

Item II

SEABROOK METPAC

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SEABROOK METPAC

A COMPUTER SOFTWARE PACKAGE WHICH EVALUATES  
THE CONSEQUENCES OF AN OFF-SITE RADIOACTIVE

RELEASE WRITTEN FOR THE SEABROOK  
NUCLEAR POWER STATION

USER MANUAL

by

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## ABSTRACT

METPAC is designed to provide current site-specific estimates and predictions of dose rates for a nuclear power station immediately following an accidental airborne radioactive release. The guidelines of NUREG-0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, were followed in the program design.

METPAC is a series of computer codes designed to calculate dose rates and graphically display the location and dimensions of the resulting plume. METPAC handles releases from combinations of any of the following four pathways: the primary vent stack, the containment leakage, an unmonitored release, and the steam line valve. The program calculates off-site whole body, and infant thyroid dose rates and can display whole body and thyroid plume locations. Protective action recommendations are also determined.

The hearts of the METPAC program are the dispersion and dose models. The dispersion model is a Gaussian, variable trajectory, plume segment atmospheric transport and diffusion code designed to handle the site-specific atmospheric dispersion characteristics associated with a nuclear power station site. Plume trajectories are calculated using data from the plant's on-site meteorological tower. The model can track plume location and magnitude as a function of time, given time-varying meteorological data. It can also project plume location, magnitude and travel time as a function of distance from the plant assuming steady-state meteorological conditions. Plume centerline diffusion factors (depleted and finite-cloud gamma) and deposition factors are provided for both continuous and intermittent releases from various release pathways.

The dose model calculates a source term for stack, containment unmonitored and steamline pathways based on a radiological measurement, a flow rate and a function  $J(t)$ . The  $J(t)$  function correlates the radiological measurement with the concentration in the release pathway for an assumed mixture of radionuclides that form the source term. This source term is

applied to an estimate of the dispersion of the radioactive release to determine off-site dose rates. Where measurements of specific radionuclides have been made, these measurements can be used to replace the assumed mixture mentioned above.

TABLE OF CONTENTS

	<u>Page</u>
DISCLAIMER OF RESPONSIBILITY.....	ii
ABSTRACT.....	iii
LIST OF FIGURES.....	vii
1.0 INTRODUCTION.....	1
1.1 Purpose.....	1
1.2 Hardware.....	1
1.3 Software.....	1
1.4 Description.....	2
1.5 Limitations.....	2
2.0 KEYBOARD.....	4
2.1 The Function Keys.....	4
2.2 Cursor Controls.....	4
2.3 Special Keys.....	5
3.0 OPERATING PROCEDURE.....	7
3.1 Theory of Operation.....	7
3.2 General Flow.....	8
3.3 Dose Estimate Procedure.....	9
3.3.1 Starting a New Accident.....	9
3.3.2 Continuing an Accident With PAGs.....	15
3.3.3 Continuing an Accident Without PAGs.....	16
3.3.4 Eliminating a Quarter Hour.....	17
3.3.5 Viewing a Plot.....	17
3.3.6 Obtaining a Printout.....	17
3.3.7 Batch Execution.....	18
3.3.8 Calculating Total Integrated Dose.....	20
3.3.9 Obtaining a TID Printout.....	20
3.3.10 Editing Data.....	21
3.3.11 Viewing Input.....	22
3.3.12 Starting Another Release Path.....	22
3.3.13 Using Prompt Mode.....	23
3.3.14 Exiting METPAC.....	24
4.0 EXAMPLES.....	37
4.1 Lesson 1.....	38
4.2 Lesson 2.....	48
4.3 Lesson 3.....	63

TABLE OF CONTENTS (Continued)

	<u>Page</u>
4.4 Lesson 4.....	71
4.5 Lesson 5.....	79
4.6 Lesson 6.....	89
4.7 Lesson 7.....	101
4.8 Lesson 8.....	126
4.9 Lesson 9.....	135
4.10 Lesson 10.....	146
4.11 Lesson 11.....	168
5.0 PROBLEMS.....	179
5.1 File Protection.....	179
5.2 Operation.....	179
6.0 REFERENCES.....	181
APPENDIX A INPUT DATA SHEETS.....	A-1
GLOSSARY.....	G-1

## LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
3.1	First METPAC Input Screen	25
3.2	Second METPAC Input Screen	26
3.3	Third METPAC Input Screen	27
3.4	Fourth METPAC Input Screen	28
3.5	Fifth METPAC Input Screen	29
3.6	Sixth METPAC Input Screen	30
3.7	Seventh METPAC Input Screen	31
3.8	Eighth METPAC Input Screen	32
3.9	Typical Plume Location Output	33
3.10	Typical Straightline Projection Printout	34
3.11	Text Screen Output	35
3.12	Typical Graphics Output Screen	36
4.1.1	Lesson 1 - Readings and Times	40
4.1.2	Lesson 1 - First Input Screen	41
4.1.3	Lesson 1 - Second Input Screen	42
4.1.4	Lesson 1 - Third Input Screen	43
4.1.5	Lesson 1 - Fourth Input Screen	44
4.1.6	Lesson 1 - Plume Position Output	45
4.1.7	Lesson 1 - Plume Projection Output	46
4.1.8	Lesson 1 - Graphics Output	47
4.2.1	Lesson 2 - Stack Readings and Times	50
4.2.2	Lesson 2 - Second Input Screen	51
4.2.3	Lesson 2 - Third Input Screen	52
4.2.4	Lesson 2 - Fourth Input Screen	53
4.2.5	Lesson 2 - 9:15 Plume Position Output	54



## LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
4.2.6	Lesson 2 - 9:15 Plume Projection Output	55
4.2.7	Lesson 2 - 9:15 Graphics Output	56
4.2.8	Lesson 2 - Second Input Screen for Projections	57
4.2.9	Lesson 2 - Third Input Screen for Projections	58
4.2.10	Lesson 2 - Fourth Input Screen for Projections	59
4.2.11	Lesson 2 - 9:30 Plume Position Output	60
4.2.12	Lesson 2 - 9:30 Plume Projection Output	61
4.2.13	Lesson 2 - 9:30 Graphics Output	62
4.3.1	Lesson 3 - Stack Readings and Times	64
4.3.2	Lesson 3 - Sixth Input Screen	65
4.3.3	Lesson 3 - Seventh Input Screen	66
4.3.4	Lesson 3 - Plume Position Output	67
4.3.5	Lesson 3 - Plume Projection Output	68
4.3.6	Lesson 3 - Graphics Output	69
4.3.7	Lesson 3 - Eighth Input Screen	70
4.4.1	Lesson 4 - Stack Readings and Times	73
4.4.2	Lesson 4 - First Input Screen	74
4.4.3	Lesson 4 - Fourth Input Screen	75
4.4.4	Lesson 4 - 9:30 Plume Position Output	76
4.4.5	Lesson 4 - 9:30 Plume Projection Output	77
4.4.6	Lesson 4 - 9:30 Graphics Output	78
4.5.1	Lesson 5 - Stack Readings and Times	81
4.5.2	Lesson 5 - Sixth Input Screen	82
4.5.3	Lesson 5 - Seventh Input Screen	83
4.5.4	Lesson 5 - Third Input Screen	84

LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
4.5.5	Lesson 5 - Plume Position Output	85
4.5.6	Lesson 5 - Plume Projection Output	86
4.5.7	Lesson 5 - Graphics Output	87
4.5.8	Lesson 5 - Eighth Input Screen	88
4.6.1	Lesson 6 - Stack Readings and Times	91
4.6.2	Lesson 6 - Second Input Screen	92
4.6.3	Lesson 6 - Third Input Screen	93
4.6.4	Lesson 6 - Fifth Input Screen	94
4.6.5	Lesson 6 - Third Input Screen After Isotopic Input	95
4.6.6	Lesson 6 - Third Input Screen at 9:30	96
4.6.7	Lesson 6 - Third Input Screen at 9:45	97
4.6.8	Lesson 6 - Plume Position Output	98
4.6.9	Lesson 6 - Plume Projection Output	99
4.6.10	Lesson 6 - Graphics Output	100
4.7.1	Lesson 7 - Stack Readings and Times	103
4.7.2	Lesson 7 - Second Input Screen	104
4.7.3	Lesson 7 - Fourth Input Screen	105
4.7.4	Lesson 7 - 9:45 Plume Position Output	106
4.7.5	Lesson 7 - 9:45 Plume Projection Output	107
4.7.6	Lesson 7 - 9:45 Graphics Output	108
4.7.7	Lesson 7 - Third Input Screen for Projection	109
4.7.8	Lesson 7 - Fourth Input Screen for Projection	110
4.7.9	Lesson 7 - 10:00 Plume Position Output	111
4.7.10	Lesson 7 - 10:00 Plume Projection Output	112
4.7.11	Lesson 7 - 10:00 Graphics Output	113

LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
4.7.12	Lesson 7 - Second Input Screen for Error Correction	114
4.7.13	Lesson 7 - Third Input Screen for 9:15	115
4.7.14	Lesson 7 - Fourth Input Screen for 9:15	116
4.7.15	Lesson 7 - Third Input Screen for 9:30	117
4.7.16	Lesson 7 - Fourth Input Screen for 9:30	118
4.7.17	Lesson 7 - Third Input Screen for 9:45	119
4.7.18	Lesson 7 - Fourth Input Screen for 9:45	120
4.7.19	Lesson 7 - Third Input Screen for 10:00	121
4.7.20	Lesson 7 - Fourth Input Screen for 10:00	122
4.7.21	Lesson 7 - Corrected Plume Position Output	123
4.7.22	Lesson 7 - Corrected Plume Projection Output	124
4.7.23	Lesson 7 - Corrected Graphics Output	125
4.8.1	Lesson 8 - Stack Readings and Times	128
4.8.2	Lesson 8 - Third Input Screen	129
4.8.3	Lesson 8 - Fourth Input Screen	130
4.8.4	Lesson 8 - Plume Position Output	131
4.8.5	Lesson 8 - Plume Projection Output	132
4.8.6	Lesson 8 - Graphics Output	133
4.8.7	Lesson 8 - Estimated Gamma Dose Rate	134
4.9.1	Lesson 9 - Third Input Screen at 10:15	137
4.9.2	Lesson 9 - Fourth Input Screen at 10:15	138
4.9.3	Lesson 9 - 10:15 Plume Position Output	139
4.9.4	Lesson 9 - 10:15 Plume Projection Output	140
4.9.5	Lesson 9 - 10:15 Graphics Output	141
4.9.6	Lesson 9 - Third Input Screen at 10:30	142

LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
4.9.7	Lesson 9 - Fourth Input Screen at 10:30	143
4.9.8	Lesson 9 - 10:30 Plume Position Output	144
4.9.9	Lesson 9 - 10:30 Graphics Output	145
4.10.1	Lesson 10 - Readings and Times	149
4.10.2	Lesson 10 - Sixth Input Screen	150
4.10.3	Lesson 10 - Second Input Screen	151
4.10.4	Lesson 10 - Seventh Input Screen	152
4.10.5	Lesson 10 - Third Input Screen at 9:15	153
4.10.6	Lesson 10 - Fourth Input Screen at 9:15	154
4.10.7	Lesson 10 - Third Input Screen at 9:30	155
4.10.8	Lesson 10 - Fourth Input Screeer at 9:30	156
4.10.9	Lesson 10 - Third Input Screen at 9:45	157
4.10.10	Lesson 10 - Fourth Input Screen at 9:45	158
4.10.11	Lesson 10 - 9:45 Ground Plume Position Output	159
4.10.12	Lesson 10 - 9:45 Ground Plume Projection Output	160
4.10.13	Lesson 10 - 9:45 Ground Plume Graphics Output	161
4.10.14	Lesson 10 - 9:45 Elevated Plume Position Output	162
4.10.15	Lesson 10 - 9:45 Elevated Plume Projection Output	163
4.10.16	Lesson 10 - 9:45 Elevated Plume Graphics Output	164
4.10.17	Lesson 10 - Eighth Input Screen	165
4.10.18	Lesson 10 - Total Integrated Dose (9:05 - 9:45)	166
4.10.19	Lesson 10 - Total Integrated Dose (9:31 - 9:45)	167
4.11.1	Lesson 11 - Readings and Times	170
4.11.2	Lesson 11 - Sixth Input Screen	171
4.11.3	Lesson 11 - Second Input Screen	172

LIST OF FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
4.11.4	Lesson 11 - Seventh Input Screen	173
4.11.5	Lesson 11 - Third Input Screen	174
4.11.6	Lesson 11 - Fourth Input Screen	175
4.11.7	Lesson 11 - Plume Projection Output	176
4.11.8	Lesson 11 - Plume Graphics Output	177
4.11.9	Lesson 11 - Eighth Input Screen	178

## 1.0 INTRODUCTION

### 1.1 Purpose

METPAC is a software package developed to produce dispersion and dose estimates during a radiological emergency. The purpose of this document is to aid the user in the execution of METPAC. The METPAC system will operate at any user-specified location and has been designed to run on an IBM PC-XT or PC-AT computer.

### 1.2 Hardware

The hardware required to operate METPAC is:

- o an IBM PC-XT or PC-AT computer with at least 512 KB of on-line memory and a greater than or equal to 10 MB hard disk. The METPAC code and files require 7.5 MB of the hard disk.
- o monochrome monitor and driver
- o color monitor and AMDEK driver card
- o Epson FX-100 printer
- o 8087 floating point processor
- o FTG light pen

The monochrome and color monitors are both used to display dispersion and dose information - the color monitor displays graphic information while the monochrome monitor displays text information about the incident. The printer can provide hard copy of both screens.

### 1.3 Software

The software has been designed to run under the PC DOS 3.1 operating system using the IBM Professional FORTRAN Compiler, IBM MACRO Assembler, and the HALO Graphics Library.

The user can execute METPAC by running a batch procedure file. The batch procedure file schedules all of the METPAC programs in their proper order. The end result is a graphic display of plume position and dose estimates.

#### 1.4 Description

METPAC is a versatile tool for analyzing the consequences of an accidental release of radiation to the atmosphere. The program allows for the analysis of a plume release or a multiple puff release from either a ground (steam line, unmonitored or containment) or elevated (stack) release path for a period of time no greater than 24 hours. Multi-level release paths can be analyzed. The program can be executed in near real-time or in a predictive mode. Default input in a predictive mode is persistence, but all parameters may be modified given knowledge of expected changes.

The result of the program execution is the calculation of the gamma (whole body) dose rate, and the infant thyroid dose rate. These dose rates are calculated for specific plume centerline points which are determined by wind speed and direction. They are also calculated on the straightline direction at site boundary and at every mile out to ten miles. Dose rate information is displayed both on the screen and on the printer. The printer will also display integrated doses for the straightline direction, and determine protective action recommendations based on those numbers. Plume configuration is displayed on the graphics screen. The plume is plotted over a ten-mile radius site map which can be modified to display additional site features. A hard copy of the graphics screen can be obtained.

#### 1.5 Limitations

Information necessary to execute METPAC must be entered manually. The system needs a minimum amount of information to execute. These are the date and time of shutdown and start of release, the radiological data for the given pathway, and the meteorological data. Once the dates and times have been entered, they cannot be changed without rerunning the program. The input of meteorological data produces the dispersion estimates (depleted and gamma CHI/Q) and plume location.

To produce a gamma dose rate, radiation monitor information and flow rate information must be provided. Thyroid dose rates will be calculated using a site-specific noble gas to iodine conversion factor. For a more refined thyroid estimate, Iodine-131 through Iodine-135 isotopes must be entered. When noble gas information is provided, the program will use those readings to override the radiation monitor readings in the production of the gamma dose rate. The newly calculated release rate will change proportionally according to further input of radiation monitor readings. The user is able to manually specify the use of monitor readings for both gamma and thyroid doses, or the use of monitor readings for gamma doses with isotopic input being used for thyroid doses, or the use of isotopic input for both gamma and thyroid doses.

The program produces plume segments or puffs in fixed 15-minute advection steps. Up to 29 plume points are tracked and any plume segments that travel beyond 20 miles will not be tracked. Releases can only terminate on the past 1/4-hour boundary.

On continued operation of the program, persistence of most conditions are assumed unless the user modifies the input data. In this way, projections may be made, either by stepping through the time periods one 1/4-hour at a time or by use of the batch option for up to 32 1/4-hour periods. Field team readings do not persist.

Only one plume type may be displayed at any time. There is no significance to the shading of the plume. Portions of a plume may not be shaded. Plumes can only be displayed in the ten mile radius around the plant because the background map has not been digitized beyond this distance. The only roads displayed are the appropriate evacuation routes.



## 2.0 THE KEYBOARD

The Keyboard is divided into three sections: the Typewriter area, the Function keys, and the Numeric keypad [1]. All the keys are typematic. This means they repeat as long as you hold them down.

### 2.1 The Function Keys



The Function keys operate only during the graphic options of METPAC. The definition of the keys are displayed to the right of the graphic screen. To execute any of the options depress the appropriate key. An example of a typical screen is shown in Figure 3.12.

### 2.2 Cursor Controls



Cursor Up moves the cursor one line up.



Cursor Down move the cursor one line down.



Cursor Right moves the cursor one character position to the right.



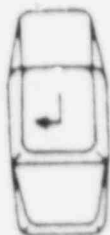
Cursor Left moves the cursor one character position to the left.

When presented with an input screen the user will be able to select any input in any order and change or correct values as the user sees fit.

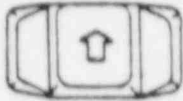
### 2.3 Special Keys



The Caps Lock key when pressed once, locks the characters A through Z in the uppercase position. You can get lower case characters while Caps Lock is on by pressing the Shift key. Press the Caps Lock key again and uppercase mode for characters A through Z is released.



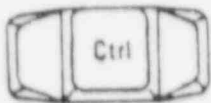
This is the Return key or the Enter key. Its use is defined by the programming language or application you are using.



When the Print Screen key is pressed along with the Shift key, a copy of the information displayed is printed on the printer. If the information on the display is alphanumeric characters, such as a program listing, Print Screen will duplicate this information on the printer. If the information is a graphic representation, it can only be reproduced on a printer that supports graphic printing.



The Backspace key when pressed, erases the last character typed and moves the previously typed characters one position to the right.



If control is depressed along with the Scroll Lock key, the METPAC program will come to a complete stop.

### 3.0 OPERATING PROCEDURE

The following sections will discuss the theory of operation of METPAC and the procedure needed to produce dose estimates. The dose procedure is written with a full description of each input step on the left and an abbreviated description on the right. The abbreviated description can be used when writing emergency plan procedures.

#### 3.1 Theory of Operation

METPAC is designed as a tool for assessing the radiological consequences of an accident at a nuclear power plant in real time. Therefore, METPAC assumes the user is running the program as the accident is occurring. The implication of this assumption is that the program expects input continuously throughout the accident with input incremented over discrete time periods. The time period chosen for updating input to METPAC is fifteen minutes. This coincides with the averaging period of the meteorological data. It is suggested that radiological inputs to METPAC be given as either a 15-minute average value or a 15-minute maximum value.

Because of the continuous operation assumption, if the user starts execution of the program after the start of the release, the user will have to start the execution of METPAC at release time and then cycle through 15-minute runs until the user brings the analysis up to real time. This will require that the user have all of the inputs over the elapsed time between the start of release and real time. A batch option is provided to facilitate this.

What-if scenarios can also be run in batch while retaining the status of the real-time accident. The batch option can provide projections for a future time period, including a predictive containment venting analysis and a predictive containment failure analysis, neither of which is available in real-time mode.

### 3.2 General Flow

In order to execute METPAC, the user need only type in METPAC, followed by (Return). This starts the execution of a batch procedure. The batch procedure turns off the echo print of all batch commands and deletes all control files. It starts the program responsible for accepting user input. If the user chooses to quit, the batch procedure will go to exit processing. If the user chooses to display the last plot, the procedure will go to plot processing. If the user chooses to display a printout, the procedure will go to print processing. If the user chooses to calculate Total Integrated Dose (TID), the procedure will go to TID processing. If the user chooses to print total integrated dose, the procedure will go to TID print processing. All other options lead to dose processing.

Under dose processing, the procedure will execute either the ground level dispersion analysis or the elevated level dispersion analysis or both depending on the levels the user chose to analyze. The Dispersion Program is run twice per level of analysis: once to analyze the current position of the plume, and once to calculate a straightline plume projection.

After the Dispersion Program finishes, the Dose Program starts executing. This program calculates doses based on the results of the Dispersion Program. After the doses are calculated, the procedure will start print processing, followed by plot processing. After plot processing, the procedure will loop back to the input processing program.

Print processing is responsible for producing text printouts of the dispersion and dose results. It also produces recommendations for protective actions if requested. If the user chooses to perform only print processing, the procedure will loop back to the input processing program.

Plot processing first displays text information to the text screen. Then, the program displays the graphics screen. The program allows the user to print what is displayed on the graphics screen. When the user exits normally from the graphics screen, then the procedure will loop back to the input processing program.

Total integrated dose processing is responsible for calculating the total integrated dose over the plume path. After the calculation is performed and the results saved, the procedure returns to the input processing program.

Total integrated dose print processing is responsible for producing text printouts of the results of the total integrated dose calculation. After the printout is obtained, the procedure returns to the input processing program.

Under exit processing, the procedure will delete some files on disk and print "Program Terminated". The batch procedure then terminates and the normal operating system prompt appears. Exiting does not destroy any of the input or output data.

The rest of this manual explains in more detail the operation of the following programs in the batch procedure: Input, Dispersion, Dose, Printout, Text and Graphics Display, TID, and TID Print.

### 3.3 Dose Estimate Procedure

This section explains in more detail how to perform various functions with METPAC.

#### 3.3.1 Starting a New Accident

It is assumed that the IBM PC system is assembled correctly and in good working order. If it is not, please refer to your Theory of Operations Manual [1].

The first step is to turn on the computer, line printer, and color monitor. The IBM system will respond by executing a RAM memory test. The monochrome screen will display the number of kilobytes of memory that have checked out.

TURN ON:  
COMPUTER  
LINE PRINTER  
COLOR MONITOR

When the test has checked out 512 KB, the floppy disk drive light will turn on for 1 second, followed by a beep. Then the floppy disk drive light will turn on for 4 seconds, followed by the hard disk drive light for 2 seconds.

The monochrome screen will then display current system date and will request a new date to be entered. Enter the date in format MM-DD-YY (Return) where MM = current month, DD = current day, and YY = the last 2 digits of the current year followed by a return. The system will specify time and request current time. The user will respond by typing the following HH:MM (Return) where HH = current hour on a 24-hour clock (0-23), MM = current minutes (0-59). The system will respond with C>.

ENTER CURRENT DATE  
MM-DD-YY (Return)

ENTER CURRENT TIME  
HH:MM (Return)

The user will now type in METPAC (Return) and the system will begin executing the METPAC procedure.

ENTER  
METPAC (Return)

The first program to execute under METPAC is the input preprocessor to the dispersion and dose calculation programs. The input preprocessor is a full screen input program. This means that the user may enter any item in the input list in any order. The user will do this by moving the cursor to the desired input location by means of the Cursor Control keys described in Section 2.2. The user will be presented with the screen shown in Figure 3.1.

This screen describes the current analysis situation that METPAC is executing. If the user is starting an analysis, a 1 (Return) should be entered. The program will verify that the user wishes to choose this option. A "Y" should be typed. Note that this

TYPE 1 (Return)  
TYPE Y

will destroy the previous database. Also note that the "Y" will not appear. If the user decides to not start a new accident, he should type "N".

Note that the "N" will not appear and that a cursor control key must be used to reposition the cursor on the list of choices.

The next screen that will be presented is shown in Figure 3.2. The user will move the cursor to the desired location and type the appropriate value for the specific input. When the user has finished with the input screen, the user should move the cursor to the "NEXT SCREEN" position and depress the Return key.

```
ENTER DATES AND  
TIMES  
MO ←  
DA ←  
YR ←  
HR ←  
MN ←  
MO ←  
DA ←  
YR ←  
HR ←  
MN ←  
NEXT SCREEN  
(Return)
```

NOTES: Please note the following:

- o The program accepts only 2 characters. Backspace may be used to edit input.
- o With the exception of the "LAST SCREEN"/"NEXT SCREEN" location, it is unnecessary to hit the Return key; moving the cursor to the next location makes the previous inputted value accepted.
- o All items in the list must have proper values. No error checking is done until after the user indicates he is done with the input screen. If there are errors with the input, the terminal will beep, a message will appear above the input screen and the cursor will automatically move to the input location that is in error. The correct values must be input, the cursor located on "NEXT SCREEN", then press (Return). The program will then continue error processing.



be the same as before. When all data values have been entered, position the cursor to "RUN" and depress (Return).

Before the "RUN" option is chosen in input Screen 4, the user must make sure the line printer is on-line and set up for printing. At this time, the color monitor must be on. After the "RUN" option is chosen, METPAC will error check Screens 3 and 4, then execute the dispersion and dose programs.

LINE PRINTER MUST  
BE ON-LINE NOW

When these programs are complete, a hard copy of the dispersion and dose estimates will be printed on the line printer (Figures 3.9 and 3.10). Then the pertinent information concerning the accident will be printed on the monochrome screen (Figure 3.11) and the color monitor will activate and clear whatever was previously on the screen. Next, the background map and Function key menu will appear on the screen (Figure 3.12). The user will specify by use of the Function key menu the design of the display to his choosing. The Function keys allow the user to do the following:

DISPERSION AND  
DOSE ESTIMATES  
PRINTED

F1 - draw or take off 5 and 10 mile radius circles and 16 cardinal direction sectors.

SELECT FUNCTION  
KEY FOR SPECIFIC  
DESIGN

F2 - Draw or take off evacuation roads.

F3 - Draw or take off points of interest.

F4 - Draw or take off town names.

F5 - Zooms in on specified area of the map.

The program will request the user to depress the upper left corner of the zoom box with the light pen. The user should determine the desired viewing area and depress the light pen on the upper left corner of this viewing area. If the user does not wish to execute this option, depress the light pen on the word "EXIT" to the right of the screen. Once the left corner has been chosen, the program will request that the user choose the lower right corner of the viewing area. Upon choosing the lower right corner of the viewing area, the program will draw a box outlining the viewing area to be enlarged. The user may then continue to modify the lower right corner of the viewing area until the box reflects the desired area to be enlarged. Once the box is suitable, the user must depress the light pen to the word "ACCEPT" and the program will start to draw the new map. If the box is unsuitable, the user must depress the light pen to the word "REJECT". The program will then ask for the new upper left corner of the box. The user can now start a new box or exit.

F6 - Redraws the map. This option allows the user to go back to the original map dimensions after a zoom. This also allows the user to view plumes of different types and elevations.

F8 - Uses the light pen to retrieve doses. The program will request that the user depress the light pen to the desired location. When the user is finished, depress the light pen on the word "EXIT" to the right of the screen.

Once the user has completed his design, he may copy the screen by depressing the F9 key.

COPY SCREEN IF  
DESIRED

To EXIT the METPAC program, depress the F10 Function key. The initial input screen will appear (Figure 3.1). To start the next quarter-hour analysis, follow procedure as listed in Section 3.3.2.

TYPE F10

### 3.3.2 Continuing an Accident with PAGs

To continue the analysis of the accident and obtain a new printout of protective action guideline recommendations (Figure 3.10), the user must enter a 2 (Return) in response to Screen 1 (Figure 3.1). This allows the user to update the release based on the next 15-minute radiological and meteorological data.

TYPE 2 (Return)

The second screen (Figure 3.2) will appear, but the time of shutdown and the time of the chosen release path will not appear. The date and time of analysis will appear above the "LAST SCREEN;" line. The date and time is filled in and the time is already incremented by 15 minutes. To continue, type (Return) when positioned at "NEXT SCREEN".

TYPE (Return)

The third screen (Figure 3.3) appears with the data fields, except field team data, filled in from the previous quarter-hour input. If the data has not changed, then type (Return). If new data must be entered, the data can be modified as in the previous section. Then, position the cursor to "MET SCREEN" and press (Return).

EDIT NEW DATA  
THEN POSITION  
CURSOR TO "MET  
SCREEN" AND  
TYPE (Return)

The fourth screen (Figure 3.4) will appear with all data fields filled in from the previous quarter-hour input. If the data has not changed, then type (Return). If new data must be entered, the data can be modified, as in the previous section. Then, position the cursor to "RUN" and type (Return). The program will then calculate dispersion and dose and display the graphics, as in the previous section.

EDIT NEW DATA  
THEN POSITION  
CURSOR TO "RUN"  
AND TYPE (Return)

### 3.3.3 Continuing an Accident Without PAGs

To continue the analysis of the accident without obtaining a printout of the protective action guideline recommendations, the user must enter a 3 (Return) in response to Screen 1 (Figure 3.1). This allows the user to update the release based on the next 15-minute radiological and meteorological data. Choosing not to produce the PAG printout (Figure 3.10) is done when conditions have not changed in the last 15 minutes or when producing a projection.

TYPE 3 (Return)

The second, third, and fourth screens appear in the same way as in Section 3.3.2. Typing a carriage return will take the user out of Screen 2. Then, on Screen 3, edit the data as in Section 3.3.1 positioning the cursor to "MET SCREEN" and typing (Return) when done. On Screen 4, edit the data as in Section 3.3.1, positioning the cursor to "RUN" and pressing (Return) when done. The program will then calculate the dispersion and dose estimates and display the graphics information.

TYPE (Return)  
EXIT DATA.  
POSITION CURSOR  
TO "MET SCREEN"  
AND TYPE (Return)  
EDIT DATA.  
POSITION CURSOR  
TO "RUN"  
AND TYPE (Return)

### 3.3.4 Eliminating a Quarter-Hour

Starting at Screen 1 (Figure 3.1), to eliminate a quarter-hour analysis, the user should type 4 (Return). Screen 1 will update with the "END TIME OF ANALYSIS" reduced by 15 minutes. This option will eliminate the last 15-minute database record from the database file.

### 3.3.5 Viewing a Plot

Starting from Screen 1 (Figure 3.1), to view a plot that was previously generated, the user should type 5 (Return). At the bottom of Screen 1, the user will be asked to enter the analysis time of the plot. If the user does not wish to execute this option, then type (Return). If valid times are entered followed by a (Return), the program will display the requested plot. Valid times are between the start time of analysis and the end time of analysis. Note: do not enter the colon.

The user can now design the plot screen as in Section 3.3.1. To exit, depress the F10 key. This will return the user to the first input screen.

### 3.3.6 Obtaining a Printout

Starting from Screen 1 (Figure 3.1), to obtain a printout that was previously generated, the user should type 6 (Return). At the bottom of Screen 1, the user will be asked to enter the analysis time to be printed. If the user does not wish to execute this option, then type (Return). If valid times are entered followed by a (Return), the program will print the requested analysis.

to project. After the user has pressed (Return), Screens 3 and 4 will be presented in the same manner as a continuing accident. Data values can remain the same or be modified as in Section 3.3.1. After positioning the cursor on "RUN" in the final quarter-hour and pressing (Return), the dispersion and dose will be calculated and the graphics will be displayed. The user can now design the plot screen as in Section 3.3.1. To exit, depress the F10 key. This will cause the eighth METPAC screen, Figure 3.8, to appear. The user will enter "Y" (Return) to save the batch generated data, or will enter "N" (Return) to keep the accident as it was before batch execution. After pressing (Return), the user is returned to the first input screen.

When an entirely separate analysis than the current accident must be performed, Batch Option 3 is chosen. After pressing 3 (Return), Screen 2 is displayed. Please note the following:

- o Valid input, cursor movement, and error validation are as described in Section 3.3.1, with the following exception.
- o If there is more than one release, then the hour and minute of the first release cannot be more than 32 quarter-hours before the hour and minute of the last release.

The seventh METPAC screen, Figure 3.7, is presented next. At this point, the number of quarter-hours to be projected is entered. Next, Screens 3 and 4 will be presented in the same manner as continuing an

EDIT NEW DATA  
THEN POSITION CURSOR  
TO "MET SCREEN" AND  
AND TYPE (Return)

EDIT NEW DATA THEN  
POSITION CURSOR  
TO "RUN" AND TYPE  
(Return)

TYPE F10

TYPE "Y" (Return)  
OR "N" (Return)

TYPE 3 (Return)

ENTER DATES AND  
TIMES, POSITION  
CURSOR TO "NEXT  
SCREEN" AND TYPE  
(Return)

ENTER NUMBER OF  
QUARTER-HOURS  
TO PROJECT

accident. After the first quarter-hour, data values will be shown on all screens. Data values can be entered, remain the same, or be modified as shown in Section 3.3.1. After positioning the cursor on "RUN" in the final quarter-hour and pressing (Return), the dispersion and dose will be calculated and the graphics will be displayed. The plot screen can now be designed as in Section 3.3.1. To exit, depress the F10 key. This will cause the eighth METPAC screen, Figure 3.8, to appear. To replace the existing real-time accident with the batch-generated one, type "Y" and (Return). To retain the existing real-time accident and reject the batch-generated one, type "N" (Return). The first input screen will again appear on the screen.

ENTER NEW DATA THEN  
POSITION CURSOR TO  
"NEXT SCREEN" AND  
TYPE (Return)

ENTER NEW DATA, THEN  
POSITION CURSOR TO  
"RUN" AND TYPE  
(Return)

TYPE F10

TYPE "Y" (Return) TO  
REPLACE. TYPE "N"  
(RETURN) TO REJECT

### 3.3.8 Calculating Total Integrated Dose

In order to calculate total integrated doses, METFAC Screen 1 (Figure 3.1) must be visible. The user needs only to type "8" (Return). This must be done before an up-to-date TID printout can be obtained.

TYPE 8 (Return)

### 3.3.9 Obtaining a TID Printout

Starting from Screen 1 (Figure 3.1), to obtain a TID printout that was previously calculated, the user should type 9 (Return). At the bottom of Screen 1, the user will be asked to enter the analysis time to be printed. If the user does not wish to execute this option, then type (Return). If valid times are entered followed by a (Return), the program will print the requested analysis. Valid times are between the start time of analysis and the end time of analysis. After the TID printout is obtained, the program returns to Screen 1 for input.

TYPE 9 (Return)

ENTER TIME (Return)

### 3.3.10 Editing Data

To edit a mistake in a previous quarter-hour data record, the user should proceed through the first screen as if continuing an accident. When the second screen is presented, the user should enter the quarter-hour that the error occurred in the time of analysis input line. This is done by typing the left arrow key three times, entering the hour, typing the right arrow key once, entering the minute. When this data has been edited, the user moves the cursor to "NEXT SCREEN" and types (Return).

When the third screen is displayed, the user may change any value by moving the cursor to the error location and typing the corrected value. After all editing has been completed, move the cursor to "MET SCREEN" and type (Return). The fourth screen will be displayed. Again, the user may edit any value by moving the cursor to the error location and entering the correct value. After all editing has been completed, position the cursor to "RUN" and press (Return). Since the program uses persistence when continuing an analysis, the program will assume that the error may have continued in future quarter-hours. The program will present Screen 3, then Screen 4 for the next quarter-hour, but will not change the field that was in error. If the user finds that the error did persist, it can be corrected at this time. The program will do this for all quarter-hours from the time of the error to the last time analyzed.

TYPE 2 (Return)

ENTER TIME OF  
ANALYSIS TO EDIT

MOVE TO "NEXT  
SCREEN" AND TYPE  
(Return)

EDIT VALUES

MOVE TO "MET SCREEN"  
TYPE (Return)

EDIT VALUES

MOVE TO "RUN"  
TYPE (Return)

VERIFY NEXT RECORD

TYPE (Return) TO  
ACCEPT

CONTINUE UNTIL ALL  
RECORDS ARE VERIFIED



After the last quarter-hour has been verified, the program continues as in Section 3.3.1. All quarter hours from the time of the error to the last analysis time will be reanalyzed, but only the last quarter-hour will be printed and plotted. Type F10 to continue.

TYPE F10

### 3.3.11 Viewing Input

To view a previous quarter-hour input screen (Figure 3.3), the user should proceed through the first screen as if continuing an accident. When the second screen is presented, the user should enter the quarter hour that is desired in the time of analysis input line. Then the user moves the cursor to "NEXT SCREEN" and types (Return). The third screen will appear for review. After reviewing the rad data, verify the cursor is positioned on "MET SCREEN" then (Return). When the user is done reviewing the MET screen, type right arrow twice to move the cursor to "DATE SCREEN" and (Return). This brings the user back to the second screen. At this time, the user may continue the accident, edit data, or return to the "LAST SCREEN" which is Screen 1.

TYPE 2 (Return)

ENTER TIME OF  
ANALYSIS TO VIEW

MOVE TO "NEXT  
SCREEN" AND TYPE  
(Return)

REVIEW DATA MOVE TO  
"MET SCREEN" AND  
TYPE (Return)

REVIEW DATA

MOVE TO "DATE  
SCREEN" AND TYPE  
(Return)

MOVE TO "LAST SCREEN"  
AND TYPE (Return)

### 3.3.12 Starting Another Release Path

To start an additional release path, the user should proceed through the first screen as if continuing an accident. When the second screen is presented, the user should move the cursor to the line on which entry of the release path date and time should

TYPE 2 (Return)

ENTER TIME OF  
NEW RELEASE

occur. The user can then enter data for the date and time, as is done in Section 3.3.1. This date and time must be after the date and time of the first release and before the date and time of the current analysis. The user should move the cursor to "NEXT SCREEN" and type (Return).

MOVE TO "NEXT  
SCREEN" AND TYPE  
(Return)

When the third screen appears, it will contain data for the first time of analysis in which the release started. The user may update this record to contain the appropriate radiological measures. Then choose "MET SCREEN" (Return). The meteorological data values can then be updated appropriately. Once this has been done and the "RUN" option has been chosen, the program will display the input screens for the next time of analysis. This will continue until the user has had a chance to update all input screens up to the current time of analysis.

UPDATE VALUES

MOVE TO "MET SCREEN"  
TYPE (Return)

UPDATE VALUES  
MOVE TO "RUN"  
TYPE (Return)

UPDATE NEXT RECORD

After the last quarter-hour has been updated, the program continues as in Section 3.3.1. All quarter hours from the time of the start of the new release path to the current analysis time will be reanalyzed, but only the last quarter-hour will be printed and plotted. Type F10 to continue.

CONTINUE UNTIL ALL  
RECORDS ARE UPDATED

TYPE F10

### 3.3.13 Using Prompt Mode

Prompt mode can be used whenever the user is shown Screen 3 or Screen 4 with the "PROMPT" option available. The use of prompt mode will walk the user through all required fields on Screens 3 and 4 one by one. A display at the top of the screen will show the range of valid data for each field. When all fields have been prompted for, Screen 4 will be shown

MOVE CURSOR  
TO "PROMPT"  
TYPE (Return)

Type (Return)

and the cursor will be positioned on "RUN". Simply press (Return) to have the program calculate the dispersion and dose estimates and display the graphics information.

#### 3.3.14 Exiting METPAC

To exit from METPAC, the user should type "Q" TYPE Q (Return) and (Return). The program will terminate without losing any data.

	START	OF	END	OF
	MO/DA/YR	HR:MN	MO/DA/YR	HR:MN
SHUTDOWN	10/23/87	9: 0		
STACK RELEASE	10/23/87	9: 5		
ANALYSIS	10/23/87	9:15	10/23/87	9:30

- 1- START NEW ACCIDENT
- 2- CONTINUE ACCIDENT WITH STRAIGHTLINE PAGES
- 3- CONTINUE ACCIDENT WITHOUT STRAIGHTLINE PAGES
- 4- ELIMINATE LAST 1/4 HOUR ANALYSIS
- 5- VIEW PLOT
- 6- OBTAIN PRINTOUT
- 7- BATCH EXECUTION
- 8- CALCULATE TOTAL INTEGRATED DOSE
- 9- OBTAIN TID PRINTOUT
- 0- QUIT

FIGURE 3.1

First METPAC Input Screen

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
SHUTDOWN	10/23/87	09:00
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
STACK RELEASE	10/23/87	09:05

LAST SCREEN  
NEXT SCREEN

FIGURE 3.2

Second METPAC Input Screen

```

SHUTDOWN: DATE 01/01/87 TIME 01:01 UNMONITORED CONTAINMENT STEAMLINE STACK
ANALYSIS: DATE 01/01/87 TIME 01:15

FIELD TEAM DOSE RATE -1.00 MR/HR
FIELD TEAM LOCATION -1.00 MILE
GROSS IODINE -1.000E+00 uCi/CC
UNMONITORED : SITE BOUNDARY DOSE RATE -1.00 MR/HR
ESTIMATED FLOW RATE -1.000E+00 CC/SEC
ISOTOPICS N Y / N
STEAMLINE : STEAMLINE DOSE RATE -1.00 MR/HR
STEAMLINE PRESSURE -1.00 PSIG
STEAMLINE PATHWAY -1 1-SRV / 2-ARV
ISOTOPICS N Y / N
MONITORED VS ISOTOPICS 0 0-MON/1-THY/2-GAM
CONTAINMENT : CONTAINMENT DOSE RATE -1.00 R/HR
CONTAINMENT PRESSURE -1.00 PSIG
FINAL PRESSURE -1.00 PSIG
ESTIMATED HOLE DIAMETER -1.00 FT
STACK VENTING N Y / N
ISOTOPICS N Y / N
MONITORED VS ISOTOPICS 0 0-MON/1-THY/2-GAM
STACK : STACK CONCENTRATION -1.000E+00 uCi/CC
STACK RELEASE RATE -1.000E+00 uCi/SEC
ISOTOPICS N Y / N
MONITORED VS ISOTOPICS 0 0-MON/1-THY/2-GAM
DATE SCREEN MET SCREEN T H O R E T

```

FIGURE 3.4

Fourth METPAC Input Screen

1. PROJECT USING CURRENT ANALYSIS WITH PERSISTENT MET AND RAD DATA
2. PROJECT USING CURRENT ANALYSIS WITH USER INPUT MET AND RAD DATA
3. PROJECT USING NEW DATA
4. RETURN TO LAST SCREEN

FIGURE 3.6

Sixth METPAC Input Screen

TOTAL NUMBER OF QUARTER HOURS TO EXECUTE (1-32)?

FIGURE 3.7

Seventh METPAC Input Screen



DO YOU WISH TO SAVE THE LAST BATCH EXECUTION ?

FIGURE 3.8

Eighth METPAC Input Screen

DATE AND TIME OF: MO/DA/YR HR:MM MO/DA/YR HR:MM  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:15

SEABROOK STATION  
 PLUME POSITION AT 09:15  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:00 TO 10/23/87 , 09:15)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE DEG F/DH	DELTA TEMPERATURE DEG C/100M	STAB	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	5.0	2.23	180.	S	0.0	0.0	E	0.00	0.50

RADIOLOGICAL: (FROM 10/23/87 , 09:00 TO 10/23/87 , 09:15)

LDCA = 3  
 STACK CONCENTRATION 1.0000E+00 uCi/cc STACK RELEASE RATE 1.3000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:15 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 3.34E+01 mR TOTAL ACCUMULATED THYROID DOSE 0.00E-01 R  
 TOTAL CURIES RELEASED 2.94E+04 Ci TOTAL CURIES IODINE RELEASED 0.00E-01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (s/M**3)
0	0.6	0.	1.34E+02	-	0.5	3.27E+07	0.00E-01	-	0.2	0.00E-01	8.48E-06	1.95E-08	8.71E-11

PLUME POINT INFORMATION AT 09:15 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (s/M**3)
2	0.8	0.	1.43E+02	-	0.5	3.27E+07	0.00E-01	-	0.3	0.00E-01	9.10E-06	3.09E-07	1.38E-10
1	0.1	0.	1.13E+02	-	0.5	3.27E+07	0.00E-01	-	0.0	0.00E-01	7.12E-08	1.00E-01	0.00E-01

FIGURE 3.9

Typical Plume Location Output

ELEVATED RELEASE PLUME PROJECTION FROM 9: 0

STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (uR/HR)	INF THY DR (R/HR)	GAMMA I/Q (SEC/M**3)	DEPLETED I/Q (SEC/M**3)	DEPOSITION (I/M**2)
0.60	0.	09:07	1.338E+02	0.000E-01	8.479E-06	1.948E-06	8.710E-11
1.00	0.	09:12	1.451E+02	0.000E-01	9.208E-06	7.700E-07	3.442E-09
2.00	0.	09:24	1.196E+02	0.000E-01	7.585E-06	3.019E-06	1.350E-08
3.00	0.	09:36	9.180E+01	0.000E-01	5.824E-06	3.223E-06	1.441E-08
4.00	0.	09:48	7.273E+01	0.000E-01	4.615E-06	2.894E-06	1.294E-08
5.00	0.	10:00	6.090E+01	0.000E-01	3.864E-06	2.921E-06	1.306E-08
6.00	0.	10:12	5.151E+01	0.000E-01	3.268E-06	2.661E-06	1.189E-08
7.00	0.	10:24	4.389E+01	0.000E-01	2.785E-06	2.243E-06	1.003E-08
8.00	0.	10:36	3.899E+01	0.000E-01	2.474E-06	2.286E-06	1.022E-08
9.00	0.	10:48	3.418E+01	0.000E-01	2.169E-06	1.949E-06	8.674E-09
10.00	0.	11:00	3.075E+01	0.000E-01	1.951E-06	1.892E-06	8.456E-09

PROTECTIVE ACTION RECOMMENDATIONS

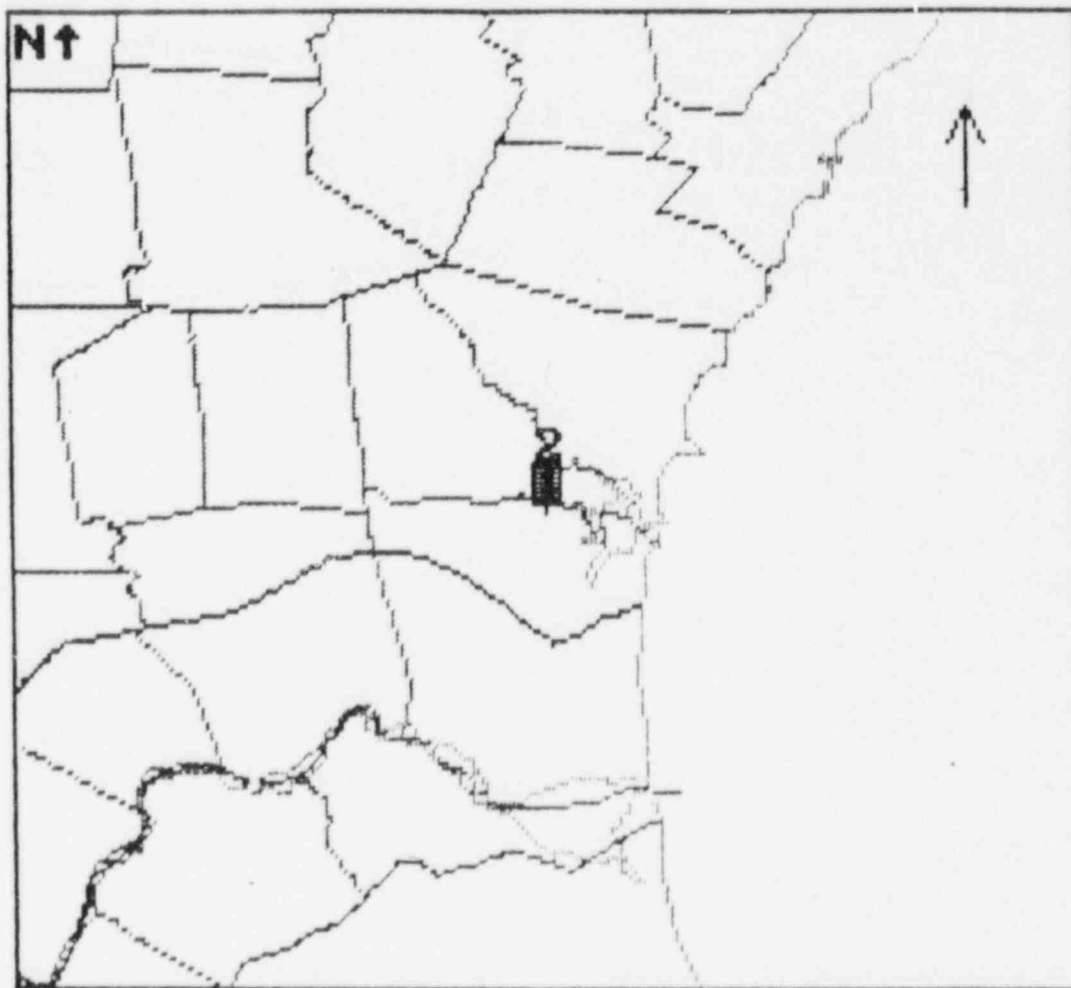
2 HR EVAC				2 HR SHEL				4 HR EVAC				4 HR SHEL			
DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)
0.60	0.	2.673E+02	0.000E-01	0.60	0.	3.515E+02	0.000E-01	0.60	0.	3.515E+02	0.000E-01	0.60	0.	3.515E+02	0.000E-01
1.00	0.	2.902E+02	0.000E-01	1.00	0.	3.896E+02	0.000E-01	1.00	0.	3.896E+02	0.000E-01	1.00	0.	3.896E+02	0.000E-01
2.00	0.	2.391E+02	0.000E-01	2.00	0.	2.805E+02	0.000E-01	2.00	0.	2.805E+02	0.000E-01	2.00	0.	2.805E+02	0.000E-01
3.00	0.	1.836E+02	0.000E-01	3.00	0.	1.971E+02	0.000E-01	3.00	0.	1.971E+02	0.000E-01	3.00	0.	1.971E+02	0.000E-01
4.00	0.	1.416E+02	0.000E-01	4.00	0.	1.416E+02	0.000E-01	4.00	0.	1.416E+02	0.000E-01	4.00	0.	1.416E+02	0.000E-01
5.00	0.	1.064E+02	0.000E-01	5.00	0.	1.064E+02	0.000E-01	5.00	0.	1.064E+02	0.000E-01	5.00	0.	1.064E+02	0.000E-01
6.00	0.	1.030E+02	0.000E-01	6.00	0.	1.142E+02	0.000E-01	6.00	0.	1.142E+02	0.000E-01	6.00	0.	1.142E+02	0.000E-01
7.00	0.	8.779E+01	0.000E-01	7.00	0.	8.852E+01	0.000E-01	7.00	0.	8.852E+01	0.000E-01	7.00	0.	8.852E+01	0.000E-01
8.00	0.	7.083E+01	0.000E-01	8.00	0.	7.083E+01	0.000E-01	8.00	0.	7.083E+01	0.000E-01	8.00	0.	7.083E+01	0.000E-01
9.00	0.	5.526E+01	0.000E-01	9.00	0.	5.526E+01	0.000E-01	9.00	0.	5.526E+01	0.000E-01	9.00	0.	5.526E+01	0.000E-01
10.00	0.	4.356E+01	0.000E-01	10.00	0.	4.356E+01	0.000E-01	10.00	0.	4.356E+01	0.000E-01	10.00	0.	4.356E+01	0.000E-01

6 HR EVAC				6 HR SHEL				8 HR EVAC				8 HR SHEL			
DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)
0.60	0.	3.515E+02	0.000E-01	0.60	0.	3.515E+02	0.000E-01	0.60	0.	3.515E+02	0.000E-01	0.60	0.	3.515E+02	0.000E-01
1.00	0.	3.896E+02	0.000E-01	1.00	0.	3.896E+02	0.000E-01	1.00	0.	3.896E+02	0.000E-01	1.00	0.	3.896E+02	0.000E-01
2.00	0.	2.805E+02	0.000E-01	2.00	0.	2.805E+02	0.000E-01	2.00	0.	2.805E+02	0.000E-01	2.00	0.	2.805E+02	0.000E-01
3.00	0.	1.971E+02	0.000E-01	3.00	0.	1.971E+02	0.000E-01	3.00	0.	1.971E+02	0.000E-01	3.00	0.	1.971E+02	0.000E-01
4.00	0.	1.416E+02	0.000E-01	4.00	0.	1.416E+02	0.000E-01	4.00	0.	1.416E+02	0.000E-01	4.00	0.	1.416E+02	0.000E-01
5.00	0.	1.064E+02	0.000E-01	5.00	0.	1.064E+02	0.000E-01	5.00	0.	1.064E+02	0.000E-01	5.00	0.	1.064E+02	0.000E-01
6.00	0.	1.142E+02	0.000E-01	6.00	0.	1.142E+02	0.000E-01	6.00	0.	1.142E+02	0.000E-01	6.00	0.	1.142E+02	0.000E-01
7.00	0.	8.852E+01	0.000E-01	7.00	0.	8.852E+01	0.000E-01	7.00	0.	8.852E+01	0.000E-01	7.00	0.	8.852E+01	0.000E-01
8.00	0.	7.083E+01	0.000E-01	8.00	0.	7.083E+01	0.000E-01	8.00	0.	7.083E+01	0.000E-01	8.00	0.	7.083E+01	0.000E-01
9.00	0.	5.526E+01	0.000E-01	9.00	0.	5.526E+01	0.000E-01	9.00	0.	5.526E+01	0.000E-01	9.00	0.	5.526E+01	0.000E-01
10.00	0.	4.356E+01	0.000E-01	10.00	0.	4.356E+01	0.000E-01	10.00	0.	4.356E+01	0.000E-01	10.00	0.	4.356E+01	0.000E-01

\* SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS  
 \* SHELTER - SEABROOK

FIGURE 3.10

Typical Straightline Projection Printout



- FUNCTION KEYS**
- 1-RADIUS
  - 2-ROADS
  - 3-PUBLIC
  - 4-LABELS
  - 5-ZOOM
  - 6-REDRAW
  - 7-
  - 8-LT PEN
  - 9-PRINT
  - 10-EXIT

**ELU GAM**  
 T=09:15  
 5.0 MPH  
 180 DEG  
 E STA  
 ↔20.00M  
 — STATE  
 --- TOWNS  
 - - - RIVER  
 - - - ROADS

FIGURE 3.12

Typical Graphics Output Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:15

STACK

FIELD TEAM DOSE RATE -1.00 MR/HR  
FIELD TEAM LOCATION -1.00 MILE  
GROSS IODINE -1.000E+00 uCi/CC

STACK : STACK CONCENTRATION 1.000E+00 uCi/CC  
STACK RELEASE RATE 1.000E+08 uCi/SEC  
ISOTOPICS N Y / N  
MONITORED VS ISOTOPICS 0 0-MON/1-THY/2-GAM  
DATE SCREEN MET SCREEN PROMPT

FIGURE 4.1.4

Lesson 1 - Third Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:15

STACK

MET DATA  
UPPER : WIND SPEED 5.00 MPH  
WIND DIRECTION 180.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/QTR HR  
SOLAR RADIATION : 0.50 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 3 1 OR 3

DATE SCREEN RAD SCREEN RUN PROMPT

FIGURE 4.1.5

Lesson 1 - Fourth Input Screen

ELEVATED RELEASE PLUME PROJECTION FROM 9: 0  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA (R/HR)	D.R. INF THY DR (R/HR)	GAMMA 3/0 (SEC/M**3)	DEPLETED 1/0 (SEC/M**3)	DEPOSITION (1/M**2)
0.60	0.	09:07	1.336E+02	0.000E-01	8.479E-06	1.948E-08	8.710E-11
1.00	0.	09:12	1.451E+02	0.000E-01	9.208E-06	7.700E-07	3.442E-09
2.00	0.	09:24	1.196E+02	0.000E-01	7.585E-06	3.019E-06	1.350E-08
3.00	0.	09:36	9.180E+01	0.000E-01	5.824E-06	3.223E-06	1.441E-08
4.00	0.	09:48	7.273E+01	0.000E-01	4.615E-06	2.894E-06	1.294E-08
5.00	0.	10:00	6.090E+01	0.000E-01	3.864E-06	2.921E-06	1.306E-08
6.00	0.	10:12	5.151E+01	0.000E-01	3.268E-06	2.661E-06	1.189E-08
7.00	0.	10:24	4.389E+01	0.000E-01	2.785E-06	2.243E-06	1.003E-08
8.00	0.	10:36	3.899E+01	0.000E-01	2.474E-06	2.286E-06	1.022E-08
9.00	0.	10:48	3.418E+01	0.000E-01	2.169E-06	1.940E-06	8.674E-09
10.00	0.	11:00	3.075E+01	0.000E-01	1.951E-06	1.892E-06	8.456E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC		2 HR SHEL		DIST (MI)	ANG (DEG)	4 HR EVAC		4 HR SHEL	
		GAMMA DOSE (R)	INF THY DO (R)	GAMMA DOSE (R)	INF THY DO (R)			GAMMA DOSE (R)	INF THY DO (R)	GAMMA DOSE (R)	INF THY DO (R)
0.60	0.	2.673E+02	2.405E+02	0.000E-01	0.000E-01	0.60	0.	3.515E+02	4.811E+02	0.000E-01	0.000E-01
1.00	0.	2.902E+02	2.612E+02	0.000E-01	0.000E-01	1.00	0.	3.696E+02	5.224E+02	0.000E-01	0.000E-01
2.00	0.	2.391E+02	2.152E+02	0.000E-01	0.000E-01	2.00	0.	2.805E+02	4.104E+02	0.000E-01	0.000E-01
3.00	0.	1.836E+02	1.652E+02	0.000E-01	0.000E-01	3.00	0.	1.971E+02	3.305E+02	0.000E-01	0.000E-01
4.00	0.	1.416E+02	1.309E+02	0.000E-01	0.000E-01	4.00	0.	1.416E+02	2.618E+02	0.000E-01	0.000E-01
5.00	0.	1.064E+02	1.096E+02	0.000E-01	0.000E-01	5.00	0.	1.064E+02	2.192E+02	0.000E-01	0.000E-01
6.00	0.	1.030E+02	9.272E+01	0.000E-01	0.000E-01	6.00	0.	1.142E+02	1.854E+02	0.000E-01	0.000E-01
7.00	0.	8.779E+01	7.901E+01	0.000E-01	0.000E-01	7.00	0.	8.852E+01	1.580E+02	0.000E-01	0.000E-01
8.00	0.	7.083E+01	7.018E+01	0.000E-01	0.000E-01	8.00	0.	7.083E+01	1.404E+02	0.000E-01	0.000E-01
9.00	0.	5.526E+01	6.153E+01	0.000E-01	0.000E-01	9.00	0.	5.526E+01	1.221E+02	0.000E-01	0.000E-01
10.00	0.	4.356E+01	5.535E+01	0.000E-01	0.000E-01	10.00	0.	4.356E+01	1.107E+02	0.000E-01	0.000E-01

DIST (MI)	ANG (DEG)	6 HR EVAC		6 HR SHEL		DIST (MI)	ANG (DEG)	8 HR EVAC		8 HR SHEL	
		GAMMA DOSE (R)	INF THY DO (R)	GAMMA DOSE (R)	INF THY DO (R)			GAMMA DOSE (R)	INF THY DO (R)	GAMMA DOSE (R)	INF THY DO (R)
0.60	0.	3.515E+02	7.216E+02	0.000E-01	0.000E-01	0.60	0.	3.515E+02	9.622E+02	0.000E-01	0.000E-01
1.00	0.	3.696E+02	7.837E+02	0.000E-01	0.000E-01	1.00	0.	3.696E+02	1.145E+03	0.000E-01	0.000E-01
2.00	0.	2.805E+02	6.456E+02	0.000E-01	0.000E-01	2.00	0.	2.805E+02	8.618E+02	0.000E-01	0.000E-01
3.00	0.	1.971E+02	4.957E+02	0.000E-01	0.000E-01	3.00	0.	1.971E+02	6.609E+02	0.000E-01	0.000E-01
4.00	0.	1.416E+02	3.927E+02	0.000E-01	0.000E-01	4.00	0.	1.416E+02	5.236E+02	0.000E-01	0.000E-01
5.00	0.	1.064E+02	3.289E+02	0.000E-01	0.000E-01	5.00	0.	1.064E+02	4.385E+02	0.000E-01	0.000E-01
6.00	0.	1.142E+02	2.782E+02	0.000E-01	0.000E-01	6.00	0.	1.142E+02	3.709E+02	0.000E-01	0.000E-01
7.00	0.	8.852E+01	2.370E+02	0.000E-01	0.000E-01	7.00	0.	8.852E+01	3.160E+02	0.000E-01	0.000E-01
8.00	0.	7.083E+01	2.105E+02	0.000E-01	0.000E-01	8.00	0.	7.083E+01	2.807E+02	0.000E-01	0.000E-01
9.00	0.	5.526E+01	1.846E+02	0.000E-01	0.000E-01	9.00	0.	5.526E+01	2.461E+02	0.000E-01	0.000E-01
10.00	0.	4.356E+01	1.660E+02	0.000E-01	0.000E-01	10.00	0.	4.356E+01	2.214E+02	0.000E-01	0.000E-01

\* SHELTER -  
 \* SHELTER -

SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS  
 SHELTER - SEABROOK

FIGURE 4.1.7

Lesson 1 - Plume Projection Output

## 4.2 Lesson 2

### Learning Objectives

1. Use the edit capabilities of METPAC to correct the 0915 projected plume location using actual meteorological data.
2. Describe how "instantaneous" radiological data is used with averaged meteorological data.

### Scenario

It is now 0916. The met data from the period 0900 to 0915 is now available. The wind direction (upper and lower) was from 0°. This is the only parameter that changed from the previous 15-minute interval.

Show the EOF coordinator where the plume actually went during the period 0905 to 0915. The stack reading is as shown in Figure 4.2.1.

### Lesson

1. Note that on Screen 2, the analysis has proceeded to the next time interval--0930. Using the cursor, the end time of analysis should be changed to 0915.
2. Proceeding to screen four, only the wind direction is changed in accordance with the 0915 met data.
3. Move to RUN and press (Return). This produces the off-site doses and a new map which shows where the plume actually went from 0905 to 0915. Note that the plume is moving in a different direction. This is the opposite direction from our initial projection using 0900 meteorology and the assumption of persistence. It may be good practice to consider holding an off-site team in reserve to chase the plume in an opposite direction.



4. It is now 0920 and the reported stack monitor reading is as shown in Figure 4.2.1. The EOF coordinator is requesting a new projection before the 0930 met data is available. (It is good practice to make these projections whether asked or not.)
5. Assume persistence of met conditions as shown in Figure 4.2.1 at the stack to make the projection. The average of the stack monitor readings or the highest reading can be used. Just be consistent in whatever method is chosen. The result in where the plume is projected to be at 0930.
6. Note that the meteorological data is averaged over a 15-minute interval. Radiological data (e.g., the stack monitor) is usually available instantaneously. It is not logical to use instantaneous radiological data with a program that averages met data! Be consistent in your decisions as to how multiple radiological data points are utilized. The radiological data can not be changed during the 15-minute interval.

### Summary

In this lesson the edit capabilities of METPAC were used to eliminate the projection generated in Lesson 1. The actual meteorological data were used when they became available to show where the plume actually went--not where it was projected to go.

It should be kept in mind that radiological data is available almost instantaneously from the various monitors. However, meteorological data is averaged over 15-minute intervals. Therefore, judgement must be used when selecting radiological data for use by METPAC. The use of the highest rad monitor reading during a 15-minute interval is probably too conservative. An average of the rad monitor readings or the reading that persisted the longest over the 15-minute interval is more appropriate.

	<u>9:15</u>	<u>9:20</u>
Wind Speed (Mph)	5	
Wind Direction (Deg)	0	
Delta Temperature (Deg F)	0	
Precipitation (inch/Qtr Hr)	0	
Solar Radiation (ly/min)	.5	
Stack Concentration (uCi/cc)	1	2
Stack Release Rate (uCi/sec)	1.3E8	2.6E8
Loca Type	3	
Field Team Dose Rate (mR/hr)		
Field Team Location (mi)		
Gross Iodine (uCi/cc)		

FIGURE 4.2.1

Lesson 2 - Stack Readings and Times

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
ANALYSIS	10/23/87	9:15
LAST SCREEN		
NEXT SCREEN		

FIGURE 4.2.2

Lesson 2 - Second Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:15

STACK

FIELD TEAM DOSE RATE -1.00 MR/HR  
FIELD TEAM LOCATION -1.00 MILE  
GROSS IODINE -1.000E+00 uCi/CC

STACK : STACK CONCENTRATION 1.000E+00 uCi/CC  
STACK RELEASE RATE 1.000E+00 uCi/SEC  
ISOTOPICS N Y / W  
MONITORED VS ISOTOPICS 0 0-MON/1-THY/2-GAM  
DATE SCREEN MET SCREEN PROMPT

FIGURE 4.2.3

Lesson 2 - Third Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:15

MET DATA

UPPER : WIND SPEED 5.00 MPH  
WIND DIRECTION 0.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.50 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 0 1 OR 3

DATE SCREEN RAD SCREEN RUN

FIGURE 4.2.4

Lesson 2 - Fourth Input Screen

DATE AND TIME OF: MO/DA/YR HR:MM MO/DA/YR HR:MM  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:15

SEABROOK STATION  
 PLUME POSITION AT 09:15  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:00 TO 10/23/87 , 09:15)

TOWER LEVEL	WIND SPEED		WIND DIR (FROM)		DELTA TEMPERATURE			PRECIPITATION	SOLAR RADIATION
	(MPH)	(M/S)	DEG	SECTOR	DEG F/DH	DEG C/100M	STAB	IN/15 MIN	LANGLEY/MIN
ELEVATED	5.0	2.23	0.	N	0.0	0.0	E	0.00	0.50

RADIOLOGICAL: (FROM 10/23/87 , 09:00 TO 10/23/87 , 09:15)

LOCA = 1  
 STACK CONCENTRATION 1.0000E+00 uCi/cc STACK RELEASE RATE 1.3000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:15 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 3.34E+01 mR TOTAL ACCUMULATED THYROID DOSE 0.00E-01 R  
 TOTAL CURIES RELEASED 2.94E+04 Ci TOTAL CURIES IODINE RELEASED 0.00E-01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
0	0.6	180.	1.34E+02	-	0.5	3.27E+07	0.00E-01	-	0.2	0.00E-01	6.48E-06	1.95E-08	6.71E-11

PLUME POINT INFORMATION AT 09:15 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
2	0.8	180.	1.43E+02	-	0.5	3.27E+07	0.00E-01	-	0.3	0.00E-01	9.10E-06	3.09E-07	1.38E-09
1	0.1	180.	1.13E+02	-	0.5	3.27E+07	0.00E-01	-	0.0	0.00E-01	7.15E-06	0.00E-01	0.00E-01

FIGURE 4.2.5

Lesson 2 - 9:15 Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:0  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (uR/HR)	INF THY DR (R/HR)	GAMMA 1/Q DEPLETED (SEC/M**3)	I/Q DEPLETED (SEC/M**3)	I/Q DEPOSITION (I/M**2)
0.60	180.	09:07	1.336E+02	0.000E-01	8.479E-06	1.948E-08	8.710E-11
1.00	180.	09:12	1.451E+02	0.000E-01	9.208E-06	7.700E-07	3.442E-09
2.00	180.	09:24	1.196E+02	0.000E-01	7.585E-06	3.019E-06	1.350E-08
3.00	180.	09:36	9.180E+01	0.000E-01	5.824E-06	3.223E-06	1.441E-08
4.00	180.	09:48	7.273E+01	0.000E-01	4.615E-06	2.894E-06	1.294E-08
5.00	180.	10:00	5.947E+01	0.000E-01	3.774E-06	2.509E-06	1.122E-08
6.00	180.	10:12	4.991E+01	0.000E-01	3.166E-06	2.168E-06	9.694E-09
7.00	180.	10:24	4.275E+01	0.000E-01	2.712E-06	1.894E-06	8.423E-09
8.00	180.	10:36	3.722E+01	0.000E-01	2.361E-06	1.670E-06	7.376E-09
9.00	180.	10:48	3.263E+01	0.000E-01	2.063E-06	1.454E-06	6.510E-09
10.00	180.	11:00	2.929E+01	0.000E-01	1.856E-06	1.291E-06	5.789E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC		2 HR SHEL		4 HR EVAC		4 HR SHEL	
		GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)	GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)
0.60	180.	2.673E+02	2.405E+02	0.000E-01	0.000E-01	3.515E+02	4.811E+02	0.000E-01	0.000E-01
1.00	180.	2.902E+02	2.612E+02	0.000E-01	0.000E-01	2.696E+02	5.224E+02	0.000E-01	0.000E-01
2.00	180.	2.391E+02	2.152E+02	0.000E-01	0.000E-01	2.805E+02	4.304E+02	0.000E-01	0.000E-01
3.00	180.	1.836E+02	1.652E+02	0.000E-01	0.000E-01	2.283E+02	3.305E+02	0.000E-01	0.000E-01
4.00	180.	1.455E+02	1.309E+02	0.000E-01	0.000E-01	1.663E+02	2.618E+02	0.000E-01	0.000E-01
5.00	180.	1.189E+02	1.071E+02	0.000E-01	0.000E-01	1.241E+02	2.141E+02	0.000E-01	0.000E-01
6.00	180.	9.981E+01	8.983E+01	0.000E-01	0.000E-01	1.106E+02	1.797E+02	0.000E-01	0.000E-01
7.00	180.	8.550E+01	7.695E+01	0.000E-01	0.000E-01	8.621E+01	1.539E+02	0.000E-01	0.000E-01
8.00	180.	6.761E+01	6.699E+01	0.000E-01	0.000E-01	6.761E+01	1.340E+02	0.000E-01	0.000E-01
9.00	180.	5.308E+01	5.910E+01	0.000E-01	0.000E-01	5.308E+01	1.182E+02	0.000E-01	0.000E-01
10.00	180.	4.150E+01	5.272E+01	0.000E-01	0.000E-01	4.150E+01	1.054E+02	0.000E-01	0.000E-01

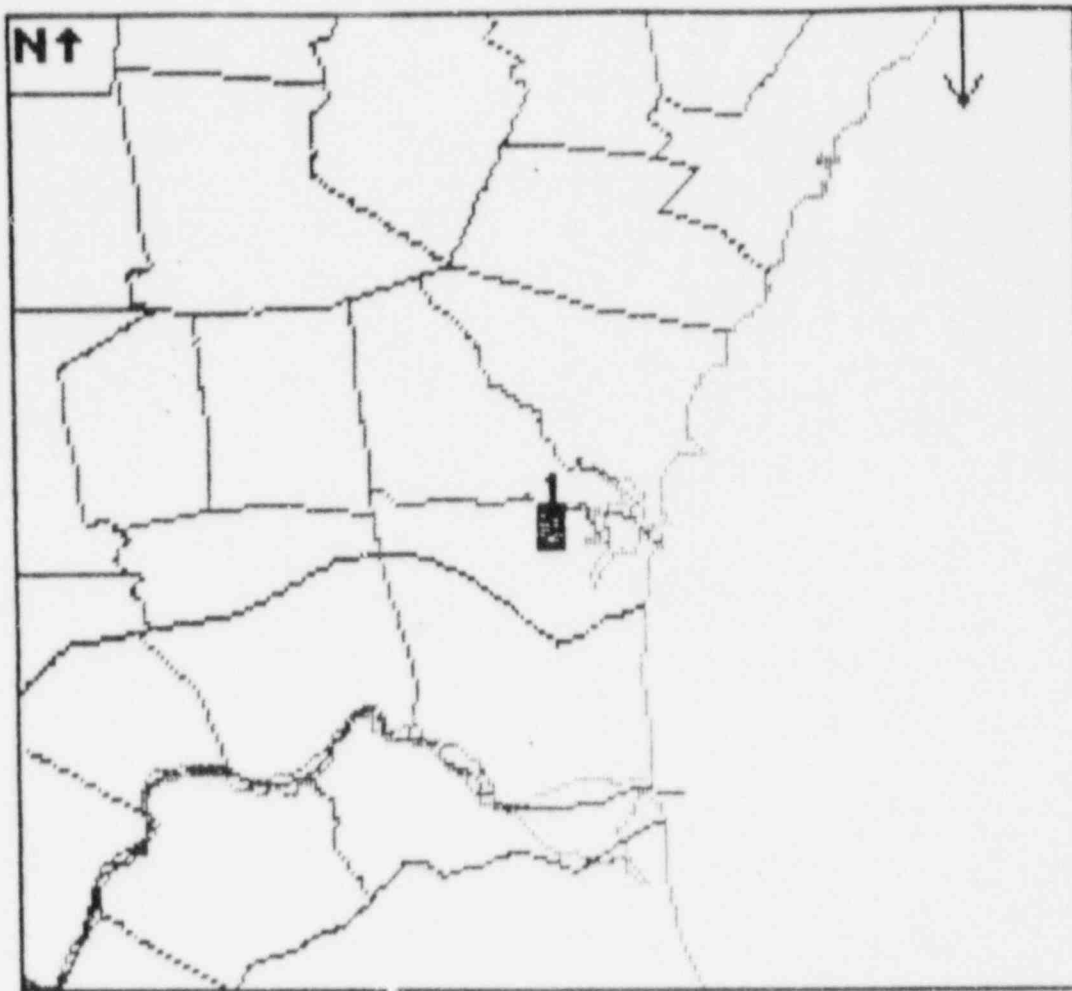
DIST (MI)	ANG (DEG)	6 HR EVAC		6 HR SHEL		8 HR EVAC		8 HR SHEL	
		GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)	GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)
0.60	180.	3.515E+02	7.216E+02	0.000E-01	0.000E-01	3.515E+02	9.622E+02	0.000E-01	0.000E-01
1.00	180.	3.696E+02	7.837E+02	0.000E-01	0.000E-01	2.696E+02	1.045E+03	0.000E-01	0.000E-01
2.00	180.	2.805E+02	6.456E+02	0.000E-01	0.000E-01	2.805E+02	8.608E+02	0.000E-01	0.000E-01
3.00	180.	2.283E+02	4.957E+02	0.000E-01	0.000E-01	2.283E+02	6.609E+02	0.000E-01	0.000E-01
4.00	180.	1.663E+02	3.927E+02	0.000E-01	0.000E-01	1.663E+02	5.206E+02	0.000E-01	0.000E-01
5.00	180.	1.241E+02	3.212E+02	0.000E-01	0.000E-01	1.241E+02	4.262E+02	0.000E-01	0.000E-01
6.00	180.	1.106E+02	2.695E+02	0.000E-01	0.000E-01	1.106E+02	3.593E+02	0.000E-01	0.000E-01
7.00	180.	8.621E+01	2.309E+02	0.000E-01	0.000E-01	8.621E+01	3.078E+02	0.000E-01	0.000E-01
8.00	180.	6.761E+01	2.010E+02	0.000E-01	0.000E-01	6.761E+01	2.680E+02	0.000E-01	0.000E-01
9.00	180.	5.308E+01	1.773E+02	0.000E-01	0.000E-01	5.308E+01	2.364E+02	0.000E-01	0.000E-01
10.00	180.	4.150E+01	1.582E+02	0.000E-01	0.000E-01	4.150E+01	2.109E+02	0.000E-01	0.000E-01

\* SHELTER -  
 \* SHELTER -

SHELTER - SALISBURY, HAMPTON, HAMPTON FALLS  
 SHELTER - SEABROOK

FIGURE 4.2.6

Lesson 2 - 9:15 Plume Projection Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

ELU GAM  
T=09:15  
5.0 MPH  
0 DEG  
E STAB  
↔20.00MI  
— STATE  
— TOWNS  
— RIVER  
— ROADS

FIGURE 4.2.7

Lesson 2 - 9:15 Graphics Output



PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
ANALYSIS	10/23/87	9:30
LAST SCREEN		
NEXT SCREEN		

FIGURE 4.2.8

Lesson 2 - Second Input Screen for Projections

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:30

STACK

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	2.000E+00	uCi/CC
	STACK RELEASE RATE	2.600E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	0	0-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		

FIGURE 4.2.9

Lesson 2 - Third Input Screen for Projections

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:30

STACK

MET DATA  
UPPER : WIND SPEED 5.00 MPH  
WIND DIRECTION 0.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.50 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 2 1 OR 3

DATE SCREEN RAD SCREEN RUN PROMPT

FIGURE 4.2.10

Lesson 2 - Fourth Input Screen for Projections

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:30

SEABROCK STATION  
 PLUME POSITION AT 09:30  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:15 TO 10/23/87 , 09:30)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE DEG F/DH	DELTA TEMPERATURE DEG C/100M	STAB	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	5.0	2.23	0.	N	0.0	0.0	E	0.00	0.50

RADIOLOGICAL: (FROM 10/23/87 , 09:15 TO 10/23/87 , 09:30)

LOCA = 3  
 STACK CONCENTRATION 2.0000E+00 uCi/CC STACK RELEASE RATE 2.6000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:30 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 9.93E+01 mR TOTAL ACCUMULATED THYROID DOSE 0.00E+01 R  
 TOTAL CURIES RELEASED 9.82E+04 Ci TOTAL CURIES IODINE RELEASED 0.00E+01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE (uCi/sec) USE	GAMMA 1% DEP. (1/m+3)	1% DEPOSITION (1/m+3)	1% DEPOSITION (1/m+3)
0	0.6	180.	2.64E+02	-	0.5	7.64E+07	0.00E-01	-	0.2	0.00E+01	8.45E-06	1.95E-08	8.71E-11

PLUME POINT INFORMATION AT 09:30 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE (uCi/sec) USE	GAMMA 1% DEP. (1/m+3)	1% DEPOSITION (1/m+3)	1% DEPOSITION (1/m+3)
1	2.1	180.	1.17E+02	-	0.7	3.27E+07	0.00E+01	-	0.6	0.00E+01	7.41E-06	3.04E-06	1.38E-08
2	1.2	180.	2.81E+02	-	0.6	7.64E+07	0.00E+01	-	0.4	0.00E+01	9.03E-06	1.57E-06	7.02E-09
1	0.1	180.	2.22E+02	-	0.5	7.64E+07	0.00E+01	-	0.0	0.00E+01	7.15E-06	0.00E+01	0.00E+01

FIGURE 4.2.11

Lesson 2 - 9:30 Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:15  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MN)	GAMMA (uR/HR)	D.R. (R/HR)	INF THY DO (R/HR)	GAMMA 1/Q (SEC/M**3)	DEPLETED 1/Q (SEC/M**3)	DEPOSITION (1/M**2)
0.60	180.	09:22	2.636E+02	0.000E-01	0.000E-01	8.479E-06	1.948E-08	8.710E-11
1.00	180.	09:27	2.863E+02	0.000E-01	0.000E-01	9.208E-06	7.700E-07	3.442E-09
2.00	180.	09:39	2.358E+02	0.000E-01	0.000E-01	7.585E-06	3.019E-06	1.350E-08
3.00	180.	09:51	1.811E+02	0.000E-01	0.000E-01	5.824E-06	3.223E-06	1.441E-08
4.00	180.	10:03	1.435E+02	0.000E-01	0.000E-01	4.615E-06	2.894E-06	1.294E-08
5.00	180.	10:15	1.173E+02	0.000E-01	0.000E-01	3.774E-06	2.509E-06	1.122E-08
6.00	180.	10:27	9.844E+01	0.000E-01	0.000E-01	3.166E-06	2.168E-06	9.694E-09
7.00	180.	10:39	8.433E+01	0.000E-01	0.000E-01	2.712E-06	1.884E-06	8.422E-09
8.00	180.	10:51	7.341E+01	0.000E-01	0.000E-01	2.361E-06	1.650E-06	7.376E-09
9.00	180.	11:03	6.476E+01	0.000E-01	0.000E-01	2.083E-06	1.458E-06	6.510E-09
10.00	180.	11:15	5.778E+01	0.000E-01	0.000E-01	1.858E-06	1.295E-06	5.789E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC GAMMA DOSE (uR)	2 HR SHEL GAMMA DOSE (uR)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (uR)	4 HR SHEL GAMMA DOSE (uR)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	180.	5.272E+02	4.745E+02	0.000E-01	0.000E-01	0.60	180.	7.592E+02	9.490E+02	0.000E-01	0.000E-01
1.00	180.	5.725E+02	5.153E+02	0.000E-01	0.000E-01	1.00	180.	8.006E+02	1.001E+03	0.000E-01	0.000E-01
2.00	180.	4.716E+02	4.245E+02	0.000E-01	0.000E-01	2.00	180.	6.123E+02	8.490E+02	0.000E-01	0.000E-01
3.00	180.	3.621E+02	3.259E+02	0.000E-01	0.000E-01	3.00	180.	4.955E+02	6.519E+02	0.000E-01	0.000E-01
4.00	180.	2.869E+02	2.582E+02	0.000E-01	0.000E-01	4.00	180.	3.639E+02	5.165E+02	0.000E-01	0.000E-01
5.00	180.	2.346E+02	2.112E+02	0.000E-01	0.000E-01	5.00	180.	2.741E+02	4.023E+02	0.000E-01	0.000E-01
6.00	180.	1.969E+02	1.772E+02	0.000E-01	0.000E-01	6.00	180.	2.428E+02	3.544E+02	0.000E-01	0.000E-01
7.00	180.	1.687E+02	1.518E+02	0.000E-01	0.000E-01	7.00	180.	1.911E+02	3.036E+02	0.000E-01	0.000E-01
8.00	180.	1.468E+02	1.321E+02	0.000E-01	0.000E-01	8.00	180.	1.517E+02	2.843E+02	0.000E-01	0.000E-01
9.00	180.	1.209E+02	1.166E+02	0.000E-01	0.000E-01	9.00	180.	1.209E+02	2.331E+02	0.000E-01	0.000E-01
10.00	180.	9.630E+01	1.040E+02	0.000E-01	0.000E-01	10.00	180.	9.630E+01	2.080E+02	0.000E-01	0.000E-01

\* SHELTER -  
 \* SHELTER -

SHELTER - SALISBURY, HAMPTON, HAMPTON FALLS  
 SHELTER - SEABROOK

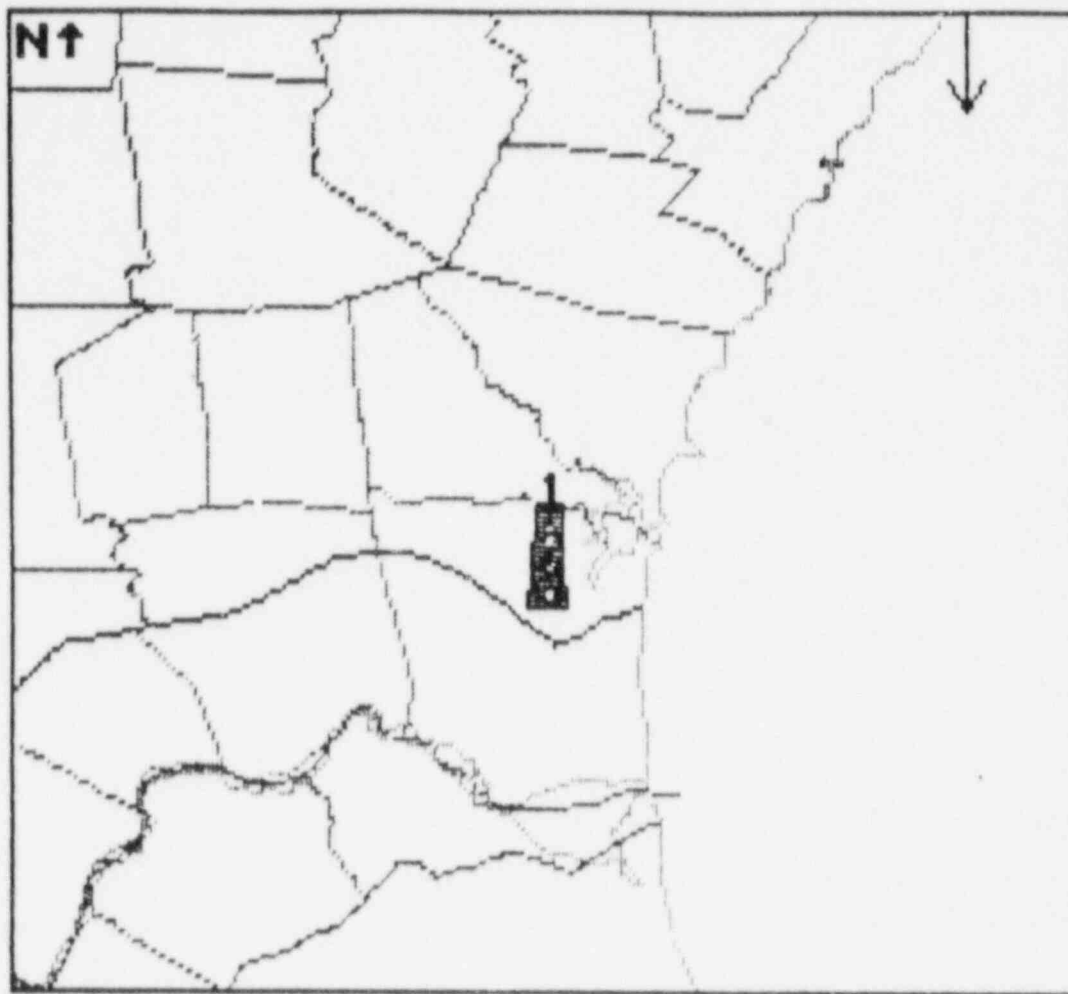
DIST (MI)	ANG (DEG)	6 HR EVAC GAMMA DOSE (uR)	6 HR SHEL GAMMA DOSE (uR)	6 HR EVAC INF THY DO (R)	6 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (uR)	8 HR SHEL GAMMA DOSE (uR)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	180.	7.592E+02	1.423E+03	0.000E-01	0.000E-01	0.60	180.	7.592E+02	1.898E+03	0.000E-01	0.000E-01
1.00	180.	8.006E+02	1.546E+03	0.000E-01	0.000E-01	1.00	180.	8.006E+02	2.061E+03	0.000E-01	0.000E-01
2.00	180.	6.123E+02	1.273E+03	0.000E-01	0.000E-01	2.00	180.	6.123E+02	1.698E+03	0.000E-01	0.000E-01
3.00	180.	4.955E+02	9.778E+02	0.000E-01	0.000E-01	3.00	180.	4.955E+02	1.304E+03	0.000E-01	0.000E-01
4.00	180.	3.639E+02	7.747E+02	0.000E-01	0.000E-01	4.00	180.	3.639E+02	1.033E+03	0.000E-01	0.000E-01
5.00	180.	2.741E+02	6.335E+02	0.000E-01	0.000E-01	5.00	180.	2.741E+02	8.447E+02	0.000E-01	0.000E-01
6.00	180.	2.428E+02	5.316E+02	0.000E-01	0.000E-01	6.00	180.	2.428E+02	7.088E+02	0.000E-01	0.000E-01
7.00	180.	1.911E+02	4.554E+02	0.000E-01	0.000E-01	7.00	180.	1.911E+02	6.072E+02	0.000E-01	0.000E-01
8.00	180.	1.517E+02	3.844E+02	0.000E-01	0.000E-01	8.00	180.	1.517E+02	5.285E+02	0.000E-01	0.000E-01
9.00	180.	1.209E+02	3.497E+02	0.000E-01	0.000E-01	9.00	180.	1.209E+02	4.663E+02	0.000E-01	0.000E-01
10.00	180.	9.630E+01	3.120E+02	0.000E-01	0.000E-01	10.00	180.	9.630E+01	4.160E+02	0.000E-01	0.000E-01

\* SHELTER - SALISBURY, NEWBURYPORT, NEWBURY  
 \* SHELTER - W. NEWBURY, AMESBURY, S. HAMPTON  
 \* SHELTER - KENSINGTON, N. HAMPTON, HAMPTON  
 \* SHELTER - HAMPTON FALLS, SEABROOK

SHELTER - SALISBURY, NEWBURYPORT, NEWBURY  
 SHELTER - W. NEWBURY, AMESBURY, S. HAMPTON  
 SHELTER - KENSINGTON, N. HAMPTON, HAMPTON  
 SHELTER - HAMPTON FALLS, SEABROOK

FIGURE 4.2.12

Lesson 2 - 9:30 Plume Projection Output



- FUNCTION KEYS
- 1-RADIUS
  - 2-ROADS
  - 3-PUBLIC
  - 4-LABELS
  - 5-ZOOM
  - 6-REDRAW
  - 7-
  - 8-LT PEN
  - 9-PRINT
  - 10-EXIT

ELU GAM  
 T=09:30  
 5.0 MPH  
 0 DEG  
 E STAB  
 ↔20.00MI  
 — STATE  
 — TOWNS  
 — RIVER  
 — ROADS

FIGURE 4.2.13

Lesson 2 - 9:30 Graphics Output

9:25

Wind Speed (Mph)

Wind Direction (Deg)

Delta Temperature (Deg F)

Precipitation (inch/Qtr Hr)

Solar Radiation (ly/min)

Stack Concentration (uCi/cc) 2

Stack Release Rate (uCi/sec) 2.6E8

Loca Type

Field Team Dose Rate (mR/hr)

Field Team Location (mi)

Gross Iodine (uCi/cc)

FIGURE 4.3.1

Lesson 3 - Stack Readings and Times

- 1- PROJECT USING CURRENT ANALYSIS WITH PERSISTENT MET AND RAD DATA
- 2- PROJECT USING CURRENT ANALYSIS WITH USER INPUT MET AND RAD DATA
- 3- PROJECT USING NEW DATA
- 4- RETURN TO LAST SCREEN

FIGURE 4.3.2

Lesson 3 - Sixth Input Screen



TOTAL NUMBER OF QUARTER HOURS TO EXECUTE : 1 - 3207 1

FIGURE 4.3.3

Lesson 3 - Seventh Input Screen

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:45

SEABROOK STATION  
 PLUME POSITION AT 09:45  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (DEG)	WIND DIR (SECTOR)	DELTA TEMPERATURE (DEG F/DH)	DELTA TEMPERATURE (DEG C/100M STAB)	PRECIPITATION (IN/15 MIN)	SOLAR RADIATION (LANGLEY/MIN)	
ELEVATED	5.0	2.23	0.	N	0.0	0.0	E	0.00	0.50

RADIOLOGICAL: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

LOCA # 3  
 STACK CONCENTRATION 2.0000E+00 uCi/cc STACK RELEASE RATE 2.6000E+08 uCi/SEC FLOW RATE 1.2000E+09 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:45 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 1.66E+02 mR TOTAL ACCUMULATED THYROID DOSE 0.00E-01 R  
 TOTAL CURIES RELEASED 1.74E+05 Ci TOTAL CURIES IODINE RELEASED 0.00E-01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
0	0.6	180.	2.65E+02	-	0.5	8.40E+07	0.00E-01	-	0.2	0.00E-01	8.48E-06	1.95E-08	8.71E-11

PLUME POINT INFORMATION AT 09:45 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
4	3.3	180.	8.46E+01	-	1.0	3.27E+07	0.00E-01	-	0.9	0.00E-01	5.37E-06	3.13E-06	1.40E-08
3	2.5	180.	2.06E+02	-	0.8	7.64E+07	0.00E-01	-	0.7	0.00E-01	6.83E-06	3.25E-06	1.45E-08
2	1.2	180.	2.82E+02	-	0.6	8.40E+07	0.00E-01	-	0.4	0.00E-01	9.03E-06	1.57E-06	7.02E-09
1	0.1	180.	2.23E+02	-	0.5	8.40E+07	0.00E-01	-	0.0	0.00E-01	7.15E-06	0.00E-01	0.00E-01

FIGURE 4.3.4

Lesson 3 - Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:30  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA (uR/HR)	D.R. INF THY DO (R/HR)	GAMMA (SEC/M**3)	I/Q DEPLETED (SEC/M**3)	I/Q DEPOSITION (1/M**2)
0.60	180.	09:37	2.648E+02	0.000E-01	8.479E-06	1.946E-08	8.710E-11
1.00	180.	09:42	2.875E+02	0.000E-01	9.208E-06	7.700E-07	3.442E-09
2.00	180.	09:54	2.369E+02	0.000E-01	7.585E-06	3.019E-06	1.350E-08
3.00	180.	10:06	1.819E+02	0.000E-01	5.824E-06	3.223E-06	1.441E-08
4.00	180.	10:18	1.441E+02	0.000E-01	4.615E-06	2.894E-06	1.294E-08
5.00	180.	10:30	1.178E+02	0.000E-01	3.774E-06	2.509E-06	1.122E-08
6.00	180.	10:42	9.888E+01	0.000E-01	3.166E-06	2.168E-06	9.694E-09
7.00	180.	10:54	8.479E+01	0.000E-01	2.712E-06	1.884E-06	8.423E-09
8.00	180.	11:06	7.374E+01	0.000E-01	2.361E-06	1.650E-06	7.376E-09
9.00	180.	11:18	6.505E+01	0.000E-01	2.083E-06	1.451E-06	6.510E-09
10.00	180.	11:30	5.804E+01	0.000E-01	1.858E-06	1.295E-06	5.789E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC GAMMA DOSE (uR)	2 HR SHEL GAMMA DOSE (uR)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (uR)	4 HR SHEL GAMMA DOSE (uR)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	180.	5.296E+02	4.766E+02	0.000E-01	0.000E-01	0.60	180.	8.288E+02	4.532E+02	0.000E-01	0.000E-01
1.00	180.	5.751E+02	5.176E+02	0.000E-01	0.000E-01	1.00	180.	8.761E+02	1.035E+03	0.000E-01	0.000E-01
2.00	180.	4.737E+02	4.264E+02	0.000E-01	0.000E-01	2.00	180.	6.743E+02	8.527E+02	0.000E-01	0.000E-01
3.00	180.	3.638E+02	3.274E+02	0.000E-01	0.000E-01	3.00	180.	5.432E+02	6.548E+02	0.000E-01	0.000E-01
4.00	180.	2.882E+02	2.594E+02	0.000E-01	0.000E-01	4.00	180.	4.016E+02	5.188E+02	0.000E-01	0.000E-01
5.00	180.	2.357E+02	2.121E+02	0.000E-01	0.000E-01	5.00	180.	3.048E+02	4.242E+02	0.000E-01	0.000E-01
6.00	180.	1.978E+02	1.780E+02	0.000E-01	0.000E-01	6.00	180.	2.686E+02	3.560E+02	0.000E-01	0.000E-01
7.00	180.	1.694E+02	1.525E+02	0.000E-01	0.000E-01	7.00	180.	2.132E+02	3.049E+02	0.000E-01	0.000E-01
8.00	180.	1.475E+02	1.327E+02	0.000E-01	0.000E-01	8.00	180.	1.708E+02	2.655E+02	0.000E-01	0.000E-01
9.00	180.	1.301E+02	1.171E+02	0.000E-01	0.000E-01	9.00	180.	1.377E+02	2.342E+02	0.000E-01	0.000E-01
10.00	180.	1.112E+02	1.045E+02	0.000E-01	0.000E-01	10.00	180.	1.112E+02	2.089E+02	0.000E-01	0.000E-01

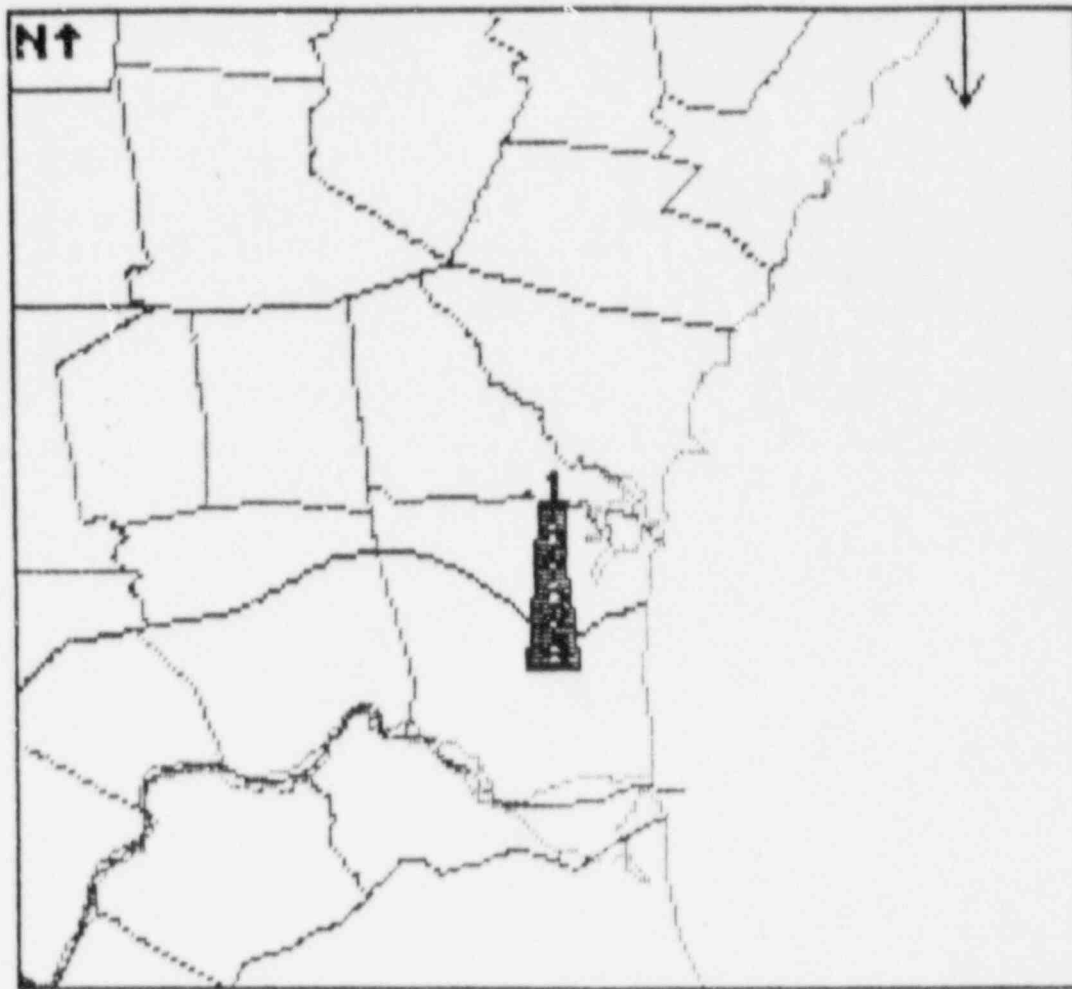
\* SHELTER - SALISBURY, HAMPTON, HAMPTON FALLS  
 \* SHELTER - SEABROOK

DIST (MI)	ANG (DEG)	6 HR EVAC GAMMA DOSE (uR)	6 HR SHEL GAMMA DOSE (uR)	6 HR EVAC INF THY DO (R)	6 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (uR)	8 HR SHEL GAMMA DOSE (uR)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	180.	8.288E+02	1.430E+03	0.000E-01	0.000E-01	0.60	180.	8.288E+02	1.906E+03	0.000E-01	0.000E-01
1.00	180.	8.761E+02	1.553E+03	0.000E-01	0.000E-01	1.00	180.	8.761E+02	2.070E+03	0.000E-01	0.000E-01
2.00	180.	6.743E+02	1.279E+03	0.000E-01	0.000E-01	2.00	180.	6.743E+02	1.705E+03	0.000E-01	0.000E-01
3.00	180.	5.432E+02	9.822E+02	0.000E-01	0.000E-01	3.00	180.	5.432E+02	1.310E+03	0.000E-01	0.000E-01
4.00	180.	4.016E+02	7.781E+02	0.000E-01	0.000E-01	4.00	180.	4.016E+02	1.038E+03	0.000E-01	0.000E-01
5.00	180.	3.048E+02	6.363E+02	0.000E-01	0.000E-01	5.00	180.	3.048E+02	8.485E+02	0.000E-01	0.000E-01
6.00	180.	2.686E+02	5.340E+02	0.000E-01	0.000E-01	6.00	180.	2.686E+02	7.119E+02	0.000E-01	0.000E-01
7.00	180.	2.132E+02	4.574E+02	0.000E-01	0.000E-01	7.00	180.	2.132E+02	6.099E+02	0.000E-01	0.000E-01
8.00	180.	1.708E+02	3.982E+02	0.000E-01	0.000E-01	8.00	180.	1.708E+02	5.309E+02	0.000E-01	0.000E-01
9.00	180.	1.377E+02	3.513E+02	0.000E-01	0.000E-01	9.00	180.	1.377E+02	4.684E+02	0.000E-01	0.000E-01
10.00	180.	1.112E+02	3.134E+02	0.000E-01	0.000E-01	10.00	180.	1.112E+02	4.179E+02	0.000E-01	0.000E-01

\* SHELTER - SALISBURY, NEWBURYPORT, NEWBURY  
 \* SHELTER - W. NEWBURY, AMESBURY, S. HAMPTON  
 \* SHELTER - KENNINGTON, N. HAMPTON, HAMPTON  
 \* SHELTER - HAMPTON FALLS, SEABROOK

FIGURE 4.3.5

Lesson 3 - Plume Projection Output



- FUNCTION KEYS
- 1-RADIUS
  - 2-ROADS
  - 3-PUBLIC
  - 4-LABELS
  - 5-ZOOM
  - 6-REDRAW
  - 7-
  - 8-LT PEN
  - 9-PRINT
  - 10-EXIT

ELU GAM  
 T=09:45  
 5.0 MPH  
 0 DEG  
 E STAB  
 ←→20.00MI

— STATE  
 — TOWNS  
 — RIVER  
 — ROADS

FIGURE 4.3.6

Lesson 3 - Graphics Output

DO YOU WISH TO SAVE THE LAST BATCH EXECUTION? Y

FIGURE 4.3.7

Lesson 3 - Eighth Input Screen

#### 4.4 Lesson 4

##### Learning Objectives

1. Update projections using Option 4 and the program's editing capabilities to produce a "real-time picture" of the plume.

##### Scenario

It is 0931. State officials have already been provided with dose projections for 0930 and 0945. The stack continues to read as shown in Figure 4.4.1. The 0930 met data indicates a change in wind speed and wind direction as noted below:

Upper 6 mph 40 deg

Lower 3 mph 40 deg

Show the officials where the plume was at 0930.

##### Lesson

1. The displayed current analysis time shown on Screen 1 is 0945. The 0945 and 0930 projections must be eliminated before continuing the real-time analysis.
2. Use Option 4 (Eliminate Last 1/4 Hour of Accident) to eliminate the 0945 projection. Enter "4" followed by a (Return) and note that the end time of analysis changes from 0945 to 0930.
3. The 0945 projection has been eliminated. Do not use Option 4 again to eliminate the 0930 projection. Use Option 2 and change the time on Screen 2 from 0945 to 0930 (as was done in Lesson 2).
4. Enter the new met data and execute "RUN."

5. Note that if Option 4 (Eliminate Last 1/4 Hour of Accident) had been used instead of Option 2 (Continue Accident) the stack monitor reading and the wind direction would have required editing as well as the wind speeds. Use of Option 2 saved three additional input steps.
  
6. Your map should resemble the one attached to the lesson.

#### Summary

The use of Option 4 (Eliminate Last 1/4 Hour of Accident) was illustrated in this lesson. Use Option 4 when more than one projection has been made and current met data becomes available. Option 2 and the edit mode should be used to change the first projection time of analysis to that of the latest met data. This procedure minimizes the amount of new data that must be input (since the met data is not likely to change by much, if at all).

	<u>9:30</u>
Wind Speed (Mph)	6
Wind Direction (Deg)	40
Delta Temperature (Deg F)	0
Precipitation (inch/Qtr Hr)	0
Solar Radiation (ly/min)	.55
Stack Concentration (uCi/cc)	2
Stack Release Rate (uCi/sec)	2.6E8
Loca Type	3
Field Team Dose Rate (mR/hr)	
Field Team Location (mi)	
Gross Iodine (uCi/cc)	

FIGURE 4.4.1

Lesson 4 - Stack Readings and Times



	START	OF	END	OF
	MO/DA/YR	HR:MN	MO/DA/YR	HR:MN
SHUTDOWN	10/23/87	9: 0		
STACK RELEASE	10/23/87	9: 5		
ANALYSIS	10/23/87	9:15	10/23/87	9:30

- 1- START NEW ACCIDENT
- 2- CONTINUE ACCIDENT WITH STRAIGHTLINE PAGES
- 3- CONTINUE ACCIDENT WITHOUT STRAIGHTLINE PAGES
- 4- ELIMINATE LAST 1/4 HOUR ANALYSIS
- 5- VIEW PLOT
- 6- OBTAIN PRINTOUT
- 7- BATCH EXECUTION
- 8- CALCULATE TOTAL INTEGRATED DOSE
- 9- OBTAIN TID PRINTOUT
- 0- QUIT

FIGURE 4.4.2

Lesson 4 - First Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:30

STAG

MET DATA  
UPPER : WIND SPEED 6.00 MPH  
WIND DIRECTION 40.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/DTR HR  
SOLAR RADIATION : 0.55 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 2 1 OR 3

DATE SCREEN RAD SCREEN RUN

FIGURE 4.4.3

Lesson 4 - Fourth Input Screen

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:30

SEABROOK STATION  
 PLUME POSITION AT 09:30  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87, 09:15 TO 10/23/87, 09:30)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE			PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	6.0	2.68	40.	NE	DEG F/DH	DEG C/100M	STAB	0.00	0.55

RADIOLOGICAL: (FROM 10/23/87, 09:15 TO 10/23/87, 09:30)

LOCA = 3  
 STACK CONCENTRATION 2.0000E+00 uCi/CC STACK RELEASE RATE 2.6000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SIIE BOUNDARY INFORMATION AT 09:30 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 9.04E+01 mR TOTAL ACCUMULATED THYROID DOSE 0.00E-01 R  
 TOTAL CURIES RELEASED 9.82E+04 Ci TOTAL CURIES IODINE RELEASED 0.00E-01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS					
			MODEL (mR/hr)	FIELD (mR/hr)	COR MI	WIDTH MI	REL RATE (uCi/sec)	ISO USE	MODEL (R/hr)	FIELD (R/hr)	COR MI	WIDTH MI	REL RATE (uCi/sec)	ISO USE	GAMMA (g/M**3)	I/W DEP. (g/M**3)	I/W DEPOSITION (g/M**2)	
0	0.6	220.	2.28E+02	-	0.5	7.64E+07	0.00E-01	-	0.2	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	7.33E-06	2.31E-08	1.24E-10

PLUME POINT INFORMATION AT 09:30 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS					
			MODEL (mR/hr)	FIELD (mR/hr)	COR MI	WIDTH MI	REL RATE (uCi/sec)	ISO USE	MODEL (R/hr)	FIELD (R/hr)	COR MI	WIDTH MI	REL RATE (uCi/sec)	ISO USE	GAMMA (g/M**3)	I/W DEP. (g/M**3)	I/W DEPOSITION (g/M**2)	
3	2.3	206.	1.09E+02	-	0.8	3.27E+07	0.00E-01	-	0.7	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	6.93E-06	3.02E-06	1.12E-08
2	1.5	220.	2.43E+02	-	0.6	7.64E+07	0.00E-01	-	0.4	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	7.82E-06	2.23E-06	1.19E-08
1	0.1	220.	1.92E+02	-	0.5	7.64E+07	0.00E-01	-	0.0	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	6.16E-06	0.00E-01	0.00E-01

FIGURE 4.4.4

Lesson 4 - 9:30 Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:15  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (R/HR)	INF THY DR (R/HR)	GAMMA I/Q (SEC/M**3)	DEPLETED I/Q (SEC/M**3)	DEPOSITION (I/M**2)
0.60	220.	09:21	2.280E+02	0.000E-01	7.334E-06	2.310E-08	1.239E-10
1.00	220.	09:25	2.452E+02	0.000E-01	7.898E-06	7.626E-07	4.091E-09
2.00	220.	09:35	1.993E+02	0.000E-01	6.410E-06	2.715E-06	1.456E-08
3.00	220.	09:45	1.522E+02	0.000E-01	4.896E-06	2.822E-06	1.514E-08
4.00	220.	09:55	1.203E+02	0.000E-01	3.870E-06	2.501E-06	1.342E-08
5.00	220.	10:05	9.824E+01	0.000E-01	3.160E-06	2.152E-06	1.154E-08
6.00	220.	10:15	8.236E+01	0.000E-01	2.649E-06	1.850E-06	9.925E-09
7.00	220.	10:25	7.050E+01	0.000E-01	2.268E-06	1.602E-06	8.591E-09
8.00	220.	10:35	6.135E+01	0.000E-01	1.973E-06	1.398E-06	7.501E-09
9.00	220.	10:45	5.410E+01	0.000E-01	1.740E-06	1.231E-06	6.606E-09
10.00	220.	10:55	4.825E+01	0.000E-01	1.552E-06	1.093E-06	5.863E-09

PROTECTIVE ACTION RECOMMENDATIONS

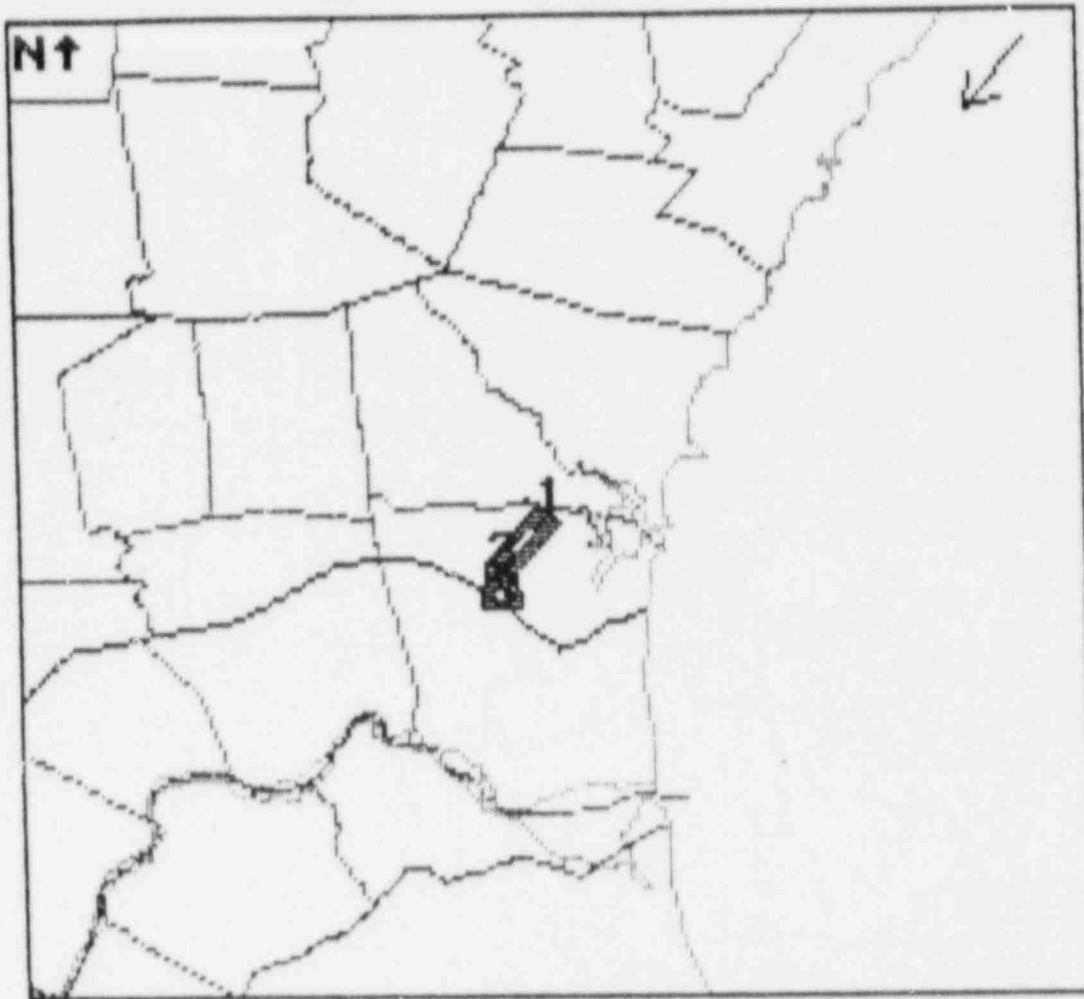
2 HR EVAC					4 HR EVAC						
DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	INF THY DR (R/HR)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	INF THY DR (R/HR)		
0.60	220.	4.560E+02	4.104E+02	0.000E-01	0.000E-01	0.60	220.	6.605E+02	6.209E+02	0.000E-01	0.000E-01
1.00	220.	4.911E+02	4.420E+02	0.000E-01	0.000E-01	1.00	220.	6.949E+02	6.539E+02	0.000E-01	0.000E-01
2.00	220.	3.986E+02	3.587E+02	0.000E-01	0.000E-01	2.00	220.	5.308E+02	7.174E+02	0.000E-01	0.000E-01
3.00	220.	3.044E+02	2.740E+02	0.000E-01	0.000E-01	3.00	220.	4.318E+02	5.480E+02	0.000E-01	0.000E-01
4.00	220.	2.406E+02	2.165E+02	0.000E-01	0.000E-01	4.00	220.	3.712E+02	4.331E+02	0.000E-01	0.000E-01
5.00	220.	1.965E+02	1.768E+02	0.000E-01	0.000E-01	5.00	220.	2.459E+02	2.537E+02	0.000E-01	0.000E-01
6.00	220.	1.647E+02	1.482E+02	0.000E-01	0.000E-01	6.00	220.	2.196E+02	2.956E+02	0.000E-01	0.000E-01
7.00	220.	1.410E+02	1.269E+02	0.000E-01	0.000E-01	7.00	220.	1.763E+02	2.538E+02	0.000E-01	0.000E-01
8.00	220.	1.227E+02	1.104E+02	0.000E-01	0.000E-01	8.00	220.	1.431E+02	2.208E+02	0.000E-01	0.000E-01
9.00	220.	1.087E+02	9.738E+01	0.000E-01	0.000E-01	9.00	220.	1.172E+02	1.948E+02	0.000E-01	0.000E-01
10.00	220.	9.650E+01	8.685E+01	0.000E-01	0.000E-01	10.00	220.	9.650E+01	1.737E+02	0.000E-01	0.000E-01

6 HR EVAC					8 HR EVAC						
DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	INF THY DR (R/HR)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	INF THY DR (R/HR)		
0.60	220.	6.605E+02	1.231E+03	0.000E-01	0.000E-01	0.60	220.	6.605E+02	1.642E+03	0.000E-01	0.000E-01
1.00	220.	6.949E+02	1.326E+03	0.000E-01	0.000E-01	1.00	220.	6.949E+02	1.788E+03	0.000E-01	0.000E-01
2.00	220.	5.308E+02	1.076E+03	0.000E-01	0.000E-01	2.00	220.	5.308E+02	1.435E+03	0.000E-01	0.000E-01
3.00	220.	4.318E+02	8.220E+02	0.000E-01	0.000E-01	3.00	220.	4.318E+02	1.096E+03	0.000E-01	0.000E-01
4.00	220.	3.712E+02	6.496E+02	0.000E-01	0.000E-01	4.00	220.	3.712E+02	8.663E+02	0.000E-01	0.000E-01
5.00	220.	2.459E+02	5.305E+02	0.000E-01	0.000E-01	5.00	220.	2.459E+02	7.072E+02	0.000E-01	0.000E-01
6.00	220.	2.196E+02	4.447E+02	0.000E-01	0.000E-01	6.00	220.	2.196E+02	5.930E+02	0.000E-01	0.000E-01
7.00	220.	1.763E+02	3.807E+02	0.000E-01	0.000E-01	7.00	220.	1.763E+02	5.076E+02	0.000E-01	0.000E-01
8.00	220.	1.431E+02	3.313E+02	0.000E-01	0.000E-01	8.00	220.	1.431E+02	4.417E+02	0.000E-01	0.000E-01
9.00	220.	1.172E+02	2.921E+02	0.000E-01	0.000E-01	9.00	220.	1.172E+02	3.895E+02	0.000E-01	0.000E-01
10.00	220.	9.650E+01	2.606E+02	0.000E-01	0.000E-01	10.00	220.	9.650E+01	3.474E+02	0.000E-01	0.000E-01

- \* SHELTER - SALISBURY, NEWBURYPORT, NEWBURY
- \* SHELTER - W. NEWBURY, MERRIMAC, AMESBURY
- \* SHELTER - NEWTON, S. HAMPTON, KENSINGTON
- \* SHELTER - W. HAMPTON, HAMPTON, HAMPTON FALLS
- \* SHELTER - SEABROOK

FIGURE 4.4.5

Lesson 4 - 9:30 Plume Projection Output



- FUNCTION KEYS
- 1-RADIUS
  - 2-ROADS
  - 3-PUBLIC
  - 4-LABELS
  - 5-ZOOM
  - 6-REDRAW
  - 7-
  - 8-LT PEN
  - 9-PRINT
  - 10-EXIT

ELU GAM  
 T=09:30  
 6.0 MPH  
 40 DEG  
 E STAB  
 ↔20.00MI

- STATE
- TOWNS
- RIVER
- ROADS

FIGURE 4.4.6

Lesson 4 - 9:30 Graphics Output

## 4.5 Lesson 5

### Learning Objectives

1. Use average or maximum radiation levels for input to the program.
2. Produce projections with new met and rad data by using Batch Option 2, "Project Using Current Analysis With User Input Met and Rad Data."
3. Use field team readings to produce a corrected dose.

### Scenario

It is 0935 and the stack monitor is as shown in Figure 4.5.1. The 0931 stack reading and field team reading is also shown in Figure 4.5.1. A new projection for 0945 is required.

### Lesson

1. This lesson re-emphasizes the fact that meteorological data is averaged over 15-minute intervals. Radiological data is available continuously.
2. Select Batch Execution by typing 7 (Return), then select user input met and rad data by pressing 2 (Return).
3. Since the new projection is needed for 0945 only, specify 1 quarter-hour by pressing 1 (Return). Screens 3 and 4 will now appear as before.
4. Use the stack and field team readings as shown in Figure 4.5.1 (or use an average) and make a projection for 0945.

5. Use the 0930 met data (it's all you have!) and assume persistence.
6. Save the data base so that the projection is available in real-time mode.

### Summary

This lesson emphasizes again the fact that met data is averaged over 15-minute intervals. Radiological data is available instantaneously and therefore must be averaged by the METPAC operator.

Projections with different met and rad data can be made by using Batch Option 2. Note that projections of up to 31 quarter-hours can be made at a time.

Field team readings can be entered at any time to produce corrected dose readings.

	<u>9:31</u>	<u>9:35</u>
Wind Speed (Mph)		
Wind Direction (Deg)		
Delta Temperature (Deg F)		
Precipitation (inch/Qtr Hr)		
Solar Radiation (ly/min)		
Stack Concentration (uCi/cc)	2.5	3.0
Stack Release Rate (uCi/sec)	3.2E8	3.9E8
Loca Type		
Field Team Dose Rate (mR/hr)	200	
Field Team Location (mi)	1.6	
Gross Iodine (uCi/cc)	0	

FIGURE 4.5.1

Lesson 5 - Stack Readings and Times



- 1- PROJECT USING CURRENT ANALYSIS WITH PERSISTENT MET AND RAD DATA
- 2- PROJECT USING CURRENT ANALYSIS WITH USER INPUT MET AND RAD DATA
- 3- PROJECT USING NEW DATA
- 4- RETURN TO LAST SCREEN

FIGURE 4.5.2

Lesson 5 - Sixth Input Screen

TOTAL NUMBER OF QUARTER HOURS TO EXECUTE ( 1 - 32) ? 1

FIGURE 4.5.3

Lesson 5 - Seventh Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:45

STACK

FIELD TEAM DOSE RATE	200.00	MR/HR
FIELD TEAM LOCATION	1.60	MILE
GROSS IODINE	0.000E-01	uCi/CC

STACK :	STACK CONCENTRATION	3.000E+00	uCi/CC
	STACK RELEASE RATE	3.900E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	0	0-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		

FIGURE 4.5.4

Lesson 5 - Third Input Screen

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN

SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:45

SEABROOK STATION  
 PLUME POSITION AT 09:45  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

TOWER LEVEL	WIND SPEED		WIND DIR (FROM)		DELTA TEMPERATURE			PRECIPITATION	SOLAR RADIATION
	(MPH)	(M/S)	DEG	SECTOR	DEG F/DH	DEG C/100M	STAB	IN/15 MIN	LANGLEY/MIN
ELEVATED	6.0	2.68	40.	NE	0.0	0.0	E	0.00	0.55

RADIOLOGICAL: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

LOCA = 3  
 FIELD TEAM DOSE RATE 2.0000E+02 MR/HR  
 FIELD TEAM GROSS IODINE 0.0000E+00 uCi/CC  
 FIELD TEAM LOCATION 1.6 MILES  
 STACK CONCENTRATION 3.0000E+00 uCi/CC STACK RELEASE RATE 3.5000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:45 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 1.76E+02 MR TOTAL ACCUMULATED THYROID DOSE 0.00E-01 R  
 TOTAL CURIES RELEASED 2.12E+05 Ci TOTAL CURIES IODINE RELEASED 0.00E-01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (MR/hr)	FIELD (MR/hr)	COR MI	WIDTH REL (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR MI	WIDTH REL (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
0	0.6	220.	3.44E+02	2.08E+02	0.5	1.26E+08	0.00E-01	-	0.2	0.00E-01	7.33E-06	2.31E-08	1.24E-10

PLUME POINT INFORMATION AT 09:45 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (MR/hr)	FIELD (MR/hr)	COR MI	WIDTH REL (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR MI	WIDTH REL (uCi/sec) USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
4	3.7	212.	7.54E+01	4.57E+01	1.1	3.27E+07	0.00E-01	-	1.0	0.00E-01	4.79E-06	2.96E-06	1.59E-08
3	3.0	220.	1.63E+02	9.87E+01	0.9	7.84E+07	0.00E-01	-	0.8	0.00E-01	5.25E-06	3.02E-06	1.62E-08
2	1.5	220.	3.42E+02	2.07E+02	0.6	1.26E+08	0.00E-01	-	0.4	0.00E-01	7.31E-06	2.08E-06	1.12E-08
1	0.1	220.	2.89E+02	1.75E+02	0.5	1.26E+08	0.00E-01	-	0.0	0.00E-01	6.16E-06	0.00E-01	0.00E-01

FIGURE 4.5.5

Lesson 5 - Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:30  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA (uR/HR)	D.R. (R/HR)	INF THY DO (R)	GAMMA (SEC/M**3)	I/Q DEFLETED (SEC/M**3)	I/Q DEPOSITION (1/M**2)
0.60	220.	09:36	3.436E+02	0.000E-01	0.000E-01	7.334E-06	2.310E-08	1.239E-10
1.00	220.	09:40	3.699E+02	0.000E-01	0.000E-01	7.898E-06	7.626E-07	4.091E-09
2.00	220.	09:50	3.003E+02	0.000E-01	0.000E-01	6.410E-06	2.715E-06	1.456E-08
3.00	220.	10:00	2.294E+02	0.000E-01	0.000E-01	4.896E-06	2.822E-06	1.514E-08
4.00	220.	10:10	1.813E+02	0.000E-01	0.000E-01	3.870E-06	2.501E-06	1.342E-08
5.00	220.	10:20	1.480E+02	0.000E-01	0.000E-01	3.160E-06	2.152E-06	1.154E-08
6.00	220.	10:30	1.241E+02	0.000E-01	0.000E-01	2.649E-06	1.850E-06	9.925E-09
7.00	220.	10:40	1.062E+02	0.000E-01	0.000E-01	2.268E-06	1.602E-06	8.591E-09
8.00	220.	10:50	9.243E+01	0.000E-01	0.000E-01	1.973E-06	1.398E-06	7.501E-09
9.00	220.	11:00	8.151E+01	0.000E-01	0.000E-01	1.740E-06	1.231E-06	6.606E-09
10.00	220.	11:10	7.270E+01	0.000E-01	0.000E-01	1.552E-06	1.093E-06	5.863E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC		2 HR SHEL		DIST (MI)	ANG (DEG)	4 HR EVAC		4 HR SHEL	
		GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)			GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)
0.60	220.	6.871E+02	6.184E+02	0.000E-01	0.000E-01	0.60	220.	1.081E+03	1.237E+03	0.000E-01	0.000E-01
1.00	220.	7.399E+02	6.659E+02	0.000E-01	0.000E-01	1.00	220.	1.139E+03	1.332E+03	0.000E-01	0.000E-01
2.00	220.	6.005E+02	5.405E+02	0.000E-01	0.000E-01	2.00	220.	8.748E+02	1.081E+03	0.000E-01	0.000E-01
3.00	220.	4.587E+02	4.128E+02	0.000E-01	0.000E-01	3.00	220.	7.079E+02	8.257E+02	0.000E-01	0.000E-01
4.00	220.	3.625E+02	3.263E+02	0.000E-01	0.000E-01	4.00	220.	5.293E+02	6.525E+02	0.000E-01	0.000E-01
5.00	220.	2.960E+02	2.664E+02	0.000E-01	0.000E-01	5.00	220.	4.075E+02	5.329E+02	0.000E-01	0.000E-01
6.00	220.	2.482E+02	2.234E+02	0.000E-01	0.000E-01	6.00	220.	3.619E+02	4.467E+02	0.000E-01	0.000E-01
7.00	220.	2.125E+02	1.912E+02	0.000E-01	0.000E-01	7.00	220.	2.921E+02	3.824E+02	0.000E-01	0.000E-01
8.00	220.	1.849E+02	1.664E+02	0.000E-01	0.000E-01	8.00	220.	2.388E+02	3.328E+02	0.000E-01	0.000E-01
9.00	220.	1.630E+02	1.467E+02	0.000E-01	0.000E-01	9.00	220.	1.970E+02	2.904E+02	0.000E-01	0.000E-01
10.00	220.	1.454E+02	1.309E+02	0.000E-01	0.000E-01	10.00	220.	1.636E+02	2.617E+02	0.000E-01	0.000E-01

- \* SHELTER - SALISBURY, NEWBURYPORT, NEWBURY
- \* SHELTER - W. NEWBURY, MERRIMAC, AMESBURY
- \* SHELTER - NEWTON, S. HAMPTON, KENSINGTON
- \* SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* SHELTER - SEABROOK

DIST (MI)	ANG (DEG)	6 HR EVAC		6 HR SHEL		DIST (MI)	ANG (DEG)	8 HR EVAC		8 HR SHEL	
		GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)			GAMMA DOSE (uR)	GAMMA DOSE (uR)	INF THY DO (R)	INF THY DO (R)
0.60	220.	1.081E+03	1.855E+03	0.000E-01	0.000E-01	0.60	220.	1.081E+03	2.474E+03	0.000E-01	0.000E-01
1.00	220.	1.139E+03	1.998E+03	0.000E-01	0.000E-01	1.00	220.	1.139E+03	2.664E+03	0.000E-01	0.000E-01
2.00	220.	8.748E+02	1.621E+03	0.000E-01	0.000E-01	2.00	220.	8.748E+02	2.162E+03	0.000E-01	0.000E-01
3.00	220.	7.079E+02	1.239E+03	0.000E-01	0.000E-01	3.00	220.	7.079E+02	1.651E+03	0.000E-01	0.000E-01
4.00	220.	5.293E+02	9.788E+02	0.000E-01	0.000E-01	4.00	220.	5.293E+02	1.305E+03	0.000E-01	0.000E-01
5.00	220.	4.075E+02	7.993E+02	0.000E-01	0.000E-01	5.00	220.	4.075E+02	1.066E+03	0.000E-01	0.000E-01
6.00	220.	3.619E+02	6.701E+02	0.000E-01	0.000E-01	6.00	220.	3.619E+02	8.934E+02	0.000E-01	0.000E-01
7.00	220.	2.921E+02	5.736E+02	0.000E-01	0.000E-01	7.00	220.	2.921E+02	7.649E+02	0.000E-01	0.000E-01
8.00	220.	2.388E+02	4.991E+02	0.000E-01	0.000E-01	8.00	220.	2.388E+02	6.655E+02	0.000E-01	0.000E-01
9.00	220.	1.970E+02	4.402E+02	0.000E-01	0.000E-01	9.00	220.	1.970E+02	5.869E+02	0.000E-01	0.000E-01
10.00	220.	1.636E+02	3.926E+02	0.000E-01	0.000E-01	10.00	220.	1.636E+02	5.234E+02	0.000E-01	0.000E-01

- \* SHELTER - SALISBURY, NEWBURYPORT, NEWBURY
- \* SHELTER - W. NEWBURY, MERRIMAC, AMESBURY
- \* SHELTER - NEWTON, S. HAMPTON, KENSINGTON
- \* SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* SHELTER - SEABROOK

FIGURE 4.5.6

Lesson 5 - Plume Projection Output

#### 4.0 EXAMPLES

The following lessons provide examples of how to run METPAC. Lesson 1 helps the user to start running METPAC using best available data. Lesson 2 explains how to edit the input screen updating the meteorological data. Lesson 3 aids the user in producing a plume projection. Lesson 4 describes how to eliminate a projection and update an analysis. Lesson 5 addresses how to deal with instantaneous dose monitor measurements. Lesson 6 shows how to enter isotopic information. Lesson 7 shows how to update an error in data. Lesson 8 shows how to deal with plume segments that are overlapping. Lesson 9 deals with terminating a release. Lesson 10 deals with starting an analysis after the release had started. Lesson 11 provides an example of a what-if analysis; a containment venting analysis.

Each lesson has attached a printout of how the input and output should appear. Lessons 1 through 9 are designed to be executed in sequence.

## 4.1 Lesson 1

### Learning Objectives

1. Input required date to METPAC.
2. Use best available (current) meteorological data to make initial projections of off-site dose rates.

### Scenario

There has been an incident at the plant. The reactor was shutdown at 0900. At 0905 the stack was reported to be reading as shown in Figure 4.1.1. You have arrived at the METPAC terminal at 0907 and have been requested to determine the off-site dose rates. Figure 4.1.1 contains all available meteorological and radiological data as of the indicated times.

Time is now 0907. Tell the EOF coordinator the off-site doses!

### Lesson

1. The following lesson should generate the same screens and output as those attached to this lesson plan.
2. Type in: METPAC (return)
3. Select "START NEW ACCIDENT" by typing: 1 (return) then: Y
4. Enter the relevant dates by typing:

Month,+,Day,+,Year,+,9,+,0,+,+,+,+,Month,+,Day,+,Year,+,9,+,5,+,+,  
(Return)

5. Note: On the second screen, only the date and time of the stack release are entered since we are assuming this is the only pathway. Select next screen by moving the cursor via the cursor pad to the words "NEXT SCREEN" and pressing (Return).

6. Enter the radiological data. When finished, move the cursor using the cursor pad, to the words "MET SCREEN" and press (Return).
7. Note: The third screen requires information on stack dose rate, etc.
8. Enter the meteorological data. When finished, move the cursor, using the cursor pad, to the word "RUN" and press (Return).
9. Note: The fourth screen requires information on wind speed, direction, etc.
10. The pertinent off-site dose rate information is produced along with a map of the plume. Note that these are projected results of where the plume will be at 0915 based on the best meteorological data available; i.e., the data from 0900. The real time analysis must be performed with the 0915 met data which is not available yet.
11. Note that the length of the plume segment corresponds to the length of a ten-minute release.
12. Exercise map options (F1) through (F6) at this time.
13. Type: (F10)
14. The procedure to follow when new met data becomes available is demonstrated in the next lesson.

### Summary

This lesson demonstrated what data is needed to run METPAC. Since meteorological data is averaged over a 15-minute period, you must wait until the end of each quarter-hour for current meteorological parameters. However, one can assume persistence of met conditions and make a projection at any time using the appropriate radiological data and the last quarter-hour met conditions.



	<u>9:00</u>
Wind Speed (Mph)	5
Wind Direction (Deg)	180°
Delta Temperature (Deg F)	0
Precipitation (inch/Qtr Hr)	0
Solar Radiation (ly/min)	.5
Stack Concentration (uCi/cc)	1
Stack Release Rate (uCi/sec)	1.3E8
Loca Type	3
Field Team Dose Rate (mR/hr)	
Field Team Location (mi)	
Gross Iodine (uCi/cc)	

FIGURE 4.1.1

Lesson 1 - Readings and Times

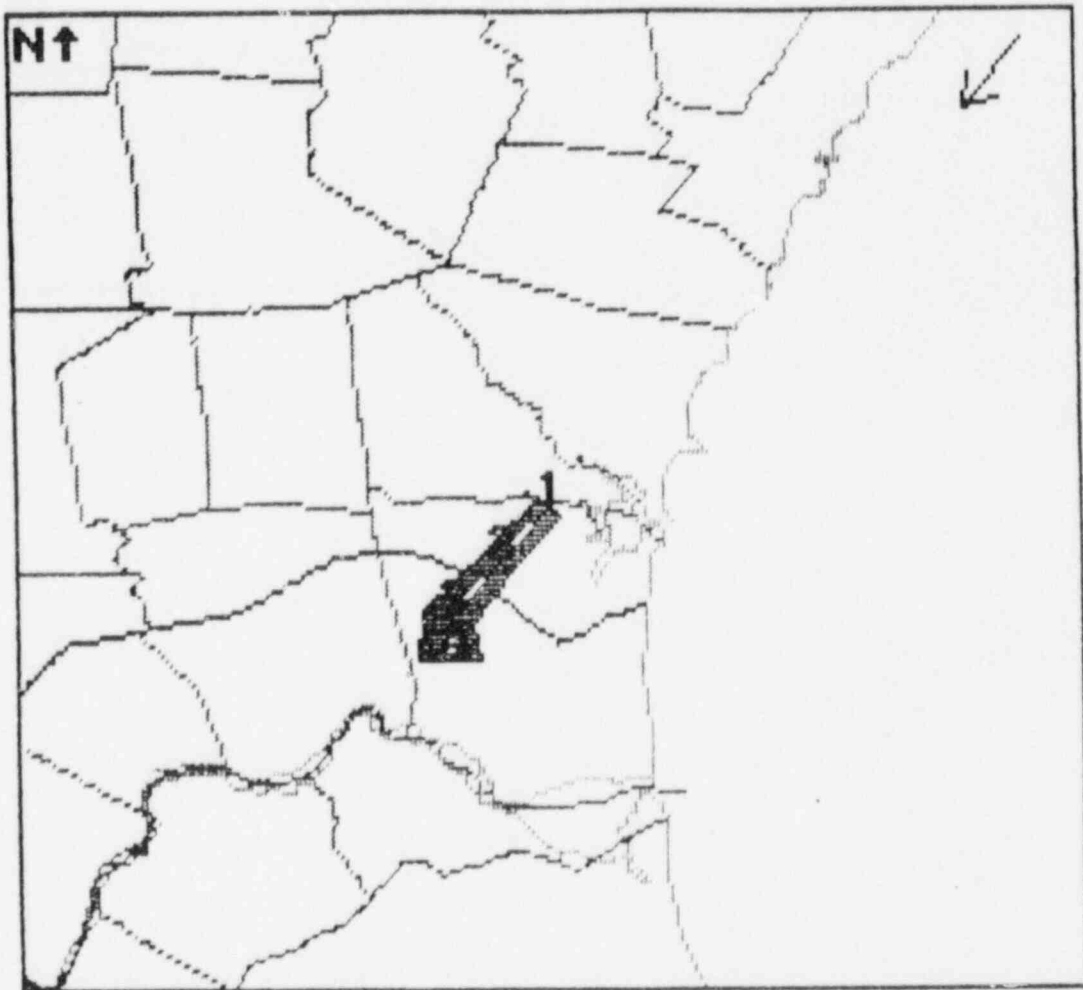
PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
SHUTDOWN	10/23/87	09:00
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
STACK RELEASE	10/23/87	09:05

LAST SCREEN  
NEXT SCREEN

FIGURE 4.1.3

Lesson 1 - Second Input Screen



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

ELU GAM  
T=09:45  
6.0 MPH  
40 DEG  
E STA  
↔20.00MI  
— STATE  
— TOWNS  
- - - RIVER  
— ROADS

FIGURE 4.5.7

Lesson 5 - Graphics Output

DO YOU WISH TO SAVE THE LAST BATCH EXECUTION? Y

FIGURE 4.5.8

Lesson 5 - Eighth Input Screen

## 4.6 Lesson 6

### Learning Objectives

Use stack air sample isotopic results (when available) to project doses.

### Scenario

It is 0940 (real time) and you have just been informed that stack range effluent sampler has been changed and analyzed. The concentration as shown in Figure 6.4.1 for the period 0905 through 0914.

### Lesson

1. On the first input screen, enter "2" and (Return). Note that on Screen 2, the time of analysis has advanced to 1000. Change it to 0915 and type (Return).
2. Move cursor to "Isotopics": Type Y and enter (Return).
3. Enter the I-131 concentration at the proper location on the screen; then position cursor to "EXIT" and type (Return).
4. The program returns to the rad data input screen. Position cursor to "MET SCREEN" and press (Return) two times. Change the monitor versus isotopic flag to 1. Position the cursor to "MET SCREEN" and press (Return) two times. Change the monitor versus isotopic flag to 1. Position the cursor to "MET SCREEN" and press (Return) two times.
5. The use of the isotopic input results in assigning a release rate for all time periods after 0905. The program will use this isotopic input in all subsequent projections and analyses.
6. A 0945 analysis has been produced which includes updated doses based on the isotopic analysis for time periods after 0905.

7. Note that all periods between 0915 and 0945 have been reanalyzed to show the new thyroid dose information.

### Summary

This exercise demonstrated the option to input isotopic air sample results, when available, to project thyroid doses. When the isotopic input option is used, the program assigns the release rate for all time periods after the sample is taken. If only iodine information is provided, then the thyroid release rate is based on those isotopics and the gamma release rate remains unchanged (based on monitor readings). If noble gas isotopics are entered, then the gamma release rate will be derived from those isotopics and the monitor readings will be used only to proportion the release rate in the following time periods. At any time, the user may select which calculational method is used.

Note that when subsequent quarter-hours are displayed for editing immediately after isotopes have been entered, the monitor versus isotopic flag is set to 0. The user must change this flag to 1 or 2 for the analysis to use the measured isotopic mixture. Failure to do so means the calculation will revert to the default isotopic mixtures for those quarter-hours whose monitor versus isotopic flags have not changed.

I 131

10

uCi/cc

FIGURE 4.6.1

Lesson 6 - Stack Readings and Times

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
ANALYSIS	10/23/87	09:15
LAST SCREEN		
NEXT SCREEN		

FIGURE 4.6.2

Lesson 6 - Second Input Screen



SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:15

STACK

FIELD TEAM DOSE RATE -1.00 MR/HR  
FIELD TEAM LOCATION -1.00 MILE  
GROSS IODINE -1.000E+00 uCi/CC

STACK : STACK CONCENTRATION 1.000E+00 uCi/CC  
STACK RELEASE RATE 1.000E+08 uCi/SEC  
ISOTOPICS Y Y / N  
MONITORED VS ISOTOPICS 0 0-MON/1-THY/2-GAM  
DATE SCREEN MET SCREEN

FIGURE 4.6.3

Lesson 6 - Third Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:15

STAT

ISOTOPIC INPUT SCREEN

ISOTOPIC	VALUE	UNITS	ISOTOPIC	VALUE	UNITS
I131	1.000E+01	uCi/CC	XE138	0.000E-01	uCi/CC
I132	0.000E-01	uCi/CC	CS134	0.000E-01	uCi/CC
I133	0.000E-01	uCi/CC	CS136	0.000E-01	uCi/CC
I134	0.000E-01	uCi/CC	CS137	0.000E-01	uCi/CC
I135	0.000E-01	uCi/CC	BA140	0.000E-01	uCi/CC
KR83M	0.000E-01	uCi/CC	LA140	0.000E-01	uCi/CC
KR85M	0.000E-01	uCi/CC	SR91	0.000E-01	uCi/CC
KR85	0.000E-01	uCi/CC	SR92	0.000E-01	uCi/CC
KR87	0.000E-01	uCi/CC	Y91	0.000E-01	uCi/CC
KR88	0.000E-01	uCi/CC	Y93	0.000E-01	uCi/CC
KR89	0.000E-01	uCi/CC	ZR95	0.000E-01	uCi/CC
XE131M	0.000E-01	uCi/CC	NB95	0.000E-01	uCi/CC
XE133M	0.000E-01	uCi/CC	NB97	0.000E-01	uCi/CC
XE133	0.000E-01	uCi/CC	RU103	0.000E-01	uCi/CC
XE135M	0.000E-01	uCi/CC	CE143	0.000E-01	uCi/CC
XE135	0.000E-01	uCi/CC	NP239	0.000E-01	uCi/CC
XE137	0.000E-01	uCi/CC			
CLEAR	EXIT				

FIGURE 4.6.4

Lesson 6 - Fifth Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
 ANALYSIS: DATE 10/23/87 TIME 09:15  
 FIELD TEAM DOSE RATE -1.00 MR/HR  
 FIELD TEAM LOCATION -1.00 MILE  
 GROSS IODINE -1.000E+00 uCi/CC

STAC

STACK : STACK CONCENTRATION 1.000E+00 uCi/CC  
 STACK RELEASE RATE 1.300E+08 uCi/SEC  
 ISOTOPICS Y Y / N  
 MONITORED VS ISOTOPICS 1 0-MON/1-THY/2-GAM  
 DATE SCREEN MET SCREEN

FIGURE 4.6.5

Lesson 6 - Third Input Screen After Isotopic Input

SHUTDOWN: DATE 10/23/87 TIME 09:00  
 ANALYSIS: DATE 10/23/87 TIME 09:30  
 FIELD TEAM DOSE RATE -1.00 MR/HR  
 FIELD TEAM LOCATION -1.00 MILE  
 GROSS IODINE -1.000E+00 uCi/CC

STAC

STACK : STACK CONCENTRATION 2.000E+00 uCi/CC  
 STACK RELEASE RATE 2.600E+08 uCi/SEC  
 ISOTOPICS N Y / N  
 MONITORED VS ISOTOPICS 1 0-MON/1-THY/2-GAM  
 DATE SCREEN MET SCREEN

FIGURE 4.6.6

Lesson 6 - Third Input Screen at 9:30

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:45

STACK

FIELD TEAM DOSE RATE	200.00	MR/HR
FIELD TEAM LOCATION	1.60	MILE
GROSS IODINE	0.000E-01	uCi/CC

STACK :	STACK CONCENTRATION	3.000E+00	uCi/CC
	STACK RELEASE RATE	3.900E+08	uCi/SEC
	ISOTOPICS	N	Y / N
DATE SCREEN	MONITORED VS ISOTOPICS	1	0-MON/1-THY/2-GAM
	MET SCREEN		PROMPT

FIGURE 4.6.7

Lesson 6 - Third Input Screen at 9:45

DATE AND TIME OF: NO/DA/YR HR:MN NO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:45

SEABROOK STATION  
 PLUME POSITION AT 09:45  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE DEG F/DM DEG C/100M STAB			PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	6.0	2.68	40.	NE	0.0	0.0	E	0.00	0.55

RADIOLOGICAL: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

LOCA = 3  
 FIELD TEAM DOSE RATE 2.0000E+02 MR/HR  
 FIELD TEAM GROSS IODINE 0.0000E+00 uCi/CC  
 FIELD TEAM LOCATION 1.6 MILES  
 STACK CONCENTRATION 3.0000E+00 uCi/CC STACK RELEASE RATE 3.9000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:45 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- GENERAL  
 TOTAL ACCUMULATED GAMMA DOSE 1.76E+02 mR TOTAL ACCUMULATED THYROID DOSE 7.11E+01 R  
 TOTAL CURIES RELEASED 2.12E+05 Ci TOTAL CURIES IODINE RELEASED 7.02E+06 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS		
			MODEL (uR/hr)	FIELD (uR/hr)	CONC (uCi/sec)	WIDTH (MI)	REL RATE USE	MODEL (R/hr)	FIELD (R/hr)	CONC (uCi/sec)	WIDTH (MI)	REL RATE USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
0	0.6	220.	3.44E+02	2.08E+02	0.5	1.26E+08	1.46E+02	-	0.2	3.90E+09	Y	7.33E-06	2.31E-08	1.24E-10	

PLUME POINT INFORMATION AT 09:45 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS		
			MODEL (uR/hr)	FIELD (uR/hr)	CONC (uCi/sec)	WIDTH (MI)	REL RATE USE	MODEL (R/hr)	FIELD (R/hr)	CONC (uCi/sec)	WIDTH (MI)	REL RATE USE	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (1/M**2)
4	3.7	212.	7.54E+01	4.57E+01	1.1	3.27E+07	6.23E+03	-	1.0	1.30E+09	Y	4.79E-06	2.96E-08	1.59E-08	
3	3.0	220.	1.63E+02	9.87E+01	0.9	7.64E+07	1.27E+04	-	0.8	2.60E+09	Y	5.75E-06	3.02E-08	1.62E-08	
2	1.5	220.	3.42E+02	2.07E+02	0.6	1.26E+08	1.31E+04	-	0.4	3.90E+09	Y	7.31E-06	2.08E-08	1.12E-08	
1	0.1	220.	2.89E+02	1.75E+02	0.5	1.26E+08	0.00E-01	-	0.0	3.90E+09	Y	6.16E-06	0.00E-01	0.00E-01	

FIGURE 4.6.8

Lesson 6 - Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:30  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (uR/HR)	INF THY DO (R/HR)	GAMMA I/Q (SEC/HR+3)	DEPLETED I/Q (SEC/HR+3)	DEPOSITION (1/HR+2)
0.60	220.	09:36	3.436E+02	1.459E+02	7.334E-06	2.310E-08	1.229E-10
1.00	220.	09:40	3.699E+02	4.818E+03	7.896E-06	7.626E-07	4.091E-09
2.00	220.	09:50	3.003E+02	1.715E+04	6.410E-06	2.715E-06	1.456E-08
3.00	220.	10:00	2.294E+02	1.782E+04	4.896E-06	2.822E-06	1.514E-08
4.00	220.	10:10	1.813E+02	1.580E+04	3.870E-06	2.501E-06	1.342E-08
5.00	220.	10:20	1.480E+02	1.360E+04	3.160E-06	2.152E-06	1.154E-08
6.00	220.	10:30	1.241E+02	1.169E+04	2.649E-06	1.850E-06	9.925E-09
7.00	220.	10:40	1.062E+02	1.012E+04	2.268E-06	1.602E-06	8.591E-09
8.00	220.	10:50	9.247E+01	8.855E+03	1.973E-06	1.398E-06	7.501E-09
9.00	220.	11:00	8.151E+01	7.780E+03	1.740E-06	1.231E-06	6.606E-09
10.00	220.	11:10	7.270E+01	6.905E+03	1.552E-06	1.093E-06	5.863E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC GAMMA DOSE (uR)	2 HR SHEL GAMMA DOSE (uR)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (uR)	4 HR SHEL GAMMA DOSE (uR)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	220.	6.871E+02	6.184E+02	2.919E+02	2.189E+02	0.60	220.	1.081E+03	1.277E+03	4.592E+02	5.108E+02
1.00	220.	7.399E+02	6.659E+02	3.676E+02	2.727E+02	1.00	220.	1.139E+03	1.332E+03	1.484E+04	1.688E+04
2.00	220.	6.005E+02	5.405E+02	2.470E+04	2.572E+04	2.00	220.	8.748E+02	1.081E+03	4.997E+04	6.002E+04
3.00	220.	4.587E+02	4.126E+02	1.566E+04	2.874E+04	3.00	220.	7.079E+02	8.257E+02	5.503E+04	6.240E+04
4.00	220.	3.625E+02	3.263E+02	1.160E+04	2.370E+04	4.00	220.	5.293E+02	6.552E+02	4.614E+04	5.530E+04
5.00	220.	2.960E+02	2.684E+02	7.719E+04	2.039E+04	5.00	220.	4.075E+02	5.329E+02	3.743E+04	4.768E+04
6.00	220.	2.482E+02	2.234E+02	2.338E+04	1.752E+04	6.00	220.	3.161E+02	4.467E+02	3.409E+04	4.091E+04
7.00	220.	2.125E+02	1.912E+02	2.024E+04	1.518E+04	7.00	220.	2.921E+02	3.624E+02	2.782E+04	3.542E+04
8.00	220.	1.849E+02	1.664E+02	1.767E+04	1.322E+04	8.00	220.	2.388E+02	2.328E+02	2.282E+04	2.642E+04
9.00	220.	1.630E+02	1.467E+02	1.556E+04	1.161E+04	9.00	220.	1.970E+02	2.934E+02	1.880E+04	2.722E+04
10.00	220.	1.454E+02	1.309E+02	1.381E+04	1.006E+04	10.00	220.	1.636E+02	2.617E+02	1.554E+04	2.417E+04

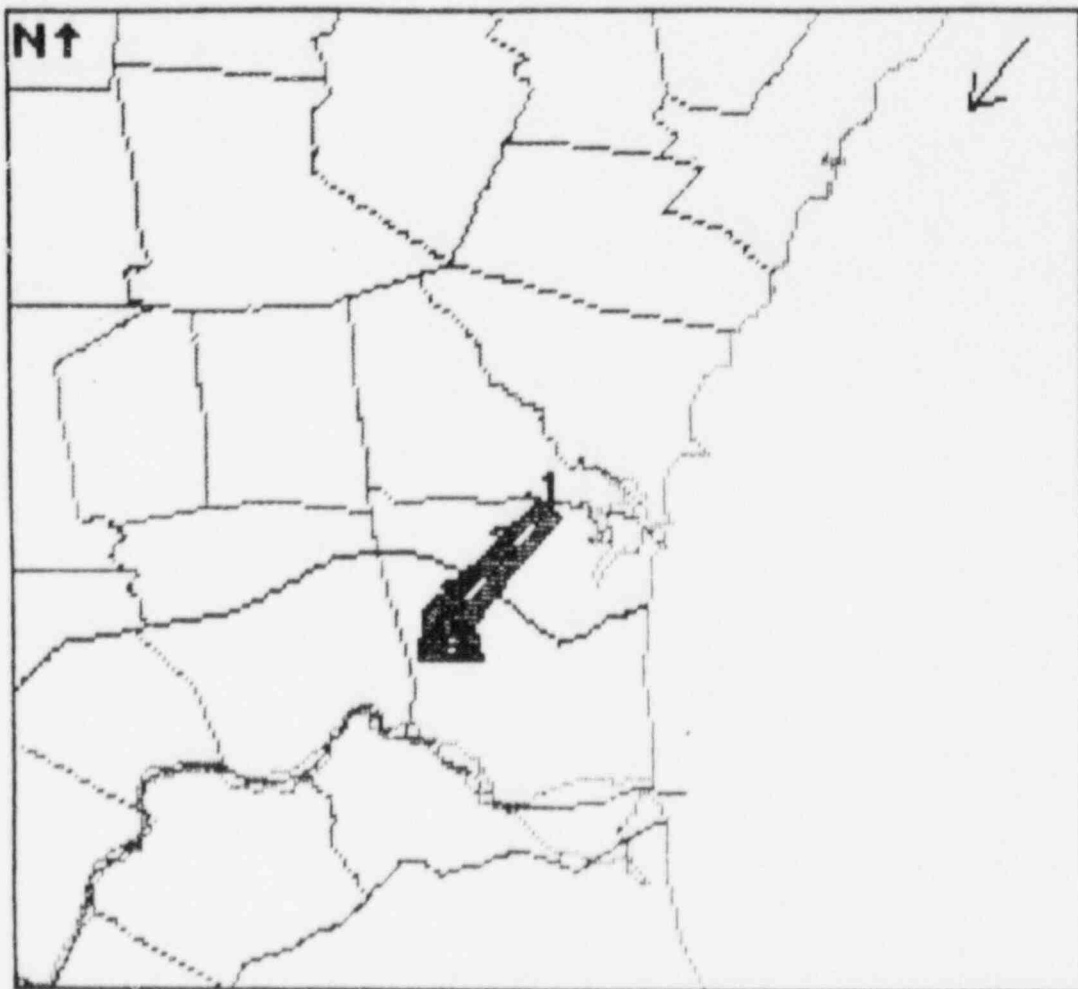
- \* EVACUATE - SALISBURY, NEWBURYPORT, NEWBURY
- \* EVACUATE - W. NEWBURY, MERRIMAC, AMESBURY
- \* EVACUATE - NEWTON, S. HAMPTON, KENSINGTON
- \* EVACUATE - W. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - BRENTWOOD, E. KINGSTON, STRATHAM
- \* SHELTER - EETER, KINGSTON, NEWFIELDS
- \* SHELTER - GREENLAND, PORTSMOUTH, RYE
- \* SHELTER - NEW CASTLE
- \* SHELTER - NEW CASTLE

DIST (MI)	ANG (DEG)	6 HR EVAC GAMMA DOSE (uR)	6 HR SHEL GAMMA DOSE (uR)	6 HR EVAC INF THY DO (R)	6 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (uR)	8 HR SHEL GAMMA DOSE (uR)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	220.	1.081E+03	1.855E+02	4.592E+02	6.027E+02	0.60	220.	1.081E+03	2.474E+03	4.592E+02	1.095E+03
1.00	220.	1.139E+03	1.998E+02	1.454E+04	2.652E+04	1.00	220.	1.139E+03	2.664E+03	1.484E+04	3.614E+04
2.00	220.	8.748E+02	1.671E+03	4.997E+04	4.434E+04	2.00	220.	8.748E+02	2.162E+03	4.997E+04	1.286E+05
3.00	220.	7.079E+02	1.329E+03	5.503E+04	9.805E+04	3.00	220.	7.079E+02	1.851E+03	5.503E+04	1.327E+05
4.00	220.	5.293E+02	9.788E+02	4.614E+04	6.697E+04	4.00	220.	5.293E+02	1.705E+03	4.614E+04	1.185E+05
5.00	220.	4.075E+02	7.993E+02	3.743E+04	5.479E+04	5.00	220.	4.075E+02	1.666E+03	3.743E+04	1.070E+05
6.00	220.	3.161E+02	6.701E+02	3.409E+04	6.479E+04	6.00	220.	3.161E+02	8.934E+02	3.409E+04	8.787E+04
7.00	220.	2.921E+02	5.736E+02	2.782E+04	5.562E+04	7.00	220.	2.921E+02	7.649E+02	2.782E+04	7.587E+04
8.00	220.	2.388E+02	4.991E+02	2.282E+04	4.855E+04	8.00	220.	2.388E+02	6.655E+02	2.282E+04	6.655E+04
9.00	220.	1.970E+02	4.402E+02	1.880E+04	4.274E+04	9.00	220.	1.970E+02	5.869E+02	1.880E+04	5.869E+04
10.00	220.	1.636E+02	3.926E+02	1.554E+04	3.798E+04	10.00	220.	1.636E+02	5.224E+02	1.554E+04	5.179E+04

- \* EVACUATE - SALISBURY, NEWBURYPORT, NEWBURY
- \* EVACUATE - W. NEWBURY, MERRIMAC, AMESBURY
- \* EVACUATE - NEWTON, S. HAMPTON, KENSINGTON
- \* EVACUATE - W. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - BRENTWOOD, E. KINGSTON, STRATHAM
- \* SHELTER - EETER, KINGSTON, NEWFIELDS
- \* SHELTER - GREENLAND, PORTSMOUTH, RYE
- \* SHELTER - NEW CASTLE

FIGURE 4.6.9

Lesson 6 - Plume Projection Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

ELU GAM  
T=09:45  
6.0 MPH  
40 DEG  
E STAB  
←→20.00MI  
— STATE  
— TOWNS  
— RIVER  
— ROADS

FIGURE 4.6.10

Lesson 6 - Graphics Output



## 4.7 Lesson 7

### Learning Objectives

1. Continue the analysis by replacing the latest projection with a real time result.
2. Correct earlier data which was found to be in error.

### Scenario

At 0945 the stack monitor is reported to be as shown in Figure 4.7.1. The wind speed and direction are as follows:

Lower 4 mph  
Upper 7 mph

It is 0946 and the EOF coordinator wants the necessary projections and analyses.

At 0950 you are advised that the 0915 met data was incorrect. Wind direction at that time was from  $20^{\circ}$  (upper and lower), not  $0^{\circ}$ . The state representatives want corrected doses.

### Lesson

1. Provide a real-time analysis for 0945. Enter 2, (Return).
2. Change time of analysis to 0945 on second screen to eliminate the 0945 projection.
3. Change the wind speed and direction and run the program.
4. The 0945 analysis has been eliminated and replaced with a real-time 0945 analysis.

5. Assume persistence of met conditions and create a new 1000 projection with the latest radiological data.
6. Correct the met data for 0915 (exit by pushing (F10), and then select "Continue Accident" on the first screen).
7. On Screen 2, change the time of analysis from 1015 to 0915 and make the corrections to the met data and enter "RUN".
8. Note that each data entry screen (0930, 0945, 1000) is displayed in sequence to allow you to make any other necessary corrections.
9. The computer prints out a corrected set of off-site doses for the last quarter-hour interval as well as an updated map.
10. Exit by pushing the (F10) key.

#### Summary

In this lesson the 9:45 analysis was deleted by continuing the accident and changing the time of analysis back to 0945. The new met data was entered on Screen 4. The 0945 projection was deleted and replaced with a real-time result. A new 1000 projection was made assuming persistence of the 0945 met conditions.

The scenario then proposed that after the new 1000 projection was made, you were informed that the met data for 0915 was incorrect. The 0915 met data was corrected by continuing the accident (time of analysis 1015) and editing the second screen back to 0915. The corrected met data was then entered on the fourth screen.

After exiting, each subsequent data entry screen was displayed in sequence to allow other corrections to be made. The computer printed a corrected set of off-site doses and a corrected plume plot.

	<u>9:45</u>
Wind Speed (Mph)	7
Wind Direction (Deg)	60
Delta Temperature (Deg F)	0
Precipitation (inch/Qtr Hr)	0
Solar Radiation (ly/min)	.6
Stack Concentration (uCi/cc)	4
Stack Release Rate (uCi/sec)	5.2E8
Loca Type	3
Field Team Dose Rate (mR/hr)	
Field Team Location (mi)	
Gross Iodine (uCi/cc)	

FIGURE 4.7.1

Lesson 7 - Stack Readings and Times

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
ANALYSIS	10/23/87	09:45
LAST SCREEN		
NEXT SCREEN		

FIGURE 4.7.2

Lesson 7 - Second Input Screen

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:45

STAC

MET DATA

UPPER : WIND SPEED 7.00 MPH  
WIND DIRECTION 60.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.60 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 3 1 OR 3

DATE SCREEN RAD SCREEN RUN

FIGURE 4.7.3

Lesson 7 - Fourth Input Screen

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 09:45

SEABROOK STATION  
 PLUME POSITION AT 09:45  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

TOWER LEVEL	WIND SPEED		WIND DIR (FROM)		DELTA TEMPERATURE			PRECIPITATION	SOLAR RADIATION
	(MPH)	(M/S)	DEG	SECTOR	DEG F/DH	DEG C/100M	STAB	IN/15 MIN	LANGLEY/MIN
ELEVATED	7.0	3.13	60.	ENE	0.0	0.0	E	0.00	0.60

RADIOLOGICAL: (FROM 10/23/87 , 09:30 TO 10/23/87 , 09:45)

LOCA = 3  
 FIELD TEAM DOSE RATE 2.0000E+02 MR/HR  
 FIELD TEAM GROSS IODINE 0.0000E+00 uCi/CC  
 FIELD TEAM LOCATION 1.6 MILES  
 STACK CONCENTRATION 3.0000E+00 uCi/CC STACK RELEASE RATE 3.9000E+08 uCi/SEC FLOW RATE 1.2000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:45 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- GENERAL  
 TOTAL ACCUMULATED GAMMA DOSE 1.66E+02 MR TOTAL ACCUMULATED THYROID DOSE 7.58E+01 R  
 TOTAL CURIES RELEASED 2.12E+05 Ci TOTAL CURIES IODINE RELEASED 7.02E+06 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (uR/hr)	FIELD (uR/hr)	COR MI	WIDTH (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL (uCi/sec) USE	GAMMA (s/M**3)	I/W DEF. (s/M**3)	I/W DEPOSITION (s/M**2)	
0	0.6	240.	3.03E+02	2.05E+02	0.5	1.26E+08	1.65E+02	-	0.2	3.90E+09	Y	6.48E-06	2.61E-08	1.63E-10

PLUME POINT INFORMATION AT 09:45 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (uR/hr)	FIELD (uR/hr)	COR MI	WIDTH (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL (uCi/sec) USE	GAMMA (s/M**3)	I/W DEF. (s/M**3)	I/W DEPOSITION (s/M**2)	
4	3.6	221.	7.14E+01	4.82E+01	1.2	3.27E+07	6.03E+03	-	1.1	1.30E+09	Y	4.53E-06	2.86E-06	1.79E-08
3	3.2	231.	1.83E+02	1.03E+02	1.0	7.64E+07	1.24E+04	-	0.9	2.60E+09	Y	4.93E-06	2.95E-06	1.85E-08
2	1.7	240.	3.00E+02	2.03E+02	0.7	1.26E+08	1.55E+04	-	0.5	3.90E+09	Y	6.41E-06	2.45E-06	1.53E-08
1	0.1	240.	2.54E+02	1.72E+02	0.5	1.26E+08	0.00E+01	-	0.0	3.90E+09	Y	5.43E-06	0.00E+01	0.00E+01

FIGURE 4.7.4

Lesson 7 - 9:45 Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:30  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (uR/HR)	INF THY DR (R/HR)	GAMMA 1/0 (SEC/MI*3)	DEPLETED 1/0 (SEC/MI*3)	1/0 DEPOSITION (1/MI*2)
0.60	240.	09:35	3.035E+02	1.649E+02	6.478E-06	2.611E-08	1.634E-10
1.00	240.	09:39	3.244E+02	4.729E+03	6.926E-06	7.485E-07	4.684E-09
2.00	240.	09:47	2.802E+02	1.560E+04	5.554E-06	2.470E-06	1.546E-08
3.00	240.	09:56	1.979E+02	1.588E+04	4.225E-06	2.514E-06	1.572E-08
4.00	240.	10:04	1.561E+02	1.393E+04	3.333E-06	2.306E-06	1.380E-08
5.00	240.	10:13	1.273E+02	1.192E+04	2.719E-06	1.886E-06	1.181E-08
6.00	240.	10:21	1.067E+02	1.021E+04	2.278E-06	1.615E-06	1.011E-08
7.00	240.	10:30	9.128E+01	8.808E+03	1.949E-06	1.394E-06	8.725E-09
8.00	240.	10:39	7.940E+01	7.673E+03	1.695E-06	1.214E-06	7.601E-09
9.00	240.	10:47	7.000E+01	6.744E+03	1.494E-06	1.067E-06	6.681E-09
10.00	240.	10:56	6.242E+01	5.977E+03	1.332E-06	9.461E-07	5.921E-09

PROTECTIVE ACTION RECOMMENDATIONS

2 HR EVAC				2 HR SHEL				4 HR EVAC				4 HR SHEL			
DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)
0.60	240.	6.069E+02	5.462E+02	3.299E+02	2.474E+02	0.60	240.	9.599E+02	1.092E+03	5.218E+02	5.773E+02	0.60	240.	9.599E+02	1.092E+03
1.00	240.	6.488E+02	5.640E+02	9.458E+03	7.097E+03	1.00	240.	1.005E+03	1.188E+03	1.464E+04	1.655E+04	1.00	240.	1.005E+03	1.188E+03
2.00	240.	5.704E+02	4.683E+02	3.121E+04	2.241E+04	2.00	240.	7.710E+02	9.266E+02	4.674E+04	5.461E+04	2.00	240.	7.710E+02	9.266E+02
3.00	240.	3.958E+02	3.563E+02	3.176E+04	2.387E+04	3.00	240.	6.241E+02	7.150E+02	5.008E+04	5.959E+04	3.00	240.	6.241E+02	7.150E+02
4.00	240.	3.122E+02	2.810E+02	2.787E+04	2.090E+04	4.00	240.	4.715E+02	5.620E+02	4.206E+04	4.877E+04	4.00	240.	4.715E+02	5.620E+02
5.00	240.	2.547E+02	2.292E+02	2.384E+04	1.788E+04	5.00	240.	3.655E+02	4.585E+02	3.421E+04	4.171E+04	5.00	240.	3.655E+02	4.585E+02
6.00	240.	2.134E+02	1.920E+02	2.041E+04	1.531E+04	6.00	240.	3.272E+02	3.841E+02	3.150E+04	3.571E+04	6.00	240.	3.272E+02	3.841E+02
7.00	240.	1.826E+02	1.643E+02	1.762E+04	1.321E+04	7.00	240.	2.662E+02	3.286E+02	2.599E+04	3.083E+04	7.00	240.	2.662E+02	3.286E+02
8.00	240.	1.588E+02	1.429E+02	1.535E+04	1.151E+04	8.00	240.	2.197E+02	2.898E+02	2.173E+04	2.655E+04	8.00	240.	2.197E+02	2.898E+02
9.00	240.	1.400E+02	1.260E+02	1.349E+04	1.012E+04	9.00	240.	1.843E+02	2.500E+02	1.776E+04	2.361E+04	9.00	240.	1.843E+02	2.500E+02
10.00	240.	1.248E+02	1.124E+02	1.195E+04	8.966E+03	10.00	240.	1.550E+02	2.247E+02	1.484E+04	2.092E+04	10.00	240.	1.550E+02	2.247E+02

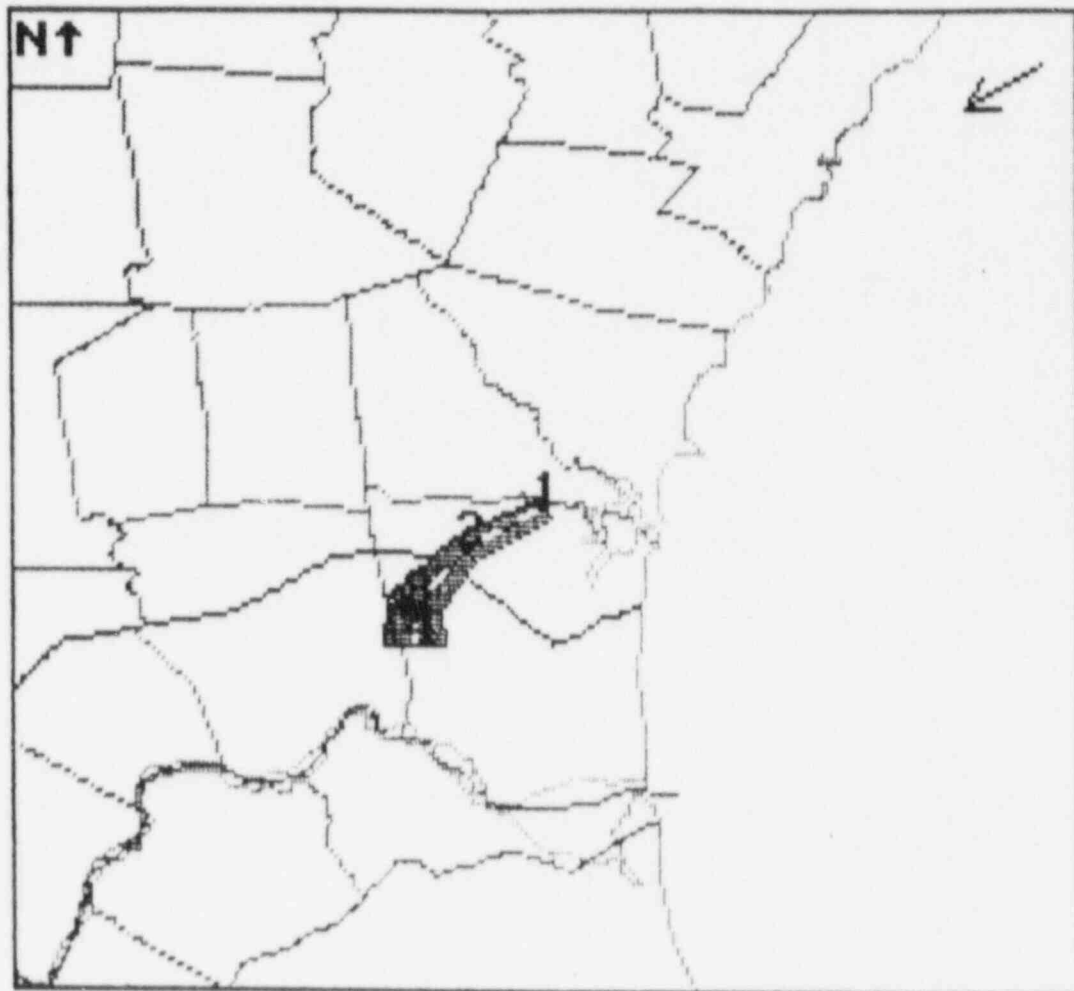
- \* EVACUATE - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* EVACUATE - MERRIMAC, AMESBURY, NEWTON
- \* EVACUATE - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* EVACUATE - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - NEWBURY, BRENTWOOD, STRATHAM
- \* SHELTER - EXETER, KINGSTON, NEWFIELDS
- \* SHELTER - GREENLAND, PORTSMOUTH, RYE
- \* SHELTER - NEW CASTLE

6 HR EVAC				6 HR SHEL				8 HR EVAC				8 HR SHEL			
DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (uR)	INF THY DO (R)
0.60	240.	9.599E+02	1.639E+03	5.218E+02	9.072E+02	0.60	240.	9.599E+02	2.185E+03	5.218E+02	1.237E+03	0.60	240.	9.599E+02	2.185E+03
1.00	240.	1.005E+03	1.752E+03	1.464E+04	2.601E+04	1.00	240.	1.005E+03	2.336E+03	1.464E+04	3.547E+04	1.00	240.	1.005E+03	2.336E+03
2.00	240.	7.710E+02	1.405E+03	4.674E+04	8.582E+04	2.00	240.	7.710E+02	1.873E+03	4.674E+04	1.170E+05	2.00	240.	7.710E+02	1.873E+03
3.00	240.	6.241E+02	1.069E+03	5.008E+04	8.735E+04	3.00	240.	6.241E+02	1.425E+03	5.008E+04	1.191E+05	3.00	240.	6.241E+02	1.425E+03
4.00	240.	4.715E+02	8.430E+02	4.206E+04	7.664E+04	4.00	240.	4.715E+02	1.124E+03	4.206E+04	1.045E+05	4.00	240.	4.715E+02	1.124E+03
5.00	240.	3.655E+02	6.877E+02	3.421E+04	6.555E+04	5.00	240.	3.655E+02	9.219E+02	3.421E+04	8.929E+04	5.00	240.	3.655E+02	9.219E+02
6.00	240.	3.272E+02	5.761E+02	3.130E+04	5.613E+04	6.00	240.	3.272E+02	7.681E+02	3.130E+04	7.654E+04	6.00	240.	3.272E+02	7.681E+02
7.00	240.	2.662E+02	4.929E+02	2.569E+04	4.844E+04	7.00	240.	2.662E+02	6.572E+02	2.569E+04	6.606E+04	7.00	240.	2.662E+02	6.572E+02
8.00	240.	2.197E+02	4.287E+02	2.123E+04	4.220E+04	8.00	240.	2.197E+02	5.717E+02	2.123E+04	5.755E+04	8.00	240.	2.197E+02	5.717E+02
9.00	240.	1.843E+02	3.780E+02	1.776E+04	3.707E+04	9.00	240.	1.843E+02	5.040E+02	1.776E+04	5.023E+04	9.00	240.	1.843E+02	5.040E+02
10.00	240.	1.550E+02	3.371E+02	1.484E+04	3.288E+04	10.00	240.	1.550E+02	4.494E+02	1.484E+04	4.463E+04	10.00	240.	1.550E+02	4.494E+02

- \* EVACUATE - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* EVACUATE - MERRIMAC, AMESBURY, NEWTON
- \* EVACUATE - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* EVACUATE - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - NEWBURY, BRENTWOOD, STRATHAM
- \* SHELTER - EXETER, KINGSTON, NEWFIELDS
- \* SHELTER - GREENLAND, PORTSMOUTH, RYE
- \* SHELTER - NEW CASTLE

FIGURE 4.7.5

Lesson 7 - 9:45 Plume Projection Output



FUNCTION  
 KEYS  
 1-RADIUS  
 2-ROADS  
 3-PUBLIC  
 4-LABELS  
 5-ZOOM  
 6-REDRAW  
 7-  
 8-LT PEN  
 9-PRINT  
 10-EXIT

ELU GAM  
 T=09:45  
 7.0 MPH  
 60 DEG  
 E STAI  
 ←→20.00MI  
 — STATE  
 — TOWNS  
 — RIVER  
 — ROADS

FIGURE 4.7.6

Lesson 7 - 9:45 Graphics Output



SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:00

STAC

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	4.000E+00	uCi/CC
	STACK RELEASE RATE	5.200E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-THY/2-LAM
DATE SCREEN	MET SCREEN		

FIGURE 4.7.7

Lesson 7 - Third Input Screen for Projection

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:00

STAG

MET DATA  
UPPER : WIND SPEED 7.00 MPH  
WIND DIRECTION 60.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.60 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 0 1 OR 2

DATE SCREEN RAD SCREEN RUN FROMPT

FIGURE 4.7.8

Lesson 7 - Fourth Input Screen for Projection

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 10:00

SEABROOK STATION  
 PLUME POSITION AT 10:00  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:45 TO 10/23/87 , 10:00)

TOWER LEVEL	WIND SPEED (MPH) (M/S)	WIND DIR (FROM) DEG SECTOR	DELTA TEMPERATURE DEG F/°H DEG C/100M STAB	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	7.0 3.13	60. ENE	0.0 0.0 E	0.00	0.60

RADIOLOGICAL: (FROM 10/23/87 , 09:45 TO 10/23/87 , 10:00)

LOCA # 3  
 STACK CONCENTRATION 4.000E+00 uCi/cc STACK RELEASE RATE 5.2000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 10:00 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- GENERAL  
 TOTAL ACCUMULATED GAMMA DOSE 2.65E+02 R TOTAL ACCUMULATED THYROID DOSE 1.31E+02 R  
 TOTAL CURIES RELEASED 3.73E+05 Ci TOTAL CURIES IODINE RELEASED 1.17E+07 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (uR/hr)	FIELD (uR/hr)	COR MI	WIDTH REL (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR MI	WIDTH REL (uCi/sec) USE	GAMMA (g/M**3)	I/W DEP. (g/M**3)	I/W DEPOSITION (1/M**2)	
0	0.6	240.	3.93E+02	2.65E+02	0.5	1.79E+08	2.20E+02	-	0.2	5.20E+09	Y	6.48E-06	2.61E-08	1.63E-10

PLUME POINT INFORMATION AT 10:00 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (uR/hr)	FIELD (uR/hr)	COR MI	WIDTH REL (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR MI	WIDTH REL (uCi/sec) USE	GAMMA (g/M**3)	I/W DEP. (g/M**3)	I/W DEPOSITION (1/M**2)	
5	5.5	227.	5.13E+01	3.46E+01	1.6	3.27E+07	4.68E+03	-	1.5	1.30E+09	Y	3.26E-06	2.22E-06	1.39E-08
4	4.9	234.	1.05E+02	7.10E+01	1.4	7.64E+07	9.71E+03	-	1.3	2.60E+09	Y	3.39E-06	2.31E-06	1.44E-08
3	3.5	240.	1.88E+02	1.27E+02	1.1	1.26E+08	1.61E+04	-	1.0	3.90E+09	Y	4.02E-06	2.55E-06	1.60E-08
2	1.7	240.	3.61E+02	2.44E+02	0.7	1.79E+08	1.92E+04	-	0.5	5.20E+09	Y	5.96E-06	2.27E-06	1.42E-08
1	0.1	240.	3.29E+02	2.22E+02	0.5	1.79E+08	0.00E-01	-	0.0	5.20E+09	Y	5.43E-06	0.00E-01	0.00E-01

FIGURE 4.7.9

Lesson 7 - 10:00 Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:45  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (uR/HR)	INF THY DR (R/HR)	GAMMA I/Q (SEC/M**3)	DEPLETED I/Q (SEC/M**3)	DEPOSITION (11/M**2)
0.60	240.	09:50	3.931E+02	2.199E+02	6.478E-06	2.611E-08	1.634E-10
1.00	240.	09:54	4.203E+02	6.305E+03	6.926E-06	7.485E-07	4.684E-09
2.00	240.	10:02	3.371E+02	2.081E+04	5.554E-06	2.470E-06	1.546E-08
3.00	240.	10:11	2.544E+02	2.118E+04	4.225E-06	2.514E-06	1.573E-08
4.00	240.	10:19	2.023E+02	1.858E+04	3.333E-06	2.206E-06	1.380E-08
5.00	240.	10:28	1.650E+02	1.589E+04	2.719E-06	1.888E-06	1.181E-08
6.00	240.	10:36	1.382E+02	1.361E+04	2.278E-06	1.615E-06	1.011E-08
7.00	240.	10:45	1.183E+02	1.174E+04	1.949E-06	1.394E-06	8.725E-09
8.00	240.	10:54	1.029E+02	1.023E+04	1.695E-06	1.214E-06	7.601E-09
9.00	240.	11:02	9.069E+01	8.993E+03	1.494E-06	1.067E-06	6.681E-09
10.00	240.	11:11	8.087E+01	7.970E+03	1.333E-06	9.461E-07	5.921E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC GAMMA DOSE (uR)	2 HR SHEL GAMMA DOSE (uR)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (uR)	4 HR SHEL GAMMA DOSE (uR)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	240.	7.863E+02	7.077E+02	4.399E+02	3.299E+02	0.60	240.	1.342E+03	1.415E+03	7.507E+02	7.698E+02
1.00	240.	8.406E+02	7.565E+02	1.261E+04	5.458E+03	1.00	240.	1.407E+03	1.513E+03	2.110E+04	2.207E+04
2.00	240.	6.741E+02	6.067E+02	4.161E+04	3.121E+04	2.00	240.	1.083E+03	1.213E+03	6.685E+04	7.267E+04
3.00	240.	5.128E+02	4.616E+02	4.235E+04	3.176E+04	3.00	240.	8.727E+02	9.201E+02	7.207E+04	7.412E+04
4.00	240.	4.045E+02	3.641E+02	3.716E+04	2.787E+04	4.00	240.	6.614E+02	7.281E+02	6.076E+04	6.532E+04
5.00	240.	3.300E+02	2.970E+02	3.178E+04	2.384E+04	5.00	240.	5.148E+02	5.939E+02	4.958E+04	5.562E+04
6.00	240.	2.764E+02	2.488E+02	2.721E+04	2.041E+04	6.00	240.	4.584E+02	4.976E+02	4.513E+04	4.762E+04
7.00	240.	2.365E+02	2.129E+02	2.249E+04	1.762E+04	7.00	240.	3.745E+02	4.257E+02	3.719E+04	4.110E+04
8.00	240.	2.057E+02	1.852E+02	2.046E+04	1.535E+04	8.00	240.	3.103E+02	3.702E+02	3.086E+04	3.581E+04
9.00	240.	1.814E+02	1.632E+02	1.749E+04	1.349E+04	9.00	240.	2.615E+02	3.265E+02	2.593E+04	3.147E+04
10.00	240.	1.617E+02	1.456E+02	1.594E+04	1.195E+04	10.00	240.	2.210E+02	2.911E+02	2.178E+04	2.789E+04

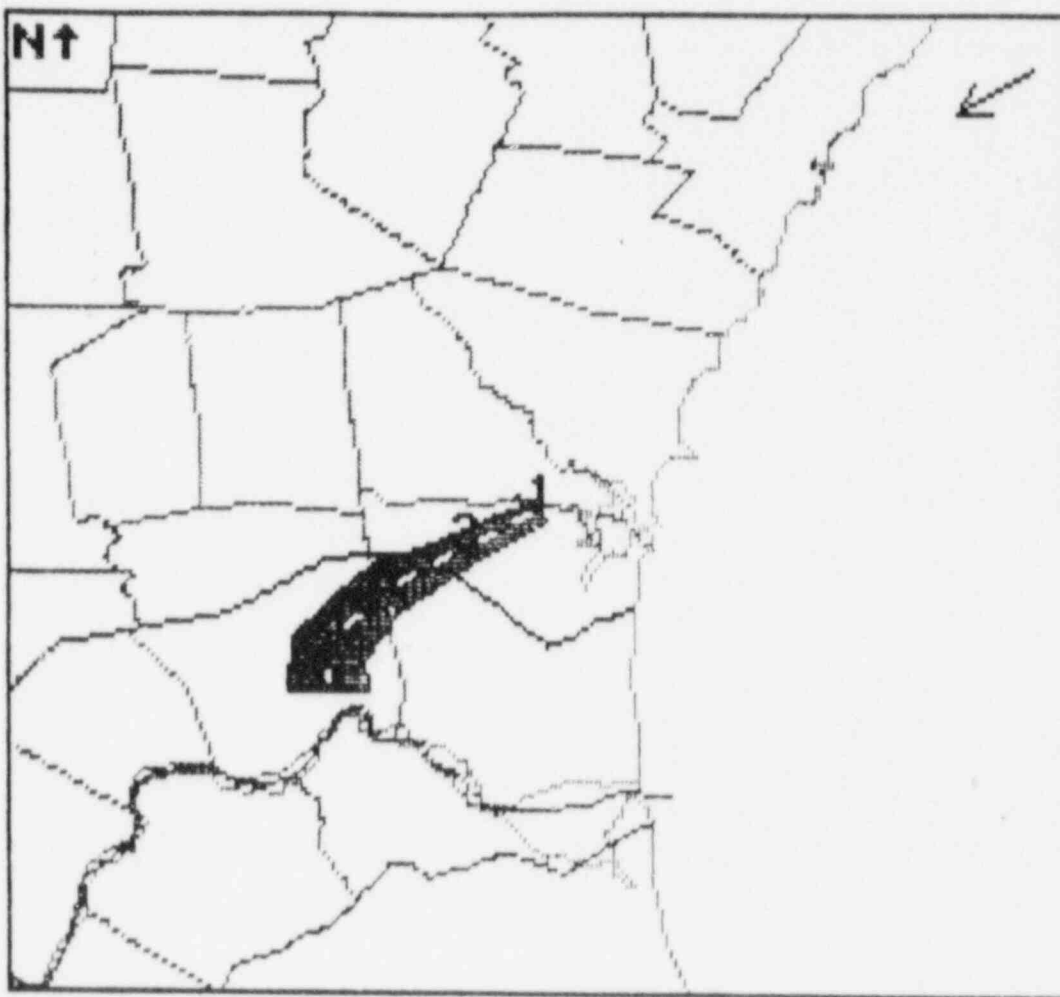
- \* EVACUATE - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* EVACUATE - MERRIMAC, AMESBURY, NEWTON
- \* EVACUATE - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* EVACUATE - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* SHELTER - MERRIMAC, AMESBURY, NEWTON
- \* SHELTER - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* SHELTER - SEABROOK

DIST (MI)	ANG (DEG)	6 HR EVAC GAMMA DOSE (uR)	6 HR SHEL GAMMA DOSE (uR)	6 HR EVAC INF THY DO (R)	6 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (uR)	8 HR SHEL GAMMA DOSE (uR)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	240.	1.342E+03	2.123E+03	7.507E+02	1.210E+03	0.60	240.	1.342E+03	2.831E+03	7.507E+02	1.649E+03
1.00	240.	1.407E+03	2.270E+03	2.110E+04	3.468E+04	1.00	240.	1.407E+03	3.026E+03	2.110E+04	4.729E+04
2.00	240.	1.083E+03	1.820E+03	6.685E+04	1.144E+05	2.00	240.	1.083E+03	3.427E+03	6.685E+04	1.560E+05
3.00	240.	8.727E+02	1.385E+03	7.207E+04	1.165E+05	3.00	240.	8.727E+02	1.846E+03	7.207E+04	1.588E+05
4.00	240.	6.614E+02	1.092E+03	6.076E+04	1.022E+05	4.00	240.	6.614E+02	1.456E+03	6.076E+04	1.392E+05
5.00	240.	5.148E+02	8.909E+02	4.958E+04	8.740E+04	5.00	240.	5.148E+02	1.188E+03	4.958E+04	1.192E+05
6.00	240.	4.584E+02	7.464E+02	4.513E+04	7.484E+04	6.00	240.	4.584E+02	9.921E+02	4.513E+04	1.021E+05
7.00	240.	3.745E+02	6.386E+02	3.719E+04	6.459E+04	7.00	240.	3.745E+02	8.515E+02	3.719E+04	8.802E+04
8.00	240.	3.103E+02	5.555E+02	3.086E+04	5.672E+04	8.00	240.	3.103E+02	7.426E+02	3.086E+04	7.872E+04
9.00	240.	2.615E+02	4.897E+02	2.593E+04	4.846E+04	9.00	240.	2.615E+02	6.509E+02	2.593E+04	6.744E+04
10.00	240.	2.210E+02	4.367E+02	2.178E+04	4.383E+04	10.00	240.	2.210E+02	5.827E+02	2.178E+04	5.977E+04

- \* EVACUATE - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* EVACUATE - MERRIMAC, AMESBURY, NEWTON
- \* EVACUATE - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* EVACUATE - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* SHELTER - MERRIMAC, AMESBURY, NEWTON
- \* SHELTER - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* SHELTER - SEABROOK

FIGURE 4.7.10

Lesson 7 - 10:00 Plume Projection Output



FUNCTION  
 KEYS  
 1-RADIUS  
 2-ROADS  
 3-PUBLIC  
 4-LABELS  
 5-ZOOM  
 6-REDRAW  
 7-  
 8-LT PEN  
 9-PRINT  
 10-EXIT

ELU GAM  
 T=10:00  
 7.0 MPH  
 60 DEG  
 E STAB  
 ↔20.00MI  
 — STATE  
 — TOWNS  
 — RIVER  
 — ROADS

FIGURE 4.7.11

Lesson 7 - 10:00 Graphics Output

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
ANALYSIS	10/23/87	09:15
LAST SCREEN		
NEXT SCREEN		

FIGURE 4.7.12

Lesson 7 - Second Input Screen for Error Correction

SHUTDOWN: DATE 10/23/87 TIME 09:15  
ANALYSIS: DATE 10/23/87 TIME 09:15

5110.7

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	1.000E+00	uCi/CC
	STACK RELEASE RATE	1.300E+08	uCi/SEC
	ISOTOPICS	Y	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		PROMPT

FIGURE 4.7.13

Lesson 7 - Third Input Screen for 9:15

SHUTDOWN: DATE 10/23/87 TIME 09:30  
ANALYSIS: DATE 10/23/87 TIME 09:30

FIELD

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	2.000E+00	uCi/CC
	STACK RELEASE RATE	2.600E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	U-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		PROMPT

FIGURE 4.7.15

Lesson 7 - Third Input Screen for 9:30



SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:30

STACK

MET DATA  
UPPER : WIND SPEED 6.00 MPH  
WIND DIRECTION 40.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/DTR HR  
SOLAR RADIATION : 0.55 LY/MIN  
RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 3 1 OR 3

DATE SCREEN RAD SCREEN RUN FROMPT

FIGURE 4.7.16

Lesson 7 - Fourth Input Screen for 9:30

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 09:45

STACK

FIELD TEAM DOSE RATE	200.00	MR/HR
FIELD TEAM LOCATION	1.60	MILE
GROSS IODINE	0.000E-01	uCi/CC

STACK :	STACK CONCENTRATION	3.000E+00	uCi/CC
	STACK RELEASE RATE	3.900E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-THY/C-GAM
DATE SCREEN	MET SCREEN		PROMPT

FIGURE 4.7.17

Lesson 7 - Third Input Screen for 9:45

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:00

STACK

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	4.000E+00	uCi/CC
	STACK RELEASE RATE	5.200E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		PROMPT

FIGURE 4.7.19

Lesson 7 - Third Input Screen for 10:00

DATE AND TIME OF: MO/DA/YR HR:MM MO/DA/YR HR:MM  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 10:00

SEABROOK STATION  
 PLUME POSITION AT 10:00  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:45 TO 10/23/87 , 10:00)

TOWER LEVEL	WIND SPEED		WIND DIR (FROM)		DELTA TEMPERATURE			PRECIPITATION	SOLAR RADIATION
	(MPH)	(M/S)	DEG	SECTOR	DEG F/DH	DEG C/100M	STAB	IN/15 MIN	LANGLEY/MIN
ELEVATED	7.0	3.13	60.	ESE	0.0	0.0	E	0.00	0.60

RADIOLOGICAL: (FROM 10/23/87 , 09:45 TO 10/23/87 , 10:00)

LOCA = 3  
 STACK CONCENTRATION 4.0000E+00 uCi/cc STACK RELEASE RATE 5.2000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 10:00 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- GENERAL  
 TOTAL ACCUMULATED GAMMA DOSE 2.65E+02 mR TOTAL ACCUMULATED THYROID DOSE 1.31E+02 R  
 TOTAL CURIES RELEASED 3.73E+05 Ci TOTAL CURIES IODINE RELEASED 1.17E+07 Ci

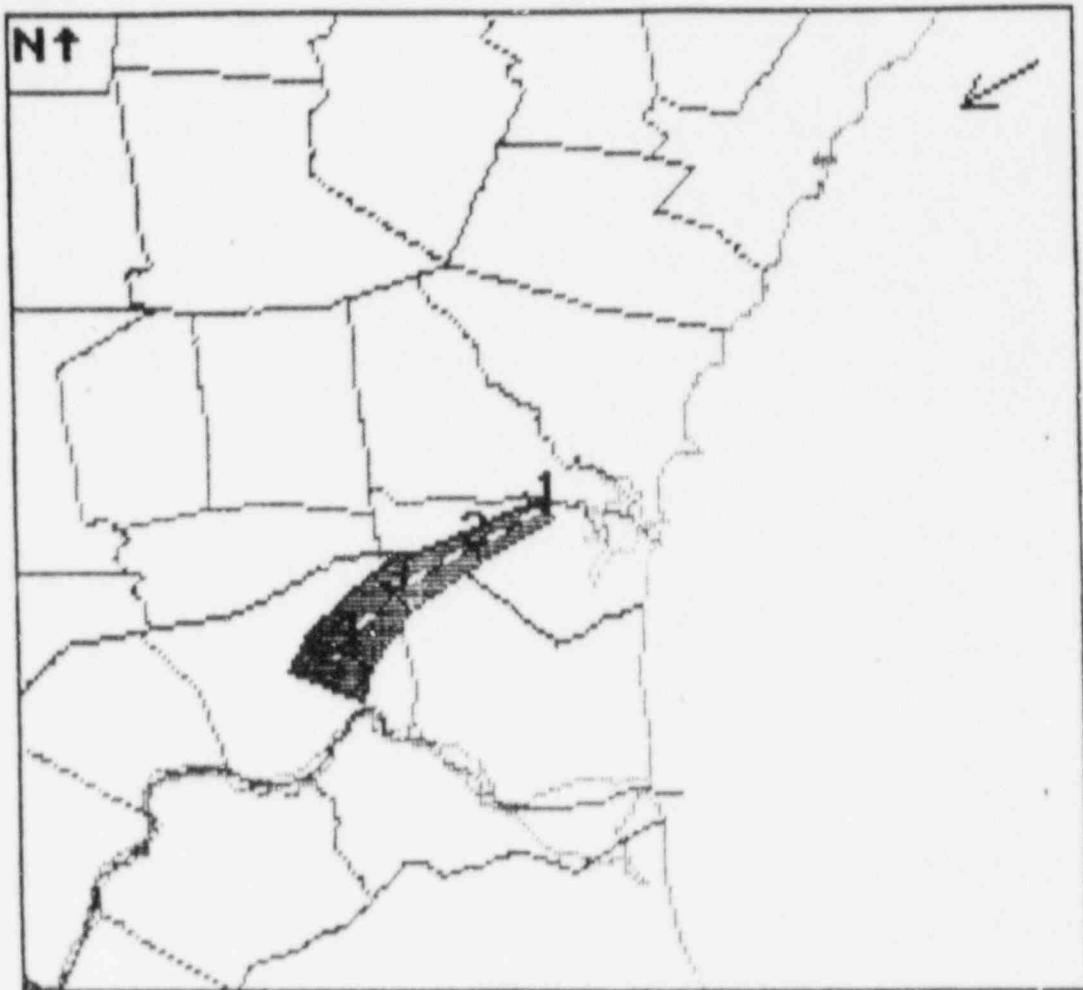
PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (mR/hr)	FIELD (mR/hr)	WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I70 DEP. (s/M**3)	I70 DEPOSITION (I/M**2)	
0	0.6	240.	3.93E+02	2.65E+02	0.5	1.79E+08	2.20E+02	-	0.2	5.20E+09	Y	6.48E-06	2.61E-08	1.63E-10

PLUME POINT INFORMATION AT 10:00 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (mR/hr)	FIELD (mR/hr)	WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (s/M**3)	I70 DEP. (s/M**3)	I70 DEPOSITION (I/M**2)	
5	5.6	229.	5.13E+01	3.46E+01	1.6	3.27E+07	4.68E+03	-	1.5	1.30E+09	Y	3.26E-06	2.22E-06	1.39E-06
4	4.9	234.	1.05E+02	7.10E+01	1.4	7.64E+07	9.71E+03	-	1.3	2.60E+09	Y	3.39E-06	2.31E-06	1.44E-06
3	3.5	240.	1.88E+02	1.27E+02	1.1	1.24E+08	1.61E+04	-	1.0	3.90E+09	Y	4.02E-06	2.55E-06	1.60E-06
2	1.7	240.	3.61E+02	2.44E+02	0.7	1.79E+08	1.92E+04	-	0.5	5.20E+09	Y	5.96E-06	2.27E-06	1.42E-06
1	0.1	240.	3.29E+02	2.22E+02	0.5	1.79E+08	0.00E-01	-	0.0	5.20E+09	Y	5.43E-06	0.00E-01	0.00E-01

FIGURE 4.7.21

Lesson 7 - Corrected Plume Position Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

ELU GAM  
T=10:00  
7.0 MPH  
60 DEG  
E STAB  
←→20.00MI  
— STATE  
— TOWNS  
- - - RIVER  
- - - ROADS

FIGURE 4.7.23

Lesson 7 - Corrected Graphics Output

## 4.8 Lesson 8

### Learning Objectives

1. Use the light pen to retrieve doses from each plume segment at a given plume point when the plume blows back on itself.
2. Review the procedure for summing dose when there are ground level releases (e.g. steam line, unmonitored, or containment leak) as well as a stack release.

### Scenario

At 1002 you are informed that the stack is as shown in Figure 4.8.1. The 1000 met data shows the upper and lower winds are now coming from 240°.

### Lesson

1. Select the Eliminate Last 1/4 Hour option to eliminate the 1000 projection.
2. Change the stack monitor reading as shown in Figure 4.8.1 (the 0945 reading).
3. Change the wind directions to 240°.
4. Note that the map shows the plume has blown back on itself. Doses must be retrieved at the given plume point via the light pen.
5. See location "X" on plume plot. Press F8, Light Pen. Press the light pen to the corresponding portion of the screen and note the dose reported.

	<u>10:00</u>
Wind Speed (Mph)	7
Wind Direction (Deg)	240
Delta Temperature (Deg F)	0
Precipitation (inch/Qtr Hr)	0
Solar Radiation (ly/min)	.65
Stack Concentration (uCi/cc)	4
Stack Release Rate (uCi/sec)	5.2E8
Loca Type	3
Field Team Dose Rate (mR/hr)	
Field Team Location (mi)	
Gross Iodine (uCi/cc)	

FIGURE 4.8.1

Lesson 8 - Stack Readings and Times

SHUTDOWN: DATE	10/23/87	TIME	09:00		
ANALYSIS: DATE	10/23/87	TIME	10:00		
	FIELD TEAM DOSE RATE		-1.00	MR/HR	
	FIELD TEAM LOCATION		-1.00	MILE	
	GROSS IODINE		-1.000E+00	uCi/CC	

STACK

STACK :	STACK CONCENTRATION	4.000E+00	uCi/CC
	STACK RELEASE RATE	5.200E+08	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		PROMPT

FIGURE 4.8.2

Lesson 8 - Third Input Screen



SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:00

STACK

MET DATA  
UPPER : WIND SPEED 7.00 MPH  
WIND DIRECTION 240.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.65 LY/MIN

RELEASE CONDITION

0 = RELEASE STOPPED  
1 = RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 2 1 OR 2

DATE SCREEN RAD SCREEN RUN

FIGURE 4.8.3

Lesson 8 - Fourth Input Screen

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 10:00

SEABROOK STATION  
 PLUME POSITION AT 10:00  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87 , 09:45 TO 10/23/87 , 10:00)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE DEG F/DH	DELTA TEMPERATURE DEG C/100M	STAR	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	7.0	3.13	240.	WSW	0.0	0.0	E	0.00	0.65

RADIOLOGICAL: (FROM 10/23/87 , 09:45 TO 10/23/87 , 10:00)

LOCA = 3  
 STACK CONCENTRATION 4.0000E+00 uCi/CC STACK RELEASE RATE 5.2000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 10:00 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- GENERAL  
 TOTAL ACCUMULATED GAMMA DOSE 2.65E+02 mR TOTAL ACCUMULATED THYROID DOSE 1.01E+02 R  
 TOTAL CURIES RELEASED 3.73E+05 Ci TOTAL CURIES IODINE RELEASED 1.17E+07 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (g/M**3)	I/W DEP. (g/M**3)	I/W DEPOSITION (I/M**2)	
0	0.6	60.	3.93E+02	2.65E+02	0.5	1.79E+08	2.20E+02	-	0.2	5.20E+09	Y	6.48E-06	2.61E-08	1.63E-10

PLUME POINT INFORMATION AT 10:00 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (mR/hr)	FIELD (mR/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	COR WIDTH MI	REL RATE (uCi/sec) USE	GAMMA (g/M**3)	I/W DEP. (g/M**3)	I/W DEPOSITION (I/M**2)	
5	2.3	213.	5.13E+01	3.46E+01	1.6	3.27E+07	4.68E+03	-	1.5	1.30E+09	Y	3.26E-06	2.22E-08	1.39E-08
4	1.5	220.	1.05E+02	7.10E+01	1.4	7.64E+07	9.71E+03	-	1.3	2.60E+09	Y	3.39E-06	2.31E-08	1.44E-08
3	0.0	338.	1.93E+02	1.30E+02	1.1	1.26E+08	1.85E+04	-	1.0	3.90E+09	Y	4.12E-06	2.93E-08	1.60E-08
2	1.7	60.	3.61E+02	2.44E+02	0.7	1.79E+08	1.92E+04	-	0.5	5.20E+09	Y	5.96E-06	2.27E-08	1.42E-08
1	0.1	60.	3.29E+02	2.22E+02	0.5	1.79E+08	6.00E+01	-	0.0	5.20E+09	Y	5.43E-06	0.00E-01	0.00E-01

FIGURE 4.8.4

Lesson 8 - Plume Position Output

LEVATED RELEASE PLUME PROJECTION FROM 9:45  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MR)	GAMMA D.K. (R/HR)	INF THY DO (R/HR)	GAMMA I/Q (SEC/M**2)	DEPLETED I/Q (SEC/M**2)	DEPOSITION (I/M**2)
0.60	60.	09:50	2.97E+02	2.199E+02	6.47E-06	2.61E-08	1.634E-10
1.00	60.	09:54	4.203E+02	6.305E+03	6.92E-06	7.485E-07	4.684E-09
2.00	60.	10:02	2.371E+02	2.081E+04	5.554E-06	2.470E-06	1.546E-08
3.00	60.	10:11	2.694E+02	2.784E+04	4.439E-06	3.305E-06	2.069E-08
4.00	60.	10:19	2.095E+02	2.276E+04	3.452E-06	2.702E-06	1.691E-08
5.00	60.	10:28	1.761E+02	2.363E+04	2.902E-06	2.805E-06	1.756E-08
6.00	60.	10:36	1.457E+02	1.687E+04	2.401E-06	2.240E-06	1.402E-08
7.00	60.	10:45	1.271E+02	1.910E+04	2.092E-06	2.267E-06	1.419E-08
8.00	60.	10:54	1.092E+02	1.555E+04	1.601E-06	1.846E-06	1.155E-08
9.00	60.	11:02	9.551E+01	1.316E+04	1.574E-06	1.562E-06	9.775E-09
10.00	60.	11:11	8.456E+01	1.114E+04	1.294E-06	1.122E-06	8.275E-09

PROTECTIVE ACTION RECOMMENDATIONS

2 HR EVAC				2 HR SHEL				4 HR EVAC				4 HR SHEL			
DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)
0.60	60.	7.863E+02	7.077E+02	4.399E+02	2.199E+02	6.47E-06	2.61E-08	0.60	60.	1.342E+03	1.415E+03	7.507E+02	7.698E+02		
1.00	60.	8.406E+02	7.565E+02	1.261E+04	9.456E+03	6.92E-06	7.485E-07	1.00	60.	1.407E+03	1.513E+03	2.110E+04	2.207E+04		
2.00	60.	6.741E+02	6.067E+02	4.161E+04	2.121E+04	5.554E-06	2.470E-06	2.00	60.	1.082E+03	1.213E+03	6.885E+04	7.222E+04		
3.00	60.	5.287E+02	4.849E+02	2.055E+04	4.177E+04	4.439E-06	3.305E-06	3.00	60.	8.252E+02	9.697E+02	8.529E+04	9.745E+04		
4.00	60.	4.190E+02	3.771E+02	4.922E+04	7.414E+04	3.452E-06	2.702E-06	4.00	60.	6.139E+02	7.542E+02	6.669E+04	7.966E+04		
5.00	60.	2.523E+02	2.170E+02	4.721E+04	7.744E+04	2.902E-06	2.805E-06	5.00	60.	4.897E+02	6.241E+02	6.569E+04	8.271E+04		
6.00	60.	2.914E+02	2.622E+02	1.774E+04	2.202E+04	2.401E-06	2.240E-06	6.00	60.	4.585E+02	5.245E+02	5.938E+04	6.264E+04		
7.00	60.	2.541E+02	2.267E+02	3.621E+04	2.662E+04	2.092E-06	2.267E-06	7.00	60.	3.807E+02	4.572E+02	5.722E+04	6.695E+04		
8.00	60.	2.185E+02	1.967E+02	2.111E+04	2.227E+04	1.601E-06	1.846E-06	8.00	60.	3.111E+02	3.974E+02	4.427E+04	5.442E+04		
9.00	60.	1.910E+02	1.719E+02	1.672E+04	1.974E+04	1.574E-06	1.562E-06	9.00	60.	2.522E+02	3.479E+02	3.572E+04	4.622E+04		
10.00	60.	1.692E+02	1.522E+02	2.228E+04	2.773E+04	1.294E-06	1.122E-06	10.00	60.	2.168E+02	2.045E+02	2.855E+04	3.922E+04		

- \* EVACUATE - SALISBURY, AMESBURY, S. HAMPTON
- \* EVACUATE - KENSINGTON, W. HAMPTON, RYE
- \* EVACUATE - HAMPTON, HAMPTON FALLS, SEABROOK
- \* SHELTER - NEWBURYPORT, NEWBURY, W. NEWBURY
- \* SHELTER - MERRIMAC, NEWTON, BRENTWOOD
- \* SHELTER - E. KINGSTON, STRATHAM, EIETER
- \* SHELTER - KINGSTON, NEWFIELDS, GREENLAND
- \* SHELTER - FORTSMOUTH, NEW CASTLE

6 HR EVAC				6 HR SHEL				8 HR EVAC				8 HR SHEL			
DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)	DIST (MI)	ANG (DEG)	GAMMA DOSE (R)	INF THY DO (R)
0.60	60.	1.342E+03	2.121E+03	7.507E+02	7.698E+02	6.47E-06	2.61E-08	0.60	60.	1.342E+03	1.801E+03	7.507E+02	1.649E+02		
1.00	60.	1.407E+03	2.270E+03	2.110E+04	2.465E+04	6.92E-06	7.485E-07	1.00	60.	1.407E+03	2.126E+03	2.110E+04	4.702E+03		
2.00	60.	1.082E+03	1.820E+03	6.885E+04	1.184E+05	5.554E-06	2.470E-06	2.00	60.	1.082E+03	2.427E+03	6.885E+04	1.511E+05		
3.00	60.	8.252E+02	1.455E+03	8.529E+04	1.521E+05	4.439E-06	3.305E-06	3.00	60.	8.252E+02	1.929E+03	8.529E+04	2.062E+05		
4.00	60.	6.139E+02	1.131E+03	6.669E+04	1.221E+05	3.452E-06	2.702E-06	4.00	60.	6.139E+02	1.508E+03	6.669E+04	1.707E+05		
5.00	60.	4.897E+02	9.511E+02	6.569E+04	1.172E+05	2.902E-06	2.805E-06	5.00	60.	4.897E+02	1.268E+03	6.569E+04	1.772E+05		
6.00	60.	4.585E+02	7.868E+02	5.938E+04	1.029E+05	2.401E-06	2.240E-06	6.00	60.	4.585E+02	1.049E+03	5.938E+04	1.415E+05		
7.00	60.	3.807E+02	6.862E+02	5.722E+04	1.177E+05	2.092E-06	2.267E-06	7.00	60.	3.807E+02	9.147E+02	5.722E+04	1.422E+05		
8.00	60.	3.111E+02	5.971E+02	4.427E+04	1.166E+05	1.601E-06	1.846E-06	8.00	60.	3.111E+02	7.867E+02	4.427E+04	1.166E+05		
9.00	60.	2.522E+02	5.158E+02	3.572E+04	1.227E+05	1.574E-06	1.562E-06	9.00	60.	2.522E+02	6.897E+02	3.572E+04	9.266E+04		
10.00	60.	2.168E+02	4.567E+02	2.855E+04	8.326E+04	1.294E-06	1.122E-06	10.00	60.	2.168E+02	6.094E+02	2.855E+04	6.504E+04		

- \* EVACUATE - SALISBURY, AMESBURY, S. HAMPTON
- \* EVACUATE - KENSINGTON, W. HAMPTON, RYE
- \* EVACUATE - HAMPTON, HAMPTON FALLS, SEABROOK
- \* SHELTER - NEWBURYPORT, NEWBURY, W. NEWBURY
- \* SHELTER - MERRIMAC, NEWTON, BRENTWOOD
- \* SHELTER - E. KINGSTON, STRATHAM, EIETER
- \* SHELTER - KINGSTON, NEWFIELDS, GREENLAND
- \* SHELTER - FORTSMOUTH, NEW CASTLE

FIGURE 4.8.5

Lesson 8 - Plume Projection Output

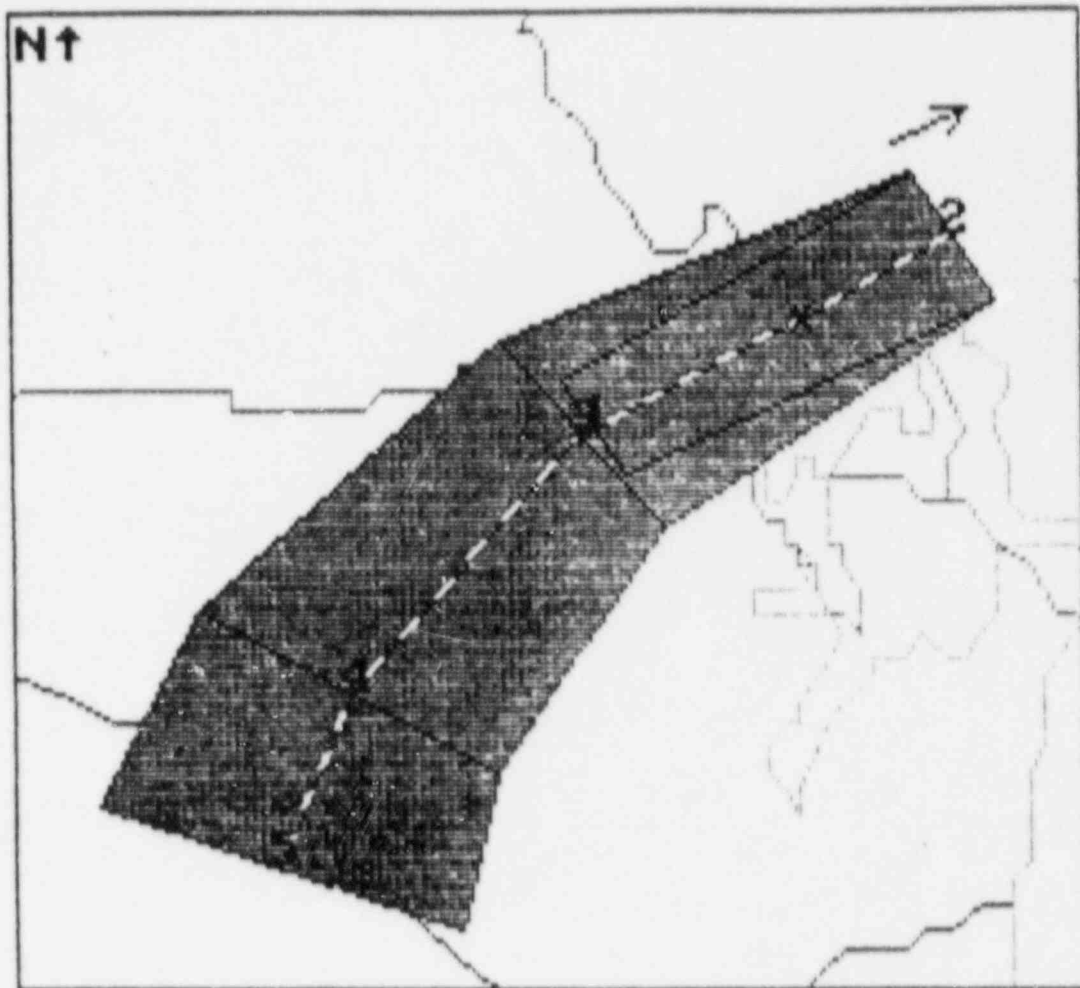


FIGURE 4.8.6

Lesson 8 - Graphics Output

Light pen dose rate at 1mi - 640 mR/hr

Dose rate between plume points 1 and 2 350 mR/hr

Dose rate between plume points 2 and 3 290 mR/hr

Estimated Dose Rate 640 mR/hr

FIGURE 4.8.7

Lesson 8 - Estimated Gamma Dose Rate

## 4.9 Lesson 9

### Learning Objectives

Terminate the release and track the detached plume.

### Scenario

The TSC reports to the EOF that the release from the plant terminated at 1010. The 1015 met data shows the winds have shifted around again to 60°. At 1030 there has been no change in the met data (i.e., 1015 still applies). Track the plume.

### Lesson

1. Produce a 1015 plot of the plume. Since there is a segment being emitted from 1000 to 1010, the release should not be terminated at this time.
2. The release is assumed to terminate just after 1015.
3. Use the continue accident option to produce a 1030 analysis. Go to the met screen.
4. Set the cursor on stack release status and change the "1" to a "0" to indicate the termination of the release.
5. Note: The stack monitor reading does not have to be set to zero.
6. The map now shows a detached plume. The program will display the plume location out to the 10-mile radius from the plant. However, calculations will continue to be performed out to 20 miles.

## Summary

Termination of the release was demonstrated in this lesson. In the scenario the release did not stop until 1010. Therefore, radioactive material was emitted for 10 minutes in the 1000-1015 met data interval. Since the plume was still dispersing, the release was not terminated in METPAC until the 1015-1030 interval, when the detached plume was followed.

However, if the release had been terminated at 1001 for example, it might have been appropriate to terminate the release in the 1000-1015 interval. A general rule cannot be given as there are many variables. For example, a stack monitor reading of a few R/hr (or higher!) may be too significant to terminate in the 1000-1015 interval even if the release terminated at 1001. The judgement of the METPAC operator must be relied upon in these situations.

The plume plots in this lesson show the detached plume as it is tracked over the countryside. The METPAC program will display the plume out to the 10-mile radius. The program will continue to calculate dose rates out to 20 miles.

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:15

STACK

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	UCI/CC

STACK :	STACK CONCENTRATION	2.000E+00	UCI/CC
	STACK RELEASE RATE	2.800E+08	UCI/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-1H/2-GAM
DATE SCREEN	MET SCREEN		

FIGURE 4.9.1

Lesson 9 - Third Input Screen at 10:15



SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:15

STACI

MET DATA  
UPPER : WIND SPEED 7.00 MPH  
WIND DIRECTION 60.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.70 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK : 1  
LOCATYPE : 2 1 OR 3

DATE SCREEN RAD SCREEN RUN PROMPT

FIGURE 4.9.2

Lesson 9 - Fourth Input Screen at 10:15

DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05  
 ANALYSIS 10/23/87 09:15 10/23/87 10:15

SEABROOK STATION  
 PLUME POSITION AT 10:15  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/23/87, 10:00 TO 10/23/87, 10:15)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE DEG F/DH	DELTA TEMPERATURE DEG C/100M	STAB	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	7.0	3.13	60.	ENE	0.0	0.0	E	0.00	0.70

RADIOLOGICAL: (FROM 10/23/87, 10:00 TO 10/23/87, 10:15)

LOCA = 3  
 STACK CONCENTRATION 2.0000E+00 uCi/cc STACK RELEASE RATE 2.8000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 10:15 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- GENERAL  
 TOTAL ACCUMULATED GAMMA DOSE 3.16E+02 mR TOTAL ACCUMULATED THYROID DOSE 1.58E+02 R  
 TOTAL CURIES RELEASED 4.57E+05 Ci TOTAL CURIES IODINE RELEASED 1.40E+07 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (uR/hr)	FIELD (uR/hr)	COR WIDTH MI	REL RATE USE (uCi/sec)	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE USE (uCi/sec)	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (l/M**2)	
0	0.6	240.	2.04E+02	1.08E+02	0.5	9.31E+07	1.10E+02	-	0.2	2.80E+09	Y	6.48E-06	2.61E-08	1.63E-10

PLUME POINT INFORMATION AT 10:15 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS			
			MODEL (uR/hr)	FIELD (uR/hr)	COR WIDTH MI	REL RATE USE (uCi/sec)	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE USE (uCi/sec)	GAMMA (s/M**3)	I/W DEP. (s/M**3)	I/W DEPOSITION (l/M**2)	
6	3.9	225.	3.94E+01	2.66E+01	2.0	3.27E+07	3.67E+03	-	1.9	1.30E+09	Y	2.50E-06	1.74E-06	1.09E-08
5	3.2	231.	7.84E+01	5.29E+01	1.8	7.64E+07	7.49E+03	-	1.7	2.80E+09	Y	2.52E-06	1.78E-06	1.11E-08
4	1.7	240.	1.33E+02	8.97E+01	1.4	1.26E+08	1.35E+04	-	1.4	3.90E+09	Y	2.84E-06	2.14E-06	1.34E-08
3	0.0	329.	2.31E+02	1.56E+02	1.1	1.79E+08	2.22E+04	-	1.0	5.20E+09	Y	3.80E-06	2.63E-06	1.65E-08
2	1.7	240.	1.88E+02	1.27E+02	0.7	9.31E+07	9.58E+03	-	0.5	2.80E+09	Y	5.96E-06	2.27E-06	1.42E-08
1	0.1	240.	1.71E+02	1.16E+02	0.5	9.31E+07	0.00E+01	-	0.0	2.80E+09	Y	5.43E-06	0.00E+01	0.00E-01

FIGURE 4.9.3

Lesson 9 - 10:15 Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 10: 0  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA D.R. (uR/HR)	INF THY DR (R/HR)	GAMMA 1/0 (SEC/MI*3)	DEFLECTED 1/0 (SEC/MI*3)	DEPOSITION (1/MI*2)
0.60	240.	10:05	2.044E+02	1.100E+02	6.478E-06	2.811E-08	1.674E-10
1.00	240.	10:09	2.185E+02	3.153E+02	6.926E-06	7.485E-07	4.664E-09
2.00	240.	10:17	1.753E+02	1.040E+04	5.554E-06	2.470E-06	1.546E-08
3.00	240.	10:26	1.333E+02	1.059E+04	4.255E-06	2.514E-06	1.573E-08
4.00	240.	10:34	1.052E+02	9.290E+03	3.335E-06	2.206E-06	1.385E-08
5.00	240.	10:43	8.579E+01	7.945E+03	2.719E-06	1.688E-06	1.181E-08
6.00	240.	10:51	7.167E+01	6.805E+03	2.276E-06	1.615E-06	1.011E-08
7.00	240.	11:00	6.149E+01	5.872E+03	1.947E-06	1.254E-06	8.725E-09
8.00	240.	11:09	5.349E+01	5.115E+03	1.695E-06	1.214E-06	7.601E-09
9.00	240.	11:17	4.716E+01	4.494E+03	1.454E-06	1.067E-06	6.661E-09
10.00	240.	11:26	4.202E+01	3.985E+03	1.232E-06	9.461E-07	5.921E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	1 HR EVAC GAMMA DOSE (uR)	2 HR SHEL GAMMA DOSE (uR)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (uR)	4 HR SHEL GAMMA DOSE (uR)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	240.	4.089E+02	3.680E+02	2.199E+02	1.644E+02	0.60	240.	7.439E+02	7.359E+02	4.028E+02	3.849E+02
1.00	240.	4.371E+02	3.934E+02	6.305E+02	4.729E+02	1.00	240.	7.860E+02	7.808E+02	1.134E+04	1.102E+04
2.00	240.	7.555E+02	3.155E+02	2.081E+04	1.567E+04	2.00	240.	6.070E+02	6.311E+02	3.677E+04	3.641E+04
3.00	240.	2.667E+02	2.405E+02	2.118E+04	1.558E+04	3.00	240.	4.871E+02	4.808E+02	3.862E+04	3.708E+04
4.00	240.	2.103E+02	1.897E+02	1.806E+04	1.393E+04	4.00	240.	3.702E+02	3.668E+02	3.275E+04	3.221E+04
5.00	240.	1.718E+02	1.544E+02	1.589E+04	1.192E+04	5.00	240.	2.891E+02	2.880E+02	2.676E+04	2.681E+04
6.00	240.	1.437E+02	1.294E+02	1.361E+04	1.021E+04	6.00	240.	2.287E+02	2.297E+02	4.07E+04	4.07E+04
7.00	240.	1.230E+02	1.107E+02	1.174E+04	8.828E+03	7.00	240.	1.810E+02	1.814E+02	3.06E+04	2.055E+04
8.00	240.	1.070E+02	9.626E+01	1.073E+04	7.671E+03	8.00	240.	1.747E+02	1.746E+02	1.31E+04	1.797E+04
9.00	240.	9.431E+01	8.488E+01	8.993E+03	6.744E+03	9.00	240.	1.478E+02	1.468E+02	1.409E+04	1.574E+04
10.00	240.	8.410E+01	7.569E+01	7.970E+03	5.977E+03	10.00	240.	1.204E+02	1.214E+02	1.189E+04	1.095E+04

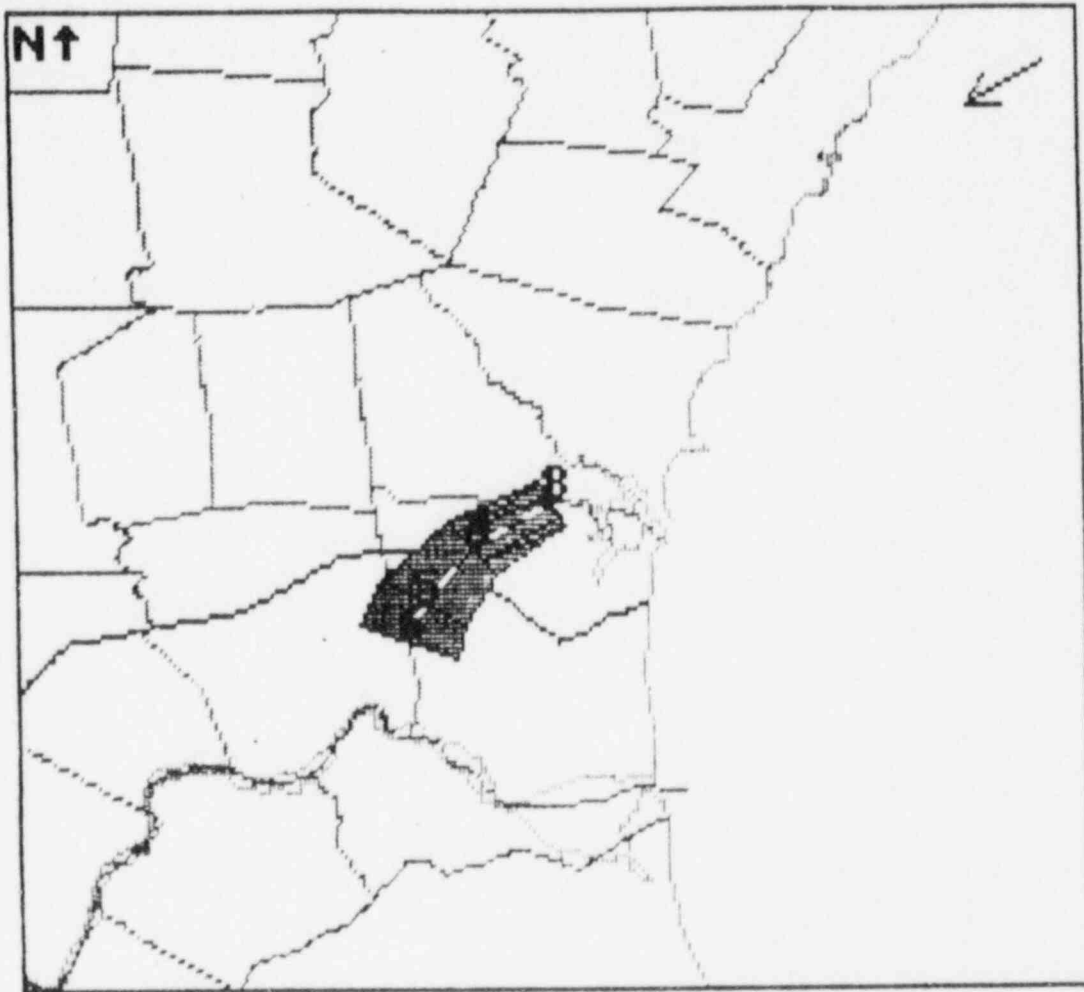
- \* EVACUATE - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* EVACUATE - MERRIMAC, AMESBURY, NEWTON
- \* EVACUATE - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* EVACUATE - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - NEWBURY, BRENTWOOD, STRATHAM
- \* SHELTER - EILEY, KINGSTON, NEWFIELDS
- \* SHELTER - GREENLAND, PORTSMOUTH, RYE
- \* SHELTER - NEW CASTLE

DIST (MI)	ANG (DEG)	6 HR EVAC GAMMA DOSE (uR)	6 HR SHEL GAMMA DOSE (uR)	6 HR EVAC INF THY DO (R)	6 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (uR)	8 HR SHEL GAMMA DOSE (uR)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	240.	7.439E+02	1.104E+03	4.078E+02	6.046E+02	0.60	240.	7.439E+02	1.470E+03	4.028E+02	8.247E+02
1.00	240.	7.860E+02	1.180E+03	1.134E+04	1.724E+04	1.00	240.	7.860E+02	1.574E+03	1.134E+04	2.264E+04
2.00	240.	6.070E+02	9.465E+02	3.605E+04	5.721E+04	2.00	240.	6.070E+02	1.262E+03	3.605E+04	7.602E+04
3.00	240.	4.871E+02	7.200E+02	3.868E+04	5.637E+04	3.00	240.	4.871E+02	1.600E+03	3.868E+04	7.941E+04
4.00	240.	3.702E+02	5.679E+02	3.276E+04	5.109E+04	4.00	240.	3.702E+02	1.552E+03	3.275E+04	6.967E+04
5.00	240.	2.891E+02	4.633E+02	2.678E+04	4.370E+04	5.00	240.	2.891E+02	6.177E+02	2.678E+04	5.959E+04
6.00	240.	2.287E+02	3.861E+02	2.427E+04	3.740E+04	6.00	240.	2.287E+02	6.175E+02	2.427E+04	5.103E+04
7.00	240.	1.810E+02	3.221E+02	2.006E+04	3.220E+04	7.00	240.	1.810E+02	4.408E+02	2.006E+04	4.404E+04
8.00	240.	1.747E+02	2.888E+02	1.671E+04	2.813E+04	8.00	240.	1.747E+02	2.851E+02	1.671E+04	3.816E+04
9.00	240.	1.478E+02	2.546E+02	1.409E+04	2.473E+04	9.00	240.	1.478E+02	2.502E+02	1.409E+04	3.272E+04
10.00	240.	1.204E+02	2.271E+02	1.189E+04	2.192E+04	10.00	240.	1.204E+02	2.227E+02	1.189E+04	2.989E+04

- \* EVACUATE - SALISBURY, NEWBURYPORT, W. NEWBURY
- \* EVACUATE - MERRIMAC, AMESBURY, NEWTON
- \* EVACUATE - S. HAMPTON, KENSINGTON, E. KINGSTON
- \* EVACUATE - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* EVACUATE - SEABROOK
- \* SHELTER - NEWBURY, BRENTWOOD, STRATHAM
- \* SHELTER - EILEY, KINGSTON, NEWFIELDS
- \* SHELTER - GREENLAND, PORTSMOUTH, RYE
- \* SHELTER - NEW CASTLE

FIGURE 4.9.4

Lesson 9 - 10:15 Plume Projection Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

ELU GAM  
T=10:15  
7.0 MPH  
60 DEG  
E STAB  
↔20.00MI  
— STATE  
— TOWNS  
— RIVER  
— ROADS

FIGURE 4.9.5

Lesson 9 - 10:15 Graphics Output

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:30

STAC

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	0.000E-01	uCi/CC
	STACK RELEASE RATE	0.000E-01	uCi/SEC
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	1	0-MON/1-THY/2-GAM
DATE SCREEN	MET SCREEN		

FIGURE 4.9.6

Lesson 9 - Third Input Screen at 10:30

SHUTDOWN: DATE 10/23/87 TIME 09:00  
ANALYSIS: DATE 10/23/87 TIME 10:30

STACH

MET DATA  
UPPER : WIND SPEED 7.00 MPH  
WIND DIRECTION 60.00 DEG FROM  
DELTA TEMPERATURE 0.00 DEG F

PRECIPITATION : 0.00 INCH/DTR HR  
SOLAR RADIATION : 0.70 LY/MIN  
RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACH : 0  
LOCATYPE : 0 1 OR 0

DATE SCREEN RAD SCREEN RUN PROMPT

FIGURE 4.9.7

Lesson 9 - Fourth Input Screen at 10:30

DATE AND TIME OF: MO/DA/YR HR:MM MO/DA/YR HR:MM  
 SHUTDOWN 10/23/87 09:00  
 STACK RELEASE 10/23/87 09:05 10/23/87 10:15  
 ANALYSIS 10/23/87 09:15 10/23/87 10:30

SEABROOK STATION  
 PLUME POSITION AT 10:30  
 RELEASE TERMINATED

METEOROLOGY: (FROM 10/23/87 , 10:15 TO 10/23/87 , 10:30)

TOWER LEVEL	WIND SPEED (MPH)	WIND SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE			PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
					DEG F/DH	DEG C/100M	STAB		
ELEVATED	7.0	3.13	60.	ENE	0.0	0.0	E	0.00	0.70

RADIOLOGICAL: (FROM 10/23/87 , 10:15 TO 10/23/87 , 10:30)

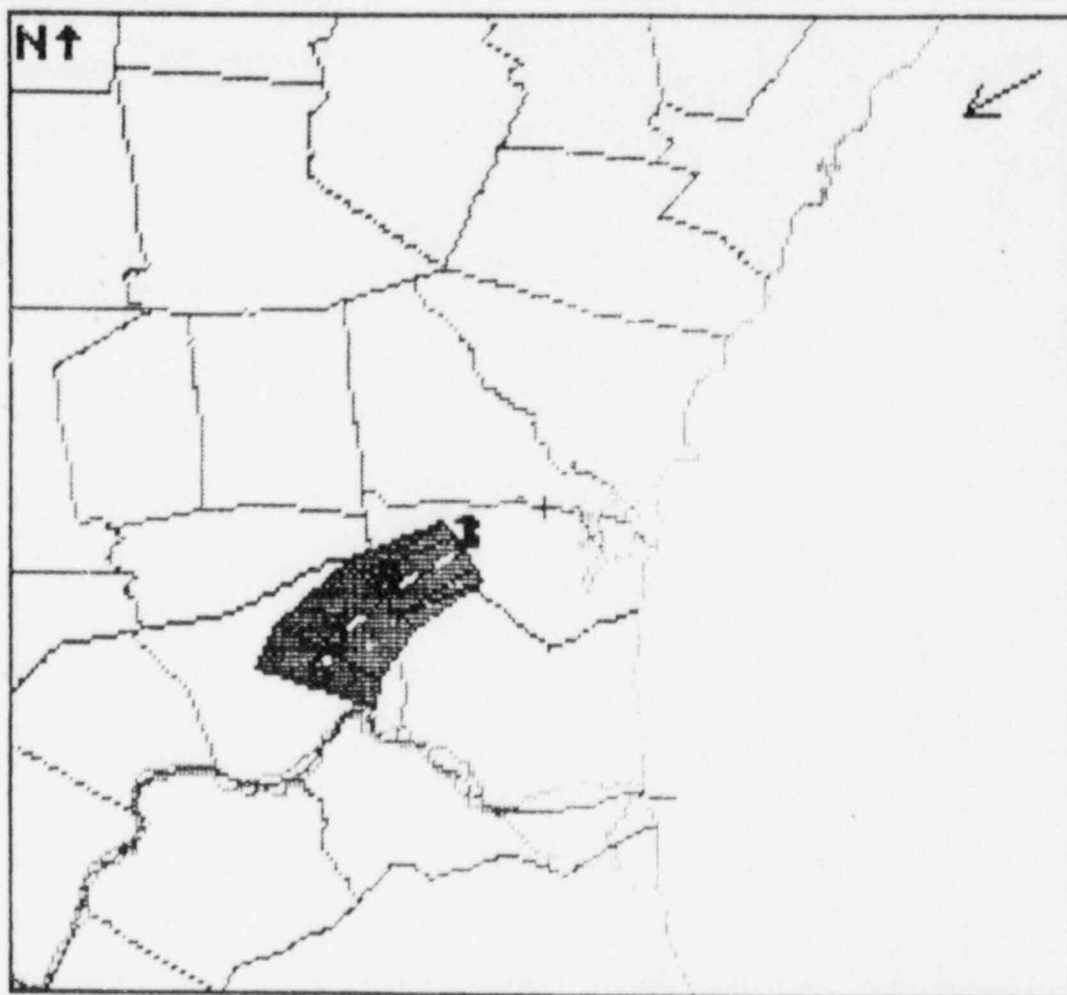
LOCA = 3  
 STACK CONCENTRATION 0.0000E-01 uCi/CC STACK RELEASE RATE 0.0000E-01 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 ISOTOPICS USED IN CALCULATION

PLUME POINT INFORMATION AT 10:30 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS		
			MODEL	FIELD	CON	WIDTH	REL RATE	ISO USE	MODEL	FIELD	CON	WIDTH	REL RATE	ISO USE	GAMMA (s/M**3)
6	5.6	229.	3.16E+01	2.13E+01	2.4	3.27E+07	2.95E+03	-	2.3	1.30E+09	Y	2.00E-06	1.40E-06	8.76E-09	
5	1.9	234.	6.16E+01	4.16E+01	2.2	7.64E+07	5.92E+03	-	2.1	2.60E+09	Y	1.98E-06	1.40E-06	8.79E-09	
4	3.5	240.	9.93E+01	6.70E+01	1.8	1.26E+08	1.01E+04	-	1.8	3.90E+09	Y	2.12E-06	1.60E-06	1.00E-08	
3	1.7	240.	1.59E+02	1.07E+02	1.4	1.79E+08	1.64E+04	-	1.4	5.20E+09	Y	2.62E-06	1.94E-06	1.22E-08	
2	3.5	240.	1.18E+02	7.95E+01	1.1	9.31E+07	9.98E+03	-	1.0	2.80E+09	Y	3.74E-06	2.37E-06	1.48E-08	
1	1.7	240.	1.08E+02	1.27E+02	0.7	9.31E+07	9.58E+03	-	0.5	2.60E+09	Y	5.96E-06	2.27E-06	1.42E-08	

FIGURE 4.9.8

Lesson 9 - 10:30 Plume Position Output



FUNCTION  
 KEYS  
 1-RADIUS  
 2-ROADS  
 3-PUBLIC  
 4-LABELS  
 5-ZOOM  
 6-REDRAW  
 7-  
 8-LT PEN  
 9-PRINT  
 10-EXIT

ELU GAM  
 T=10:30  
 7.0 MPH  
 60 DEG  
 E STAB  
 ↔20.00MI  
 — STATE  
 — TOWNS  
 — RIVER  
 — ROADS

FIGURE 4.9.9

Lesson 9 - 10:30 Graphics Output



#### 4.10 Lesson 10

##### Learning Objectives

1. Begin analysis when the release has been proceeding for an hour prior to your arrival at the EOF.
2. Use METPAC to analyze a ground level and elevated (stack) release.
3. Use the Batch Option 3, "Project Using New Data," to quickly bring METPAC up to date.
4. Produce the total integrated dose report.

##### Scenario

This is a new accident condition. The reactor shutdown at 0800. At 0905 a stack release began as indicated by data in Figure 4.10.1. At 0920, a radioactive release of undetermined origin was detected at the site boundary. The site boundary dose rate and the stack monitor readings are as shown in Figure 4.10.1. A total integrated dose report for 0945 has been requested.

You activate the METPAC computer at 1000. Begin your analysis.

There has been no change in plant status since 0920.

##### Lesson

1. Gather all met and rad data from 0905 and later.
2. Select Batch Execution and then specify 3 - project using new data.
3. Give the computer 0905 as the start of the stack release and 0920 as the start of the unmonitored release.

4. Specify 3 quarter-hours to project (9:15, 9:30, and 9:45).
5. Enter met and rad data for each 15-minute period as each screen is presented.
6. Note that a map of the ground level release has been produced, separate from the stack (elevated) release.
7. To see the map of the elevated release at 0945, type F6 (redraw).
8. Press "2" (elevated gamma) then (Return) in response to the prompt "enter type of plume."
9. Note that this plume map shows three segments--one for 0905-0915, another for 0916-0930, and a final one for 0931-0945.
10. Dose rates from the elevated and ground level releases must be added (at the same plume location) to arrive at the total dose rate (gamma).
11. Remember to save the batch execution.
12. The first step in producing a total integrated dose report is to calculate the total integrated dose by depressing 8 (Return).
13. The selection of 9 (Return), then entry of 0945 (Return) will result in the total integrated dose report for 0945 being printed. The first section is a total for the entire accident, and the second section contains the current quarter-hour's doses.
14. Time of analysis is now 1000 and you are ready to enter current data as it is received at the EOF.

## Summary

This lesson demonstrated the METPAC program's capability to track both elevated and ground level releases. It also demonstrates how to operate METPAC in batch mode well after a release has occurred. Each of the plume maps is viewed separately by using the redraw function (F6) on the color monitor. Total dose rate at a given location is determined by summing the dose rates due to the elevated and ground level releases. The total integrated dose report was also produced. This report shows the summed doses for both ground and elevated at predetermined distances from the plant.

	<u>9:15</u>	<u>9:30</u>	<u>9:45</u>
Lower Wind Speed (Mph)		6	6
Lower Wind Direction (Deg)		160	160
Lower Delta Temperature (Deg F)		0	0
Upper Wind Speed (Mph)	8	8	8
Upper Wind Direction (Deg)	180	180	180
Upper Delta Temperature (Deg F)	1	1	1
Precipitation (inch/Qtr Hr)	0	0	0
Solar Radiation (1y/min)	.4	.4	.4
Stack Concentration (uCi/cc)	2	2	2
Stack Release Rate (uCi/sec)	2.6E8	2.6E8	2.6E8
Site Boundary Dose Rate (mR/hr)		300	300
Loca Type	3	3	3

FIGURE 4.10.1

Lesson 10 - Readings and Times

- 1- PROJECT USING CURRENT ANALYSIS WITH PERSISTENT MET AND RAD DATA
- 2- PROJECT USING CURRENT ANALYSIS WITH USER INPUT MET AND RAD DATA
- 3- PROJECT USING NEW DATA
- 4- RETURN TO LAST SCREEN

FIGURE 4.10.2

Lesson 10 - Sixth Input Screen

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
SHUTDOWN	10/26/87	08:00
UNMONITORED RELEASE	10/26/87	09:20
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	-1/-1/-1	-1:-1
STACK RELEASE	10/26/87	09:00

LAST SCREEN  
NEXT SCREEN

FIGURE 4.10.3

Lesson 10 - Second Input Screen

TOTAL NUMBER OF QUARTER HOURS TO EXCLUDE . . . . .

FIGURE 4.10.4

Lesson 10 - Seventh Input Screen

SHUTDOWN: DATE 10/26/87 TIME 03:00  
ANALYSIS: DATE 10/26/87 TIME 09:15

BTAG

FIELD TEAM DOSE RATE	-1.00	MR/HR
FIELD TEAM LOCATION	-1.00	MILE
GROSS IODINE	-1.000E+00	uCi/CC

STACK :	STACK CONCENTRATION	1.000E+00	uCi/CC
	STACK RELEASE RATE	2.600E+08	uCi/SEC
	ISOTOPICS	N	Y / N
DATE SCREEN	MONITORED NO. ISOTOPICS	0	0-MON/1-THY/2-GRU
	MET SCREEN:		

FIGURE 4.10.5

Lesson 10 - Third Input Screen at 9:15



SHUTDOWN: DATE 10/26/87 TIME 08:00  
ANALYSIS: DATE 10/26/87 TIME 09:15

STAGE

MET DATA  
UPPER : WIND SPEED 8.00 MPH  
WIND DIRECTION 180.00 DEG FROM  
DELTA TEMPERATURE 1.00 DEG F

PRECIPITATION : 0.00 INCH/DTR HR  
SOLAR RADIATION : 0.40 LY/MIN

RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STAGE : 1  
LOCATYPE : 3 1 OR 3

DATE SCREEN

RAD SCREEN

RUN

FIXURE

FIGURE 4.10.6

Lesson 10 - Fourth Input Screen at 9:15

SHUTDOWN: DATE 10/26/87 TIME 08:00 UNMONITORED  
 ANALYSIS: DATE 10/26/87 TIME 09:30

STACK

	FIELD TEAM DOSE RATE	-1.00	MR/HR
	FIELD TEAM LOCATION	-1.00	MILE
	GROSS IODINE	-1.000E+00	UCI/CC
UNMONITORED :	SITE BOUNDARY DOSE RATE	300.00	MR/HR
	ESTIMATED FLOW RATE	-1.000E+00	CC/SEC
	ISOTOPICS	N	Y / N

STACK :	STACK CONCENTRATION	1.000E+00	UCI/CC
	STACK RELEASE RATE	1.000E+00	UCI/SEC
	ISOTOPICS	N	Y / N
DATE SCREEN	MONITORED VS ISOTOPICS	0	0-MON/1-THY/2-GAS
	MET SCREEN		

FIGURE 4.10.7

Lesson 10 - Third Input Screen at 9:30

SHUTDOWN: DATE 10/26/87 TIME 09:30 UNMONITORED  
ANALYSIS: DATE 10/26/87 TIME 09:30

STACK

MET DATA

UPPER :	WIND SPEED	0.00	MPH
	WIND DIRECTION	180.00	DEG FROM
	DELTA TEMPERATURE	1.00	DEG F
LOWER :	WIND SPEED	0.00	MPH
	WIND DIRECTION	180.00	DEG FROM
	DELTA TEMPERATURE	0.00	DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.00 LY/MIN

UNMONITORED : RELEASE CONDITION

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK :  
LOCATYPE :

DATE SCREEN      RAD SCREEN      RWI      PROMPT

FIGURE 4.10.8

Lesson 10 - Fourth Input Screen at 9:30

SHUTDOWN: DATE	10/25/87	TIME	08:00	UNMONITORED	
ANALYSIS: DATE	10/26/87	TIME	09:45		STACK
	FIELD TEAM DOSE RATE	-1.00		MR/HR	
	FIELD TEAM LOCATION	-1.00		MILE	
	GROSS IODINE	-1.000E+00		uCi/CC	
UNMONITORED :	SITE BOUNDARY DOSE RATE	300.00		MR/HR	
	ESTIMATED FLOW RATE	-1.000E+00		CC/SEC	
	ISOTOPICS	N		Y / N	

STACK :	STACK CONCENTRATION	2.000E+00		uCi/CC	
	STACK RELEASE RATE	2.600E+02		uCi/SEC	
	ISOTOPICS	N		Y / N	
	MONITORED VS ISOTOPICS	0		0-MON/1-100/2-500	
DATE SCREEN	NET SCREEN				FROM 1

FIGURE 4.10.9

Lesson 10 - Third Input Screen at 9:45

SHUTDOWN: DATE 10/26/87 TIME 08:00 UNMONITORED  
ANALYSIS: DATE 10/26/87 TIME 09:45

STACK

MET DATA

UPPER :	WIND SPEED	8.00	MPH
	WIND DIRECTION	180.00	DEG FROM
	DELTA TEMPERATURE	1.00	DEG F
LOWER :	WIND SPEED	6.00	MPH
	WIND DIRECTION	160.00	DEG FROM
	DELTA TEMPERATURE	0.00	DEG F

PRECIPITATION : 0.00 INCH/OTR HR  
SOLAR RADIATION : 0.40 LY/MIN

RELEASE CONDITION

UNMONITORED :

1

0 - RELEASE STOPPED  
1 - RELEASE CONTINUOUS

STACK :

1

LOCATYPE :

0

1 OR 2

DATE SCREEN

RAD SCREEN

RUN

PROMPT

FIGURE 4.10.10

Lesson 10 - Fourth Input Screen at 9:45

DATE AND TIME OF: MO/DA/YR HR:MM MO/DA/YR HR:MM  
 SHUTDOWN 10/26/87 08:00  
 UNMONITORED RELEASE 10/26/87 09:20  
 ANALYSIS 10/26/87 09:15 10/26/87 09:45

SEABROOK STATION  
 PLUME POSITION AT 09:45  
 RELEASE CONTINUING

METEOROLGY: (FROM 10/26/87 , 09:30 TO 10/26/87 , 09:45)

TOWER LEVEL	WIND SPEED		WIND DIR (FROM)		DELTA TEMPERATURE			PRECIPITATION	SOLAR RADIATION
	(MPH)	(M/S)	DEG	SECTOR	DEG F/DH	DEG C/100M	STAB	IN/15 MIN	LANGLEY/MIN
GROUND	6.0	2.68	160.	SSE	0.0	0.0	E	0.00	0.40

RADIOLOGICAL: (FROM 10/26/87 , 09:30 TO 10/26/87 , 09:45)

LOCA = 3  
 SITE BOUNDARY DOSE RATE 3.0000E+02 mR/hr  
 SITE BOUNDARY READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:45 GROUND RELEASE

1000 M RADIUS BAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 1.50E+02 mR TOTAL ACCUMULATED THYROID DOSE 0.00E+01 R  
 TOTAL CURIES RELEASED 1.07E+05 Ci TOTAL CURIES IODINE RELEASED 0.00E+01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS		
			MODEL	FIELD	COR	WIDTH	REL RATE	ISO	MODEL	FIELD	COR	WIDTH	REL RATE	ISO	GAMMA
			(mR/hr)	(mR/hr)	M	(uCi/sec)	USE	(R/hr)	(R/hr)	M	(uCi/sec)	USE	(s/M**2)	(s/M**2)	(s/M**2)
0	0.6	340.	3.00E+02	-	0.6	5.92E+07		0.00E-01	-	0.4	0.00E-01		1.50E-05	3.25E-05	1.75E-07

PLUME POINT INFORMATION AT 09:45 GROUND RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION					INFANT THYROID DOSE RATE INFORMATION					DISPERSION FACTORS		
			MODEL	FIELD	COR	WIDTH	REL RATE	ISO	MODEL	FIELD	COR	WIDTH	REL RATE	ISO	GAMMA
			(mR/hr)	(mR/hr)	M	(uCi/sec)	USE	(R/hr)	(R/hr)	M	(uCi/sec)	USE	(s/M**2)	(s/M**2)	(s/M**2)
3	2.5	340.	1.15E+02	-	1.0	5.92E+07		0.00E-01	-	0.9	0.00E-01		5.71E-06	6.97E-06	3.71E-08
2	1.5	340.	1.71E+02	-	0.8	5.92E+07		0.00E-01	-	0.7	0.00E-01		8.52E-06	1.28E-05	6.97E-08
1	0.1	340.	2.01E+03	-	0.3	5.92E+07		0.00E-01	-	0.3	0.00E-01		1.00E-04	1.24E-07	6.97E-08

FIGURE 4.10.11

Lesson 10 - 9:45 Ground Plume Position Output

GROUND RELEASE PLUME PROJECTION FROM 9:30  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA (R/HR)	D.A. (R/HR)	INF THY DO (R)	GAMMA I/Q (SEC/M**3)	DEPLETED I/Q (SEC/M**3)	DEPOSITION (I/M**2)
0.60	340.	09:36	3.000E+02	0.000E-01		1.495E-05	3.253E-05	1.745E-07
1.00	340.	09:40	2.251E+02	0.000E-01		1.122E-05	2.001E-05	1.074E-07
2.00	340.	09:50	1.375E+02	0.000E-01		6.853E-06	9.165E-06	4.917E-08
3.00	340.	10:00	9.836E+01	0.000E-01		4.888E-06	5.535E-06	2.969E-08
4.00	340.	10:10	7.555E+01	0.000E-01		3.766E-06	3.601E-06	2.039E-08
5.00	340.	10:20	6.133E+01	0.000E-01		3.042E-06	2.812E-06	1.502E-08
6.00	340.	10:30	5.091E+01	0.000E-01		2.507E-06	2.184E-06	1.172E-08
7.00	340.	10:40	4.248E+01	0.000E-01		2.167E-06	1.757E-06	9.424E-09
8.00	340.	10:50	3.580E+01	0.000E-01		1.884E-06	1.450E-06	7.777E-09
9.00	340.	11:00	3.034E+01	0.000E-01		1.621E-06	1.221E-06	6.548E-09
10.00	340.	11:10	2.574E+01	0.000E-01		1.482E-06	1.044E-06	5.612E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	1 HR EVAC GAMMA DOSE (R)	2 HR SHEL GAMMA DOSE (R)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (R)	4 HR SHEL GAMMA DOSE (R)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	340.	3.000E+02	5.400E+02	0.000E-01	0.000E-01	0.60	340.	8.690E+02	1.080E+03	0.000E-01	0.000E-01
1.00	340.	4.502E+02	4.052E+02	0.000E-01	0.000E-01	1.00	340.	6.370E+02	8.102E+02	0.000E-01	0.000E-01
2.00	340.	2.750E+02	2.475E+02	0.000E-01	0.000E-01	2.00	340.	3.662E+02	4.950E+02	0.000E-01	0.000E-01
3.00	340.	1.961E+02	1.785E+02	0.000E-01	0.000E-01	3.00	340.	2.448E+02	3.530E+02	0.000E-01	0.000E-01
4.00	340.	1.511E+02	1.360E+02	0.000E-01	0.000E-01	4.00	340.	1.760E+02	2.720E+02	0.000E-01	0.000E-01
5.00	340.	1.221E+02	1.099E+02	0.000E-01	0.000E-01	5.00	340.	1.320E+02	2.197E+02	0.000E-01	0.000E-01
6.00	340.	1.018E+02	9.164E+01	0.000E-01	0.000E-01	6.00	340.	1.058E+02	1.833E+02	0.000E-01	0.000E-01
7.00	340.	8.695E+01	7.826E+01	0.000E-01	0.000E-01	7.00	340.	1.087E+02	1.565E+02	0.000E-01	0.000E-01
8.00	340.	7.567E+01	6.804E+01	0.000E-01	0.000E-01	8.00	340.	8.820E+01	1.361E+02	0.000E-01	0.000E-01
9.00	340.	6.667E+01	6.001E+01	0.000E-01	0.000E-01	9.00	340.	7.223E+01	1.200E+02	0.000E-01	0.000E-01
10.00	340.	5.948E+01	5.353E+01	0.000E-01	0.000E-01	10.00	340.	5.948E+01	1.071E+02	0.000E-01	0.000E-01

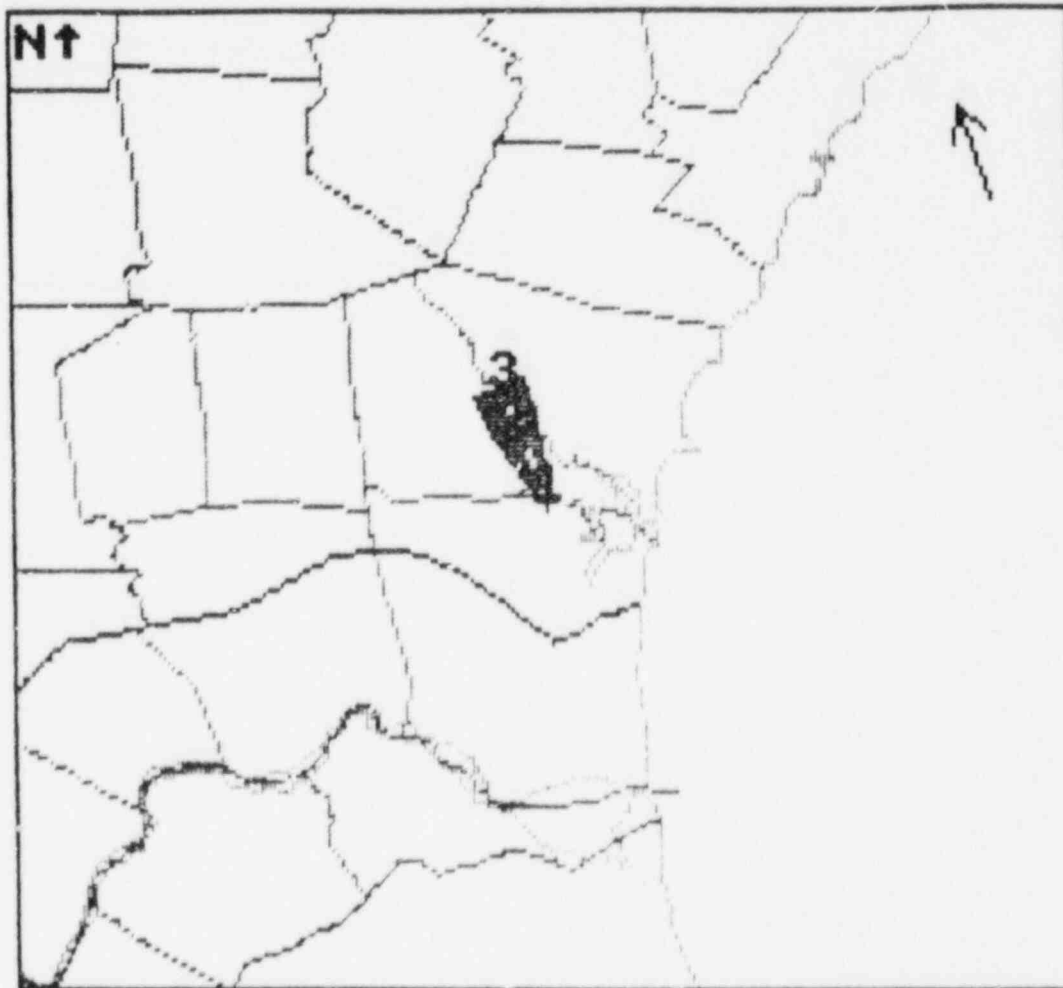
SHELTER - HAMPTON, HAMPTON FALLS, SEABROOK

DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (R)	8 HR SHEL GAMMA DOSE (R)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (R)	8 HR SHEL GAMMA DOSE (R)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	340.	8.690E+02	1.620E+03	0.000E-01	0.000E-01	0.60	340.	8.690E+02	2.160E+03	0.000E-01	0.000E-01
1.00	340.	6.370E+02	1.215E+03	0.000E-01	0.000E-01	1.00	340.	6.370E+02	1.621E+03	0.000E-01	0.000E-01
2.00	340.	3.662E+02	7.425E+02	0.000E-01	0.000E-01	2.00	340.	3.662E+02	9.899E+02	0.000E-01	0.000E-01
3.00	340.	2.448E+02	5.295E+02	0.000E-01	0.000E-01	3.00	340.	2.448E+02	7.060E+02	0.000E-01	0.000E-01
4.00	340.	1.760E+02	4.080E+02	0.000E-01	0.000E-01	4.00	340.	1.760E+02	5.440E+02	0.000E-01	0.000E-01
5.00	340.	1.320E+02	3.295E+02	0.000E-01	0.000E-01	5.00	340.	1.320E+02	4.394E+02	0.000E-01	0.000E-01
6.00	340.	1.058E+02	2.749E+02	0.000E-01	0.000E-01	6.00	340.	1.058E+02	3.623E+02	0.000E-01	0.000E-01
7.00	340.	1.087E+02	2.348E+02	0.000E-01	0.000E-01	7.00	340.	1.087E+02	3.130E+02	0.000E-01	0.000E-01
8.00	340.	8.820E+01	2.041E+02	0.000E-01	0.000E-01	8.00	340.	8.820E+01	2.722E+02	0.000E-01	0.000E-01
9.00	340.	7.223E+01	1.800E+02	0.000E-01	0.000E-01	9.00	340.	7.223E+01	2.400E+02	0.000E-01	0.000E-01
10.00	340.	5.948E+01	1.606E+02	0.000E-01	0.000E-01	10.00	340.	5.948E+01	2.141E+02	0.000E-01	0.000E-01

SHELTER - HAMPTON, HAMPTON FALLS, SEABROOK  
 SHELTER - SALISBURY, AMESBURY, S. HAMPTON  
 SHELTER - YENNINGTON, W. HAMPTON, STRATHAM  
 SHELTER - EETER, NEWFIELDS, GREENLAND  
 SHELTER - HAMPTON, HAMPTON FALLS, SEABROOK

FIGURE 4.10.12

Lesson 10 - 9:45 Ground Plume Projection Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

GRD GAM  
T=09:45  
6.0 MPH  
160 DEG  
E STAB  
←→20.00MI  
— STATE  
— TOWNS  
— RIVER  
— ROADS

FIGURE 4.10.13

Lesson 10 - 9:45 Ground Plume Graphics Output



DATE AND TIME OF: MO/DA/YR HR:MN MO/DA/YR HR:MN  
 SHUTDOWN 10/26/87 08:00  
 STACK RELEASE 10/26/87 09:05  
 ANALYSIS 10/26/87 09:15 10/26/87 09:45

SEABROOK STATION  
 PLUME POSITION AT 09:45  
 RELEASE CONTINUING

METEOROLOGY: (FROM 10/26/87 , 09:30 TO 10/26/87 , 09:45)

TOWER LEVEL	WIND SPEED (MPH) (M/S)	WIND DIR (FROM) DEG	WIND DIR (FROM) SECTOR	DELTA TEMPERATURE DEG F/DH	DELTA TEMPERATURE DEG C/100M	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
ELEVATED	6.0 3.58	180.	S	1.0	1.1	E 0.00	0.40

RADIOLOGICAL: (FROM 10/26/87 , 09:30 TO 10/26/87 , 09:45)

LOCA = 3  
 STACK CONCENTRATION 2.0000E+02 uCi/cc STACK RELEASE RATE 2.6000E+08 uCi/SEC FLOW RATE 1.3000E+08 cc/sec  
 MONITOR READINGS USED IN CALCULATION

SITE BOUNDARY INFORMATION AT 09:45 ELEVATED RELEASE

1000 M RADIUS EAL LIMIT -- SITE AREA  
 TOTAL ACCUMULATED GAMMA DOSE 1.40E+02 mR TOTAL ACCUMULATED THYROID DOSE 0.00E+01 R  
 TOTAL CURIES RELEASED 2.61E+05 Ci TOTAL CURIES IODINE RELEASED 0.00E+01 Ci

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (uR/hr)	FIELD (uR/hr)	COR WIDTH MI	REL RATE ISO (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE ISO (uCi/sec) USE	GAMMA 1/0 DEP. (s/M**3)	1/0 DEPOSITION (s/M**3)	1/0 DEPOSITION (s/M**3)
0	0.6	0.	1.97E+02	-	0.5	1.00E+08	0.00E-01	-	0.2	0.00E+01	5.81E-06	2.86E-06	2.05E-10

PLUME POINT INFORMATION AT 09:45 ELEVATED RELEASE PLUME NO. 1

PLUME NO	DIST MI	ANG DEG	WHOLE BODY DOSE RATE INFORMATION				INFANT THYROID DOSE RATE INFORMATION				DISPERSION FACTORS		
			MODEL (uR/hr)	FIELD (uR/hr)	COR WIDTH MI	REL RATE ISO (uCi/sec) USE	MODEL (R/hr)	FIELD (R/hr)	MI	REL RATE ISO (uCi/sec) USE	GAMMA 1/0 DEP. (s/M**3)	1/0 DEPOSITION (s/M**3)	1/0 DEPOSITION (s/M**3)
4	5.0	0.	7.33E+01	-	1.5	9.01E+07	0.00E-01	-	1.4	0.00E+01	2.32E-06	1.96E-06	1.41E-08
3	4.0	0.	9.50E+01	-	1.7	9.86E+07	0.00E-01	-	1.1	0.00E+01	2.93E-06	1.97E-06	1.41E-08
2	2.0	0.	1.66E+02	-	0.7	1.00E+08	0.00E-01	-	0.6	0.00E+01	4.90E-06	2.27E-06	1.62E-08
1	0.1	0.	1.65E+02	-	0.5	1.00E+08	0.00E-01	-	0.0	0.00E+01	4.86E-06	0.00E-01	0.00E-01

FIGURE 4.10.14

Lesson 10 - 9:45 Elevated Plume Position Output

ELEVATED RELEASE PLUME PROJECTION FROM 9:30  
 STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA (R/HR)	D.R. INF THY DR (R/HR)	GAMMA I/Q (SEC/M**3)	DEPLETED I/Q (SEC/M**3)	DEPOSITION (I/M**2)
0.60	0.	09:35	1.970E+02	0.000E-01	5.812E-06	2.861E-08	2.046E-10
1.00	0.	09:38	2.093E+02	0.000E-01	6.175E-06	7.312E-07	5.230E-09
2.00	0.	09:45	1.662E+02	0.000E-01	4.903E-06	2.268E-06	1.673E-08
3.00	0.	09:53	1.260E+02	0.000E-01	3.717E-06	2.270E-06	1.623E-08
4.00	0.	10:00	9.925E+01	0.000E-01	2.928E-06	1.975E-06	1.413E-08
5.00	0.	10:08	8.781E+01	0.000E-01	2.442E-06	1.941E-06	1.369E-08
6.00	0.	10:15	8.982E+01	0.000E-01	2.059E-06	1.740E-06	1.245E-08
7.00	0.	10:23	8.941E+01	0.000E-01	1.752E-06	1.456E-06	1.041E-08
8.00	0.	10:30	8.263E+01	0.000E-01	1.552E-06	1.456E-06	1.042E-08
9.00	0.	10:38	4.609E+01	0.000E-01	1.361E-06	1.252E-06	8.684E-09
10.00	0.	10:45	4.128E+01	0.000E-01	1.220E-06	1.180E-06	8.478E-09

PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	2 HR EVAC GAMMA DOSE (R)	2 HR SHEL GAMMA DOSE (R)	2 HR EVAC INF THY DO (R)	2 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	4 HR EVAC GAMMA DOSE (R)	4 HR SHEL GAMMA DOSE (R)	4 HR EVAC INF THY DO (R)	4 HR SHEL INF THY DO (R)
0.60	0.	3.941E+02	3.547E+02	0.000E-01	0.000E-01	0.60	0.	6.232E+02	7.092E+02	0.000E-01	0.000E-01
1.00	0.	4.187E+02	3.788E+02	0.000E-01	0.000E-01	1.00	0.	6.517E+02	7.536E+02	0.000E-01	0.000E-01
2.00	0.	3.324E+02	2.992E+02	0.000E-01	0.000E-01	2.00	0.	4.981E+02	5.984E+02	0.000E-01	0.000E-01
3.00	0.	2.520E+02	2.268E+02	0.000E-01	0.000E-01	3.00	0.	3.802E+02	4.527E+02	0.000E-01	0.000E-01
4.00	0.	1.985E+02	1.767E+02	0.000E-01	0.000E-01	4.00	0.	2.726E+02	3.273E+02	0.000E-01	0.000E-01
5.00	0.	1.656E+02	1.490E+02	0.000E-01	0.000E-01	5.00	0.	2.164E+02	2.981E+02	0.000E-01	0.000E-01
6.00	0.	1.393E+02	1.257E+02	0.000E-01	0.000E-01	6.00	0.	2.211E+02	2.513E+02	0.000E-01	0.000E-01
7.00	0.	1.188E+02	1.069E+02	0.000E-01	0.000E-01	7.00	0.	1.802E+02	2.159E+02	0.000E-01	0.000E-01
8.00	0.	1.052E+02	9.468E+01	0.000E-01	0.000E-01	8.00	0.	1.534E+02	1.894E+02	0.000E-01	0.000E-01
9.00	0.	9.218E+01	8.297E+01	0.000E-01	0.000E-01	9.00	0.	1.283E+02	1.659E+02	0.000E-01	0.000E-01
10.00	0.	8.272E+01	7.445E+01	0.000E-01	0.000E-01	10.00	0.	1.107E+02	1.499E+02	0.000E-01	0.000E-01

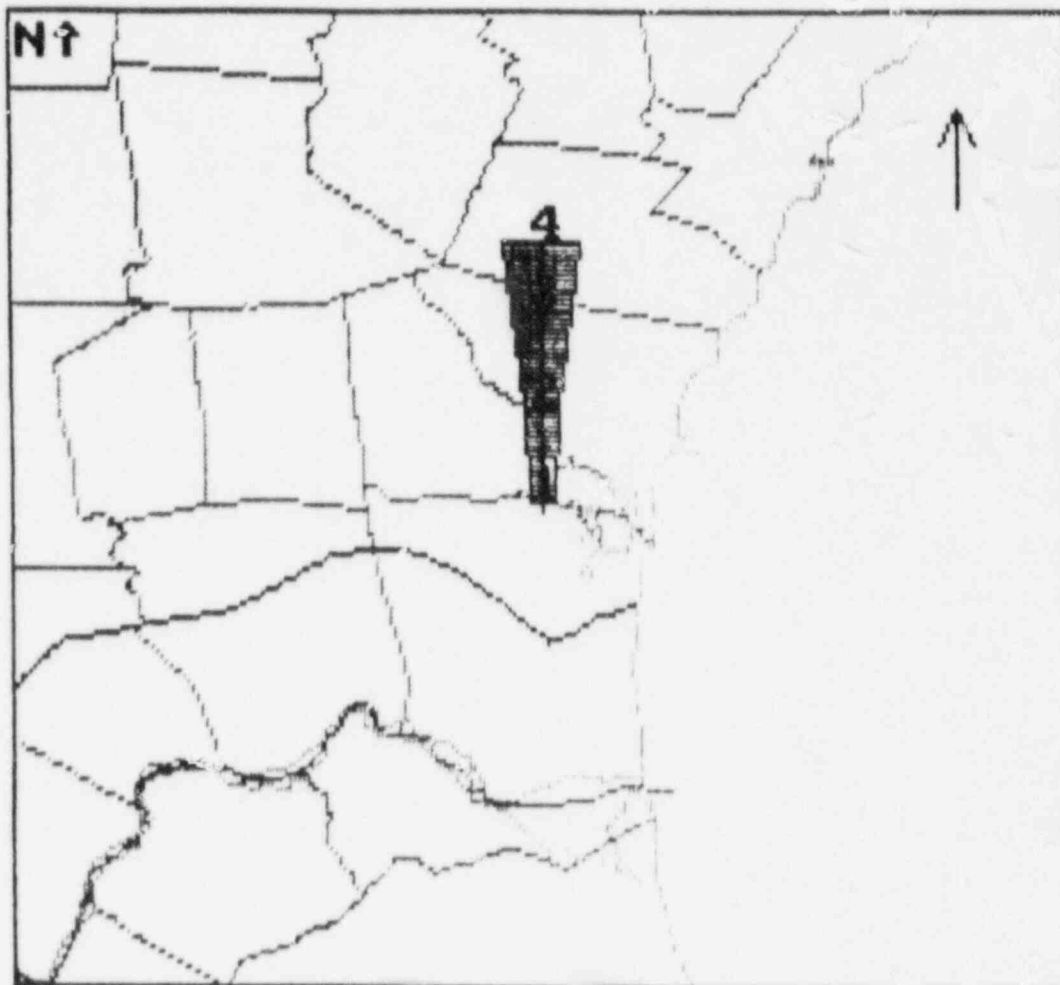
DIST (MI)	ANG (DEG)	6 HR EVAC GAMMA DOSE (R)	6 HR SHEL GAMMA DOSE (R)	6 HR EVAC INF THY DO (R)	6 HR SHEL INF THY DO (R)	DIST (MI)	ANG (DEG)	8 HR EVAC GAMMA DOSE (R)	8 HR SHEL GAMMA DOSE (R)	8 HR EVAC INF THY DO (R)	8 HR SHEL INF THY DO (R)
0.60	0.	6.232E+02	1.064E+03	0.000E-01	0.000E-01	0.60	0.	6.232E+02	1.419E+03	0.000E-01	0.000E-01
1.00	0.	6.517E+02	1.120E+03	0.000E-01	0.000E-01	1.00	0.	6.517E+02	1.507E+03	0.000E-01	0.000E-01
2.00	0.	4.981E+02	8.975E+02	0.000E-01	0.000E-01	2.00	0.	4.981E+02	1.197E+03	0.000E-01	0.000E-01
3.00	0.	3.802E+02	6.805E+02	0.000E-01	0.000E-01	3.00	0.	3.802E+02	9.074E+02	0.000E-01	0.000E-01
4.00	0.	2.726E+02	5.360E+02	0.000E-01	0.000E-01	4.00	0.	2.726E+02	7.146E+02	0.000E-01	0.000E-01
5.00	0.	2.164E+02	4.471E+02	0.000E-01	0.000E-01	5.00	0.	2.164E+02	5.962E+02	0.000E-01	0.000E-01
6.00	0.	2.211E+02	3.770E+02	0.000E-01	0.000E-01	6.00	0.	2.211E+02	5.027E+02	0.000E-01	0.000E-01
7.00	0.	1.802E+02	3.208E+02	0.000E-01	0.000E-01	7.00	0.	1.802E+02	4.278E+02	0.000E-01	0.000E-01
8.00	0.	1.534E+02	2.840E+02	0.000E-01	0.000E-01	8.00	0.	1.534E+02	3.787E+02	0.000E-01	0.000E-01
9.00	0.	1.283E+02	2.489E+02	0.000E-01	0.000E-01	9.00	0.	1.283E+02	3.319E+02	0.000E-01	0.000E-01
10.00	0.	1.107E+02	2.233E+02	0.000E-01	0.000E-01	10.00	0.	1.107E+02	2.978E+02	0.000E-01	0.000E-01

- \* SHELTER - N. HAMPTON, HAMPTON, HAMPTON FALLS
- \* SHELTER - SEABROOK
- \* SHELTER -
- \* SHELTER -
- \* SHELTER -

- SHELTER - SALISBURY, AMESBURY, S. HAMPTON
- SHELTER - KENSINGTON, N. HAMPTON, STRATHAM
- SHELTER - EXETER, NEWFIELDS, GREENLAND
- SHELTER - PORTSMOUTH, RYE, NEW CASTLE
- SHELTER - HAMPTON, HAMPTON FALLS, SEABROOK

FIGURE 4.10.15

Lesson 10 - 9:45 Elevated Plume Projection Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

ELU GAM  
T=09:45  
8.0 MPH  
180 DEG  
E STAB  
←→20.00MI  
— STATE  
-- TOWNS  
— RIVER  
— ROADS

FIGURE 4.10.16

Lesson 10 - 9:45 Elevated Plume Graphics Output

DO YOU WISH TO SAVE THE LAST BATCH EXECUTION? Y

FIGURE 4.10.17

Lesson 10 - Eighth Input Screen

INTEGRATED DOSES AT TIME 09:45

WHOLE BODY DOSE (MR) FROM START OF RELEASE TO 09:45

SECT\DIS(MI)	0.6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
N	1.427E+02	1.386E+02	8.169E+01	6.301E+01	2.397E+01	1.973E+01	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-	-	-
SEE	-	-	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-
NNW	1.500E+02	1.169E+02	3.570E+01	-	-	-	-	-	-	-	-

THYROID DOSE (R) FROM START OF RELEASE TO 09:45

SECT\DIS(MI)	0.6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
N	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-	-	-
SEE	-	-	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-

FIGURE 4.10.18

Lesson 10 - Total Integrated Dose (9:05 - 9:45)

INTEGRATED DOSES AT TIME 09:45

WHOLE BODY DOSE (r) FOR THE 15 MINUTE PERIOD ENDING 09:45

SECT\DIS(M)	0.6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
N	4.926E+01	4.706E+01	4.155E+01	3.276E+01	2.397E+01	1.973E+01	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-
NNW	7.500E+01	6.066E+01	3.570E+01	-	-	-	-	-	-	-	-

THYROID DOSE (r) FOR THE 15 MINUTE PERIOD ENDING 09:45

SECT\DIS(M)	0.6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
N	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-	-	-	-	-
SSE	-	-	-	-	-	-	-	-	-	-	-
S	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-

FIGURE 4.10.19

Lesson 10 - Total Integrated Dose (9:31 - 9:45)

## 4.11 Lesson 11

### Learning Objectives

1. To perform a containment venting what if analysis. This will determine the length and strength of such a release.

### Scenario

Due to existing conditions, the pressure in the containment has been rising and is now above the design basis leakage, as shown in Figure 4.11.1. Without destroying your current METPAC accident, you have been asked to predict the duration of a venting release and the accompanying dosages. The time of shutdown and the current met conditions are also shown in Figure 4.11.1.

### Lesson

1. Since a containment venting analysis can only be performed in batch mode, press 7 (Return). Run Batch Option 3.
2. Enter time of shutdown and the time of proposed containment venting release.
3. Enter 1 quarter-hour. When performing a containment venting analysis, the duration is determined by the computer. One quarter-hour is the entry for this analysis.
4. Enter the rad and met data. Be sure to enter "Y" for "STACK VENTING."
5. Note that the plume is as seen before, but the printout is slightly different. The printout has been tailored to the duration of the venting.

6. Do not save the batch execution. The previously existing METPAC accident will be needed.

#### Summary

This lesson demonstrated METPAC's ability to produce the resultant doses from an anticipated containment venting release without destroying the current METPAC state. This aspect of METPAC can be useful in other situations, such as "what-if the monitor reading was ..." and "what-if the met conditions changed to ...".



Shutdown	10/26/87	7:00
Containment Release	10/26/87	13:45
Wind Speed (Mph)	7	
Wind Direction (Deg)	120	
Delta Temperature (Deg F)	-2	
Precipitation (inch/Qtr Hr)	0	
Solar Radiation (ly/min)	0	
Containment Dose Rate (R/hr)	50000	
Containment Pressure (PSIG)	100	
Final Pressure	50	
Loca Type	3	

FIGURE 4.11.1

Lesson 11 - Readings and Times

- 1- PROJECT USING CURRENT ANALYSIS WITH PERSISTENT MET AND RAD DATA
- 2- PROJECT USING CURRENT ANALYSIS WITH USER INPUT MET AND RAD DATA
- 3- PROJECT USING NEW DATA
- 4- RETURN TO LAST SCREEN

FIGURE 4.11.2

Lesson 11 - Sixth Input Screen

PLEASE ENTER DATE AND TIME OF SHUTDOWN AND DATE AND TIME OF RELEASE

	MO/DA/YR	HR:MN
SHUTDOWN	10/26/87	07:00
UNMONITORED RELEASE	-1/-1/-1	-1:-1
STEAM LINE	-1/-1/-1	-1:-1
CONTAINMENT RELEASE	10/26/87	13:45
STACK RELEASE	-1/-1/-1	-1:-1

LAST SCREEN  
NEXT SCREEN

FIGURE 4.11.3

Lesson 11 - Second Input Screen

TOTAL NUMBER OF QUARTER HOURS TO EXECUTE ( 1 - 32) ? 1

FIGURE 4.11.4

Lesson 11 - Seventh Input Screen

SHUTDOWN: DATE	10/26/87	TIME	07:00	CONTAINMENT
ANALYSIS: DATE	10/26/87	TIME	14:00	
FIELD TEAM DOSE RATE			-1.00	MR/HR
FIELD TEAM LOCATION			-1.00	MILE
GROSS IODINE			-1.000E+00	UC1/CC

CONTAINMENT :	CONTAINMENT DOSE RATE	50000.00	R/HR
	CONTAINMENT PRESSURE	100.00	PSIG
	FINAL PRESSURE	50.00	PSIG
	ESTIMATED HOLE DIAMETER	-1.00	FT
	STACK VENTING	Y	Y / N
	ISOTOPICS	N	Y / N
	MONITORED VS ISOTOPICS	0	0-PON/1-THY/2-GAM

DATE SCREEN

MET SCREEN

FIGURE 4.11.5

Lesson 11 - Third Input Screen

SHUTDOWN: DATE 10/26/87 TIME 07:00  
ANALYSIS: DATE 10/26/87 TIME 14:00  
NET DATA

CONTAINMENT

LOWER : WIND SPEED 7.00 MPH  
WIND DIRECTION 120.00 DEG FROM  
DELTA TEMPERATURE -2.00 DEG F

PRECIPITATION : 0.00 INCH/DTR HR  
SOLAR RADIATION : 0.00 LY/MIN  
RELEASE CONDITION

CONTAINMENT : 1 0 = RELEASE STOPPED  
1 = RELEASE CONTINUOUS  
LOCATYPE : 3 1 OR 3

DATE SCREEN RAD SCREEN RUN PROMPT

FIGURE 4.11.6

Lesson 11 - Fourth Input Screen

DATE AND TIME OF: MO/DA/YR HR:MM MO/DA/YR HR:MM

SEABROOK STATION  
PLUME POSITION AT 14:00  
RELEASE CONTINUING

SHUTDOWN 10/26/87 07:00  
CONTAINMENT RELEASE 10/26/87 13:45  
ANALYSIS 10/26/87 14:00 10/26/87 14:00

METEOROLOGY: (FROM 10/26/87 , 13:45 TO 10/26/87 , 14:00)

TOWER LEVEL	WIND (MPH)	SPEED (M/S)	WIND DIR (FROM) DEG	WIND DIR (TO) SECTOR	DELTA TEMPERATURE DEG F/DH	DELTA TEMPERATURE DEG C/100M STAB	PRECIPITATION IN/15 MIN	SOLAR RADIATION LANGLEY/MIN
GROUND	7.0	3.13	120.	ESE	-2.0	-3.4	A	0.00 0.00

RADIOLOGICAL: (FROM 10/26/87 , 13:45 TO 10/26/87 , 14:00)

LOCA # 3  
CONTAINMENT MONITOR 5.0000E+04 R/H/ CONTAINMENT PRESSURE 1.0000E+02  
CONTAINMENT FAILURE SIZE OF HOLE 8.8887E+01 FT  
CONTAINMENT MONITOR READINGS USED IN CALCULATION

CONTAINMENT VENTING PLUME PROJECTION FROM 13:45

STRAIGHT LINE PLUME PROJECTION INFORMATION

DIST (MI)	ANG (DEG)	ARRIVAL TIME (HR:MM)	GAMMA DOSE (MR)	THYR DOSE (R)	GAMMA (SEC/M**3)	I/O DEPLETED (SEC/M**3)	I/O DEPOSITION (I/M**2)
0.60	300.	13:50	3.972E+02	0.000E+01	1.108E-06	1.262E-06	4.738E-09
1.00	300.	13:54	1.653E+02	0.000E+01	4.611E-07	4.741E-07	1.780E-08
2.00	300.	14:02	9.141E+01	0.000E+01	2.550E-07	2.481E-07	5.317E-09
3.00	300.	14:11	6.416E+01	0.000E+01	1.754E-07	1.688E-07	6.220E-09
4.00	300.	14:19	4.980E+01	0.000E+01	1.369E-07	1.271E-07	4.773E-09
5.00	300.	14:26	4.087E+01	0.000E+01	1.140E-07	1.017E-07	3.819E-09
6.00	300.	14:36	3.475E+01	0.000E+01	9.695E-08	6.447E-08	3.170E-09
7.00	300.	14:45	3.029E+01	0.000E+01	8.451E-08	7.190E-08	2.700E-09
8.00	300.	14:54	2.689E+01	0.000E+01	7.501E-08	6.238E-08	2.342E-09
9.00	300.	15:02	2.420E+01	0.000E+01	6.752E-08	5.489E-08	2.061E-09
10.00	300.	15:11	2.202E+01	0.000E+01	6.144E-08	4.890E-08	1.824E-09

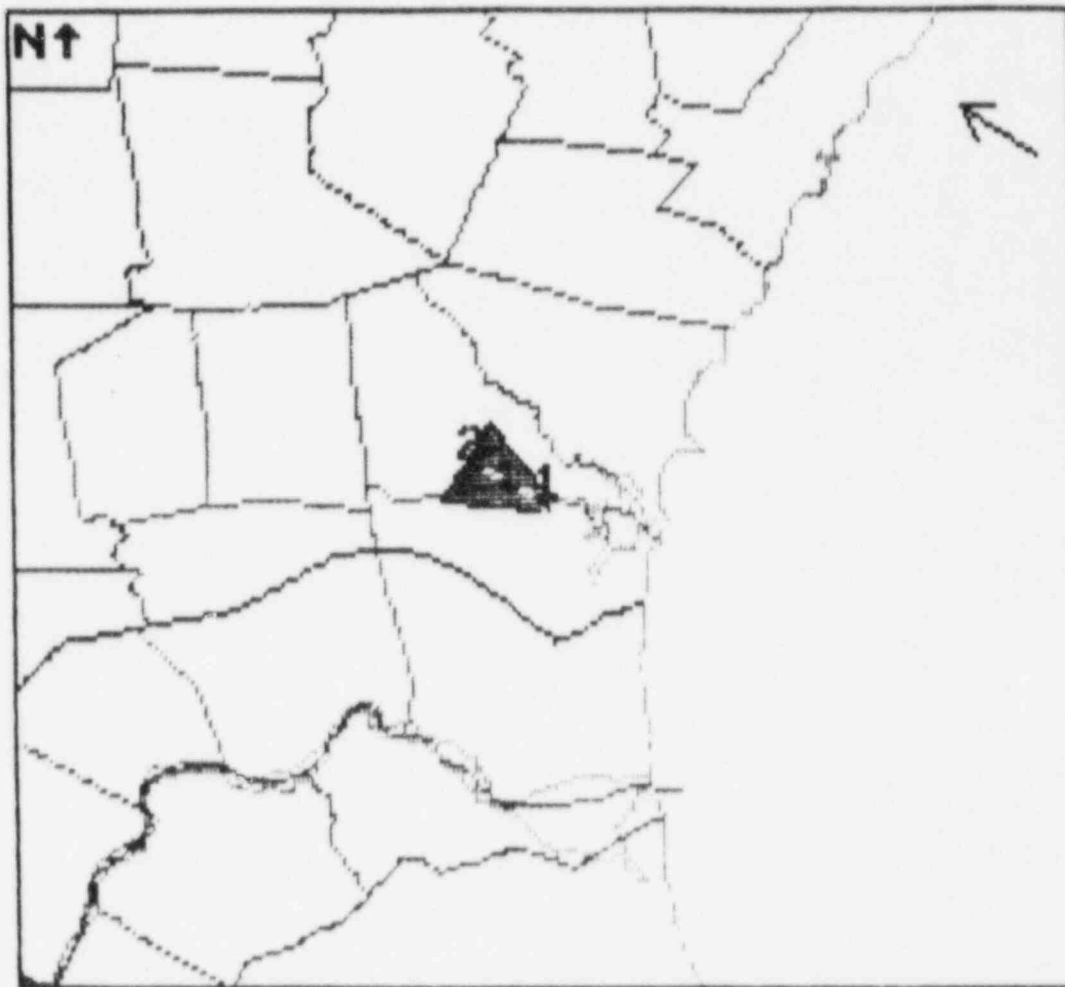
PROTECTIVE ACTION RECOMMENDATIONS

DIST (MI)	ANG (DEG)	1.7 HR EVAC GAMMA DOSE (MR)	1.7 HR SHEL GAMMA DOSE (MR)	1.7 HR EVAC INF THY DO (R)	1.7 HR SHEL INF THY DO (R)
0.60	300.	3.972E+02	3.575E+02	0.000E+01	0.000E+01
1.00	300.	1.653E+02	1.487E+02	0.000E+01	0.000E+01
2.00	300.	9.141E+01	8.227E+01	0.000E+01	0.000E+01
3.00	300.	6.416E+01	5.775E+01	0.000E+01	0.000E+01
4.00	300.	4.980E+01	4.487E+01	0.000E+01	0.000E+01
5.00	300.	4.087E+01	3.678E+01	0.000E+01	0.000E+01
6.00	300.	3.475E+01	3.177E+01	0.000E+01	0.000E+01
7.00	300.	3.029E+01	2.726E+01	0.000E+01	0.000E+01
8.00	300.	2.689E+01	2.420E+01	0.000E+01	0.000E+01
9.00	300.	2.420E+01	2.178E+01	0.000E+01	0.000E+01
10.00	300.	2.202E+01	1.982E+01	0.000E+01	0.000E+01

\*\*\*\*\*  
\* SHELTER - S. HAMPTON, KENSINGTON, HAMPTON \*  
\* SHELTER - HAMPTON FALLS, SEABROOK \*  
\*\*\*\*\*

FIGURE 4.11.7

Lesson 11 - Plume Projection Output



FUNCTION  
KEYS  
1-RADIUS  
2-ROADS  
3-PUBLIC  
4-LABELS  
5-ZOOM  
6-REDRAW  
7-  
8-LT PEN  
9-PRINT  
10-EXIT

GRD GAM  
T=14:00  
7.0 MPH  
120 DEG  
A STAB  
↔20.00MI  
— STATE  
— TOWNS  
— RIVER  
— ROADS

FIGURE 4.11.8

Lesson 11 - Plume Graphics Output



DO YOU WISH TO SAVE THE LAST BATCH EXECUTION? N

FIGURE 4.11.9

Lesson 11 - Eighth Input Screen

-178-

5913R/18.174

## 5.0 PROBLEMS

### 5.1 File Protection

FORTRAN programs are protected from editing. The only problem that can occur is if one of the METPAC files is purged from the system. To help reduce this possibility, all METPAC files will be placed in a DOS subdirectory. There is no absolute protection from having these files deleted; therefore, the only resolution to the problem is to maintain plenty of backup. With the backup diskettes and the following procedure, one would be able to restore METPAC to its original state. The procedure to reload METPAC is as follows:

Turn on system.

After entry of date and time, load the METPAC Reload Disk i into Drive A.

Type A:RELOAD.

Follow any further instructions as specified on the screen (usually for loading other disks).

This procedure should return METPAC to its original state. Any analysis previously performed will be lost.

### 5.2 Operation

If (CTRL) (<sup>scroll</sup>/<sub>lock</sub>) key depressed by accident and the screen displays "abort batch procedure", type N.

If the computer is turned off during METPAC execution, attempt to restart the computer. If the eighth input screen appears, do not save the batch execution. Depending on the state of METPAC when the machine was turned off, the previous accident data may be lost. It is safest to eliminate the last quarter-hour and perform that analysis again.

If a printer off-line error or out of paper error occurs during METPAC execution, fix the printer and type R (for retry). If the printer is not working, type A.

If the user is in the input program and the cursor control keys fail to work, depress the (Numlock) key once and try again.

If the user shuts off the computer or loses power during the execution of the dispersion or dose model, data loss will result. Use Option 4 of Screen 1 to eliminate all the quarter hours that were being analyzed.

When in prompt mode, certain prompt messages read "TO" when what is meant is "OR". For example, the release condition is either 0 or 1. Also, prompt mode will always go through both Screens 3 and 4, regardless of data being previously entered.

If a wind speed of 100 mph or more is entered, the printout and the graphics screen will read "\*\*\*\* MPH".

Review the PAG printout carefully as there is no blank line to aid in the separation of "Evacuate" towns from "Shelter" towns.

Round off of values in prompt and error messages can occur. For instance, a maximum value of 99.9 will appear in the message as 1E2, and the value 1E2 will be rejected. These round-off errors occur because of space limitations.

Once isotopic values have been entered for the unmonitored pathway, the only way to not persist those values, without entering new values, is to enter a dose rate of 0.

When viewing multiple quarter-hours of data, the best practice is to return all the way back to Screen 1. In some cases, a quarter-hour cannot be viewed unless this is done.

6.0 REFERENCES

1. International Business Machines, IBM Guide to Operations, Personal Computer XT, 1983, International Business Machine, Boca Raton, Florida.
2. Small System Services, Inc., FORTRAN IV Extended User's Manual, Appendix C, 1983, Small System Services, Inc., Urbana, Illinois.

APPENDIX A

Input Data Sheets

SEABROOK STATION

METPAC INPUT DATA SHEET (VERSION 4.0)

SHUTDOWN: DATE \_\_\_\_\_ TIME \_\_\_\_\_  
ANALYSIS: DATE \_\_\_\_\_ TIME \_\_\_\_\_

Radiological Data

Unmonitored

Site Boundary Dose Rate \_\_\_\_\_ mR/hr  
Estimated Flow Rate \_\_\_\_\_ cc/sec  
Isotopics \_\_\_\_\_ y/n

Steam Line

Steam Line Dose Rate \_\_\_\_\_ mR/hr  
Steam Line Pressure \_\_\_\_\_ psig  
Steam Line Pathway \_\_\_\_\_ 1-srv / 2-arv  
Isotopics \_\_\_\_\_ y/n  
Monitored Versus Isotopics \_\_\_\_\_ 0-mon/1-thy/2-gam

Containment

Containment Dose Rate \_\_\_\_\_ R/hr  
Containment Pressure \_\_\_\_\_ psig  
Internal Pressure \_\_\_\_\_ psig  
Estimated Hole Diameter \_\_\_\_\_ ft  
Stack Venting \_\_\_\_\_ y/n  
Isotopics \_\_\_\_\_ y/n  
Monitored Versus Isotopics \_\_\_\_\_ 0-mon/i-thy/2-gam

Stack

Stack Concentration \_\_\_\_\_ uCi/cc  
Stack Release Rate \_\_\_\_\_ uCi/sec  
Isotopics \_\_\_\_\_ y/n  
Monitored Versus Isotopics \_\_\_\_\_ 0-mon/1-thy/2-gam

SEABROOK STATION

METPAC INPUT DATA SHEET (VERSION 4.0)

(Continued)

Lower

Upper

Wind Speed	_____	mph	_____	mph
Wind Direction	_____	deg from	_____	deg from
Delta Temperature	_____	deg F	_____	deg F
Precipitation	_____	ln/qtr hr		
Solar Radiation	_____	ly/min		

Release Status

Unmonitored _____	Steam Line _____	Containment _____	Stack _____
OCA Type _____	1 or 3		

Field Monitoring Data

Field Team Dose Rate	_____	mR/hr
Field Team Location	_____	mile
Gross Iodine	_____	uCi/cc

METPAC DATA SHEET B

Release Path \_\_\_\_\_

Sample Time \_\_\_\_\_

ISOTOPIC INPUT

KR83M	_____	uCl/cc	I131	_____	uCl/cc
KR85M	_____	uCl/cc	I132	_____	uCl/cc
KR85	_____	uCl/cc	I133	_____	uCl/cc
KR87	_____	uCl/cc	I134	_____	uCl/cc
KR88	_____	uCl/cc	I135	_____	uCl/cc
KR89	_____	uCl/cc	BA140	_____	uCl/cc
XE131M	_____	uCl/cc	LA140	_____	uCl/cc
XE133M	_____	uCl/cc	SR91	_____	uCl/cc
XE133	_____	uCl/cc	SR92	_____	uCl/cc
XE135M	_____	uCl/cc	Y91	_____	uCl/cc
XE135	_____	uCl/cc	Y93	_____	uCl/cc
XE137	_____	uCl/cc	ZR95	_____	uCl/cc
XE138	_____	uCl/cc	NB95	_____	uCl/cc
CS134	_____	uCl/cc	NB97	_____	uCl/cc
CS136	_____	uCl/cc	RU103	_____	uCl/cc
CS137	_____	uCl/cc	CE143	_____	uCl/cc
			NP239	_____	uCl/cc



## GLOSSARY

- Advection - The process of transport of an atmospheric property solely by the mass motion of the atmosphere.
- Batch Procedure File - A file that contains one or more commands that the operating system will execute one at a time.
- Beep - A tone 1/4 of a second duration at 800 Hz.
- Byte - A unit of computer storage defined as 8 bits on the IBM.
- Cursor - A movable marker on the display screen that indicates what data is to be entered.
- Deposition - The fallout of airborne material onto the ground.
- Diffusion - The exchange of fluid parcels between regions in space.
- Dispersion - The act or process of scattering.
- Dose Rate - The rate at which an individual at the ground is being exposed to radioactive elements.
- Gamma Dose - Dose received to the entire body due to exposure to radiation.
- Gaussian Plume Segmented Model - A statistical analysis performed on finite sections of the plume.
- Floppy Disk - A secondary data and program storage device that writes to media which is removable.
- Hard Disk - A secondary data and program storage device that writes to media which is not removable.
- Kilobyte - (KB)-1024 bytes of memory.
- Light Pen - A light sensitive device that is used to select a location on the display by touching the screen with the pen.
- PAG - Protective Action Guidelines.
- PC DOS - IBM Personal Computer Disk Operating System.

Plume - A cloud of radioactive elements.

Plume Segment - Discreet portions of a cloud of radioactive elements.

RAM - Random Access Memory.

Screen - A display of text or graphic information on a monitor.

Shutdown - Stop the fission process.

Source Term - The quantity of radioactive material released to the biosphere.

Stability - The displacement tendencies for a parcel of air.

Thyroid Dose - Dose received from the inhalation of iodine which is deposited in the thyroid gland.

Variable Trajectory - A path that changes with time.

WRGM - Wide Range Gas Monitor.

ITEM II  
SEABROOK METPACK BACKUP  
HP-41