shown for the output concentrations are incorrect because they were being advanced by a factor of four. Additionally, since four times as much meteorological data are present as normal to an annual model run, four separate runs (each quarter year or approximately three months) were preformed to cover the entire year of Walker Branch, 15-minute data.

Actual model output consisted of 15-minute averages (in micrograms/cubic meter) of water vapor for the cooling tower and CO_2 and NO_x concentrations for the ten boiler stacks output at the monitoring tower location. The printed output consisted of a set of tables summarizing the maximum 50 concentrations for each of the modeled releases and two additional files listing the concentrations for every 15-minute period and every non-zero concentration, respectively. Approximately 80 – 85 percent of all projected concentrations at the tower are zeros (due mainly to wind direction not blowing from the sources toward the tower during that time).

ISCST3-projected maximums were 1.04 g/m³ for water vapor, 27,569 μg/m³ for CO_2 and 23 μg/m³ for NO_x. A copy of the ISCST3 output for the third quarter modeled is included in this appendix.

One important factor in considering the concentrations obtained is that these are conservative, probably worst-case, projections. The emission rates assume continuous, annual operation of all sources at full-rated capacity. The 350 gal/min emission rate for the cooling towers is for "droplet and vapor drag out." For modeling purposes, the assumption was made that this water is all vapor or aerosol. In reality, some larger droplets may be present and more may form as the

plume travels downwind. These particles may condense or drop out before ever reaching the monitoring tower. The extent of this phenomena would probably be highly dependent upon local ambient meteorological conditions at any given time.

3.0 REFERENCES

U.S.E.P.A. 1995. Compilation *of Air Pollution Emission Factors, 5th Edition*. AP-42. OAQPS. Research Triangle Park, North Carolina.

U.S.E.P.A. 1987. *On-Site* Meteorological *Program Guidance for Regulatory Modeling Applications*. OAQPS. Research Triangle Park, North Carolina.

U.S.E.P.A. 1995. *User's Guide for the Industrial Source Complex Dispersion Models*. OAQPS. Research Triangle Park, North Carolina.

```
CO STARTING
CO TITLEONE CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET
CO MODELOPT DFAULT CONC   RURAL
*** ave time is really 15 min per met data
CO AVERTIME 1
CO POLLUTID OTHER
CO TERRHGTS ELEV
CO FLAGPOLE
CO DCAYCOEF   0.000000E+00
CO RUNORNOT RUN
CO ERRORFIL ERRORS.OUT
CO FINISHED


SO STARTING
SO ELEVUNIT FEET

*** Source Location Cards:
***          SRCID SRCTYP        XS            YS            ZS

SO LOCATION CT1    POINT        743267.       3981595.      1040.0
*** COOLING TOWER
SO LOCATION S1C    POINT        742933.       3981537.      1039.5
***  FRONT END BLDG.
SO LOCATION S2C    POINT        743170.       3981701.      1054.0
*** KLYSTRON HALL
SO LOCATION S3C    POINT        743471.       3981795.      1088.0
*** RING SERVICE BLDG.
SO LOCATION S4C    POINT        743552.       3981865.      1041.0
*** RTBT SERVICE BLDG.
SO LOCATION S5C    POINT        743645.       3981965.      1038.5
*** TARGET BLDG.
SO LOCATION S6C    POINT        743239.       3981635.      1050.0
*** UTILITY BLDG.
SO LOCATION S7C    POINT        743347.       3981717.      1050.0
*** OFFICE BLDG.
SO LOCATION S8C    POINT        743567.       3982073.      1038.5
*** TARGET BLDG.
SO LOCATION S9C    POINT        743339.       3981977.      1088.0
*** RING SERVICE BLDG.
SO LOCATION S10C   POINT        743447.       3982027.      1041.0
*** RTBT SERVICE BLDG.
*** Source Parameter Cards:
*** POINT:   SRCID       QS            HS         TS          VS          DS
*** VOLUME:  SRCID       QS            HS       SYINIT      SZINIT
*** AREA:    SRCID       QS            HS        XINIT

*** WATER VAPOR EMISSIONS (350GPM) FROM COOLING TOWERS (13 COMBINED)
```

```
SO SRCPARAM   CT1       22015.          7.52       304.80       9.8000      4.8800
*** CO2 EMISSIONS FROM 10 BOILER STACKS
SO SRCPARAM   S1C       55.2300        13.5600    480.0000      7.1800       .4064
SO SRCPARAM   S2C       43.1500         9.1400    480.0000      7.1800       .3048
SO SRCPARAM   S3C       55.2300         8.5300    480.0000      7.1800       .4064
SO SRCPARAM   S4C       28.2900        14.9300    480.0000      7.1800       .2540
SO SRCPARAM   S5C     102.73000        20.4200    480.0000      7.1800       .4064
SO SRCPARAM   S6C       37.4200         7.9200    480.0000      7.1800       .3048
SO SRCPARAM   S7C       19.6600        11.5800    480.0000      7.1800       .2040
SO SRCPARAM   S8C     102.73000        20.4200    480.0000      7.1800       .4064
SO SRCPARAM   S9C       55.2300         8.5300    480.0000      7.1800       .4064
SO SRCPARAM   S10C      28.2900         14.930    480.0000      7.1800       .2540

SO BUILDHGT CT1         7.52    7.52    7.52    7.52    7.52    7.52
SO BUILDHGT CT1         7.52    7.52    7.52    7.52    7.52    7.52
SO BUILDHGT CT1         7.52    7.52    7.52    7.52    7.52    7.52
SO BUILDHGT CT1         7.52    7.52    7.52    7.52    7.52    7.52
SO BUILDHGT CT1         7.52    7.52    7.52    7.52    7.52    7.52
SO BUILDHGT CT1         7.52    7.52    7.52    7.52    7.52    7.52
SO BUILDWID CT1        79.02   67.64   54.21   39.13   22.86   20.43
SO BUILDWID CT1        36.20   50.87   64.00   75.18   84.08   90.43
SO BUILDWID CT1        94.02   96.76   98.21   97.74   94.30   88.00
SO BUILDWID CT1        79.02   67.64   54.21   39.13   22.86   20.43
SO BUILDWID CT1        36.20   50.87   64.00   75.18   84.08   90.43
SO BUILDWID CT1        94.02   96.76   98.21   97.74   94.30   88.00

SO BUILDHGT S1C        10.52   10.52   10.52   10.52   10.52   10.52
SO BUILDHGT S1C        10.52   10.52   10.52   10.52   10.52   10.52
SO BUILDHGT S1C        10.52   10.52   10.52   10.52   10.52   10.52
SO BUILDHGT S1C        10.52   10.52   10.52   10.52   10.52   10.52
SO BUILDHGT S1C        10.52   10.52   10.52   10.52   10.52   10.52
SO BUILDHGT S1C        10.52   10.52   10.52   10.52   10.52   10.52
SO BUILDWID S1C        39.57   37.93   35.14   31.28   26.48   26.48
SO BUILDWID S1C        28.53   29.72   30.00   31.69   33.41   34.11
SO BUILDWID S1C        33.79   32.43   34.14   37.25   39.22   40.00
SO BUILDWID S1C        39.57   37.93   35.14   31.28   26.48   26.48
SO BUILDWID S1C        28.53   29.72   30.00   31.69   33.41   34.11
SO BUILDWID S1C        33.79   32.43   34.14   37.25   39.22   40.00

SO BUILDHGT S2C         6.10    6.10    6.10    6.10    6.10    6.10
SO BUILDHGT S2C         6.10    6.10    6.10    6.10    6.10    6.10
SO BUILDHGT S2C         6.10    6.10    6.10    6.10    6.10    6.10
SO BUILDHGT S2C         6.10    6.10    6.10    6.10    6.10    6.10
SO BUILDHGT S2C         6.10    6.10    6.10    6.10    6.10    6.10
SO BUILDHGT S2C         6.10    6.10    6.10    6.10    6.10    6.10
SO BUILDWID S2C       394.37  329.75  255.11  172.73   85.09   70.76
SO BUILDWID S2C       159.19  242.78  319.00  385.52  440.33  481.76
SO BUILDWID S2C       508.55  519.89  519.11  510.34  486.05  447.00
SO BUILDWID S2C       394.37  329.75  255.11  172.73   85.09   70.76
SO BUILDWID S2C       159.19  242.78  319.00  385.52  440.33  481.76
SO BUILDWID S2C       508.55  519.89  519.11  510.34  486.05  447.00
```

SO BUILDHGT S3C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S3C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S3C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S3C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S3C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S3C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDWID S3C	33.19	32.38	30.58	27.85	26.25	29.31
SO BUILDWID S3C	32.21	34.12	35.00	34.82	33.57	31.31
SO BUILDWID S3C	28.10	24.20	26.58	29.64	31.80	33.00
SO BUILDWID S3C	33.19	32.38	30.58	27.85	26.25	29.31
SO BUILDWID S3C	32.21	34.12	35.00	34.82	33.57	31.31
SO BUILDWID S3C	28.10	24.20	26.58	29.64	31.80	33.00
SO BUILDHGT S4C	17.37	17.37	17.37	5.49	5.49	5.49
SO BUILDHGT S4C	17.37	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S4C	5.49	5.49	5.49	5.49	5.49	17.37
SO BUILDHGT S4C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S4C	17.37	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S4C	5.49	5.49	5.49	5.49	5.49	17.37
SO BUILDWID S4C	115.69	109.86	100.69	14.41	10.95	10.69
SO BUILDWID S4C	83.96	18.08	21.00	23.29	24.86	25.69
SO BUILDWID S4C	25.73	24.99	23.49	23.32	23.52	118.00
SO BUILDWID S4C	115.69	109.86	100.69	88.46	73.55	67.40
SO BUILDWID S4C	83.96	18.08	21.00	23.29	24.86	25.69
SO BUILDWID S4C	25.73	24.99	23.49	23.32	23.52	118.00
SO BUILDHGT S5C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S5C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S5C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S5C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S5C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S5C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDWID S5C	115.69	109.86	100.69	88.46	73.55	67.40
SO BUILDWID S5C	83.96	97.97	109.00	116.72	120.90	121.40
SO BUILDWID S5C	118.21	111.43	104.84	111.91	116.73	118.00
SO BUILDWID S5C	115.69	109.86	100.69	88.46	73.55	67.40
SO BUILDWID S5C	83.96	97.97	109.00	116.72	120.90	121.40
SO BUILDWID S5C	118.21	111.43	104.84	111.91	116.73	118.00
SO BUILDHGT S6C	4.88	4.88	4.88	4.88	4.88	4.88
SO BUILDHGT S6C	4.88	4.88	4.88	4.88	4.88	4.88
SO BUILDHGT S6C	4.88	4.88	4.88	4.88	4.88	4.88
SO BUILDHGT S6C	4.88	4.88	4.88	4.88	4.88	4.88
SO BUILDHGT S6C	4.88	4.88	4.88	4.88	4.88	4.88
SO BUILDHGT S6C	4.88	4.88	4.88	4.88	4.88	4.88
SO BUILDWID S6C	47.16	42.88	37.30	30.59	22.95	23.11

SO BUILDWID S6C	31.09	38.12	44.00	48.54	51.61	53.11
SO BUILDWID S6C	52.99	51.26	49.30	51.09	51.32	50.00
SO BUILDWID S6C	47.16	42.88	37.30	30.59	22.95	23.11
SO BUILDWID S6C	31.09	38.12	44.00	48.54	51.61	53.11
SO BUILDWID S6C	52.99	51.26	49.30	51.09	51.32	50.00
SO BUILDHGT S7C	8.53	8.53	8.53	8.53	8.53	8.53
SO BUILDHGT S7C	8.53	8.53	8.53	8.53	8.53	8.53
SO BUILDHGT S7C	8.53	8.53	8.53	8.53	8.53	8.53
SO BUILDHGT S7C	8.53	8.53	8.53	8.53	8.53	8.53
SO BUILDHGT S7C	8.53	8.53	8.53	8.53	8.53	8.53
SO BUILDHGT S7C	8.53	8.53	8.53	8.53	8.53	8.53
SO BUILDWID S7C	51.21	54.85	56.84	57.09	55.61	55.50
SO BUILDWID S7C	58.94	61.41	62.00	60.71	57.58	52.69
SO BUILDWID S7C	46.26	41.42	44.11	45.45	45.42	46.00
SO BUILDWID S7C	51.21	54.85	56.84	57.09	55.61	55.50
SO BUILDWID S7C	58.94	61.41	62.00	60.71	57.58	52.69
SO BUILDWID S7C	46.26	41.42	44.11	45.45	45.42	46.00
SO BUILDHGT S8C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S8C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S8C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S8C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S8C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S8C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDWID S8C	113.02	106.61	96.96	84.36	69.20	68.80
SO BUILDWID S8C	83.87	96.40	106.00	112.38	115.34	114.80
SO BUILDWID S8C	110.77	103.37	103.96	111.40	115.45	116.00
SO BUILDWID S8C	113.02	106.61	96.96	84.36	69.20	68.80
SO BUILDWID S8C	83.87	96.40	106.00	112.38	115.34	114.80
SO BUILDWID S8C	110.77	103.37	103.96	111.40	115.45	116.00
SO BUILDHGT S9C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S9C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S9C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S9C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S9C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDHGT S9C	5.49	5.49	5.49	5.49	5.49	5.49
SO BUILDWID S9C	34.35	33.66	31.94	29.26	25.69	26.31
SO BUILDWID S9C	30.15	33.08	35.00	35.86	35.63	34.31
SO BUILDWID S9C	31.95	28.63	26.94	30.24	32.62	34.00
SO BUILDWID S9C	34.35	33.66	31.94	29.26	25.68	26.31
SO BUILDWID S9C	30.15	33.08	35.00	35.86	35.63	34.31
SO BUILDWID S9C	31.95	28.63	26.94	30.24	32.62	34.00
SO BUILDHGT S10C	5.49	5.49	5.49	17.37	17.37	17.37
SO BUILDHGT S10C	17.37	17.37	17.37	17.37	17.37	17.37
SO BUILDHGT S10C	5.49	5.49	5.49	5.49	5.49	5.49

```
SO BUILDHGT S10C        5.49    5.49    5.49   17.37   17.37   17.37
SO BUILDHGT S10C       17.37   17.37   17.37   17.37   17.37   17.37
SO BUILDHGT S10C        5.49    5.49    5.49    5.49    5.49    5.49
SO BUILDWID S10C       20.80   18.96   16.55   84.36   69.20   68.80
SO BUILDWID S10C       83.87   96.40  106.00  112.38  115.34  114.80
SO BUILDWID S10C       23.55   22.94   22.95   22.38   22.53   22.00
SO BUILDWID S10C       20.80   18.96   16.55   84.36   69.20   68.80
SO BUILDWID S10C       83.87   96.40  106.00  112.38  115.34  114.80
SO BUILDWID S10C       23.55   22.94   22.95   22.38   22.53   22.00

SO SRCGROUP   CT CT1
SO SRCGROUP   CO2 S1C-S10C
SO FINISHED


RE STARTING
RE ELEVUNIT FEET
RE DISCCART  744522.  3982825.  1120.  36.0
RE FINISHED


ME STARTING
*** all windspeeds <.7 m/sec set equal zero (calm)
ME INPUTFIL  ORNA8.ASC
ME ANEMHGHT    9.100 METERS
ME SURFDATA  13891  1991            ORTN
ME UAIRDATA  13897  1991            NATN
ME WINDCATS    1.54    3.09    5.14    8.23   10.80
ME FINISHED


OU STARTING
OU MAXTABLE ALLAVE 50
OU MAXIFILE 1 CT  .1 WB12CT.SUM
OU MAXIFILE 1 CO2 .1 WB12CO2.SUM
OU FINISHED


 *** Message Summary For ISC3 Model Setup ***

 --------- Summary of Total Messages --------

A Total of            0 Fatal Error Message(s)
A Total of            1 Warning Message(s)
A Total of            0 Informational Message(s)


   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***
```

```
   ********   WARNING MESSAGES   ********
CO W205      9 FLAGDF:No Option Parameter Setting.  Forced by Default to ZFLAG=0.

***********************************
*** SETUP Finishes Successfully ***
***********************************
```

```
 *** ISCST3 - VERSION 97363 ***    *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET              ***        06/15/98
                                   ***                                                                  ***        19:41:09
                                                                                                                   PAGE   1
**MODELOPTs: CONC                          RURAL  ELEV   FLGPOL DFAULT

                                            ***     MODEL SETUP OPTIONS SUMMARY       ***
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**Intermediate Terrain Processing is Selected

**Model Is Setup For Calculation of Average CONCentration Values.

  --  SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION.  DDPLETE =  F
**Model Uses NO WET DEPLETION.  WDPLETE =  F
**NO WET SCAVENGING Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

**Model Uses RURAL Dispersion.

**Model Uses Regulatory DEFAULT Options:
           1. Final Plume Rise.
           2. Stack-tip Downwash.
           3. Buoyancy-induced Dispersion.
           4. Use Calms Processing Routine.
           5. Not Use Missing Data Processing Routine.
           6. Default Wind Profile Exponents.
           7. Default Vertical Potential Temperature Gradients.
           8. "Upper Bound" Values for Supersquat Buildings.
           9. No Exponential Decay for RURAL Mode

**Model Accepts Receptors on ELEV Terrain.

**Model Accepts FLAGPOLE Receptor Heights.

**Model Calculates  1 Short Term Average(s) of:   1-HR

**This Run Includes:    11 Source(s);       2 Source Group(s); and       1 Receptor(s)

**The Model Assumes A Pollutant Type of:  OTHER

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
         Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)
         Model Outputs External File(s) of Threshold Violations (MAXIFILE Keyword)

**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                m for Missing Hours
                                                                b for Both Calm and Missing Hours
```

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**Misc. Inputs:  Anem. Hgt. (m) =     9.10 ;    Decay Coef. =   0.0000     ;    Rot. Angle =     0.0
                 Emission Units = GRAMS/SEC                                 ;  Emission Rate Unit Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

**Input Runstream File: wb12.inp                                            ;  **Output Print File: wb12.out
**Detailed Error/Message File:   ERRORS.OUT
```

*** ISCST3 - VERSION 97363 *** *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET *** 06/15/98
*** *** 19:41:09
PAGE 2

**MODELOPTs: CONC RURAL ELEV FLGPOL DFAULT

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
CT1	0	0.22015E+05	743267.0	3981595.0	317.0	7.52	304.80	9.80	4.88	YES	
S1C	0	0.55230E+02	742933.0	3981537.0	316.8	13.56	480.00	7.18	0.41	YES	
S2C	0	0.43150E+02	743170.0	3981701.0	321.3	9.14	480.00	7.18	0.30	YES	
S3C	0	0.55230E+02	743471.0	3981795.0	331.6	8.53	480.00	7.18	0.41	YES	
S4C	0	0.28290E+02	743552.0	3981865.0	317.3	14.93	480.00	7.18	0.25	YES	
S5C	0	0.10273E+03	743645.0	3981965.0	316.5	20.42	480.00	7.18	0.41	YES	
S6C	0	0.37420E+02	743239.0	3981635.0	320.0	7.92	480.00	7.18	0.30	YES	
S7C	0	0.19660E+02	743347.0	3981717.0	320.0	11.58	480.00	7.18	0.20	YES	
S8C	0	0.10273E+03	743567.0	3982073.0	316.5	20.42	480.00	7.18	0.41	YES	
S9C	0	0.55230E+02	743339.0	3981977.0	331.6	8.53	480.00	7.18	0.41	YES	
S10C	0	0.28290E+02	743447.0	3982027.0	317.3	14.93	480.00	7.18	0.25	YES	

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*** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET          ***        06/15/98
                                   ***                                                              ***        19:41:09
                                                                                                               PAGE   3
**MODELOPTs: CONC                        RURAL  ELEV   FLGPOL DFAULT


                                      *** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID                                                SOURCE IDs


 CT        CT1     ,

 CO2       S1C     , S2C     , S3C     , S4C     , S5C     , S6C     , S7C     , S8C     , S9C     , S10C    ,
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*** ISCST3 - VERSION 97363 ***    *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET          ***        06/15/98
                                  ***                                                              ***        19:41:09
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**MODELOPTs: CONC                        RURAL  ELEV   FLGPOL DFAULT

                                         *** DIRECTION SPECIFIC BUILDING DIMENSIONS ***
```

SOURCE ID: CT1

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	7.5,	79.0,	0	2	7.5,	67.6,	0	3	7.5,	54.2,	0	4	7.5,	39.1,	0	5	7.5,	22.9,	0	6	7.5,	20.4,	0
7	7.5,	36.2,	0	8	7.5,	50.9,	0	9	7.5,	64.0,	0	10	7.5,	75.2,	0	11	7.5,	84.1,	0	12	7.5,	90.4,	0
13	7.5,	94.0,	0	14	7.5,	96.8,	0	15	7.5,	98.2,	0	16	7.5,	97.7,	0	17	7.5,	94.3,	0	18	7.5,	88.0,	0
19	7.5,	79.0,	0	20	7.5,	67.6,	0	21	7.5,	54.2,	0	22	7.5,	39.1,	0	23	7.5,	22.9,	0	24	7.5,	20.4,	0
25	7.5,	36.2,	0	26	7.5,	50.9,	0	27	7.5,	64.0,	0	28	7.5,	75.2,	0	29	7.5,	84.1,	0	30	7.5,	90.4,	0
31	7.5,	94.0,	0	32	7.5,	96.8,	0	33	7.5,	98.2,	0	34	7.5,	97.7,	0	35	7.5,	94.3,	0	36	7.5,	88.0,	0

SOURCE ID: S1C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	10.5,	39.6,	0	2	10.5,	37.9,	0	3	10.5,	35.1,	0	4	10.5,	31.3,	0	5	10.5,	26.5,	0	6	10.5,	26.5,	0
7	10.5,	28.5,	0	8	10.5,	29.7,	0	9	10.5,	30.0,	0	10	10.5,	31.7,	0	11	10.5,	33.4,	0	12	10.5,	34.1,	0
13	10.5,	33.8,	0	14	10.5,	32.4,	0	15	10.5,	34.1,	0	16	10.5,	37.3,	0	17	10.5,	39.2,	0	18	10.5,	40.0,	0
19	10.5,	39.6,	0	20	10.5,	37.9,	0	21	10.5,	35.1,	0	22	10.5,	31.3,	0	23	10.5,	26.5,	0	24	10.5,	26.5,	0
25	10.5,	28.5,	0	26	10.5,	29.7,	0	27	10.5,	30.0,	0	28	10.5,	31.7,	0	29	10.5,	33.4,	0	30	10.5,	34.1,	0
31	10.5,	33.8,	0	32	10.5,	32.4,	0	33	10.5,	34.1,	0	34	10.5,	37.3,	0	35	10.5,	39.2,	0	36	10.5,	40.0,	0

SOURCE ID: S2C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	6.1,	394.4,	0	2	6.1,	329.8,	0	3	6.1,	255.1,	0	4	6.1,	172.7,	0	5	6.1,	85.1,	0	6	6.1,	70.8,	0
7	6.1,	159.2,	0	8	6.1,	242.8,	0	9	6.1,	319.0,	0	10	6.1,	385.5,	0	11	6.1,	440.3,	0	12	6.1,	481.8,	0
13	6.1,	508.5,	0	14	6.1,	519.9,	0	15	6.1,	519.1,	0	16	6.1,	510.3,	0	17	6.1,	486.0,	0	18	6.1,	447.0,	0
19	6.1,	394.4,	0	20	6.1,	329.8,	0	21	6.1,	255.1,	0	22	6.1,	172.7,	0	23	6.1,	85.1,	0	24	6.1,	70.8,	0
25	6.1,	159.2,	0	26	6.1,	242.8,	0	27	6.1,	319.0,	0	28	6.1,	385.5,	0	29	6.1,	440.3,	0	30	6.1,	481.8,	0
31	6.1,	508.5,	0	32	6.1,	519.9,	0	33	6.1,	519.1,	0	34	6.1,	510.3,	0	35	6.1,	486.0,	0	36	6.1,	447.0,	0

SOURCE ID: S3C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	5.5,	33.2,	0	2	5.5,	32.4,	0	3	5.5,	30.6,	0	4	5.5,	27.8,	0	5	5.5,	26.3,	0	6	5.5,	29.3,	0
7	5.5,	32.2,	0	8	5.5,	34.1,	0	9	5.5,	35.0,	0	10	5.5,	34.8,	0	11	5.5,	33.6,	0	12	5.5,	31.3,	0
13	5.5,	28.1,	0	14	5.5,	24.2,	0	15	5.5,	26.6,	0	16	5.5,	29.6,	0	17	5.5,	31.8,	0	18	5.5,	33.0,	0
19	5.5,	33.2,	0	20	5.5,	32.4,	0	21	5.5,	30.6,	0	22	5.5,	27.8,	0	23	5.5,	26.3,	0	24	5.5,	29.3,	0
25	5.5,	32.2,	0	26	5.5,	34.1,	0	27	5.5,	35.0,	0	28	5.5,	34.8,	0	29	5.5,	33.6,	0	30	5.5,	31.3,	0
31	5.5,	28.1,	0	32	5.5,	24.2,	0	33	5.5,	26.6,	0	34	5.5,	29.6,	0	35	5.5,	31.8,	0	36	5.5,	33.0,	0

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*** ISCST3 - VERSION 97363 ***    *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET          ***        06/15/98
                                  ***                                                              ***        19:41:09
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**MODELOPTs: CONC                        RURAL  ELEV   FLGPOL DFAULT

                                         *** DIRECTION SPECIFIC BUILDING DIMENSIONS ***
```

SOURCE ID: S4C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	17.4,	115.7,	0	2	17.4,	109.9,	0	3	17.4,	100.7,	0	4	5.5,	14.4,	0	5	5.5,	10.9,	0	6	5.5,	10.7,	0
7	17.4,	84.0,	0	8	5.5,	18.1,	0	9	5.5,	21.0,	0	10	5.5,	23.3,	0	11	5.5,	24.9,	0	12	5.5,	25.7,	0
13	5.5,	25.7,	0	14	5.5,	25.0,	0	15	5.5,	23.5,	0	16	5.5,	23.3,	0	17	5.5,	23.5,	0	18	17.4,	118.0,	0
19	17.4,	115.7,	0	20	17.4,	109.9,	0	21	17.4,	100.7,	0	22	17.4,	88.5,	0	23	17.4,	73.6,	0	24	17.4,	67.4,	0
25	17.4,	84.0,	0	26	5.5,	18.1,	0	27	5.5,	21.0,	0	28	5.5,	23.3,	0	29	5.5,	24.9,	0	30	5.5,	25.7,	0
31	5.5,	25.7,	0	32	5.5,	25.0,	0	33	5.5,	23.5,	0	34	5.5,	23.3,	0	35	5.5,	23.5,	0	36	17.4,	118.0,	0

SOURCE ID: S5C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	17.4,	115.7,	0	2	17.4,	109.9,	0	3	17.4,	100.7,	0	4	17.4,	88.5,	0	5	17.4,	73.6,	0	6	17.4,	67.4,	0
7	17.4,	84.0,	0	8	17.4,	98.0,	0	9	17.4,	109.0,	0	10	17.4,	116.7,	0	11	17.4,	120.9,	0	12	17.4,	121.4,	0
13	17.4,	118.2,	0	14	17.4,	111.4,	0	15	17.4,	104.8,	0	16	17.4,	111.9,	0	17	17.4,	116.7,	0	18	17.4,	118.0,	0
19	17.4,	115.7,	0	20	17.4,	109.9,	0	21	17.4,	100.7,	0	22	17.4,	88.5,	0	23	17.4,	73.6,	0	24	17.4,	67.4,	0
25	17.4,	84.0,	0	26	17.4,	98.0,	0	27	17.4,	109.0,	0	28	17.4,	116.7,	0	29	17.4,	120.9,	0	30	17.4,	121.4,	0
31	17.4,	118.2,	0	32	17.4,	111.4,	0	33	17.4,	104.8,	0	34	17.4,	111.9,	0	35	17.4,	116.7,	0	36	17.4,	118.0,	0

SOURCE ID: S6C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	4.9,	47.2,	0	2	4.9,	42.9,	0	3	4.9,	37.3,	0	4	4.9,	30.6,	0	5	4.9,	22.9,	0	6	4.9,	23.1,	0
7	4.9,	31.1,	0	8	4.9,	38.1,	0	9	4.9,	44.0,	0	10	4.9,	48.5,	0	11	4.9,	51.6,	0	12	4.9,	53.1,	0
13	4.9,	53.0,	0	14	4.9,	51.3,	0	15	4.9,	49.3,	0	16	4.9,	51.1,	0	17	4.9,	51.3,	0	18	4.9,	50.0,	0
19	4.9,	47.2,	0	20	4.9,	42.9,	0	21	4.9,	37.3,	0	22	4.9,	30.6,	0	23	4.9,	22.9,	0	24	4.9,	23.1,	0
25	4.9,	31.1,	0	26	4.9,	38.1,	0	27	4.9,	44.0,	0	28	4.9,	48.5,	0	29	4.9,	51.6,	0	30	4.9,	53.1,	0
31	4.9,	53.0,	0	32	4.9,	51.3,	0	33	4.9,	49.3,	0	34	4.9,	51.1,	0	35	4.9,	51.3,	0	36	4.9,	50.0,	0

SOURCE ID: S7C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	8.5,	51.2,	0	2	8.5,	54.8,	0	3	8.5,	56.8,	0	4	8.5,	57.1,	0	5	8.5,	55.6,	0	6	8.5,	55.5,	0
7	8.5,	58.9,	0	8	8.5,	61.4,	0	9	8.5,	62.0,	0	10	8.5,	60.7,	0	11	8.5,	57.6,	0	12	8.5,	52.7,	0
13	8.5,	46.3,	0	14	8.5,	41.4,	0	15	8.5,	44.1,	0	16	8.5,	45.5,	0	17	8.5,	45.4,	0	18	8.5,	46.0,	0
19	8.5,	51.2,	0	20	8.5,	54.8,	0	21	8.5,	56.8,	0	22	8.5,	57.1,	0	23	8.5,	55.6,	0	24	8.5,	55.5,	0
25	8.5,	58.9,	0	26	8.5,	61.4,	0	27	8.5,	62.0,	0	28	8.5,	60.7,	0	29	8.5,	57.6,	0	30	8.5,	52.7,	0
31	8.5,	46.3,	0	32	8.5,	41.4,	0	33	8.5,	44.1,	0	34	8.5,	45.5,	0	35	8.5,	45.4,	0	36	8.5,	46.0,	0

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*** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET                    ***        06/15/98
                                   ***                                                                        ***        19:41:09
                                                                                                                         PAGE   6
**MODELOPTs: CONC                          RURAL  ELEV   FLGPOL DFAULT

                                           *** DIRECTION SPECIFIC BUILDING DIMENSIONS ***
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SOURCE ID: S8C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	17.4,	113.0,	0	2	17.4,	106.6,	0	3	17.4,	97.0,	0	4	17.4,	84.4,	0	5	17.4,	69.2,	0	6	17.4,	68.8,	0
7	17.4,	83.9,	0	8	17.4,	96.4,	0	9	17.4,	106.0,	0	10	17.4,	112.4,	0	11	17.4,	115.3,	0	12	17.4,	114.8,	0
13	17.4,	110.8,	0	14	17.4,	103.4,	0	15	17.4,	104.0,	0	16	17.4,	111.4,	0	17	17.4,	115.5,	0	18	17.4,	116.0,	0
19	17.4,	113.0,	0	20	17.4,	106.6,	0	21	17.4,	97.0,	0	22	17.4,	84.4,	0	23	17.4,	69.2,	0	24	17.4,	68.8,	0
25	17.4,	83.9,	0	26	17.4,	96.4,	0	27	17.4,	106.0,	0	28	17.4,	112.4,	0	29	17.4,	115.3,	0	30	17.4,	114.8,	0
31	17.4,	110.8,	0	32	17.4,	103.4,	0	33	17.4,	104.0,	0	34	17.4,	111.4,	0	35	17.4,	115.5,	0	36	17.4,	116.0,	0

SOURCE ID: S9C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	5.5,	34.3,	0	2	5.5,	33.7,	0	3	5.5,	31.9,	0	4	5.5,	29.3,	0	5	5.5,	25.7,	0	6	5.5,	26.3,	0
7	5.5,	30.1,	0	8	5.5,	33.1,	0	9	5.5,	35.0,	0	10	5.5,	35.9,	0	11	5.5,	35.6,	0	12	5.5,	34.3,	0
13	5.5,	31.9,	0	14	5.5,	28.6,	0	15	5.5,	26.9,	0	16	5.5,	30.2,	0	17	5.5,	32.6,	0	18	5.5,	34.0,	0
19	5.5,	34.3,	0	20	5.5,	33.7,	0	21	5.5,	31.9,	0	22	5.5,	29.3,	0	23	5.5,	25.7,	0	24	5.5,	26.3,	0
25	5.5,	30.1,	0	26	5.5,	33.1,	0	27	5.5,	35.0,	0	28	5.5,	35.9,	0	29	5.5,	35.6,	0	30	5.5,	34.3,	0
31	5.5,	31.9,	0	32	5.5,	28.6,	0	33	5.5,	26.9,	0	34	5.5,	30.2,	0	35	5.5,	32.6,	0	36	5.5,	34.0,	0

SOURCE ID: S10C

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	5.5,	20.8,	0	2	5.5,	19.0,	0	3	5.5,	16.5,	0	4	17.4,	84.4,	0	5	17.4,	69.2,	0	6	17.4,	68.8,	0
7	17.4,	83.9,	0	8	17.4,	96.4,	0	9	17.4,	106.0,	0	10	17.4,	112.4,	0	11	17.4,	115.3,	0	12	17.4,	114.8,	0
13	5.5,	23.5,	0	14	5.5,	22.9,	0	15	5.5,	22.9,	0	16	5.5,	22.4,	0	17	5.5,	22.5,	0	18	5.5,	22.0,	0
19	5.5,	20.8,	0	20	5.5,	19.0,	0	21	5.5,	16.5,	0	22	17.4,	84.4,	0	23	17.4,	69.2,	0	24	17.4,	68.8,	0
25	17.4,	83.9,	0	26	17.4,	96.4,	0	27	17.4,	106.0,	0	28	17.4,	112.4,	0	29	17.4,	115.3,	0	30	17.4,	114.8,	0
31	5.5,	23.5,	0	32	5.5,	22.9,	0	33	5.5,	22.9,	0	34	5.5,	22.4,	0	35	5.5,	22.5,	0	36	5.5,	22.0,	0

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 *** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET                  ***        06/15/98
                                    ***                                                                      ***        19:41:09
                                                                                                                        PAGE    7
**MODELOPTs: CONC                          RURAL  ELEV   FLGPOL DFAULT


                                          *** DISCRETE CARTESIAN RECEPTORS ***
                                            (X-COORD, Y-COORD, ZELEV, ZFLAG)
                                                        (METERS)

    ( 744522.0, 3982825.0,     341.4,      36.0);
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*** ISCST3 - VERSION 97363 ***    *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET          ***        06/15/98
                                  ***                                                              ***        19:41:09
                                                                                                            PAGE    8
**MODELOPTs: CONC                        RURAL  ELEV   FLGPOL DFAULT
```

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

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1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1
```

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

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*** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET                    ***        06/15/98
                                   ***                                                                        ***        19:41:09
                                                                                                                         PAGE    9
**MODELOPTs: CONC                          RURAL  ELEV   FLGPOL DFAULT
```

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: ORNA8.ASC — FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 13891 — UPPER AIR STATION NO.: 13897
NAME: ORTN — NAME: NATN
YEAR: 1991 — YEAR: 1991

YR	MN	DY	HR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	MIXING HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-0 (M)	IPCODE	PRATE (mm/HR)
91	1	1	1	32.0	1.82	303.1	2	2125.8	2161.9	0.0000	0.0	0.0000	0	0.00
91	1	1	2	52.1	2.30	303.2	3	2196.4	2223.4	0.0000	0.0	0.0000	0	0.00
91	1	1	3	97.4	3.72	302.8	2	2266.9	2284.9	0.0000	0.0	0.0000	0	0.00
91	1	1	4	119.5	3.90	300.0	3	2337.4	2346.5	0.0000	0.0	0.0000	0	0.00
91	1	1	5	104.3	3.39	298.1	3	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	6	122.6	2.57	297.3	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	7	108.5	2.71	297.2	3	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	8	120.6	2.76	297.4	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	9	134.4	2.15	298.5	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	10	99.4	1.20	300.6	1	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	11	106.0	1.38	301.9	2	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	12	113.0	1.24	302.7	2	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	13	98.5	1.38	303.1	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	14	120.9	1.13	303.6	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	15	123.5	0.00	304.4	3	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	16	9.2	0.78	304.0	1	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	17	11.2	0.98	302.5	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	18	312.1	0.78	302.1	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	19	250.0	0.00	301.9	3	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	20	144.0	1.88	301.4	3	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	21	128.3	4.62	299.7	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	22	114.9	5.02	298.3	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	23	88.2	7.96	296.5	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00
91	1	1	24	81.5	5.35	293.9	4	2408.0	2408.0	0.0000	0.0	0.0000	0	0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

```
*** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET                    ***        06/15/98
                                   ***                                                                        ***        19:41:09
                                                                                                                         PAGE  10
**MODELOPTs: CONC                        RURAL  ELEV   FLGPOL DFAULT

                                 *** THE MAXIMUM   50   1-HR AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP:  CT       ***
                                     INCLUDING SOURCE(S):    CT1     ,

                                        ** CONC OF OTHER    IN MICROGRAMS/M**3                          **
```

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	1040519.44000	(91052301)	AT (	744522.00, 3982825.00)	DC	26.	408944.15600	(91103013)	AT (	744522.00, 3982825.00)	DC
2.	860371.37500	(91071318)	AT (	744522.00, 3982825.00)	DC	27.	407653.59400	(91041610)	AT (	744522.00, 3982825.00)	DC
3.	852523.31300	(91021122)	AT (	744522.00, 3982825.00)	DC	28.	407477.68800	(91071319)	AT (	744522.00, 3982825.00)	DC
4.	730122.50000	(91062409)	AT (	744522.00, 3982825.00)	DC	29.	406411.00000	(91053015)	AT (	744522.00, 3982825.00)	DC
5.	715342.68800	(91032316)	AT (	744522.00, 3982825.00)	DC	30.	406308.28100	(91012307)	AT (	744522.00, 3982825.00)	DC
6.	661015.50000	(91122008)	AT (	744522.00, 3982825.00)	DC	31.	403909.93800	(91011924)	AT (	744522.00, 3982825.00)	DC
7.	588806.12500	(91122006)	AT (	744522.00, 3982825.00)	DC	32.	401106.93800	(91051419)	AT (	744522.00, 3982825.00)	DC
8.	566632.50000	(91031924)	AT (	744522.00, 3982825.00)	DC	33.	398889.31300	(91051006)	AT (	744522.00, 3982825.00)	DC
9.	528942.06300	(91090713)	AT (	744522.00, 3982825.00)	DC	34.	390928.28100	(91082716)	AT (	744522.00, 3982825.00)	DC
10.	522100.75000	(91031210)	AT (	744522.00, 3982825.00)	DC	35.	387549.31300	(91051422)	AT (	744522.00, 3982825.00)	DC
11.	505200.96900	(91050223)	AT (	744522.00, 3982825.00)	DC	36.	384416.31300	(91120224)	AT (	744522.00, 3982825.00)	DC
12.	495518.90600	(91081406)	AT (	744522.00, 3982825.00)	DC	37.	376056.21900	(91030411)	AT (	744522.00, 3982825.00)	DC
13.	484229.78100	(91051024)	AT (	744522.00, 3982825.00)	DC	38.	374980.28100	(91100124)	AT (	744522.00, 3982825.00)	DC
14.	484089.75000	(91051012)	AT (	744522.00, 3982825.00)	DC	39.	374238.78100	(91041723)	AT (	744522.00, 3982825.00)	DC
15.	458267.34400	(91091508)	AT (	744522.00, 3982825.00)	DC	40.	370532.78100	(91100202)	AT (	744522.00, 3982825.00)	DC
16.	452520.68800	(91101006)	AT (	744522.00, 3982825.00)	DC	41.	368265.96900	(91051414)	AT (	744522.00, 3982825.00)	DC
17.	451771.87500	(91042012)	AT (	744522.00, 3982825.00)	DC	42.	367364.46900	(91122813)	AT (	744522.00, 3982825.00)	DC
18.	447626.53100	(91110306)	AT (	744522.00, 3982825.00)	DC	43.	359781.78100	(91110402)	AT (	744522.00, 3982825.00)	DC
19.	436331.84400	(91070504)	AT (	744522.00, 3982825.00)	DC	44.	352743.71900	(91021209)	AT (	744522.00, 3982825.00)	DC
20.	434912.84400	(91013015)	AT (	744522.00, 3982825.00)	DC	45.	351305.65600	(91011914)	AT (	744522.00, 3982825.00)	DC
21.	431920.71900	(91082706)	AT (	744522.00, 3982825.00)	DC	46.	349772.53100	(91032315)	AT (	744522.00, 3982825.00)	DC
22.	414508.93800	(91012304)	AT (	744522.00, 3982825.00)	DC	47.	344577.96900	(91122005)	AT (	744522.00, 3982825.00)	DC
23.	413562.81300	(91050716)	AT (	744522.00, 3982825.00)	DC	48.	343476.03100	(91122814)	AT (	744522.00, 3982825.00)	DC
24.	411230.18800	(91081509)	AT (	744522.00, 3982825.00)	DC	49.	337569.43800	(91052401)	AT (	744522.00, 3982825.00)	DC
25.	410081.40600	(91042020)	AT (	744522.00, 3982825.00)	DC	50.	334396.34400	(91101824)	AT (	744522.00, 3982825.00)	DC

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*** RECEPTOR TYPES:  GC = GRIDCART
                     GP = GRIDPOLR
                     DC = DISCCART
                     DP = DISCPOLR
                     BD = BOUNDARY
```

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*** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET                    ***        06/15/98
                                   ***                                                                        ***        19:41:09
                                                                                                                         PAGE  11
**MODELOPTs: CONC                        RURAL  ELEV   FLGPOL DFAULT

                                 *** THE MAXIMUM   50   1-HR AVERAGE CONCENTRATION   VALUES FOR SOURCE GROUP:  CO2      ***
                                     INCLUDING SOURCE(S):    S1C     , S2C     , S3C     , S4C     , S5C     , S6C     , S7C     ,
        S8C     , S9C     , S10C    ,

                                        ** CONC OF OTHER    IN MICROGRAMS/M**3                          **
```

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR (XR,YR)	OF TYPE
1.	23410.70120	(91071812)	AT (	744522.00, 3982825.00)	DC	26.	17071.55470	(91062409)	AT (	744522.00, 3982825.00)	DC
2.	21986.40040	(91032316)	AT (	744522.00, 3982825.00)	DC	27.	16991.44140	(91032418)	AT (	744522.00, 3982825.00)	DC
3.	21535.64450	(91120224)	AT (	744522.00, 3982825.00)	DC	28.	16965.68750	(91020413)	AT (	744522.00, 3982825.00)	DC
4.	20892.60940	(91081509)	AT (	744522.00, 3982825.00)	DC	29.	16848.01560	(91082716)	AT (	744522.00, 3982825.00)	DC
5.	20041.11330	(91051421)	AT (	744522.00, 3982825.00)	DC	30.	16829.27340	(91112409)	AT (	744522.00, 3982825.00)	DC
6.	20030.30660	(91040123)	AT (	744522.00, 3982825.00)	DC	31.	16754.21090	(91082516)	AT (	744522.00, 3982825.00)	DC
7.	19808.75980	(91020822)	AT (	744522.00, 3982825.00)	DC	32.	16634.74020	(91100218)	AT (	744522.00, 3982825.00)	DC
8.	19677.09960	(91011924)	AT (	744522.00, 3982825.00)	DC	33.	16623.85740	(91012001)	AT (	744522.00, 3982825.00)	DC
9.	19644.17970	(91010308)	AT (	744522.00, 3982825.00)	DC	34.	16616.91020	(91123123)	AT (	744522.00, 3982825.00)	DC
10.	19468.10550	(91082621)	AT (	744522.00, 3982825.00)	DC	35.	16578.47850	(91071318)	AT (	744522.00, 3982825.00)	DC
11.	19457.75000	(91090713)	AT (	744522.00, 3982825.00)	DC	36.	16355.34860	(91110402)	AT (	744522.00, 3982825.00)	DC
12.	19398.85160	(91071507)	AT (	744522.00, 3982825.00)	DC	37.	16330.78220	(91100423)	AT (	744522.00, 3982825.00)	DC
13.	18869.52930	(91071319)	AT (	744522.00, 3982825.00)	DC	38.	16329.21580	(91050711)	AT (	744522.00, 3982825.00)	DC
14.	18642.33980	(91032315)	AT (	744522.00, 3982825.00)	DC	39.	16133.59860	(91120405)	AT (	744522.00, 3982825.00)	DC
15.	18337.98050	(91103013)	AT (	744522.00, 3982825.00)	DC	40.	16127.61620	(91031210)	AT (	744522.00, 3982825.00)	DC
16.	18333.78710	(91050716)	AT (	744522.00, 3982825.00)	DC	41.	15932.03130	(91091421)	AT (	744522.00, 3982825.00)	DC
17.	18156.91020	(91100422)	AT (	744522.00, 3982825.00)	DC	42.	15881.87790	(91112318)	AT (	744522.00, 3982825.00)	DC
18.	17871.23240	(91030411)	AT (	744522.00, 3982825.00)	DC	43.	15826.50290	(91122009)	AT (	744522.00, 3982825.00)	DC
19.	17843.57420	(91040321)	AT (	744522.00, 3982825.00)	DC	44.	15798.71290	(91062103)	AT (	744522.00, 3982825.00)	DC
20.	17636.11520	(91052301)	AT (	744522.00, 3982825.00)	DC	45.	15557.46880	(91112315)	AT (	744522.00, 3982825.00)	DC
21.	17512.26170	(91091619)	AT (	744522.00, 3982825.00)	DC	46.	15491.74800	(91031905)	AT (	744522.00, 3982825.00)	DC
22.	17505.71290	(91091610)	AT (	744522.00, 3982825.00)	DC	47.	15443.38180	(91041616)	AT (	744522.00, 3982825.00)	DC
23.	17472.12110	(91100420)	AT (	744522.00, 3982825.00)	DC	48.	15405.26950	(91031924)	AT (	744522.00, 3982825.00)	DC
24.	17386.54490	(91110307)	AT (	744522.00, 3982825.00)	DC	49.	15323.43360	(91051419)	AT (	744522.00, 3982825.00)	DC
25.	17223.24020	(91121006)	AT (	744522.00, 3982825.00)	DC	50.	14943.97560	(91101006)	AT (	744522.00, 3982825.00)	DC

```
*** RECEPTOR TYPES:  GC = GRIDCART
                     GP = GRIDPOLR
                     DC = DISCCART
                     DP = DISCPOLR
                     BD = BOUNDARY
```

```
 *** ISCST3 - VERSION 97363 ***     *** CT & 10 STACKS @ MON. TOWER*4MW*1991 JUL-SEP WB MET                  ***        06/15/98
                                    ***                                                                      ***        19:41:09
                                                                                                                        PAGE  12
**MODELOPTs: CONC                          RURAL  ELEV   FLGPOL DFAULT


*** Message Summary : ISCST3 Model Execution ***

 --------- Summary of Total Messages --------

A Total of            0 Fatal Error Message(s)
A Total of            1 Warning Message(s)
A Total of          666 Informational Message(s)

A Total of          666 Calm Hours Identified


   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***


   ********   WARNING MESSAGES   ********
CO W205     9 FLAGDF:No Option Parameter Setting.  Forced by Default to ZFLAG=0.

   ************************************
   *** ISCST3 Finishes Successfully ***
   ************************************
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