PRAIRIE ISLAND NUCLEAR
GENERATING PLANT
NORTHERN STATES POWER COMPANY

EMERGENCY PLAN IMPLEMENTING PROCEDURES

Number: TABLE OF CONTENTS Rev: 24

Retention Time: History Copy Lifetime

Reviewed By: D.A. Schuelke
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Plant Manager

TITLE:

F3
EMERGENCY PLAN
IMPLEMENTING PROCEDURES
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IBM

TEMPORARY MEMO

Temporary Memo No. TM-83-48 EFFECTIVE DATE 12-29-83

EXPIRATION DATE 12-28-84

Procedure Number/Title/Revision: F3-13, Rev.5 OFFSITE DOSE CALCULATION

Description of Change (attach pages as necessary):

1.0 At the 4113 Terminal, press the "POWER ON" button located above the keyboard and below the terminal screen. Adjust the intensity as necessary.

2.0 Press the "CAPS LOCK" key so that the red light comes on.

3.0 When the blinking cursor appears on the screen, press the "RETURN" button.

Prepared by: [signature] Date 12-29-83

Approved for Use: [signature] SRO Date 12-29-83

[signature] SRO Date 12-29-83

Approved for Deletion: _____ SRO Date _____

_____ SRO Date _____

Is the affected procedure Q-Listed? Yes No OC Review Date _____

Should Change be Permanent? Yes No

Approved by PSERP _____ Date _____

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4.0 Log onto the Midas System as follows:

4.1 A prompt requesting a username should appear, e.g.:

Node NSPPIB: : VAX-11/750

Username:

(1) Type in the username, "MIDAS1".

(2) Press "RETURN".

4.2 A prompt requesting the password should appear, e.g.:

Password:

(1) Type in the password, "MIDAS1". Note that the pasword will not appear on the screen as it is typed.

(2) Press "RETURN".

NOTE: If the wrong username or password is entered, the computer will respond with: "User authorization failure". Press the "RETURN" button and repeat Step 4.0.

5.0 A welcone and various other messages should now appear on the screen. Once the messages are complete, a standard four-line prompt should appear, e.g.:

```
ENTER:  [xx]    FUNCTION OR TASK CODE
        [xxxx]  FUNCTION AND TASK CODE
        [FM]    FUNCTION MENU
        [Z]     Control-Z to exit from menu
```

5.1 Enter "VM" for video display of Met input.

5.2 Press "RETURN"

5.3 A prompt will appear requesting you to enter "ME" or "RA".

(1) Enter "ME"

(2) Press Return

At this time a graphic will appear on the screen giving temperatures, wind speed, wind direction and stability class.

NOTE: If information on display does not update every 5 seconds, Enter CONTROL C and repeat Steps 5.1, 5.2 & 5.3.

NOTE: Use 15 min averages for wind speed and direction preferrable 10 meter values.

6.0 TO EXIT

6.1 Enter CONTROL C

6.2 Enter CONTROL Z

PRAIRIE ISLAND NUCLEAR GENERATING PLANT NORTHERN STATES POWER COMPANY	EMERGENCY PLAN IMPLEMENTING PROCEDURES Number: F3-13 Rev: 5 Retention Time: History Copy Lifetime
Reviewed By: D.A. Schuelke Supt. Rad Protection Approved By: D J Mendele Plant Manager OC Date: 12-21-83	TITLE: OFFSITE DOSE CALCULATION

1.0 PURPOSE

The projected offsite dose rates at various distances from the plant SHALL be calculated during an emergency involving a release or a potential release to the environment.

The offsite dose projections should be used by plant management and offsite officials as a basis for determining protective actions such as sheltering or evacuation when the Protective Action Guides (PAG's) are exceeded.

This Instruction SHALL describe the method to obtain the required information and to calculate the offsite dose projections at various distances from the plant, by two methods:

a. computer method, and

b. hand calculation method when the computers are unavailable.

2.0 APPLICABILITY

This Instruction SHALL apply to the Radiation Protection Group and all Radiological Emergency Coordinators.

3.0 REQUIRED EQUIPMENT

(1) Radiation Monitoring System
(2) Meteorological Equipment
(3) Computer System (Apple or MIDAS)

4.0 PRECAUTIONS

(1) Use care when reading log scales on the radiation monitors and their calibration curves.

(2) Use care when working with exponents.

(3) Use a calculator whenever possible and check all calculations.

(4) Inform the Emergency Director of all projected dose rate calculations.

5.0 PROCEDURE

5.1 When it has been determined that a release to the atmosphere has occurred or there is a potential for a release to the atmosphere, the Emergency Director SHALL designate the Radiation Protection Group responsible for projecting offsite dose rates.

5.2 Determine the exact flow path and the release rate from the plant.

Aux Bldg Special	8000	cfm/stack
Containment Purge	32,250	cfm
Containment In-Service Purge	4000	cfm
SFP Special	5000	cfm/stack
Steam Dump	4000	cfm
Shield Building Vent	200	cfm per train (400 cfm/stack)
PORV's	2500	cfm
SG Safeties	5500	cfm

5.3 Determine the concentration of activity being released from the plant by either of the following methods:

(1) Radiation Monitors: The release concentration may be determined by obtaining the count rate or dose rate from the affected radiation monitor on the release path (e.g. R-22, R-50, etc.).

(2) Manual Determination: The activity being released via the steam headers or the shield building vent may be determined manually, in accordance with procedure, F3-20, "Manual Determination of Radioactive Release Concentrations".

(3) Sample Analysis: Sample analysis on the release path may be used to determine the isotopes for noble gas, iodines, and particulates being released.

5.4 Obtain the meteorological data from the following locations (See Attachment D):

(a) Met Tower - (MIDAS System)

(b) Alternate meteorological sources.

5.5 Perform all offsite dose rate calculations in accordance with Attachment A, B or C.

5.6 Report all results to the Emergency Director on a periodic basis. Inform the Emergency Director immediately of any significant projected offsite dose rates.

5.7 Continue to calculate the projected offsite dose rates at approximately 15 minute intervals, as per this instruction, until the emergency situation is terminated or until such time as determined by the Emergency Director or his designee.

5.8 The Radiological Emergency Coordinator SHALL notify the offsite officials of all projected offsite dose rates on a periodic basis or when requested.

ATTACHMENT A

ACCIDENT DOSE CALCULATION BY APPLE COMPUTER

1.0 Insert or insure that the floppy disk labeled "Met Twr Dose Calcs" is inserted into the Apple disk drive. Close the disk door.

NOTE: The computer is normally on. The monitor may or may not be on. If the computer is on and displaying met tower information in the monitor, proceed to Step (4).

2.0 Insure that the computer and the monitor are plugged into 115 VAC.

3.0 Turn the monitor "ON" (on-off pushbutton) and the Apple computer "ON" (rocker switch on rear, near AC cord receptacle).

4.0 The computer may be in one of two modes, as denoted by the character to the left of the cursor. If there are no characters on the screen, or the cursor is not present, push "RESET". The two characters are:

a) Asterisk (*): This indicates that the computer is in machine language mode.

Then: push: "RESET"
type: "RUN DOSE"
push: "RETURN"

b) Square Bracket (]): This indicates that the computer has been loaded with basic language.

Then: type: "RUN DOSE"
push: "RETURN"

5.0 If a printout of the offsite dose projections is required, verify the printer is plugged in and turned on.

6.0 The computer will now display a series of questions on the monitor screen (with the required input format, such as mph, μCi/cc, CFM, etc.) which the operator must answer by inputting the data into the computer. The end of each response is signalled by pressing "RETURN".

ATTACHMENT A
(Continued)

NOTE: (a) The program is divided into several logical sections. At the conclusion of each section, the operator is asked to examine his responses and will be allowed to make corrections.

(b) Responses in any other units or form will yield invalid results. In most instances, no checking is done for input format other than a check for numeric information when requested.

(c) If a response is in alphanumeric notation or contains illegal characters, the computer will print the word "RE-ENTER" and allow the data to be re-inputed.

7.0 The computer will ask for the isotopes and the concentration of each isotope being released. Enter the isotope in a format similar to the example for each of the isotopes identified. After the isotope is entered, a check is made to insure that data for that isotope has been previously stored. Upon completion of the isotope list, type "END".

NOTE: If the dose projections are based on either a potential release from containment or on radiation monitor readings, all dose projections will be based on Xe-133 equivalent.

8.0 The computer will ask for iodine isotopes released and the amount of iodine (μCi) which has and is expected to be released. Enter all iodine isotopes and their respective activities. At the completion of the iodine list, type "END".

ATTACHMENT A
(Continued)

NOTE: If NO iodine analysis is available, type "NO" for the first iodine isotope.

9.0 The computer will ask for the particulates released and the activity which has or is expected to be released. Enter all particulate isotopes and their respective activities. At the completion of the particulate list, type "END".

NOTE: If no particulate analysis is available, type "NO" for the first particulate isotope.

10.0 The computer will compute and display projected plume centerline offsite whole body dose rates (mR/hr) due to noble gas releases at various distances from plant site (0.5 miles to 10 miles). The computer will also compute and display plume centerline doses (mR) to the thyroid when iodine is released, and a lung dose (mR) and whole body dose (mR) due to inhalation of particulates when particulates are being released. If particulates or iodines have been released, the dose assessment computer will calculate and display the projected ground deposition (dpm/100 sq. cm.) due to iodines or particulates.

11.0 To repeat the projected offsite dose calculations, type "RUN DOSE" and "RETURN".

ATTACHMENT B

QUICK ACCIDENT DOSE CALCULATIONS (ACRISA) BY MIDAS

1.0 At the 4113 Terminal, press the "POWER-ON" button located above the keyboard and below the terminal screen. Adjust the intensity as necessary.

2.0 Press the "CAPS LOCK" key so that the red light comes on.

3.0 When the blinking cursor appears on the screen, press the "RETURN" button.

4.0 Log onto the Midas System as follows:

4.1 A prompt requesting a username should appear, e.g.:

Node NSPPIB: : VAX-11/750

Username:

(1) Type in the username, "MIDAS1".

(2) Press "RETURN".

4.2 A prompt requesting the password should appear, e.g.:

Password:

(1) Type in the password, "MIDAS1". Note that the password will not appear on the screen as it is typed.

(2) Press "RETURN".

NOTE: If the wrong username or password is entered, the computer will respond with: "User authorization failure". Press the "RETURN" button and repeat step 4.0.

ATTACHMENT B (Continued)

5.0 A welcome and various other messages should now appear on the screen. Once the messages are complete, a standard four-line prompt should appear, e.g.:

```
ENTER: [xx]    FUNCTION OR TASK CODE
       [xxxx]  FUNCTION AND TASK CODE
       [FM]    FUNCTION MENU
       [ Z]    Control-Z to exit from menu
```

5.1 To run the Quick Accident Dose Calculations (ACRISA), Type "A".

5.2 Press "RETURN". Quick Accident Dose Calculations should now be scheduled, using current meteorological data (option 1), and manual entry of isotopic data (release option 6).

6.0 The user will be prompted for an estimate of the expected release duration (hours), e.g.:

```
DURATION OF RELEASE AFTER START OF RELEASE (HOURS) 8.0

ENTER: [N.N]       NEW VALUE
       [RETURN]    NO CHANGE
```

6.1 Estimate the expected duration of the release, in hours. Enter the hours and press "RETURN". Proceed to step 7.0.

6.2 If the release duration is not known or cannot be estimated, simply press "RETURN" and the computer will use a default release duration of 8.0 hours.

7.0 If met data is current, proceed to step 8.0. If met data is not current, the user will be prompted to manually input met data, e.g.:

```
                *** MANUAL ENTRY OF DATA IS REQUIRED ***

RULES:     1.  ENTER VALUES FOR THE N.N COLUMNS SEPARATED BY COMMAS
           2.  IF THE DEFAULT VALUE IS ACCEPTABLE ENTER A COMMA
           3.  YOU CANNOT CHANGE GOOD DATA
           4.  MAX. SIGMA THETA IS 40., MIN. IS .5 DEG.

EXAMPLES: [90,5.2,2.5,40] VALUES ENTERED FOR EACH PARAMETER
          [90,,,]         DIRECTION ENTERED, OTHERS ARE DEFAULT
          [90,,2.6,40]    DEFAULT USED FOR 2ND ENTRY
**************************************************
SOME OR ALL MET DATA ARE BAD FOR RELEASE POINT 1 GROUND RELEASE

PARAMETER              DIR          SPD          DT
SENSOR NAME          DIR10A       SPD10A       DT60A
UNITS                  DEG          MPH        DEG.F
DEFAULT VALUES         N/A          5.0          0.8
CURRENT VALUES         N            N.N          N.N

ENTER: [N,N.N,N.N]  DIR,SPD,DT
```

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ATTACHMENT B (Continued)

7.1 Enter the 10 meter wind direction (degrees), 10 meter wind speed (mph) and the DT (degrees F). Separate each entry by a comma, e.g.:

180, 5, - 1.3

7.2 Press the "RETURN" button.

7.3 The values entered as per step 7.1 will now be displayed, followed by another prompt, e.g.:

CURRENT VALUES 180. 5.0 -1.3
******

ENTER: [N,N.N,N.N] DIR,SPD,DT
[RETURN] TO MAINTAIN CURRENT VALUES

7.4 If the current values are not correct, repeat step 7.1.

7.5 If the current values are satisfactory, press "RETURN". Go to step 8.0 to manually input isotopic release data.

8.0 The user will now be prompted for manual entry of isotopic data, e.g.:

INPUT DATA MODE

ENTER: [1] ISOTOPIC RELEASE RATES (UCI/SEC)
[2] FLOW RATE (CFM) AND ISOTOPIC CONCENTRATION (UCI/CC)

8.1 Select option [2], flow rate in CFM and isotopic concentration in μCi/cc.

(1) Enter "2"

(2) Press "RETURN"

9.0 The user will now be prompted for a flow rate, e.g.:

ENTER: [N.N] FLOW RATE (CFM)
[RETURN] GO BACK TO PREVIOUS OPTION

9.1 Enter the total flow rate (CFM) for release point 1. This is the total flow of Unit 1 and Unit 2 Shield Building Stacks, e.g., 16800

9.2 Press "RETURN".

ATTACHMENT B (Continued)

10.0 A prompt should now occur requesting entry of the isotope name, e.g.:

```
ENTRY OF DATA FOR RELEASE POINT 1
ENTER: [XXXXXX]     ISOTOPE NAME
       [RETURN]     CONTINUE TO NEXT RELEASE POINT
```

10.1 Enter isotope name (e.g., XE133) and press "RETURN".

NOTE: If release concentrations are based on rad monitor readings, enter XE133. If concentrations are based on sample analysis, enter isotope on analysis sheet.

11.0 A prompt should now request the concentration (μCi/cc) of the isotope being released (i.e. that isotope enter as per step 10.1) e.g.:

ENTER: [N.N] RELEASE VALUE FOR ISOTOPE XE133 μCi/cc

11.1 Obtain the concentration of the isotope being released, as follows:

(1) If releases are based on rad monitors, obtain the shield building stack monitor readings (R-22 or R-50, whichever is on scale) and using the applicable calibration curve, obtain the release concentration in μCi/cc.

NOTE: Obtain rad monitor readings from both Unit 1 and Unit 2 stacks.

(2) If releases are based on sample analysis, obtain the concentration from the analysis sheet.

ATTACHMENT B (Continued)

11.2 Determine the average concentration being released.

$$\text{Avg. Conc.} = \frac{R_1 C_1}{R_T} + \frac{R_2 C_2}{R_T}$$

where: R_1 = flow (CFM) thru Unit 1 Stack

R_2 = flow (CFM) thru Unit 2 Stack

R_T = $R_1 + R_2$

C_1 = Concentration (μCi/cc) going out Unit 1 Stack

C_2 = Concentration (μCi/cc) going out Unit 2 Stack

11.3 Enter the Average Concentration determined in 11.2 and press "RETURN".

11.4 A prompt will again appear to input an isotope name, e.g.:

ENTER: [XXXXXX] ISOTOPE NAME
[RETURN] CONTINUE TO NEXT RELEASE POINT

(1) If release concentrations are based on rad monitor readings, press "RETURN" and go to step 12.0.

(2) If release concentrations are based on sample analysis, repeat steps 10.0 and 11.0 for each isotope. When the last isotope has been entered, press "RETURN" and go to step 12.0.

12.0 Calculations should now be in progress. The gamma dose isopleth will now be displayed on the terminal screen.

13.0 Hard copies may be obtained as follows:

13.1 Turn on the Hard Copy Unit. Allow several minutes for warmup.

13.2 A hard copy may be obtained by pressing the "HARD COPY" button on 4113 keyboard or the "COPY" button on the Hard Copy Unit.

NOTE: If an inverse color copy of the plume map is desired, press the "SHIFT" and "HARD COPY" buttons simultaneously.

ATTACHMENT B (Continued)

14.0 When the mapping has been completed, the following prompt should appear at the top of the screen:

FUNCTION KEYS ENABLED-ENTER A FUNC. KEY OR [CO] CONTINUE

14.1 Type "CO" and press "RETURN".

15.0 The following prompt should appear:

*** FUNCTION KEYS DISABLED ***

ENTER: [RETURN] SUMMARY PRINT REPORT, [N] SKIP
[I] POINT OF INTEREST, [SO] START OVER

15.1 Press "RETURN" to obtain the Dose Calculation Summary Print. The "RETURN" will have to be pressed several times, to complete the Dose Calculation Summary Report, and proceed to step 16.0.

15.2 If it is desired to skip the summary report, enter "N", press "RETURN", and go to step 16.0.

15.3 To determine the dose rate at a specific point, enter "I" and press "RETURN". Use the scroll knobs to move the cursor to the desired location and press the space bar. Point of interest is terminated by typing "E" at any point while in the point of interest mode, press "RETURN" and go to step 15.1.

15.4 To repeat or start over the Quick Accident Dose Calculations, type "SO", press "RETURN" and go to step 18.0.

16.0 When the summary report is completed, the following prompt will appear:

ENTER: [RETURN] PROJECTED DOSE SUMMARY REPORT,
[N] SKIP, [SO] START OVER

16.1 To obtain the Projected Dose Summary Report, press "RETURN". The "RETURN" may have to be pressed several times to complete the Projected Dose Summary Report, and proceed to step 17.0.

16.2 To bypass the Projected Dose Summary Report, type "N", press "RETURN", and go to step 17.0.

16.3 To repeat or start the Quick Accident Dose Calculations over, type "SO", press "RETURN" and go to step 18.0.

ATTACHMENT B (Continued)

17.0 When the Projected Dose Summary Report is completed, the following prompt should appear:

```
ENTER: [SO]      START OVER
       [RETURN]  MORE REPORTS
```

17.1 To repeat the Quick Accident Dose Calculations, type "SO", press "RETURN", and go to 18.0.

17.2 If it is desired to obtain more reports, press "RETURN", and select the desired reports. Upon completion of the reports, repeat step 17.0.

18.0 The following prompt will appear:

```
ENTER: [RUN]       BYPASS MENU AND INTERMEDIATE PRINT
       [RETURN]    PRINT MENU
       [EX]        EXIT
```

18.1 To repeat the Quick Accident Dose Calculations, type "RUN", press "RETURN", and go to step 6.0.

18.2 To exit the program, type "EX", press "RETURN" and go to step 19.0.

19.0 The standard 7-line prompt should appear, as follows:

```
ENTER: [xx]    FUNCTION OR TASK CODE
       [xxxx]  FUNCTION AND TASK CODE
       [LT]    LAST TASK
       [NT]    NEXT TASK
       [TM]    TASK MENU
       [FM]    FUNCTION MENU
       [ Z]    Control-Z to exit from menu
```

19.1 To repeat the Quick Accident Dose Calculations:

(1) Enter "A"

(2) Press "RETURN"

(3) Go to step 6.0.

19.2 To exit the MIDAS Menu, press the "CONTROL" and the "Z" buttons simultaneously. This will log the user off the computer, as indicated by the following example:

```
MIDAS1    logged out at 14-DEC-1983  10:02:35.50
```

ATTACHMENT C
ACCIDENT DOSE CALCULATIONS (HAND METHOD)

1.0 Centerline Whole Body Dose Rates, D_C

NOTE: Use Dose Rate Calculation Worksheets, Figure 1 (PINGP 584) and Figure 2 (PINGP 583)

1.1 Obtain the following meteorological data and insert on Figure 1 (PINGP 584):

(a) Wind Speed (mph @ Ground Elevation)
(b) Wind Direction (Degrees @ Ground Elevation)
(c) Stability Class

1.2 Using Figure 3, determine the values for $\chi U/Q$ for that Stability Class, at various distances from the plant, beginning at the site boundary (0.5 miles), out to the 10 mile boundary. List $\chi U/Q$ values on Figure 1 (PINGP 584).

1.3 Determine each release path of gases and assume a release rate (R) of noble gases from the plant or estimate a potential release rate. Use the following known values. Insert those values on the Calculation Worksheet Attachment, Figure 2 (PINGP 583): (Use one (1) worksheet attachment for each known release path):

Aux Building Special	8,000 cfm per stack
Containment Purge	32,250 cfm
Containment In-Service Purge	4,000 cfm
SFP Special	5,000 cfm
Shield Building Vent	200 cfm per train (400 cfm/stack)
Steam Dump	4,000 cfm
PORV's	2,500 cfm
SG Safeties	5,500 cfm

1.4 Determine the release concentration of Noble Gases being released from the plant for each release path, using either of the following methods, and insert those values on the appropriate calculation Worksheet Attachment, Figure 2 (PINGP 583):

(a) Obtain the count rate or dose rate from the applicable Rad Monitor. Refer to the applicable Calibration Curve to obtain the release concentration in μCi/cc.

(b) If the applicable Rad Monitor is out of service, determine the release concentration in accordance with F3-20, "Manual Determination of Radioactive Release Concentrations".

(c) If Grab Samples have been obtained and analyzed for the Release Path, use the individual Isotopes obtained from the analysis.

ATTACHMENT C (Continued)

NOTE: When using the Rad Monitor Reading or the Manual Determination Method (F3-20) to determine the release concentrations, the release concentration result is Xe-133 equivalent.

1.5 For each Release Path, complete the Calculation Worksheet Attachment Figure 2 (PINGP 583), as follows:

(a) Multiply each Isotope release concentration, C_i (μCi/cc) times its respective Whole Body dose factor, K_i.

(b) Sum the K_iC_i column.

(c) Multiply the ΣK_iC_i obtained in (b) times the Released Rate (R) in CFM.

(d) Transfer $R\Sigma K_iC_i$ to the Dose Rate Calculation Worksheet, Figure 1 (PINGP 584).

1.6 When all the results from each Worksheet Attachment has been transferred to Figure 1 (PINGP 584), total the results to obtain $\sum_i [R_i \sum_i (K_iC_i)]$.

1.7 Calculate the Centerline Whole Body Dose Rate as follows; use Calculation Worksheet, Figure 1, (PINGP 584):

$$D_C \text{ mRem/hr} = 0.12035 \frac{(\chi U/Q)}{U} \Sigma[R_i \Sigma(K_iC_i)]$$

NOTE: Complete the Dose Rate Calculation for each distance indicated, from the Plant Site (0.5 miles) out to the 10 mile boundary, or as otherwise directed by the REC.

2.0 Whole Body Dose Rates Off Centerline

2.1 To calculate the Whole Body Dose Rate at any point off the Centerline, the Centerline Dose Rate must first be calculated in accordance with 1.0.

2.2 Determine the Horizontal Dispersion Coefficient, σy (meters) from Figure 4, at the desired distance downwind from the Plant Site for the given Stability Class.

ATTACHMENT C (Continued)

2.3 Determine the crosswind distance, Y (meters), where the dose rate is to be determined.

| NOTE: 1 Mile = 1.6094 Km |

2.4 Calculate the dose rate (mRem/hr) off the Centerline, as follows:

$$D_{point} = D_C \exp\left[-1/2 \left(\frac{Y}{\sigma y}\right)^2\right]$$

Where D_C = Centerline Dose Rate (mRem/hr) at a given Downwind Distance as determined by Section 1.0

Y = Croswind Distance off the Centerline (meters).

σy = Horizontal Dispersion Coefficient at a given Downwind Distance for the particular Stability Class (meters). from Figure 4.

3.0 Calculating Thyroid Dose

3.1 When sample analysis indicates that iodine has been released, determine the total amount of iodine released, in μCi.

3.2 Using Figure 3, determine a value for $\chi U/Q$ (m^{-2}) based on a Downwind Distance and the applicable Stability Class.

3.3 Obtain the ground level wind speed, U, in mph and convert wind speed to mps as follows:

mph x 0.447 = mps

3.4 Determine the Thyroid Dose Factors, R_i, from the following table:

Nuclide	R_i mRem/yr / μCi/m^3
I-131	1.62 E07
I-132	5.87 E05
I-133	4.39 E06
I-134	2.50 E04
I-135	1.36 E06

ATTACHMENT C (Continued)

3.5 Calculate the Offsite Dose from Iodine (mRem) as follows:

$$D\ (mRem) = 3.17 \times 10^{-8} \frac{\chi U/Q}{U} \sum_i R_i q_i$$

Where: 3.17×10^{-8} = conversion factor (year/sec)

$\chi U/Q$ = (m^{-2} determined from Figure 3, as a function of Downwind Distance and Stability Class

U = Wind speed mps [mps = mph x 0.447]

R_i = Thyroid Dose factor ($mRem/yr/\mu Ci/m^3$]

q_i = quantity of Iodine released (μCi)

4.0 Off-Site Ground Deposition of Radioiodine and Particulates

4.1 Determine mean wind direction. This determines applicable sectors.

4.2 Determine distance in kilometers, from the plant site to point of interest. This is the R value. (Convert miles to km if necessary using 1.609 km/mile factor.)

4.3 Determine deposition rate, D, from Figure 5 for R chosen.

4.4 Determine fraction of release, F, from Figure 6 for R chosen.

4.5 Determine amount of iodine and/or particulates released, Q, in microcuries.

4.6 Find deposition of iodine and/or particulates in (dpm/100 sq. cm) at R using the following equations:

(a) Iodine: $d = 28.26[DFQ/R]$

(b) Particulates: $d = 76.52[DFQ/R]$

where d - is the deposition of radioiodine or particulates onto ground at location R (in km) from the release point. The deposition occurs in the mean wind direction downwind from the release point. The value of R determines the sector location. Equations (a) & (b) assume that the desposition in a given sector is uniform across the sector at a given R value. Units are dpm/100 sq. cm.

ATTACHMENT C (Continued)

D - is the acceptable value of relative deposition rate (meters^{-1}) as a function of distance from the source. The relative deposition rate is the deposition rate per unit downwind distance (Ci/sec per meter) divided by the source strength (Ci/sec), and represents a plume depletion factor due to dry deposition of elemental radioiodines and other particulates. This factor is obtained from Figure 5.

F - is the acceptable value of the fraction of the release transported into the sector in question as located by the value for R and determined according to the distribution of wind direction. This factor is obtained from Figure 6.

Q - is the total radioiodine (elemental and non-elemental) or particulates released per event in units of microcuries.

R - is the distance in kilometers downwind from the release point where the deposition value is to be determined.

28.26 - is a factor which (1) accounts for only elemental radioiodine, (2) converts 22.5 degrees to radians, (3) allows R to be entered in equation (a) as km, and (4) converts $\mu Ci/m^2$ to $dpm/100\ cm^2$.

56.52 - is a factor which (1) accounts for particulates, (2) converts 22.5 degrees to radians, (3) allows R to be entered in equation (b) as km, and (4) converts $\mu Ci/m^2$ to $dpm/100\ cm^2$.

5.0 Total Population Exposure Estimate

5.1 Obtain the Dose (D) to the Offsite Population.

5.2 If sheltering is the recommended protective action in effect, obtain the sheltering factor (SF). See F3-8.

5.3 From the Population Distribution Map, obtain the number of persons in the Plume Pathway (P).

5.4 Calculate the Total Population Exposure (TPE) as follows:

$$TPE = D \times SF \times P$$

where TPE = Total Population Exposure
D = Dose to the Offsite Population (Rem)
SF = Sheltering Factor
P = Population in Plume Pathway

FIGURE 2

DOSE RATE CALCULATION WORKSHEET

DATE _____ TIME _____

MET DATA: WIND SPEED U = _____ MPH

WIND DIRECTION _____ DEG. SECTOR _____

ΔT _____ °C STABILITY CLASS _____

DISTANCE	$\chi U/Q$	DISTANCE	$\chi U/Q$
0.5		5.0	
1.0		6.0	
1.5		7.0	
2.0		8.0	
3.0		9.0	
4.0		10.0	

$R_i \Sigma K_i C_i$ (TRANSFER RESULTS FROM WORKSHEET ATTACHMENTS)

$R_1 \Sigma K_i C_i$ = _____ $R_4 \Sigma K_i C_i$ = _____

$R_2 \Sigma K_i C_i$ = _____ $R_5 \Sigma K_i C_i$ = _____

$R_3 \Sigma K_i C_i$ = _____ $R_6 \Sigma K_i C_i$ = _____

TOTAL $\Sigma_i [R_i \Sigma K_i C_i]$ = _____

CALCULATE DOSE RATE AS FOLLOWS:

$$D_C = 0.12035 \frac{(\chi U/Q)}{U} \Sigma_i [R_i \Sigma_i (K_i C_i)]$$

$$D_C = 0.12035 \frac{(\quad)}{(\quad)} (\quad)$$

DISTANCE	D_C (mR/hr)	DISTANCE	D_C (mR/hr)
0.5		5.0	
1.0		6.0	
1.5		7.0	
2.0		8.0	
3.0		9.0	
4.0		10.0	

CALCULATIONS:

COMPLETED BY _____

FIGURE 2

CALCULATION WORKSHEET ATTACHMENT

RELEASE PATH _____

RELEASE RATE R = _____ CFM

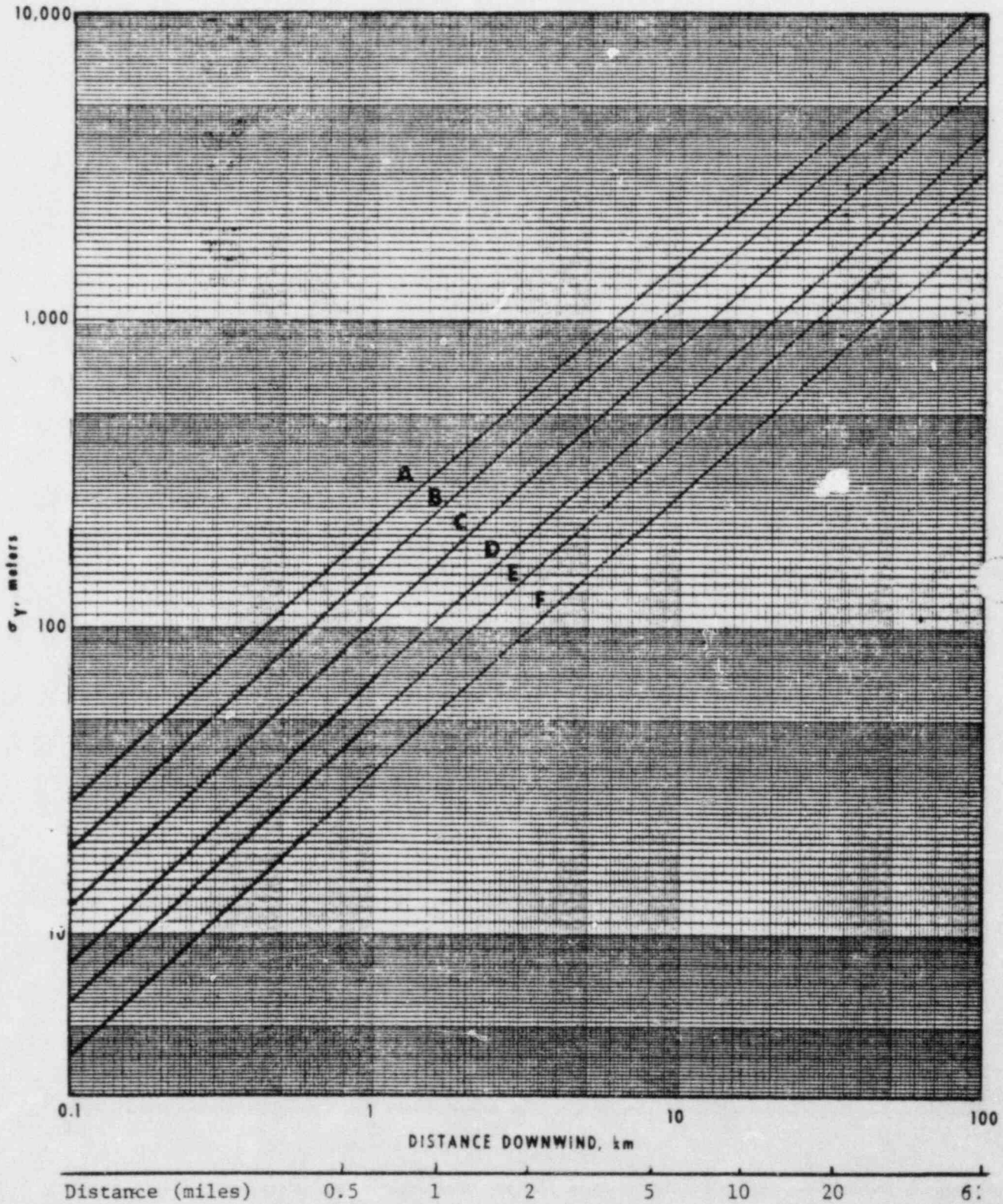
ISOTOPE	K_i WHOLE BODY DOSE FACTOR	C_i µCi/cc	K_iC_i
Kr-83m	7.56E-2		
Kr-85m	1.17E3		
Kr-85	1.61E1		
Kr-87	5.92E3		
Kr-88	1.47E4		
Kr-89	1.66E4		
Kr-90	1.56E4		
Xe-131m	9.15E1		
Xe-133m	2.51E2		
Xe-133	2.94E2		
Xe-135m	3.12E3		
Xe-135	1.81E3		
Xe-137	1.42E3		
Xe-138	8.83E3		
Ar-41	8.84E3		
		$\sum_i K_i C_i$ =	
		$R\sum_i K_i C_i$ =	

FIGURE 3

TYPICAL VALUES FOR XU/Q AS A FUNCTION OF
ATMOSPHERIC STABILITY CLASS AND DOWNWIND DISTANCE

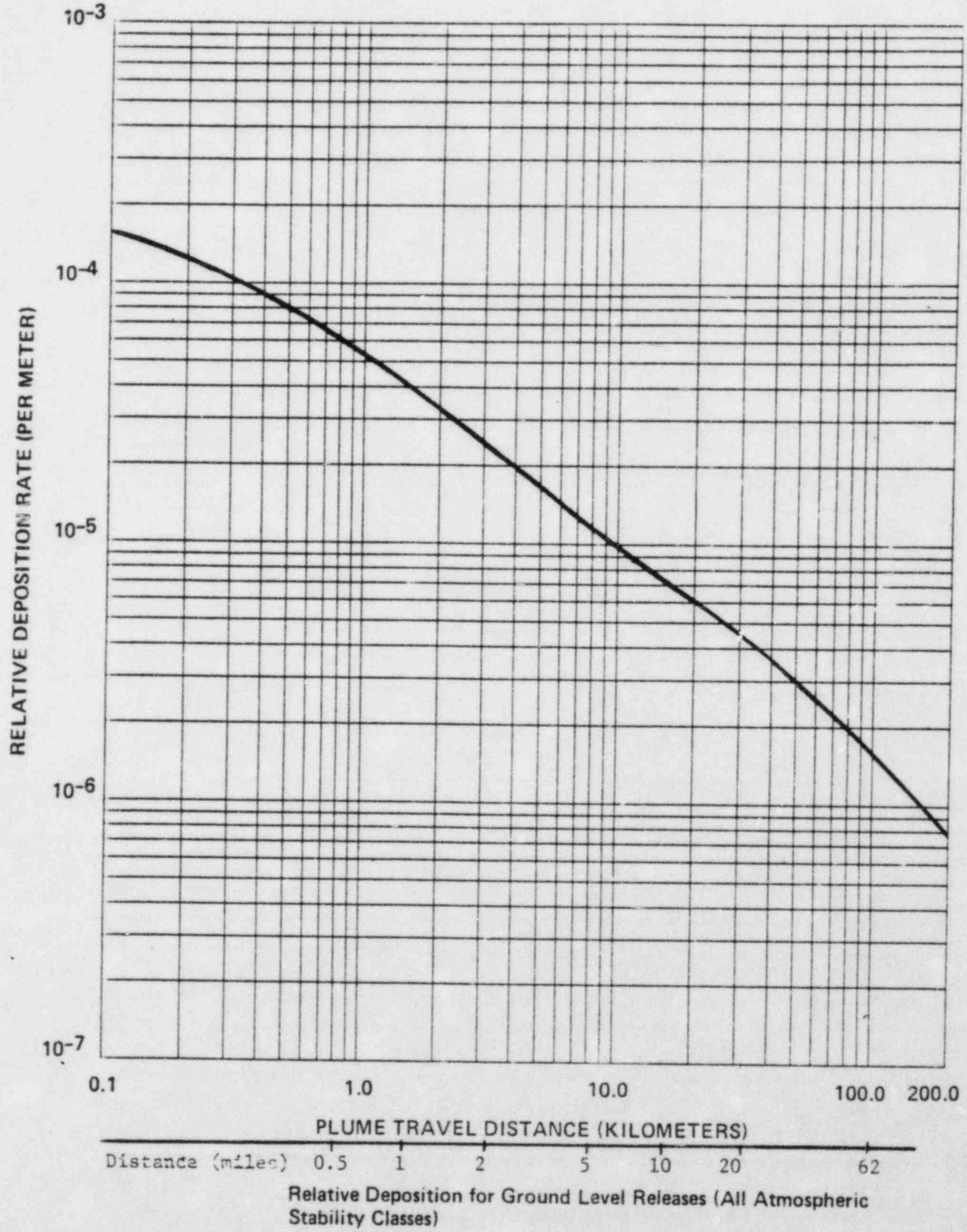
DOWNWIND DISTANCE	XU/Q (m^{-2}) AS PER STABILITY CLASS					
(Miles)	A	B	C	D	E	F
0.5	6.8E-6	2.6E-5	8E-5	2.2E-4	4E-4	9E-4
1.0	1.2E-6	5.4E-6	2.1E-5	6.8E-5	1.3E-4	2.8E-4
1.5	9.0E-7	2.9E-6	1.1E-5	4.0E-5	8.0E-5	1.7E-4
2.0	6.2E-7	1.5E-6	5.4E-6	2.2E-5	4.5E-5	9.5E-5
3.0	4.5E-7	7.5E-7	2.6E-6	1.2E-5	2.6E-5	5.5E-5
4.0	3.6E-7	4.9E-7	1.7E-6	8E-6	1.8E-5	3.8E-5
5.0	2.9E-7	3.8E-7	1.1E-6	5.9E-6	1.2E-5	2.9E-5
6.0	2.5E-7	3.1E-7	7.9E-7	4.2E-6	9.8E-6	2.2E-5
7.0	2.3E-7	2.8E-7	5.8E-7	3.3E-6	7.7E-6	1.9E-5
8.0	1.9E-7	2.5E-7	4.5E-7	2.8E-6	6.2E-6	1.7E-5
9.0	1.7E-7	2.3E-7	3.6E-7	2.2E-6	5.2E-6	1.4E-5
10.0	1.6E-7	2.1E-7	3.2E-7	1.9E-6	4.5E-6	1.2E-5

FIGURE 4



Horizontal dispersion coefficient as a function of downwind distance from the source.

FIGURE 5



Relative Deposition for Ground Level Releases (All Atmospheric Stability Classes)

FIGURE 6

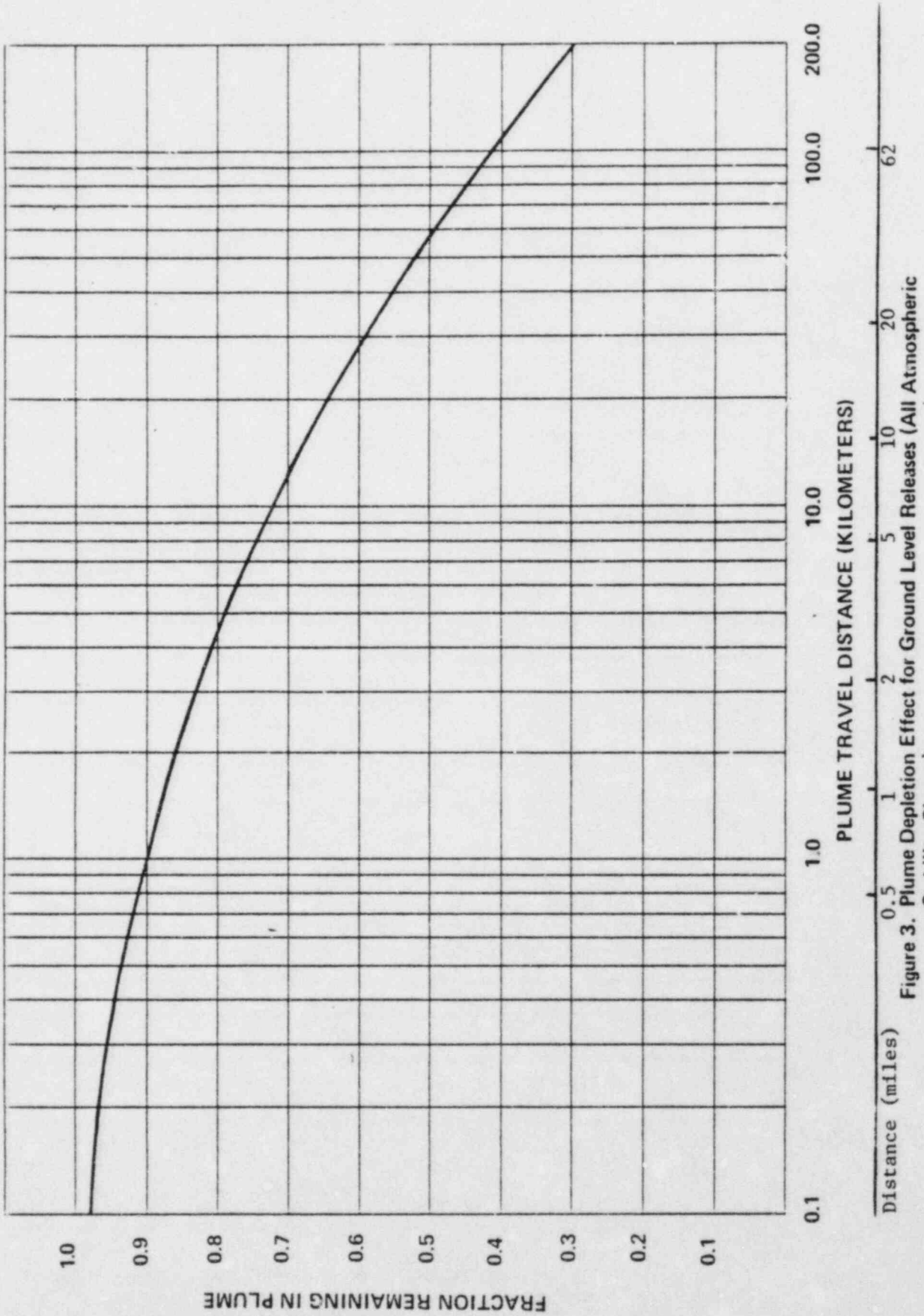


Figure 3. Plume Depletion Effect for Ground Level Releases (All Atmospheric Stability Classes)

ATTACHMENT D

ALTERNATE METEOROLOGICAL DATA . STABILITY CLASS DETERMINATION

1.0 Met Tower (Micromet System)

ΔT (°C) 60m - 10m	ΔT (°F) 60m - 10m	σθ	Stability Class
<-.95	<-1.71	>23	A
-.95 to -0.85	-1.71 to -1.53	18 - 23	B
-.84 to -.75	-1.52 to -1.35	13 - 18	C
-.74 to -.25	-1.33 to - .45	8 - 13	D
-.24 to +.75	- .44 to +1.35	4 - 8	E
+.76 to +2.0	+1.36 to +3.6	<4	F
>2.0	>+3.6		G

2.0 Lock & Dam #3
Ground level wind speed and wind direction is available (24-hours/day, 365 days/year) from the Lockmaster at Lock and Dam #3.

Lockmaster - Phone # 388-5794

NOTE: Stability Class is available from the National Weather Service. See Item # 3 below.

3.0 Stability Class is available from the Minneapolis National Weather Service and can be obtained by either of the following methods:

A. Telephone - 725-3400
or 725-3401
or 725-3402

B. Weather Service Information Printer

(1) Turn on TI printer. The printer "ON LINE" lite and the modem "DTR" lite should be lit.

(2) Select TI printer speed:

(a) Press "CMD" button and type "C".

(b) Printer should respond with either:
CONFIG: 13; 23; 32 (indicates 300 baud)
CONFIG: 13; 25; 32 (indicates 1200 baud)

(c) Select desired printer speed, then type either 23 (for 300 baud) or 25 (for 1200 baud); Press "RETURN". Then press "ENTER".

ATTACHMENT D (Continued)

(3) Set modem to same speed as printer, with modem center switch:

(a) Down = 300 baud

(b) Up = 1200 baud

(4) Modem right switch must be in VOice to dial.

(5) Using plant ext. 331, dial 8-9-341-2459. When tone is heard, switch right toggle switch up to DAta and then back to center position. Hang up phone.

NOTE: No need to wait for tone change.

(6) Press return twice.
Printer will print: Telenet
Terminal =

(7) Type: D1
Press return
Printer will print: @

(8) Type: C 617133
Press return
Printer will print: 617 133B connected

(9) Press return
Printer will print: Please Log In

(10) Type: LOGIN NSP
Press return
Printer will print: PASSWORD:
XXXXXX

(11) Type: POWER
Press return (Note: Password will not print)
Printer will print: Logged into weather service ___
___
___
+

NOTE: The + sign will always indicate that the computer is waiting for instructions.

ATTACHMENT D (Continued)

(12) Type command for desired weather information, as follows:

(a)	Wind speed & direction map	Type: MWQ A Press return
(b)	Weather-sky cover	Type: MWQ X Press return
(c)	Precipitation last 6 hours	Type: MWQ (Press return
(d)	Last hour radar map showing intensity of precipitation	Type: RADMAP MSP Press return
(e)	Forecast	Type: ZONES MN Press return
(f)	PASQUILL Stability Index	Type: -PASQ MSP Press return
(g)	SPECIAL LOG P.I.	Type: -REDW Press return

(13) When finished:
Type: LOGOUT
Press return
Printer will print: Logged Out from WSI
------ Disconnected

(14) Turn Printer Off

(15) Leave modem right switch in the center position.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

March 22, 1984

50-282/306 Prairie Island

MEMORANDUM FOR: Chief, Document Management Branch, TIDC

FROM: Director, Divison of Rules and Records, ADM

SUBJECT: REVIEW OF UTILITY EMERGENCY PLAN DOCUMENTATION

The submitter of the attached document has expressed no desire to withhold any information contained therein. Therefore, this material may now be made publicly available.

J. M. Felton, Director
Division of Rules and Records
Office of Administration

Attachment: As stated

Northern States Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401
Telephone (612) 330-5500

January 19, 1984

Regional Administrator
Region III
U S Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

EMERGENCY RESPONSE PLAN
IMPLEMENTING PROCEDURES

Furnished with this letter is one copy of Revision 24 to the NSP Prairie Island Nuclear Emergency Plan Implementing Procedures. This revision includes the following procedures:

		Rev.
F3	Table of Contents	23
F3-13	Offsite Dose Calculation	5
Temporary Memo 83-48 (Refer: F3-13, Offsite Dose Calculation)		

Fred Fey

F L Fey
Gen Supt Radiation Prot & Chemistry

FLF/GDH/GDW

Attachment

cc: [redacted]
NRC Resident Inspector (w/o attachment)
G Charnoff (w/o attachment)
EP File

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