No. 108
U.S. NRC, Dir. of NRR
Washington, D.C. 20555
Mr. S.A. Varga, Chief, Oper.
Reactors BR#1, Div. of Licensing

SALEM GENERATING STATION
EMERGENCY PLAN
EMERGENCY PLAN PROCEDURES INDEX
SEPTEMBER 30, 1982

EMERGENCY PROCEDURE
EP IV-108
PROTECTIVE ACTION RECOMMENDATIONS

ACTION LEVEL

Declaration of an emergency at the Alert level or higher.

RESPONSIBLE INDIVIDUAL

The Radiological Support Manager (RSM) has overall responsibility for this procedure. Until the RSM is operational at the EOF, the requirements of this procedure may be met by the Shift Radiation Protection Technician or the Dose Assessment/ALARA Supervisor under the direction of the Radiation Protection Engineer.

NOTE

Only the individual with the emergency coordinator function may make the decision to notify state and local authorities of off-site Protective Action Recommendations.

ACTION STATEMENTS

1. The Senior Shift Supervisor/EDO, upon determination that a radiological incident is in progress, shall contact the Shift Radiation Protection Technician or the Dose Assessment/ALARA Supervisor to initiate dose assessment.

2. Dose assessments shall be calculated based on data supplied by the plant effluent monitors and measured data from the field teams. This calculation shall be performed by the Shift Radiation Protection Technician in the TSC or by the RSM in the EOF when the EOF is operational.

ACTION STATEMENTS

3. The dose rates or projected doses shall be compared to the Protective Action Recommendations (Attachment 1) and the Evacuation Time Estimates for areas near the site (Attachment 3). Additional predetermined criteria for protective action are presented in Attachment 4.

4. The RSM or the Dose Assessment/ALARA Supervisor shall provide the Senior Shift Supervisor/EDO with Protective Action Recommendations prior to activation of the EOF. The RSM shall provide protective action recommendations to the Emergency Response Manager when the EOF is activated.

ATTACHMENTS

1. Off-Site Protective Action Recommendations For The Public

2. Emergency Worker Exposure Criteria

3. Evacuation Time Estimates

4. Predetermined Protective Action Recommendations

NOTE

Forwar[illegible] [illegible]pleted forms to the Nuclear Emergency Planning Engineer. Attach other completed EP's or attachments used.

Prepared By: James Clancy

Reviewed By: [signature] 9/10/82
Department Head — Date

Reviewed By: Cheryl A. Sakenas for 9-10-82
Nuclear Emergency Planning Engineer — Date

Reviewed By: Bruce W. Leap 9/13/82
Station Quality Assurance Review — Date
(if required see EP VI-2)

SORC Meeting No.: 82-86 J. Gallagher 9/23/82
Date

Approved By: H. J. Midura 9/23/82
General Manager - Salem Operations — Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection — Date

OFF-SITE PROTECTIVE ACTION RECOMMENDATIONS (PAR) GUIDELINES FOR THE PUBLIC

I. IF RELEASE DURATION CAN BE PREDICTED

WHOLE BODY DOSE (millirem)	THYROID DOSE (millirem)	PAR: Adults	PAR: Children & Women of child bearing age
<500	<3000	NONE	NONE
500-1000	3000-5000	SHELTER**	SHELTER**
1000-5000	5000-25000	SHELTER	EVACUATE***
>5000	>25000	EVACUATE	EVACUATE

II. IF RELEASE DURATION CANNOT BE PREDICTED*

WHOLE BODY DOSE RATE (millirem/hr)	THYROID DOSE RATE (millirem/hr)	Adults	Children & Women of child bearing age
<125	<750	NONE	NONE
125-250	750-1250	SHELTER**	SHELTER**
250-1250	1250-6250	SHELTER	EVACUATE***
>1250	>6250	EVACUATE	EVACUATE

NOTES:

* DOSE RATE PAR's assume 4 hour integrated dose with 2 hours response time and 2 hour minimum evacuation time. These must be reevaluated periodically.

** Protective action is not required at these levels, however, states may issue an advisory to seek shelter and await further instructions.

*** Recommendation to evacuate must also be based on environmental (e.g., weather, etc.) and other affecting conditions.

ATTACHMENT 2
EMERGENCY WORKERS EXPOSURE CRITERIA

WARNING

CRITERIA ARE FOR RADIATION EXPOSURE TO VOLUNTEERS ONLY.

EMERGENCY EXPOSURE AUTHORIZATION REQUIRED, EXPOSURES ARE TO BE "ONCE IN A LIFETIME".

LIFE-SAVING	NON-LIFE-SAVING
Authorized Exposure: 75 rems whole body	Authorized Exposure: 25 rems whole body
Any and all actions necessary to save or preserve life, including but not limited to: Removal of injured personnel First Aid Personnel decontamination Ambulance services Medical treatment	Repair or operation of equipment necessary to mitigate a situation which has or may have the potential to cause projected off-site doses which would require protective action. Corrective actions necessary to prevent plant safety status from further deteriorating or to effect significant improvement in plant safety status. Corrective actions necessary to cause significant reductions in in-plant radiological hazards.

ATTACHMENT 3

EVACUATION TIME ESTIMATES

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for Areas Near the Site of:
SALEM AND HOPE CREEK
NUCLEAR GENERATING STATIONS

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prepared for
PUBLIC SERVICE ELECTRIC AND GAS COMPANY

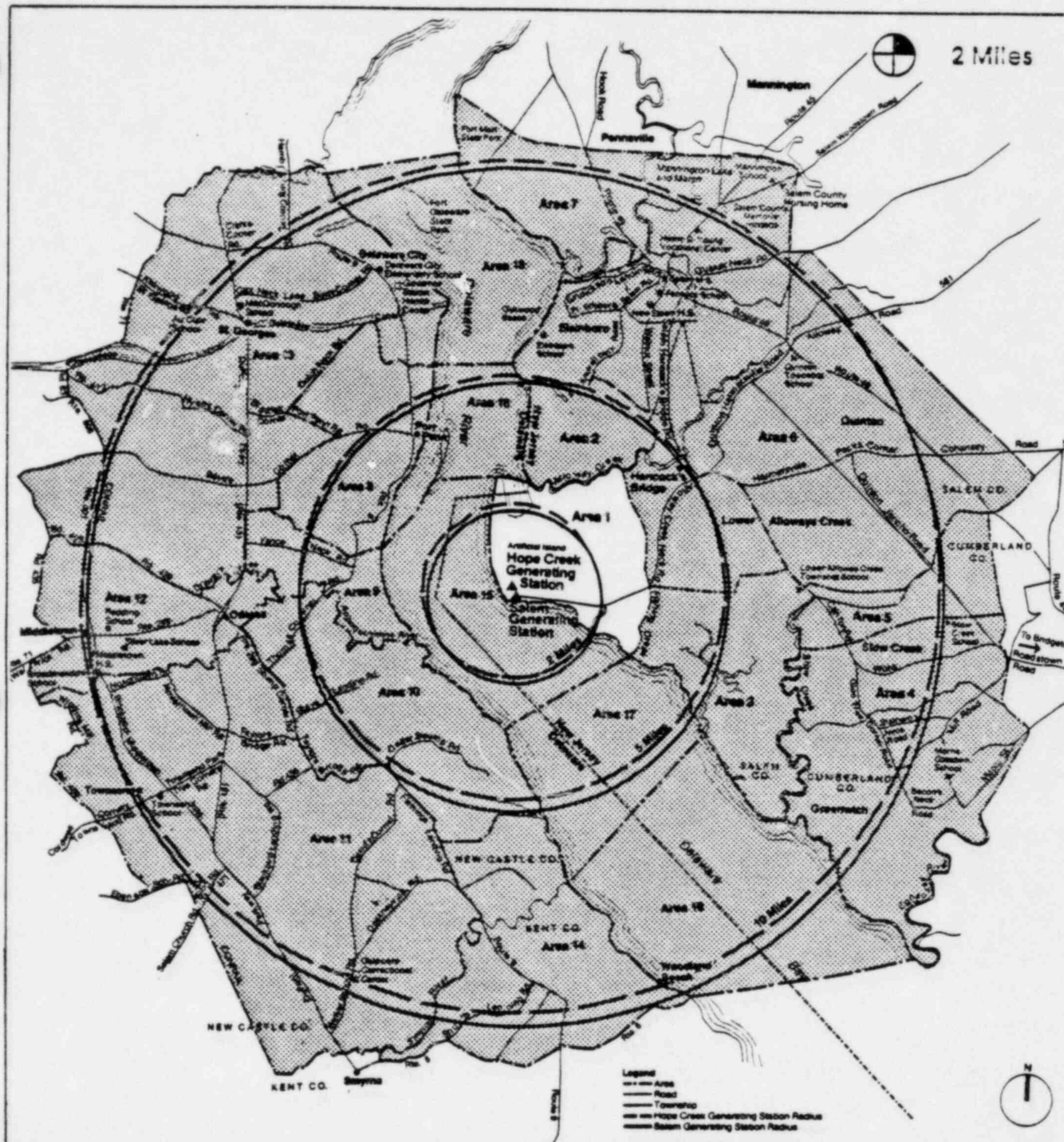
prepared by
PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

February 27, 1981

TABLE 1

RELATIONSHIP BETWEEN EVACUATION SECTIONS AND EVACUATION PLANNING AREAS

EVACUATION SECTIONS	EVACUATION PLANNING AREAS
A	1
B	1, 3, 15, 17
C	1, 2, 3
D	1, 3, 4, 5, 15, 17, 19
E	1, 2, 3, 5, 6, 7
F	15
G	8, 9, 15, 16
H	9, 10, 15, 17
I	8, 9, 12, 13, 15, 16, 18
J	9, 10, 11, 12, 14, 15
K	1, 15
L	1, 2, 3, 8, 9, 10, 15, 16, 17
M	1 through 19

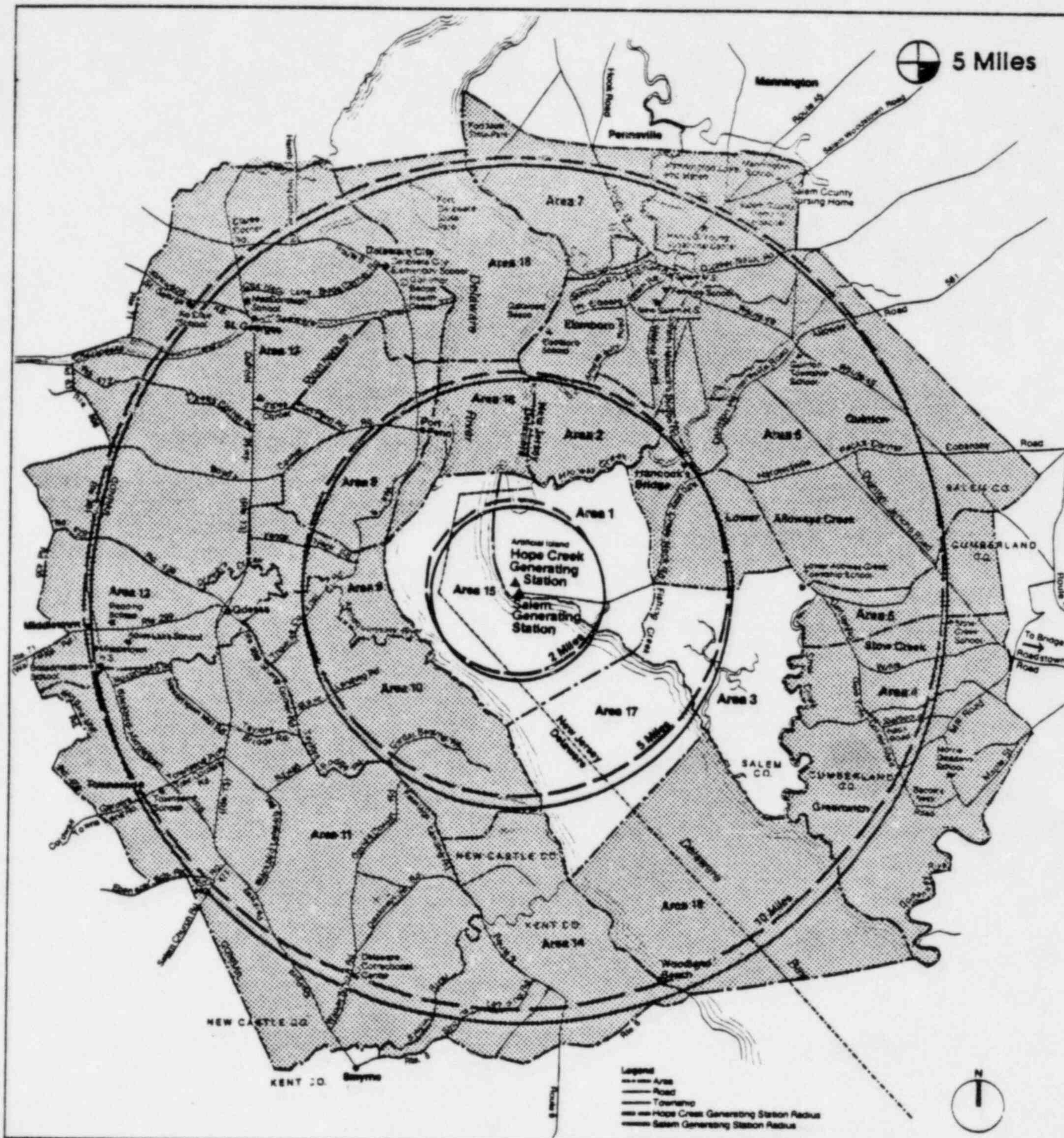


Planning Areas
90° Section A

Evacuation Time Estimates

Figure 3

Salem Generating Stations
Hope Creek Generating Stations

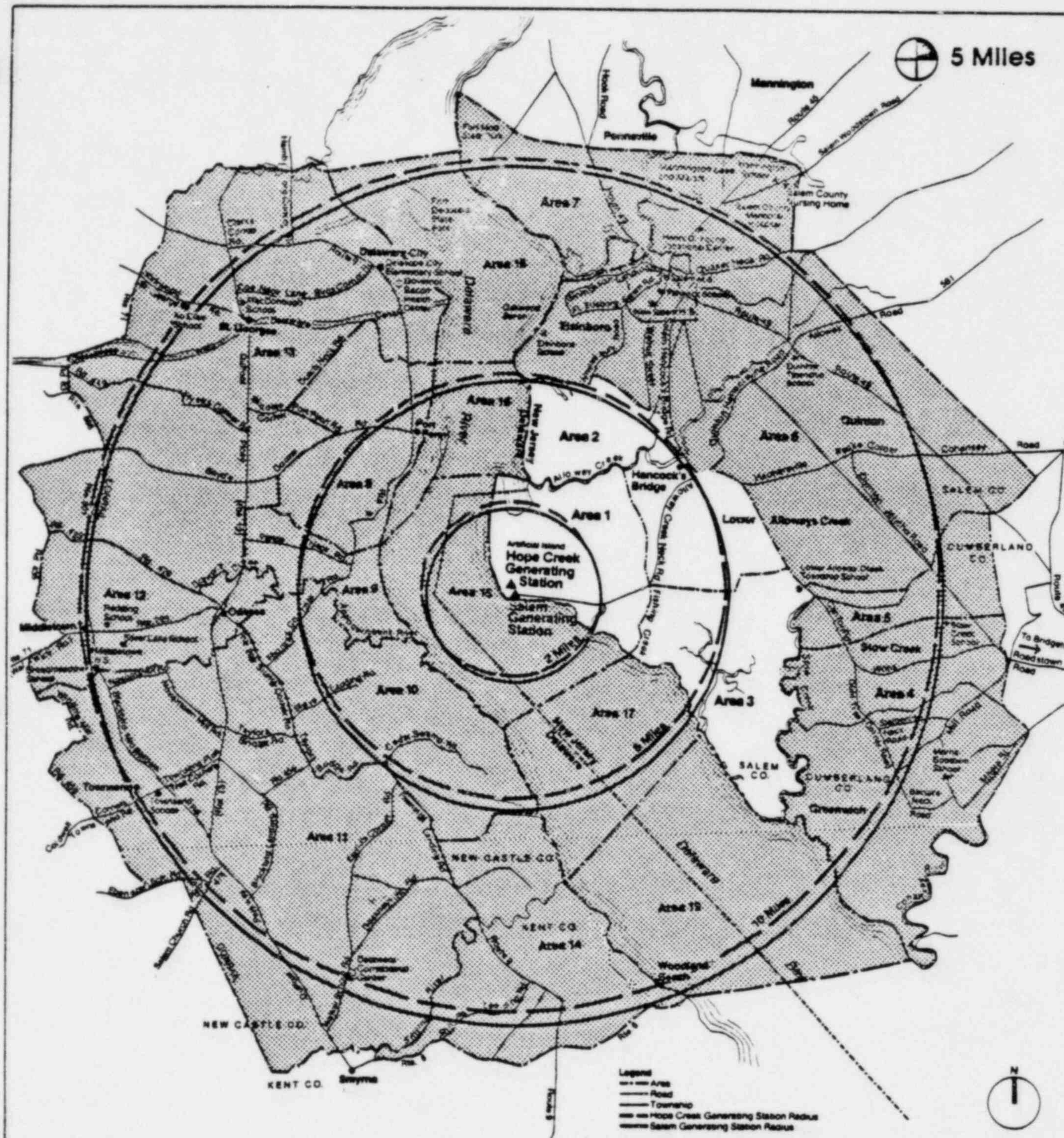


Planning Areas
90° Section B

Evacuation Time Estimates

Figure 4

Salem Generating Stations
Hope Creek Generating Stations

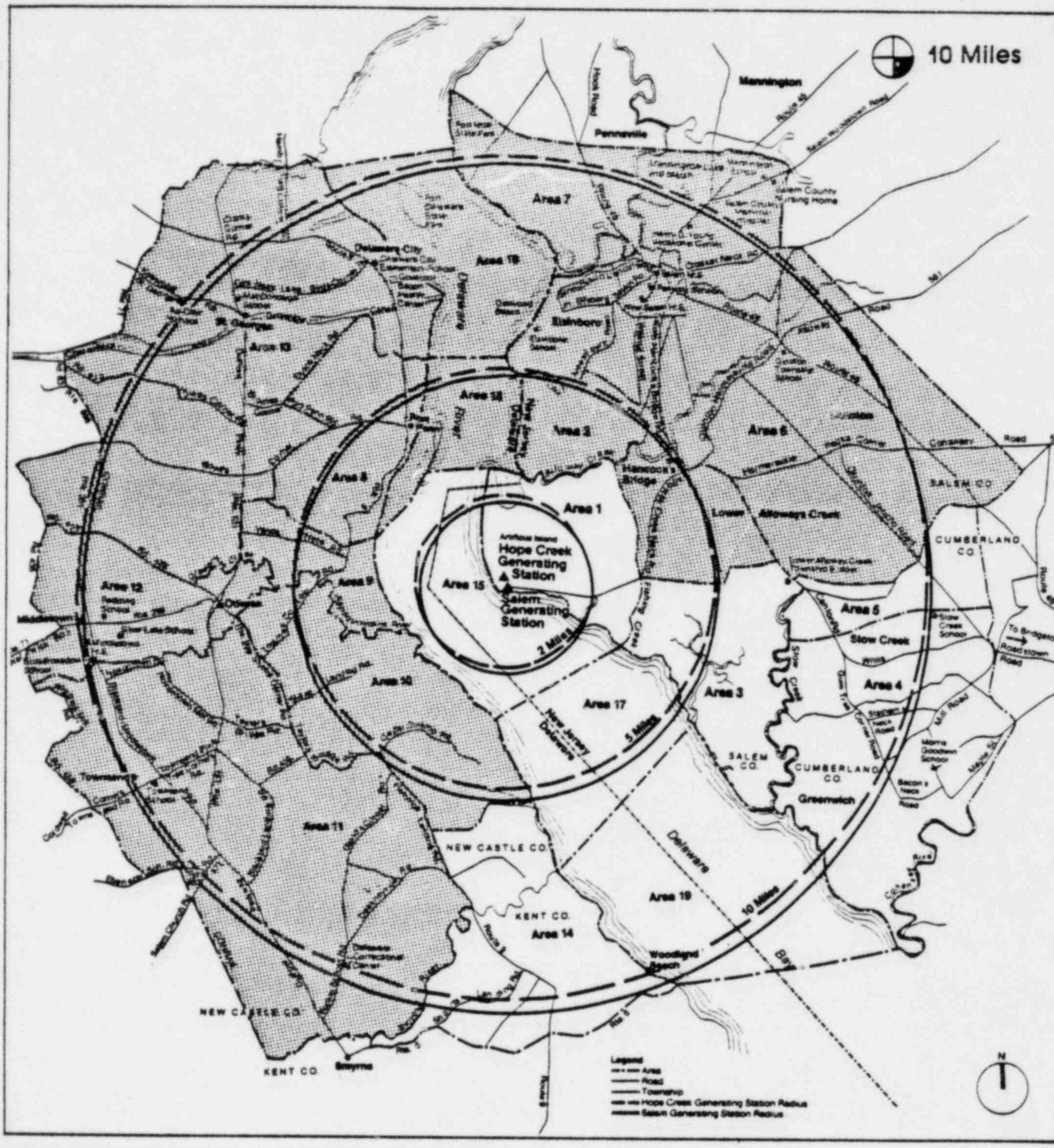


Planning Areas
90° Section C

Evacuation Time Estimates

Figure 5

Salem Generating Stations
Hope Creek Generating Stations

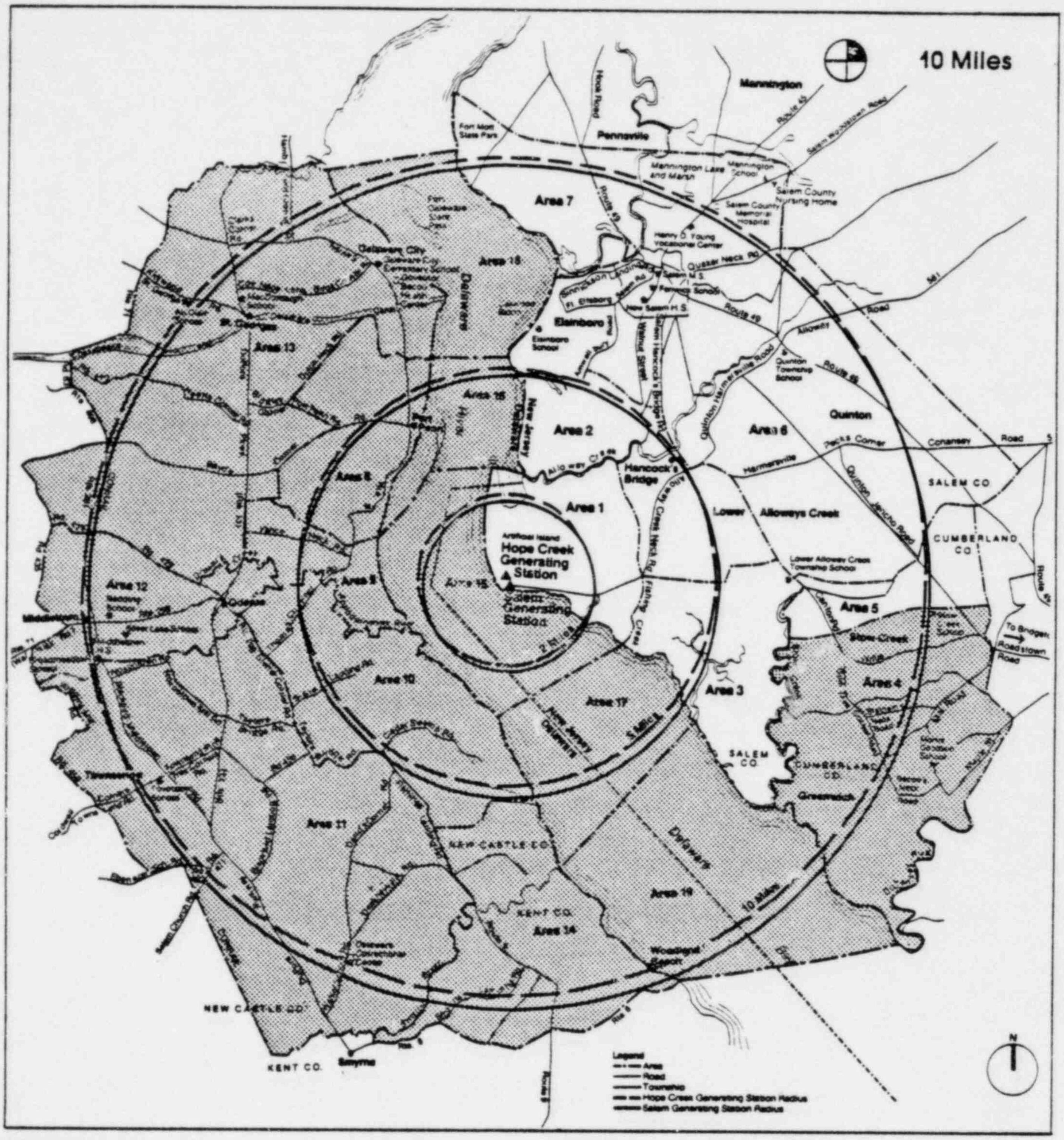


Planning Areas
90° Section D

Evacuation Time Estimates

Figure 6

Salem Generating Stations
Hope Creek Generating Stations

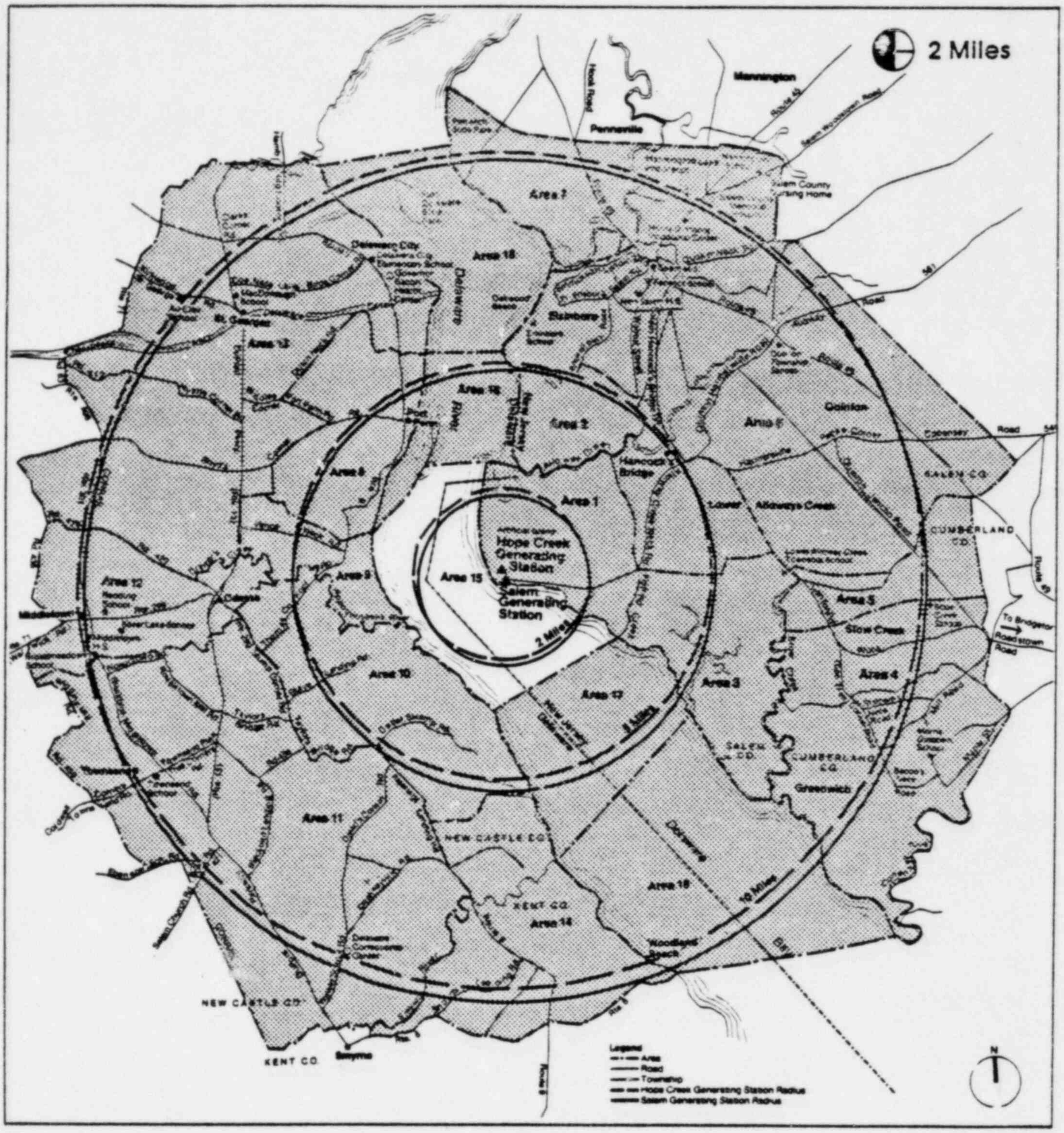


Planning Areas
90° Section E

Evacuation Time Estimates

Figure 7

Salem Generating Stations
Hope Creek Generating Stations

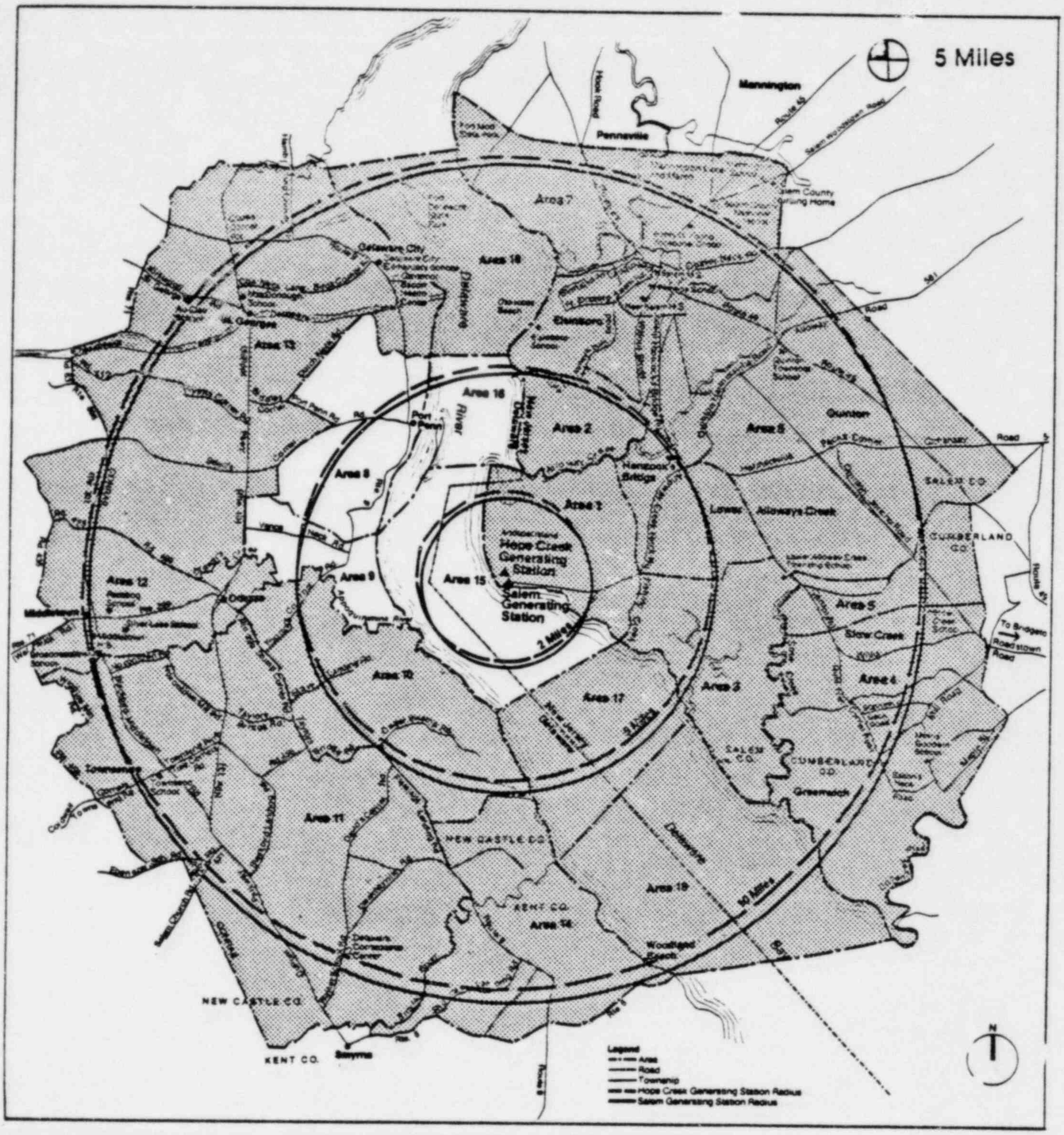


Planning Areas
180° Section F

Evacuation Time Estimates

Figure 8

Salem Generating Stations
Hope Creek Generating Stations

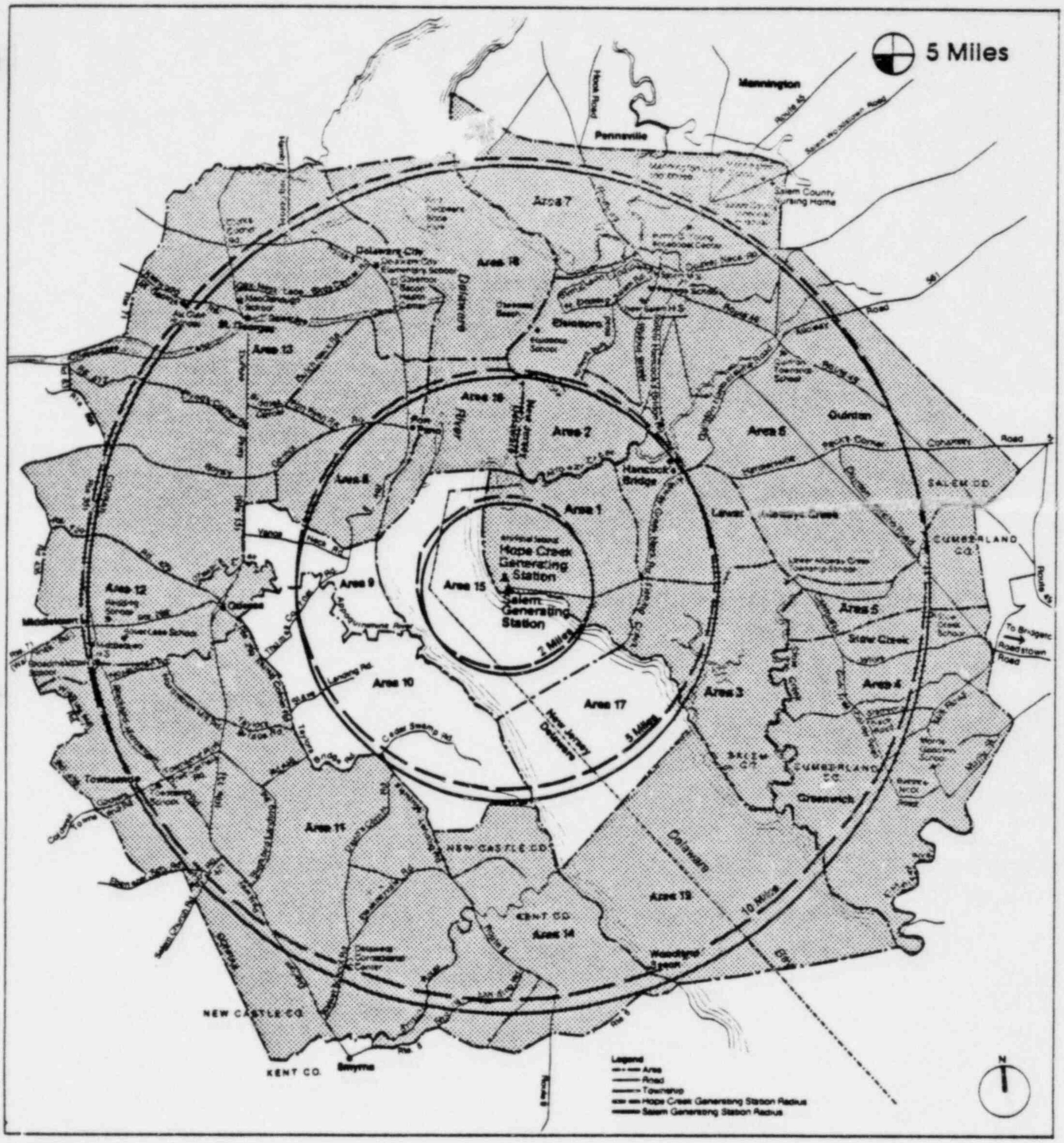


Planning Areas
90° Section G

Evacuation Time Estimates

Figure 9

Salem Generating Stations
Hope Creek Generating Stations

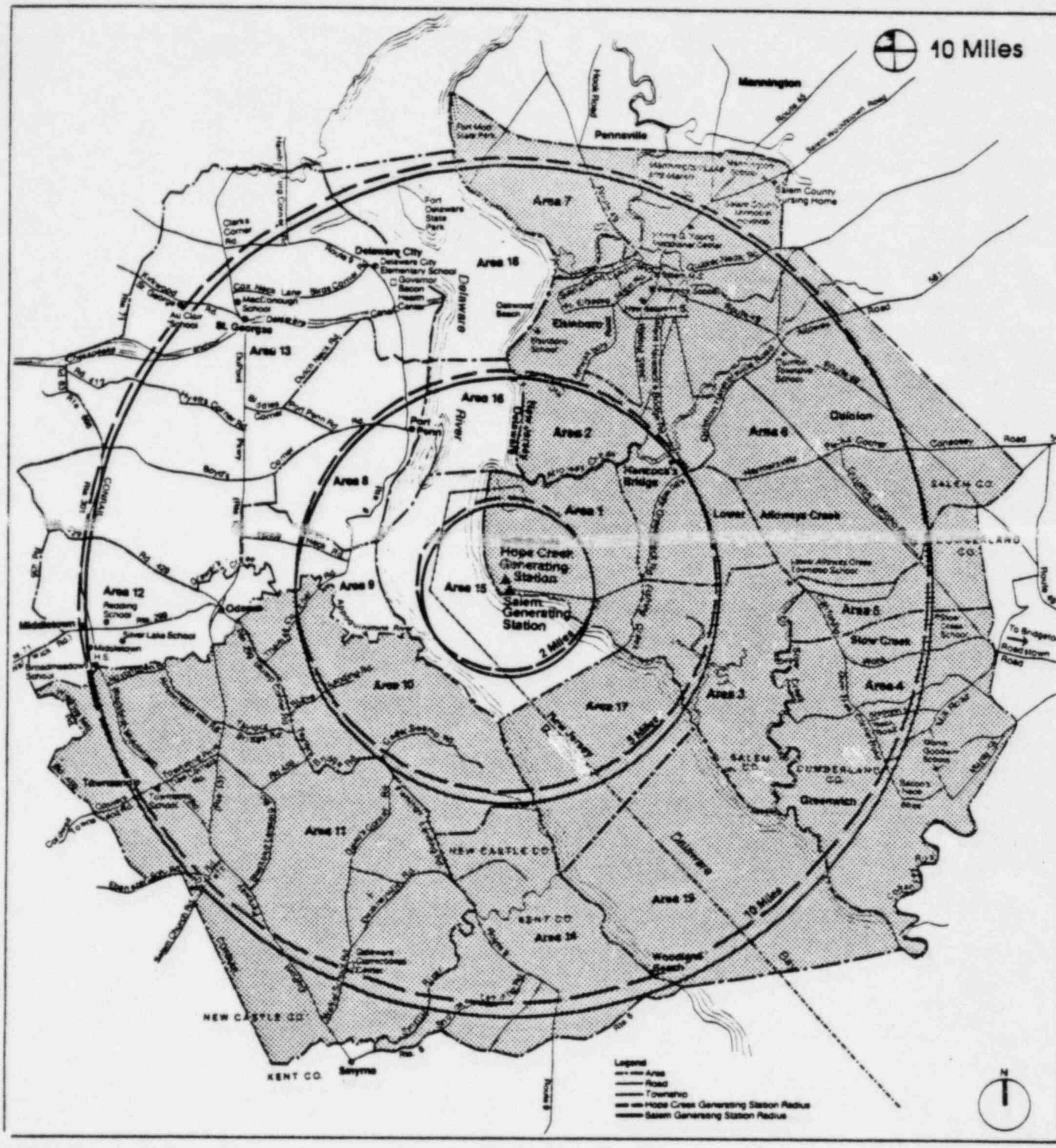


Planning Areas
90° Section H

Evacuation Time Estimates

Figure 10

Salem Generating Stations
Hope Creek Generating Stations

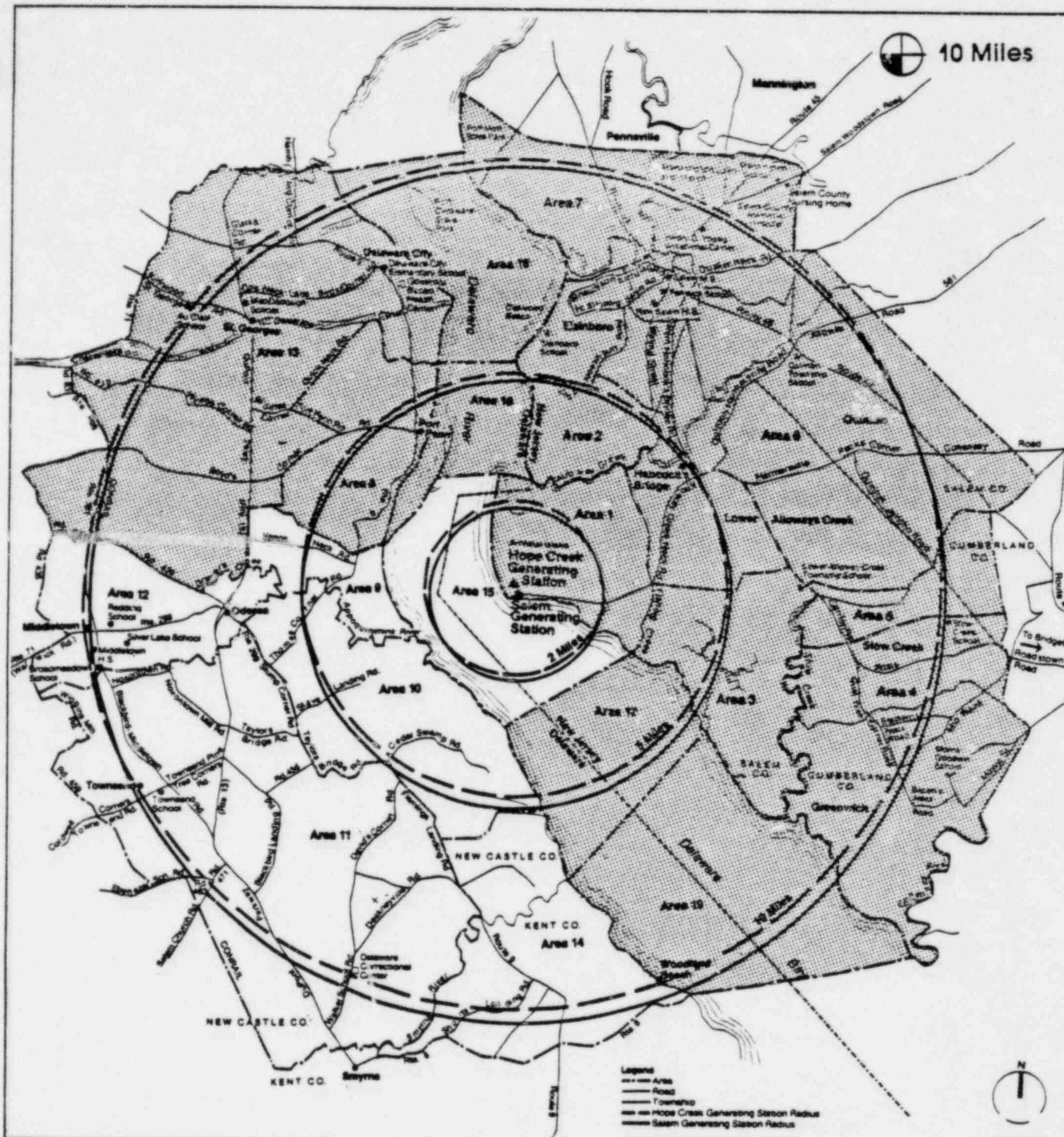


Planning Areas
90° Section I

Evacuation Time Estimates

Figure 11

Salem Generating Stations
Hope Creek Generating Stations

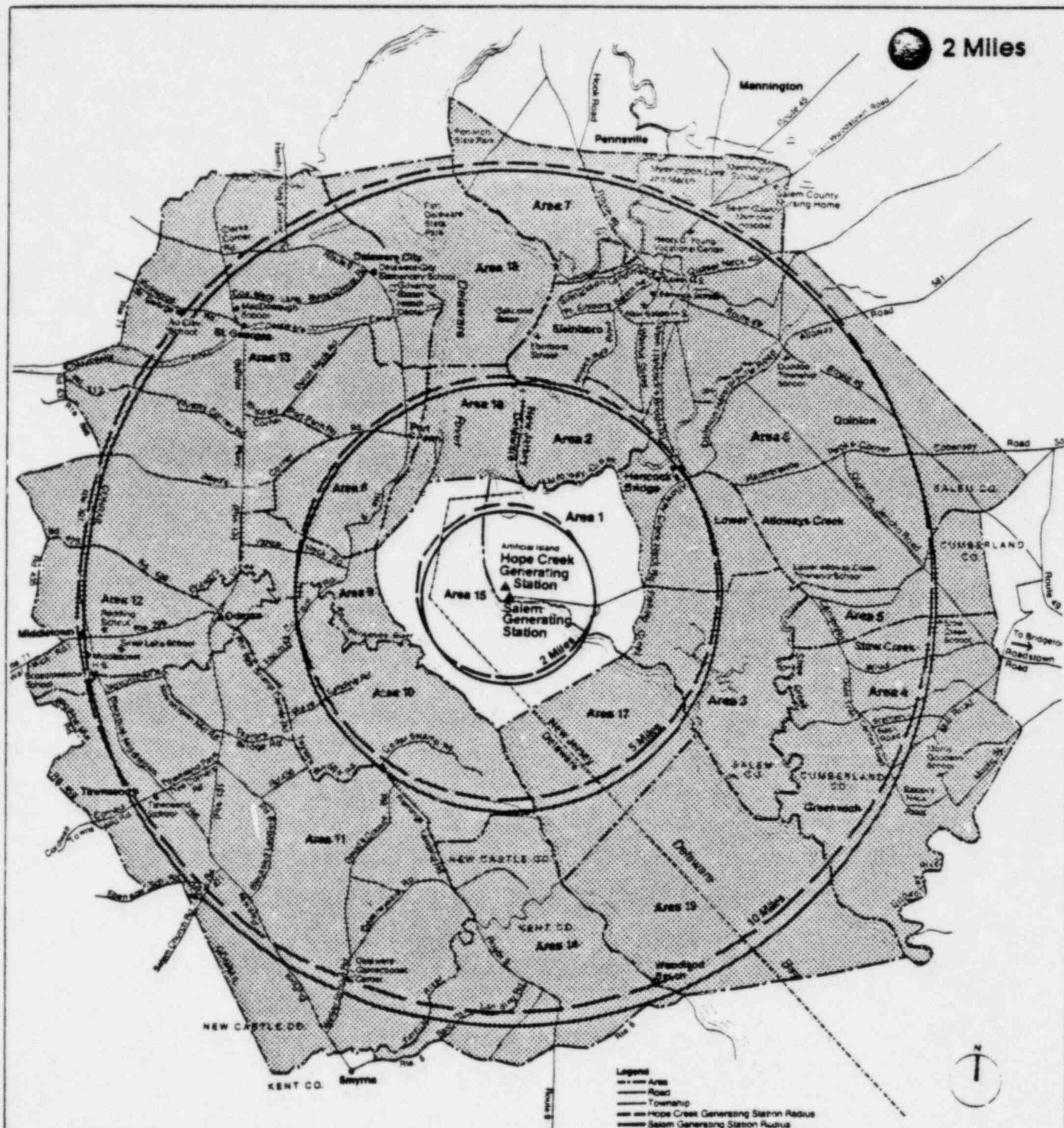


Planning Areas
90° Section J

Evacuation Time Estimates

Figure 12

Salem Generating Stations
Hope Creek Generating Stations

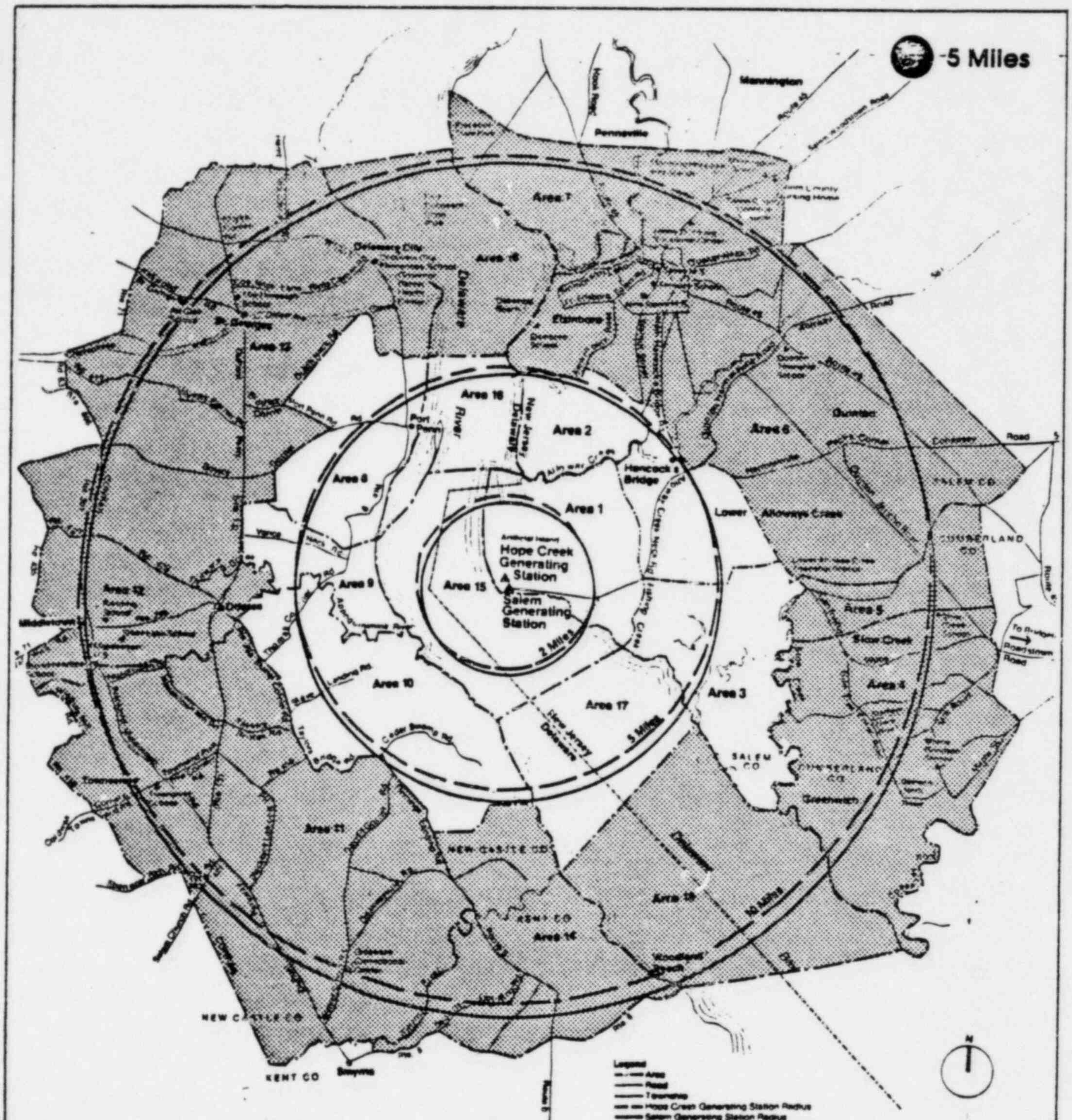


Planning Areas
360° Section K

Evacuation Time Estimates

Figure 13

Salem Generating Stations
Hope Creek Generating Stations



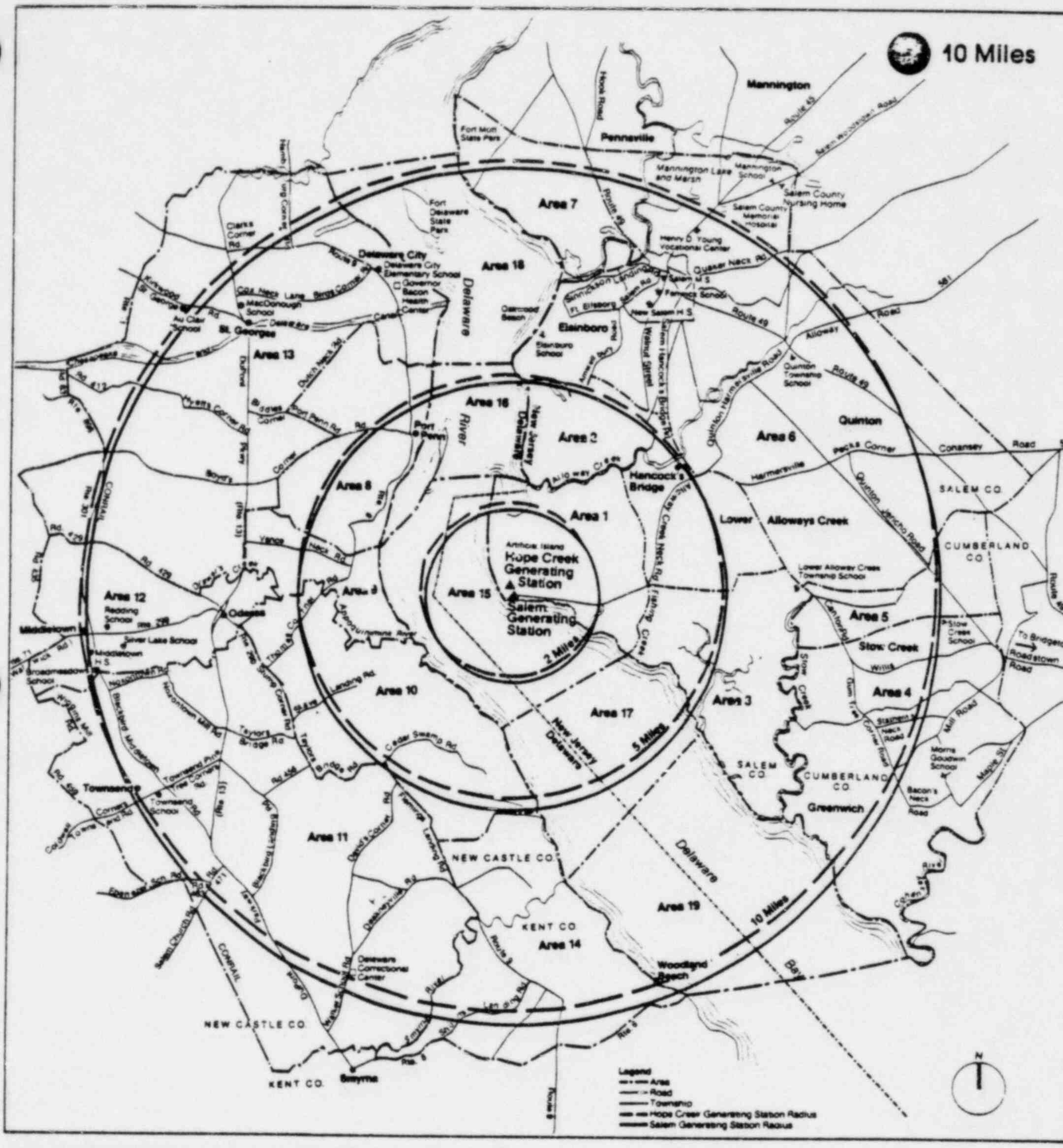
Planning Areas
360° Section L

Evacuation Time Estimates

Figure 14

Salem Generating Stations
Hope Creek Generating Stations

Rev. 2



Planning Areas
360° Section M

Evacuation Time Estimates

Figure 15

Salem Generating Stations
Hope Creek Generating Stations

TABLE 2
SALEM/HOPE CREEK NUCLEAR GENERATING STATIONS
EVACUATION TIME ESTIMATED (1)
(NIGHT SCENARIO)

EVACUATION SECTION	NOTIFICATION TIME HOURS : MINUTES	TRAVEL TIME FOR GENERAL POPULATION		TOTAL EVACUATION TIME(2) FOR GENERAL POPULATION		SPECIAL FACILITIES(3)	
		WITH AUTO	WITHOUT AUTO	WITH AUTO	WITHOUT AUTO	SCHOOL	OTHERS(4)
A	: 05	:20	--	:45	--	--	--
B	: 45	:35	--	1:40	--	--	2:45
C	: 45	:35	1:35	1:40	2:40	--	--
D	: 45	:35	1:50	1:40	2:55	--	2:45
E	: 45	3:05	4:10	2:10	--	--	1:25
F	: 45	--	--	--	--	--	2:05
G	: 45	:20	--	1:25	--	--	2:20
H	: 45	:25	2:15	1:30	3:20	--	2:20
I	: 45	:50	2:25	1:55	3:30	--	3:30
J	: 45	:45	2:55	1:50	4:00	--	2:05
K	: 45	:20	--	1:25	--	--	2:05
L	: 45	:35	2:15	1:40	3:20	--	2:20
M	: 45	3:05	4:10	4:10	5:15	--	3:30
Site Emergency	: 45	3:05	4:10	4:10	5:15	--	3:30

(1) Table revised from original report (2-22-81) to reduce notification time as per NUREG 0654 and current notification capabilities.

(2) Includes general population mobilization time of 20 minutes.

(3) Includes dispatch time, loading time, an roadway travel time where applicable.

(4) Special Facilities in Sections B, D, F, G, H, J include Delaware River and Delaware Bay. For special facilities other than the river and the bay, it is assumed that notification will occur within 15 minutes and that mobilization and evacuation will begin immediately thereafter.

TABLE 3
SALEM/HOPE CREEK NUCLEAR GENERATING STATIONS
EVACUATION TIME ESTIMATES (1)
(DAY SCENARIO)

EVACUATION SECTION	NOTIFICATION TIME HOURS	:	MINUTES	TRAVEL TIME FOR GENERAL POPULATION WITH AUTO	WITHOUT AUTO	TOTAL EVACUATION TIME(2) FOR GENERAL POPULATION WITH AUTO	WITHOUT AUTO	SPECIAL FACILITIES(3) SCHOOL	OTHERS
A		:	05	2:10	--	2:35	--	--	--
B		:	45	2:15	--	3:20	--	:30	2:20
C		:	45	2:15	2:40	3:20	3:45	:30	--
D		:	45	2:35	1:50	3:40	2:55	1:45	2:45
E		:	45	3:50	5:10	4:55	6:15	4:45	1:25
F		:	45	--	--	--	--	--	2:05
G		:	45	:20	--	1:25	--	--	2:20
H		:	45	:25	2:15	1:30	3:20	--	2:20
I		:	45	1:50	3:15	2:55	4:20	2:00	3:30
J		:	45	1:40	3:30	2:45	4:35	2:10	2:05
K		:	45	2:10	--	3:15	--	--	2:05
L		:	45	2:15	2:40	3:20	3:45	:30	2:20
M		:	45	3:50	5:10	4:55	6:15	4:45	3:30
Site Emergency		:	45	3:50	5:10	4:55	6:15	4:45	3:30

(1) Table revised from original report (2-27-81) to reduce notification time as per NUREG 0654 and current notification capabilities.

(2) Includes general population mobilization time of 20 minutes.

(3) Includes dispatch time, loading time, an roadway travel time where applicable.

TABLE 4
SALEM/HOPE CREEK NUCLEAR GENERATING STATIONS
EVACUATION TIME ESTIMATES[1]
(ADVERSE WEATHER CONDITIONS)

EVACUATION SECTION	NOTIFICATION TIME HOURS : MINUTES	TRAVEL TIME FOR GENERAL POPULATION		TOTAL EVACUATION TIME[2] FOR GENERAL POPULATION		SPECIAL FACILITIES[3]	
		WITH AUTO	WITHOUT AUTO	WITH AUTO	WITHOUT AUTO	SCHOOL	OTHERS[4]
A	: 05	3:30	--	4:15	--	--	--
B	: 45	3:40	--	4:45	--	:30	2:20
C	: 45	3:40	3:30	4:45	4:35	:30	--
D	: 45	3:55	2:40	5:00	3:45	1:40	2:45
E	: 45	6:20	7:40	7:25	8:45	7:15	5:05
F	: 45	--	--	--	--	--	2:05
G	: 45	:20	--	1:25	--	--	2:20
H	: 45	:25	2:15	1:30	3:20	--	2:20
I	: 45	2:55	4:30	4:00	5:35	2:50	4:25
J	: 45	2:30	4:25	3:35	5:30	2:55	2:05
K	: 45	3:30	--	4:35	--	--	2:05
L	: 45	3:40	3:30	4:45	4:35	:30	2:20
M	: 45	6:20	7:40	7:25	8:45	7:15	5:05
Site Emergency	: 45	6:20	7:40	7:25	8:45	7:15	5:05

(1) Table revised from original report (2-27-82) to reduce notification time as per NUREG 0654 and current notification capabilities.

(2) Includes general population mobilization time of 20 minutes.

(3) Includes dispatch time, loading time, and roadway travel time where applicable.

(4) Special Facilities in Sections B, D, F, G, H, J include Delaware River and Delaware Bay. For special facilities other than the river and the bay, it is assumed that notification will occur within 15 minutes and that mobilization and evacuation will begin immediately thereafter.

ATTACHMENT 4

PREDETERMINED PROTECTIVE ACTION RECOMMENDATIONS

DIRECTIONS: If any of the following cases occur, immediately convey the protective action recommendations as required to State/County officials via the "Initial Contact Message Form: (Attachment No. 1 of EP I-4). These recommendations shall be made in parallel with that which may have already been made in accordance with Attachment 1 of this procedure. Cases I through IV consist of probable combinations of 2 or more fission product boundary failures (Core, RCS, Containment failure).

The specific plant conditions indicating these failures are:

DEGRADED CORE

A. 5 or more core exit thermocouples indicate greater than 1200°F

OR

B. 2 or more wide range hot leg RTD's indicate greater than 700°F

AND

C. One of the following:

1) Rapidly diverging Δ T

OR

2) No $\Delta T(T_h - T_c = 0)$

OR

3) R - 31A or 31B Offscale

LOSS OF CONTAINMENT INTEGRITY

A. Containment H_2 concentration greater than 4%

OR

B. Indication of Containment pressure greater than 47 psig and increasing (2/4)

OR

C. The following:

1) Indication of Containment pressure greater than 23.5 psig and increasing (2/4)

AND

2) There are less than 3 Fan Coil Units available, with only 1 Containment Spray train capability

OR

3) There are less than 5 Fan Coil Units available, with no Containment Spray train capability

LOSS OF COOLANT

A. R-21 indicator greater than 20 R/HR, and 2 of 4 of the below listed monitors reading offscale:

1) R2

2) R7

3) R10A

4) R10B

OR

B. Inadequate sub-cooling, as indicated by P-250 strip-chart recorder or manual calculation and the plant in model 1, 2, or 3.

OR

C. Potential, Unisolatable steam line break outside of containment with indication of a primary to secondary leak in the affected generator.

OR

D. Either of the following:

1) 2 out of 5 Fan Coil Unit Drainage Alarms Actuate

OR

2) Indication of Containment pressure greater than 4.0 psig (2/4)

AND BOTH OF THE FOLLOWING:

3) Containment Sump level greater than 81'3"

AND

4) There is no indication of an In-containment steam line break

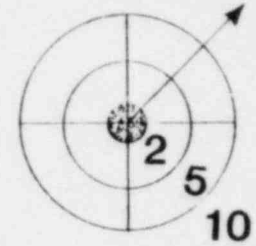
PREDETERMINED PROTECTIVE ACTION RECOMMENDATION

CASE

Case I

Core Degradation with potential for LOCA and failure of Containment Boundary

0 - 2.0 mile evacuation in all four quadrants

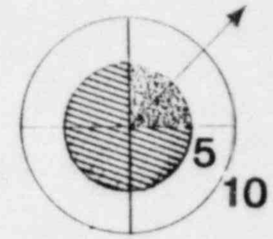


Case II

Core Degradation and LOCA with no immediate potential for Containment Boundary Failure

0 - 5.0 mile evacuation in downwind quadrant

0 - 5.0 mile sheltering in unaffected quadrants

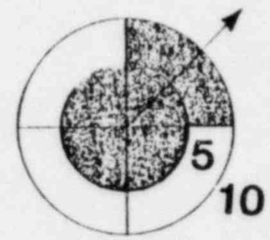


Case III

Core Degradation and LOCA with likely Failure of Containment Boundary as judged by Emergency Coordinator

0 - 5.0 mile evacuation in all four quadrants

5.0 - 10.0 mile evacuation in downwind quadrant

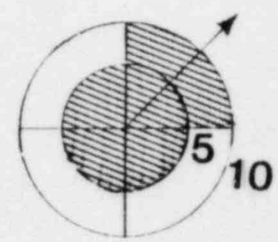


Case IV

Core Degradation and LOCA with imminent Failure of Containment Boundary as judged by Emergency Coordinator

0 - 5.0 mile sheltering in all four quadrants

5.0 - 10.0 mile sheltering in downwind quadrant



NOTE: Recommendation revised from Case III to provide protection to the general public in the event the evacuation is incomplete upon imminent failure.

LEGEND:

EMERGENCY PROCEDURE
EP IV-110-A
FIELD MONITORING
COORDINATED
BY TSC

ACTION LEVEL

When requested by the Senior Shift Supervisor/EDO.

RESPONSIBLE INDIVIDUAL

A. Radiation Protection Technician.

LIMITS OF AUTHORITY

1. Exposure in excess of 10CFR20.101 shall be approved in accordance with EP IV-106.

2. Re-entry into areas with suspected dose rates >100 mR/hr shall be approved by the Radiation Protection Engineer/Senior Shift Supervisor/EDO.

3. Change-out of the air samples or TLD's at the environmental monitoring stations requires the approval of the Radiation Protection Engineer and Maplewood Research and Test Lab.

4. Issuance of Potassium Iodide (KI) tablets requires the approval of the Senior Shift Supervisor/EDO.

ACTION STATEMENTS

1. Upon the request to initiate an Emergency Radiation Survey obtain and record the following information (from the Control Room Liaison):
   a) Wind Direction (towards)________________
   (from)________________

ACTION STATEMENTS (continued)

b) Areas or locations to be surveyed: ____________

____

____

____

____

c) Plant conditions which may affect the safety of the survey team or the survey results.

____

____

____

____

d) Enter team composition on Attachment 1, "Emergency Team Assignments".

2. Provide the TSC with the names of the team members assembled at the Control Point.

3. Log each team member's name, badge number, dosimeter number, and dosimeter reading on the Dosimeter Log (re-zero dosimeters if necessary). Record the dose, time, and date on each Dosimeter Card. Any subsequent dosimeter resets should be recorded on the Dosimeter Card and Dosimeter Log (Attachment 2).

4. Field survey teams(s) will be dispatched to appropriate locations by a radio communicator within the TSC.

5. Quickly brief the team leader on the incident and provide him/her with the following information from Step 1.

a) Wind direction from (meter reading +180° = direction toward).

ACTION STATEMENTS (continued)

b) Areas or locations to be surveyed.
c) Plant conditions which may affect the safety of the survey team or the survey results.

6. If it is suspected that the survey team will be exposed to significant quantities of radio-iodine, see Procedure EP I-15 for use of stable iodine.

NOTE

Approval of the Senior Shift Supervisor/EDO, acting on advice from the Radiation Protection Engineer must be obtained prior to distribution of Potassium Iodine (KI) tablets.

7. Ensure each team member has adequate protective clothing as required for the specific situation.

8. Assign a name to each team before dispatching vehicles. Use numbers for Field Team designations (e.g., team one, team two, etc.). Keys for vehicles are located in the Administration Building and the TSC. A key for the Emergency Van is also located at the Control Room.

9. If the assigned vehicle is not equipped with emergency equipment, obtain the necessary materials from one of the following locations:

a) Control Point
b) TSC
c) Emergency Van
d) EOF

ACTION STATEMENTS (continued)

NOTE

The minimum items required include:

1. Air Sampler
2. Dose Rate Meter
3. Count Rate Meter
4. SAM-2 or equivalent counting equipment (every team need not have a SAM-2)
5. Particulate Filters
6. Charcoal or Silver Zeolite Cartridges
7. Communications Equipment (if not in vehicle)

10. Dispatch each survey team to the appropriate survey vehicle. Perform a communications check between the vehicle, control point and the TSC.

NOTE

If the vehicle is not radio-equipped, instruct the team to obtain a portable radio from security at the Main Gate.

11. While one team is performing the radio communications check, the other team member should be performing an operational check of all emergency equipment. If the emergency equipment kit is equipped with a SAM-2 assay meter, set up instrument for warm-up and stabilization as per instructions (see Attachment 4 for instrumentation instructions).

12. Proceed to the first survey location (Attachment 5 contains maps and directions to some sites which may be used). Insure the team is continuously monitoring

ACTION STATEMENTS (continued)

the radiation levels with a Beta/Gamma Survey instrument. Document the survey results on the Survey Maps and/or the Emergency Survey Log (Attachment 3). Inform the TSC of any significant fluctuations in the survey results.

13. Upon arrival at the first survey location, initiate an air sample. Record the start times and the initial flow rate on the Emergency Survey Log. Specific instructions on surveys to be performed will be provided to the team from the Control Point or TSC.

14. Special consideration should be given to current meteorological conditions when directing the field monitoring teams for plume tracking. This is especially necessary if wind speeds at Artificial Island are less than five miles per hour, for frequent wind shifts, if inversion conditions exist, or if back-up meteorological data is used from the Wilmington Airport or some other off-site facility. Field teams should await instructions from the radio communicator at the TSC or EOF (if activated) regarding plume tracking.

NOTE

The maximum flow rate is 2 SCFM for charcoal and 2 SCFM for Silver Zeolite cartridges.

ACTION STATEMENTS (continued)

15. During the collection of the air samples, monitor the radiation levels and record the results on the Emergency Survey Log. Inform the TSC of the survey results while waiting for the air sample to finish collecting.

16. Refer to Section V of the Instrument Instruction (Attachment 4) for the operation of the SAM-2. Perform Steps 6 through 8g.

17. Upon completion of the air sample collection, count the samples per Steps 8k - 9 of the SAM-2 operational instructions (Attachment 4). Document the results on the Emergency Survey Log. All samples shall be labeled with pertinent information and retained for future analysis. Remain in plume only to collect sample and perform surveys. Count samples in as low a background as possible.

NOTE

Samples should be checked for excessive dose rates. All samples with a dose rate greater than than 100 mR/hr should be stored in a remote, shielded corner of the vehicle.

18. Inform the TSC of the survey and air sample results.

19. For counting of charcoal or zeolite cartridges, repeat Steps 8j - 10 of the SAM-2 instructions (Section V of Attachment 4) for each survey location.

ACTION STATEMENTS (continued)

20. If the radio should fail, see the Communications Section of this procedure (directly before signature sheet) for phone number of the TSC, Control Point, EOF and Control Room.

21. Upon completing the assigned survey request additional instructions from the TSC. If surveys are to be terminated:

    a) Log each team member's final dosimeter reading, the return time and the net exposure on the Dosimeter Log and the Dosimeter Cards.
    b) Inform the TSC that the team is back on-site.
    c) Direct the team to return the equipment to the proper storage locations.
    d) If appropriate, have the air samples analyzed for isotopic content.

22. Debrief the TSC on the survey results.

ATTACHMENTS

1. Emergency Team Assignments
2. Dosimeter Log
3. Emergency Survey Log Sheet
4. Instrument Descriptions
5. Survey Locations and Maps

COMMUNICATIONS

SSS	TSC	Control Room 1	Control Room 2	Control Point	EOF-(RSM)
Radio	Radio	No [illegible]	No [illegible]	No [illegible]	[illegible]

extensions on [illegible]

Prepared By: James Clancy

Reviewed By: [signature] 9/10/82
Department Head Date

Reviewed By: Cheryl A. Sakenas for 9-10-82
Nuclear Emergency Planning Engineer Date

Reviewed By: Bruce W. Lee 9/13/82
Station Quality Assurance Review Date
(if required see EP VI-2)

SORC Meeting No.: 82-86 J. Gallagher 9/23/82
Date

Approved By: H. J. Midura 9/23/82
General Manager - Salem Operations Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection Date

ATTACHMENT 1

EMERGENCY TEAM ASSIGNMENTS

TEAM CODE	TEAM MEMBERS	ORIGINAL ASSIGNMENT	TIME OUT	TIME IN
ONE OR ALPHA	______________ * ______________ ______________			
TWO OR BRAVO	______________ * ______________ ______________			
THREE OR DELTA	______________ * ______________ ______________			
FOUR OR FOXTROT	______________ * ______________ ______________			

* DENOTES TEAM LEADER

EMERGENCY DOSIMETER LOG

TEAM LEADER: ______________________________ TEAM CODE: ______________

NAME	BADGE NUMBER	DOSIMETER SERIAL NO.	TIME OUT	TIME IN	DATE	INITIAL READING	FINAL READING	NET READING

ATTACHMENT 3
EMERGENCY SURVEY LOG SHEET

T[illegible]S DESIGNATION ______________________ TEAM MEMBERS: ______________

____

INSTRUMENT SERIAL NUMBERS: ______________

TELETECTOR__________ PRM-4__________ RADECO__________ PIC-6 __________

E-520__________ RO-2 __________ SAM-2__________

____

AIR SAMPLE CALCULATION

$$\mu Ci/cc = \frac{\text{Net Counts Per Minute}}{(\text{cubic feet})(2.832 \times 10^4\ cm^3/ft^3)(2.2 \times 10^6\ dpm/\mu Ci)(\text{Detector EFF})}$$

TYPE OF FILTER	(P) (SZ) (C)	(P) (SZ) (C)	(P) (SZ) (C)	(P) (SZ) (C)
LOCATION				
GAMMA DOSE RATE				
[illegible]TA DOSE RATE				
SAMPLE DATE				
SAMPLE START TIME				
SAMPLE STOP TIME				
Δt				
AVG. FLOW RATE				
VOLUME (ft^3)				
COUNT DATE				
COUNT TIME				
NCPM*				
÷EFF = DPM				
$\div 2.2 \times 10^6 = \mu Ci$				
$\div ft^3 = \mu Ci/ft^3$				
$[illegible].832 \times 10^4 = \mu Ci/cm^3$				

* NCPM = Gross CPM - Background CPM at Analysis Location.
P = Particulate, SZ = Silver Zeolite, C = Charcoal

ATTACHMENT 4
INSTRUMENT OPERATION INSTRUCTIONS

I. OPERATION OF RO-2 (JUNO TYPE ION CHAMBER) SURVEY METER

A. DESCRIPTION

The Eberline RO-2/RO-2A is a 3" diameter air filled ion-chamber survey meter. It has four linear ranges; RO-2: 0-5, 0-50, 0-500 and 0-5,000 mR/hr; RO-2A: 0-50, 0-500 ml/hr and 0-5, 0-50 R/hr. The RO-2 and RO-2A utilize 3 and 4 NEDA 1604 (9 volt) batteries respectively. Its energy response is linear from 0.05 MeV to 6 MeV and can be operated in a temperature range of -40°F to +140°F. The detector's outer wall is 200 mg/cm^2 and the inner wall is 7 mg/cm^2.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the function switch to BATT 1 and then to BATT 2 positions. The meter should read above the BATT cutoff line in both cases.

2. Turn the function switch to ZERO position. Check that the meter reads zero. If not, set it to zero with the ZERO knob. (The zero setting of the instrument may be checked in any radiation field by merely selecting the ZERO position.)

3. Set the function switch to the desired range of operation. Wait 10 seconds for full meter response. The switch position selected is the full scale reading of that range.

C. TO PERFORM A DOSE RATE SURVEY

1. When measuring beta or low energy gamma or X-ray emissions, open the sliding beta shield on the bottom of the case and face the bottom of the instrument toward the radiation source. To open or close the shield, depress the friction release button on the left side of the case and manually move the slide or let it fall due to gravity. When the shield is open, protect the thin face against damage.

2. Hold RO-2 waist level (approximately 1 meter above ground).

3. Hold meter steady and note open window and closed window readings.

4. Record reading, location, date and time.

II. OPERATION OF PIC-6A ION CHANGER SURVEY METER

A. DESCRIPTION

The Eberline PIC-6A is a 1/2" diameter, 30 mg/cm^2 walled, gas filled ion chamber, portable survey meter. It has 6 logarithmic ranges: 1-10, 10-100, and 100-1000 mR/hr plus 1-10, 10-100 and 100-1000 R/hr. It utilizes a 2 NEDA type 604 batteries (9 volts) and weighs about 3.3 pounds. Its energy response is linear from 0.8 to approximately 6 MeV, and it can be operated from -10° to +140°F.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the function switch to BATT. The meter should read in the BATT OK region.

2. Set the function switch to the desired range. A single rotary switch selects the range to respond in either the mR/hr range or the R/hr range.

3. Wait 10 seconds for full meter response.

C. TO PERFORM A DOSE RATE SURVEY

1. Hold PIC-6A at waist level (approximately 1 meter above ground).

2. Hold meter steady and note closed window reading.

3. Hold meter steady and note open window reading.

4. Record readings, location, date, and time.

III. OPERATION OF E-520 GM TUBE SURVEY METER

A. DESCRIPTION

The Eberline E-520 is an external GM tube probe plus internal tube portable survey meter. The external GM tube has 4 linear ranges of 0-0.2, 0-2, 0-20, and 0-200 mR/hr. It utilizes two "D" batteries and weighs approximmately 4-1/2 lbs. Its energy response is linear from 0.2 to 2 MeV. With alkaline or NiCd batteries, it can be operated from -40° +140°F. The external detector outer wall is approximately 200 mg/cm^2 and the inner wall is 30 mg/cm^2. An external speaker is available for use with this meter.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the function switch to BATT. The meter should read in the BATT OK region.

2. Set the function switch to one of the five sensitivity ranges.

3. Wait 15 seconds for full meter response.

C. TO PERFORM A DOSE RATE SURVEY

NOTE

This GM tube survey meter may saturate (and read zero) in a radiation field in excess of 1000 R/hr.

NOTE

The high range detector (0-2000 mR/hr) is located in the meter case and not in the hand held probe.

1. Hold E-520 at waist level (approximately 1 meter above ground).

2. Hold meter steady and note closed window reading.

3. Hold meter setady and note open window reading.

4. Record readings, location, date, and time.

IV. OPERATION OF THE HIGH VOLUME AIR SAMPLER (H-709V)

A. DESCRIPTION

The H-709V is a 110 VAC, 2-28 CFM variable flow, high volume air sampler. The sampler is designed to accept a 2-inch filter paper for particulate sample collection and a CESCO charcoal, or Silver Zeolite cartridge for Iodine 131 sampling.

B. TO OPERATE AIR SAMPLER

1. Place the Iodine cartridge and a filter paper into the filter holder. Attach the filter housing to the sampler.

2. Plug the sampler into a 110 V outlet and turn it on. Insure the flow meter is operating by tapping lightly on the flow meter housing. Switch the sampler power switch to the variable position for a 2 inch sample.

3. Obtain a 40 cubic foot sample; approximately 2 CFM for 20 minutes.

NOTE

Smaller volume samples may be requested by the EDO. Sampling times should be adjusted accordingly.

4. Observe flow rate during sample. Record air flow, duration of sampling time, and location where sample was taken.

5. Place cartridge and filter paper into separate envelopes and mark each envelope with the following information:

Emergency Station No.: ________________________ Date: _______________

Sample Start Time: ___________ min. Sample Stop Time _________ min.

Sample Flow Rate: _______________ ft^3/min. Tech. _____________________

Record sample data on the Emergency Survey Log Sheet (Attachment 3).

V. OPERATION OF SAM-2 DUAL SINGLE CHANNEL ANALYZER
(with 2" x 1/2" NaI crystal)

A. DESCRIPTION

The Eberline SAM-2 is a lightweight (7 lbs.) two channel gamma spectrometer which is stabilized to correct automatically for gain changes (caused by temperature changes, etc.). It can read out each channel independently or the sum or difference of both channels on either a scaler or ratemeter. It will operate from either a 110 volt AC outlet or its own 8 pound battery pack. It

utilizes a 2" x 1/2" Sodium Iodide crystal which, with its lead shield collar, weighs about 8 pounds. This counting system is designed to operate from 32°F to 140°F. It has both a preset timer and a manual timer. It is fused for both AC and DC operation.

CAUTION

The Sodium Iodide probe is fragile and should be handled with care. The Sodium Iodide probe should not be taken through rapid temperature changes, it may crack if brought from 30° to 60° without some thermal wrapping to slow down temperature equalization.

B. OPERATION

1. Utilize a gamma survey meter (low range) to find as low a background area as practicable (0.5 mrem/hour) in which to perform the counting functions. If background is greater than 0.5 mrem/hour, provide shielding as necessary.

2. Plug cord into 115 VAC, 60 Hz power source or connect to battery power through BATTERY connector (pin 1 negative, pin 2 positive).

3. Connect detector.

4. Turn power switch to ON and, if battery pack isused, insure BATT OK light is on. Allow the instrument to warm up for at least 10 minutes. A 20 minute warm up period or longer will provide optimum stability results.

5. Set controls as follows:

a) STABILIZER-ON (rear of instrument)
b) H.V. ADJUST - 8.00 (or at least 1/3 of the way onto the high voltage plateau)
c) Both THRESHOLDS - 10.00
d) Both IN-OUT to OUT
e) DISPLAY - ON
f) TIMED-STOP-MAN - STOP
g) CH1 to +, CH2 to OFF

6. Press RESET-START switch. The display should be all zeros.

7. Operation Check

a) Set TIMED-STOP-MAN switch to TIMED
b) Set COUNT TIME IN MINUTES switches to 1 and X.1. Press RESET-START switch. Unit should stop counting after 6 seconds, registering 4500-8500 counts (no background).
c) Under the above conditions, the rate meter should read 45000 to 85000 counts per minute.

8. Counting Iodine-131

a) Care must be taken not to contaminate the detector with samples. The face of the detector may be covered with a thin plastic sheet.
b) Set thresholds and windows, for both channels, to the values posted on the instrument case.
c) Set CH1 switch to "+" and CH1 window to "IN".
d) Set CH2 switch to "-" and CH2 window to "IN".
e) Set COUNT TIME to 1 minute (1 and X1). Set COUNT to "TIMED".
f) Press START button.

g) Count background for one minute. If background is greater than 500 cpm, provide additionaly shielding (if practicable). If the number is less than zero, as evidenced by a series of nines, then minor adjustments of the Channel 2 window will correct this, usually clockwise to increase the count.

h) Place a Ba-133 source on the face of the detector and press the reset-start button for one count.

i) Using the formula: $\frac{\text{cpm } 1.2}{\text{source dpm}}$ and the results from h, determine the efficiency. This number should be ± 10% of the I-131 EFF posted on the SAM-2 case.

NOTE

1.2 is a correction factor to allow for the difference in energy abundancies between Ba-133 and I-131.

j) Remove the source and count background for 5 minutes (set count time to 5 and X1), record this value.

k) Place saran wrapped samples on detector face and make 5 minute counts (divide by 5 and get cpm), record these values.

l) Carefully mark and save all samples for later laboratory evaluation. Wrap samples in clean saran wrap or equivalent (e.g., surgical gloves) for storage. If sample is to be saved it must be properly identified and a log kept of sample information (Attachment 3 should suffice).

NOTE

Samples should be stored in a suitable area which will not cause a significant change in background radiation levels. If sample causes a high radiation area to be formed in the immediate area, then a suitable storage area should be used (e.g., lead bricks in rear of vehicle). After delivering samples to EOF, the samples should be stored in a locked storage area.

9. Calculate Airborne I^{131} activity as follows:

   a) Divide the Net cpm (background subtracted) by the efficiency factor from step i above to get a reading in dpm.
   b) Multiply the reading (in dpm) obtained in 9.a above, by 4.5 x 10^{-7} uCi/dpm to obtain a reading in uCi.
   c) Multiply the sampling time (minutes) times the sample flow rate (ft^3/min) times 2.832 x 10^{-4} cc/ft^3 to find the total sample volume (in cc).
   d) Divide the total I^{131} reading of step 10.b above (uCi) by the total sample volume (in cc) found in 10.c above to get total activity in uCi/cc.
   e) Record the following information:
   Emergency Station No. _____ Date/Time Sample Counted ______
   I^{131} Activity: ______uCi/cc Date/Time Sample Taken ________

10. Refer to Figure 4-1 to obtain thyroid dose rate.

11. Alternate Method
    Refer to Table 4-1 to determine a quick estimate of concentration and thyroid dose rate based on an assumed efficiency.

12. Communicate SAM-2 results and derived dose rate to TSC.

VI. OPERATION OF PNC-4 PORTABLE NEUTRON COUNTER

A. DESCRIPTION

The Eberline PNC-4 has a BF_3 detector with cadmium shield and moderator for use in detecting fast or slow neutron radiation. The count rate is read out over four decades (500, 5K, 50K and 500K cpm) using two separate meter movements. The instrument requires five standard "D" size batteries. Within the instrument is a moderator consisting of parafin wax encased in a cadmium sheath. Total weight of the instrument is about 12 pounds.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn switch to BATT check position. The left pointer (black) should read in the green area.

2. Release switch and it will spring return to the ON position.

C. TO PERFORM A DOSE RATE SURVEY

1. To detect fast neutrons, the detector must be inserted into the "moderator" and to detect slow neutrons the detector must be out of the "moderator".

2. If possible, use a beta-gamma survey meter when performing neutron surveys as a precaution.

3. Hold the PNC-4 at waist level (approximately 1 meter above ground).

4. To read the meter, simply read whichever of the two pointers is on scale. The black pointer is read up to 5K cpm, above which it disappears from view and the red pointer comes on scale.

5. Watch the pointer long enough to obtain the average reading for fast and slow neutrons, as required.

6. Record the readings, location, date and time.

VII. OPERATION OF PRM-4 PULSE RATE METER

A. DESCRIPTION

The Eberline PRM-4 pulse rate meter is used for the detection of beta and gamma radiation. The count rate is read out over four decades (200, 2K, 20K and 200K cpm) using two separate meter movements. The instrument requires five standard "D" size batteries. Total weight of the instrument is 5.25 pounds.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the switch to the BATT check position. The left pointer (black) should read in the green area.

2. Release seitch and it will spring return to the ON position.

C. TO PERFORM A DOSE RATE SURVEY

1. Using the HP-240 probe detection of gamma radiation is done with the sliding window closed. To detect beta, simply open the sliding window.

2. Hold the PRM-4 at waist level (approximately 1 meter above ground).

3. To read the meter, simply read whichever of the two pointers is on scale. The black pointer is read up to 2K cpm, above which it disappears from view and the red pointer comes on scale.

4. Watch the pointer long enough to obtain the average reading.

5. Record the readings, location, date and time.

VIII OPERATION OF THE GENARAC (6330) PORTABLE ALTERNATOR

A. DESCRIPTION

The GENERAC 6330 Portable Alternator is a revolving field single phase alternator rated at 115 VAC, 60 cycles, 13 amps, 1500 watts. The alternator is driven by a 4 cycle, single cylinder, 3.5 horsepower gasoline engine. The unit itself is light-weight and can be moved by one person and is easily handled by two persons.

B. GENERAL CHECKOUT

1. Check the alternator and engine in the technical manuals attached to the unit.

C. ALTERNATOR OPERATION

1. Operate the GENERAC 6330 Portable Alternator engine unit as outlined in the technical manuals attached to the unit.

IX OPERATION OF THE EBERLINE RM-14 COUNT RATE METER WITH PROBE (HP-210)

A. DESCRIPTION

The Eberline Radiation Monitor (RM-14) is a count rate meter which is commonly employed as a frisker at control points when used with a pancake type probe. For use as a count rate meter, an HP-210 pancake probe is employed. This instrument can be used to count particulate filter samples, charcoal or silver zeolites for I^{131} concentration determination. It should be noted that the gamma efficiency of the HP-210 probe is significantly less than that for the RD-19 probe (SAM-2). The HP-210 can also detect the beta emissions from I-131, however, the minimum detectable activity for I-131 using the HP-210 probe is considerably greater than that obtained using the SAM-2/RD-19 instrumentation. It should also be noted that the RM-14/HP-210 is incapable of discriminating between different energy isotopes. The use of silver zeolite for sample collection does improve this condition.

B. GENERAL INSTRUMENT CHECKOUT

1. Energize the RM-14 by plugging the power cord (which exits the instrument chassis at its rear) into a 120 VAC supply. Then switch the five (5) position rotary switch from "off" to one of the three (3) counting ranges (X1, X10, X100).

2. Connect the HP-210 probe detector using its coaxial cable to the terminal at the right hand corner of the face of the instrument.

3. Place the rotary switch to the "X10" position, flip on the test toggle switch to on (located on back of instrument chassis), the count rate should rise to 3600 cpm + 10%. If the instrument "on test" reads in this range, the instrument should be in good working order.

4. When operating with batteries (no AC power available), turn rotary switch to "BATT" position to see if battery charge is within proper charge range (indicated on instrument scale).

C. COUNT RATE METER OPERATION

1. Using sample holder or generally applied counting geometry, record background count rate.

2. Using check source (use gamma emitting check source, e.g., CO-60), read and record count rate.

3. Sample Type: Particulates: Place the filter in the holder or preferred geometry, then read and record count rate. Allow instrument reading to stabilize for approximately 5 to 10 seconds. Then read and record count rate. Charcoals and Silver Zeolites: Place the cartridge into the sample holder or preferred geometry, place the probe onto the cartridge, read, and record count rate.

To calculate the concentration, use the following formulas:

Particulate Filters:

$$uCi/cc = \frac{\text{Net cpm}}{\text{sample volume in ft}^3} \times (1.6E-11) \times \frac{1}{\text{Efficiency}}$$

Cartridge Filters:

$$uCi/cc = \frac{\text{Net cpm}}{\text{sample volume in ft}^3} \times (1.6E-11) \times \frac{1}{\text{efficiency}}$$

PSE&G FIELD SURVEY TEAM DATA
IODINE DOSE RATE CALCULATION

a) Sector and distance ________ b) Time of sample ________
c) Field team name ________ d) Instrument eff. (demical)* ________
e) DPM above background ________ f) Sample volume (ft³) ________
g) (e) ÷ (f)x(1.6E-11)**x(1/eff)= ________ uCi I-131/cc
h) Child thyroid dose rate from graph ________ mrem/hr

* Efficiency obtained from calibration sticker on instrument. The default value for efficiency is 0.025 (1/eff = 40)

** 1.6E-11 = (4.50 E-7 uCi/dpm) x (3.53E-5 cubic feet/cc)

uCi/cc IODINE-131

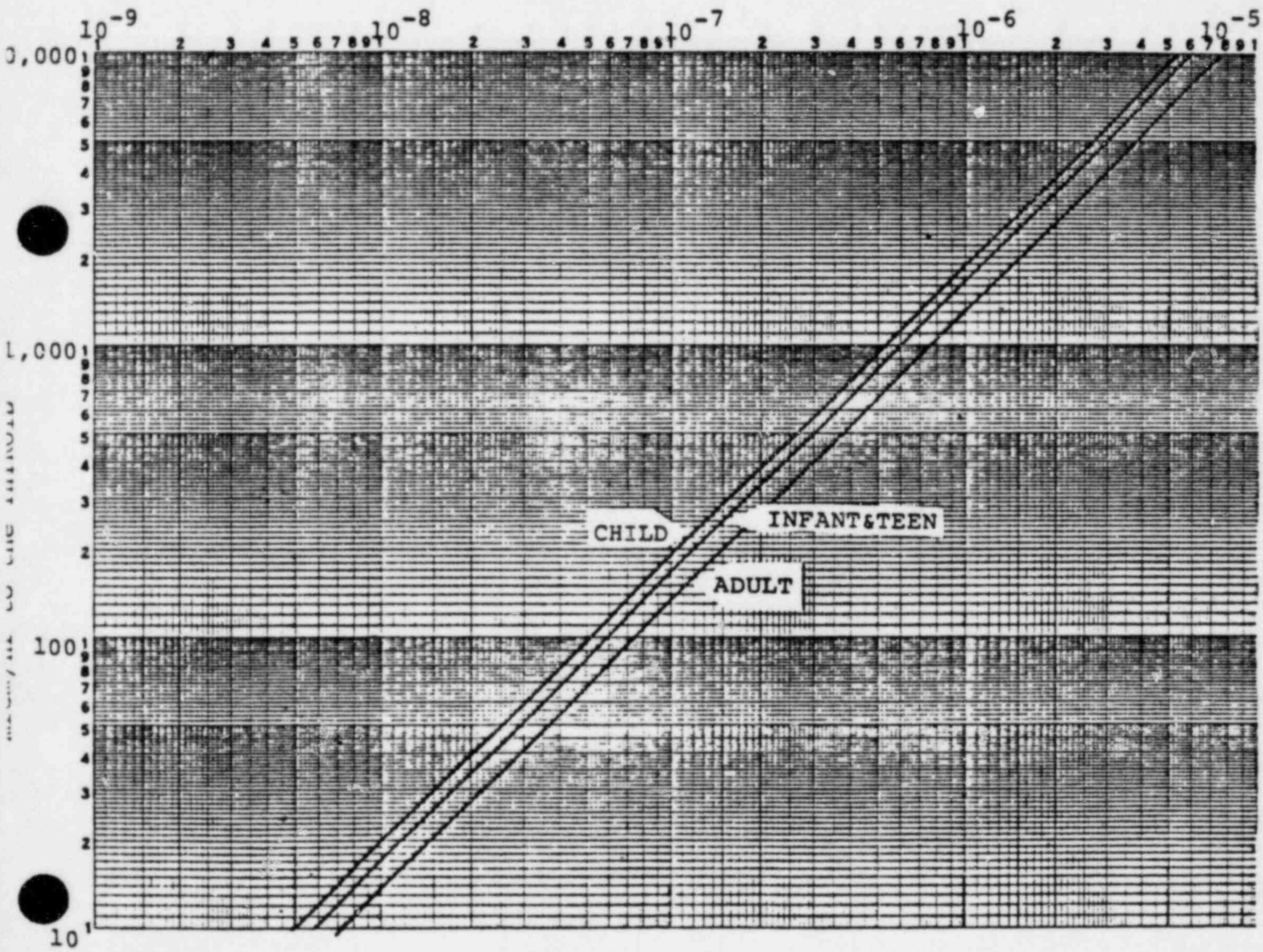


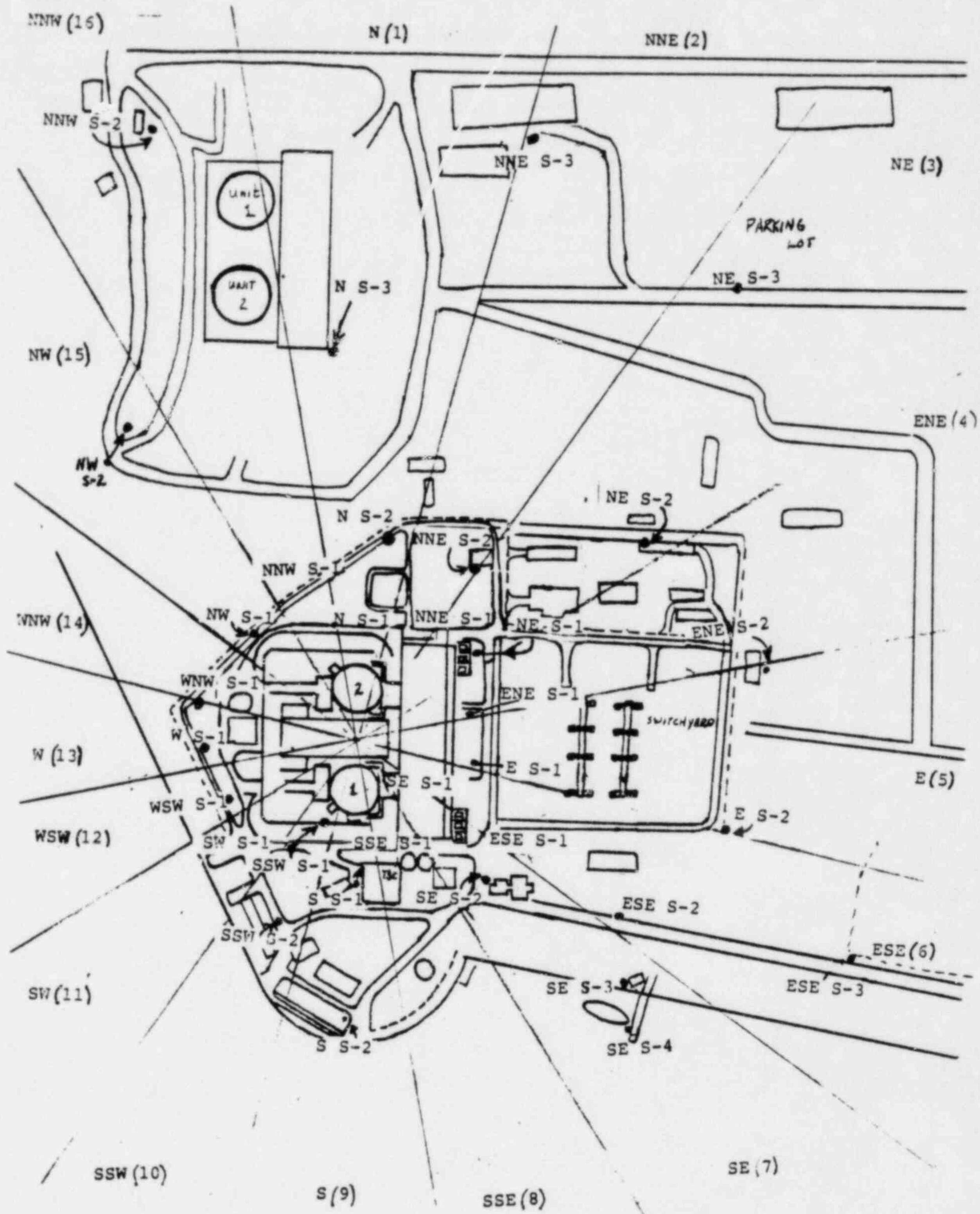
TABLE 4-1

SAM-2 cpm Above Background	uCi/cc* (assuming 1 ft^3 and 2.5% eff)	REM DOSE TO THYROID FOR 1 HOUR EXPOSURE			
		Child	Infant and Teen	Non-Occu-pational Adult	Working Adult
1×10^5	6.4 E-5	118	108	87	131
5×10^4	3.2 E-5	59	54	44	65
1×10^4	6.4 E-6	12	11	9	13
5×10^3	3.2 E-6	6	5	4	7
1×10^3	6.4 E-7	1.2	1.1	0.9	1.3
5×10^2	3.2 E-7	0.6	0.5	0.4	0.7
1×10^2	6.4 E-8	0.12	0.11	0.09	0.13
50	3.2 E-8	0.06	0.05	0.04	0.07
10	6.4 E-9	0.01	0.01	0.01	0.01

*To correct for actual sample volume divide tabulated uCi/cc value by the actual volume in cubic feet.

ATTACHMENT 5

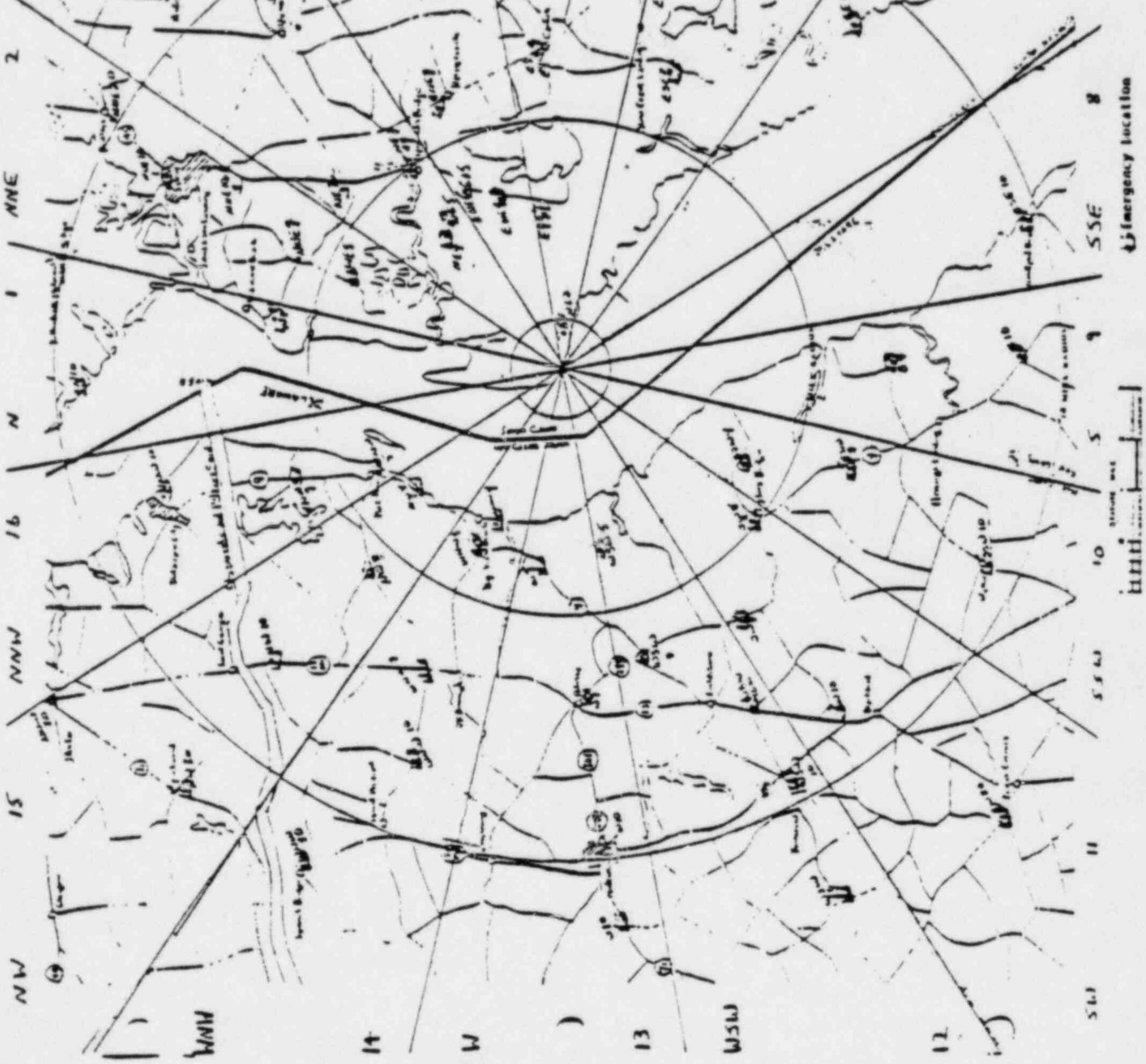
ON SITE EMERGENCY MONITORING LOCATIONS



ATTACHMENT 5
ON SITE EMERGENCY MONITORING LOCATIONS

Location	Description
N-S1	420; N, on inner access road
N-S2	750' N, security road inside fences
N-S3	1500' N, Hope Creek Unit 1 Turbine Building (center of east side on ground)
NNE-S1	400' NNE, NW corner SNGS Unit 2 Turbine Building (on ground)
NNE-S2	850' NNE, SNGS North Fence Vehicle Access Gate
NNE-S3	2075' NNE, SE corner Hope Creek Change House
NE-S1	600' NE, inner access road, NE intersection
NE-S2	1150' NE, SW corner SNGS #2 Warehouse
NE-S3	1825' NE, SW corner Hope Creek parking lot for trades
ENE-S1	450' ENE, NE corner SNGS Administration Building
ENE-S2	1360' ENE, inside site security fence at NE corner of switchyard
E-S1	400' E, SE corner SNGS Cafeteria
E-S2	1300' E, SE corner switchyard, outside security fence
ESE-S1	500' ESE, sidewalk 150' N of Unit 1 Guardhouse (at Hose Station)
ESE-S2	1020' ESE, Guardhouse to SNGS employee parking lot
ESE-S3	1960' ESE, access road on outermost parking lot fence
SE-S1	160' SE, closest outside entrance to HP control point (next to #1 Unit Steam Mixing Bottle)
SE-S2	560' SE, NW corner of SNGS Main Guardhouse
SE-S3	1060' SE, SW corner of permanent Visitors Center
SE-S4	1100' SE, "Second Sun" barge (when in port)
SSE-S1	360' SE, NW corner of TSC
S-S1	360' S, NW corner of B Building
S-S2	825' SE, NE corner of Circ Water Intake Structure
SSW-S1	250' SSW, Chemistry Trailer
SSW-S2	560' SSW, on security fence halfway between N end of Circ Water Intake and S end of Service Water Structures
SW-S1	490' SW, NE corner of Service Water Structure
WSW-S1	440' WSW, 150' N of 11S1 on access road
W-S1	510' W, security access road, due W of a point midway between the two Containment Buildings, W of S end of A Building
WNW-S1	690' WNW, inside NW corner of security fence at right angle (inside fence)
NW-S1	600' NW, inside security fence, 275' from NW corner of fence (near river)
NW-S2	1340' NW, Hope Creek Structure, SW corner Hope Creek Road
NNW-S1	600' NNW, inside security fence, 500' from NW corner of fence
NNW-S2	2400' NNW, SE corner of Hope Creek Material Test Lab

ATTACHMENT 5
OFFSITE EMERGENCY MONITORING LOCATIONS



ATTACHMENT 5
OFF SITE EMERGENCY MONITORING STATIONS

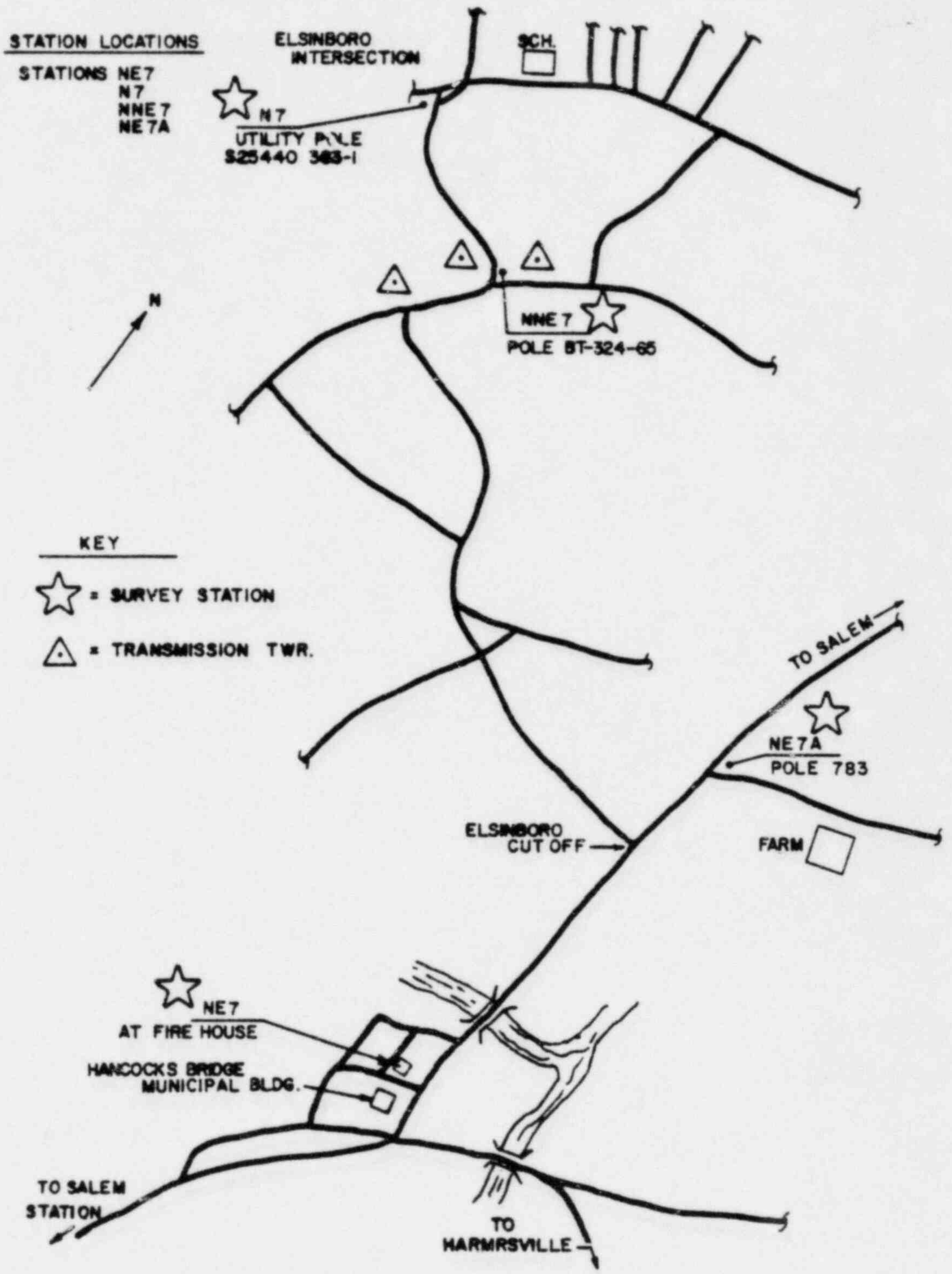
SECTOR	MILE	AZMUTH	SNGS ENV.	EMERGENCY * OLD	EMERGENCY * NEW	LOCATION
1	5.8	7 3/4°	1F1	1	N7	Ft. Elfsborg, across from Gold Course
1	9.6	355 1/2°		None	N10	Ft. Mott, Ft. Mott Rd., S end
1	10.5	10°	1G1	None	N20	Rt. 499 0.2 mi. S of Hook Rd. Richmonds Dairy
2	4.4	20°	2E1	None	NNE5	Farm
2	5.8	24 1/2°		2	NNE7	Ft. Elsborg & Amwellbury Rd.
2	8.7	24 2/2°	2F2	7	NNE10	Salem Test Lab
2	7.4	26°	2F5	None	NNE10a	Salem High School
2	10.3	28°		None	NNE20	Salem County Hospital
3	3.8	45 1/8°		None	NE4	End of Poplar St.
3	4.1	49°	3E1	None	NE5	Farm
3	5.1	51.5°	3F2	4	NE7	LAC
3	5.8	39°		3	NE7a	Mill St. & Han. Bridge-Quinton Rd.
3	8.8	49°		8	NE10	Water Works Road, Quinton (0.2 mil N of 3F3)
3	10.8	44 1/2°		None	NE20	Corner Clancey & Quaker Neck Rd.
4	3.7	66°	4D2	None	ENE4	Alloway Creek Neck Road
4	4.1	59°		5	ENE5	Alloway Creek Neck Road
4	5.9	62 /2°		None	ENE7	Harmersville, Dilks Store, Red Light
4	8.6	67°		None	ENE10	Woodmere, Corner Harmersville Pecks Corner Rd., & Jerico Rd.
4	10.5	72°		None	ENE20	Pecks Corner, Rt. 49 & Harmersville Road
5	0.9	90°	5S1	62	E1	Split in Site Access Rd., Hope Creek-Salem Y*
5	3.5	80°	5D1	6	E4	Pole GCC) G-68 SP10-40, Air Sampler*
5	6.5	84 1/2°	5F1	9	E7	Canton, main intersection
5	12.6	99°		None	E20	Shiloh, main intersection Rt. 49 & Bank
6	6.4	104°	6F1	None	ESE7	Stowe Neck Rd.
6	8.1	102°		10	ESE10	Gum Tree Corner
6	11.3	118°		12	ESE20	Greenwich, 0.7 mi. S of center of town on Cohansey Creek
7	8.8	128°	7F2	11	SE10	Bayside
7	11.4	125°		None	SE20	Ragged Island
8	9.6	161°		None	SSE10	Woodland Bench, Rt. 6 at Del. Bay
8	14.5	168°		None	SSE20	Rt. 9 at Whitehall Neck
9	4.2	188°	9E1	None	S5	Tailor's Bridge Spur Rd.-end
9	5.8	179°		None	S10	Broadway Meadow
9	8.8	176°		None	S20	Whitehall Crossroads
10	3.9	203°	10D1	105	SSW4	Taylors Bridge Spur Rd.*
10	5.6	198 1/2°	10F1	None	SSW7	Rt. 9 intersection
10	8.9	203°		None	SSW10	Walker, Rt. 9
10	11.6	198°	10G1	None	SSW20	Smyrna, Rt. 13 & Rt. 6 corner
11	4.9	218°	11E2	None	SW5	Taylors Bridge, Rt. 9
11	6.0	235°	11F1	None	SW7	Taylors Bridge
11	8.9	231°		None	SW10	Point Breeze Fork, Rt. 13 & 896
11	12.3	225°		None	SW20	Dexter Corners

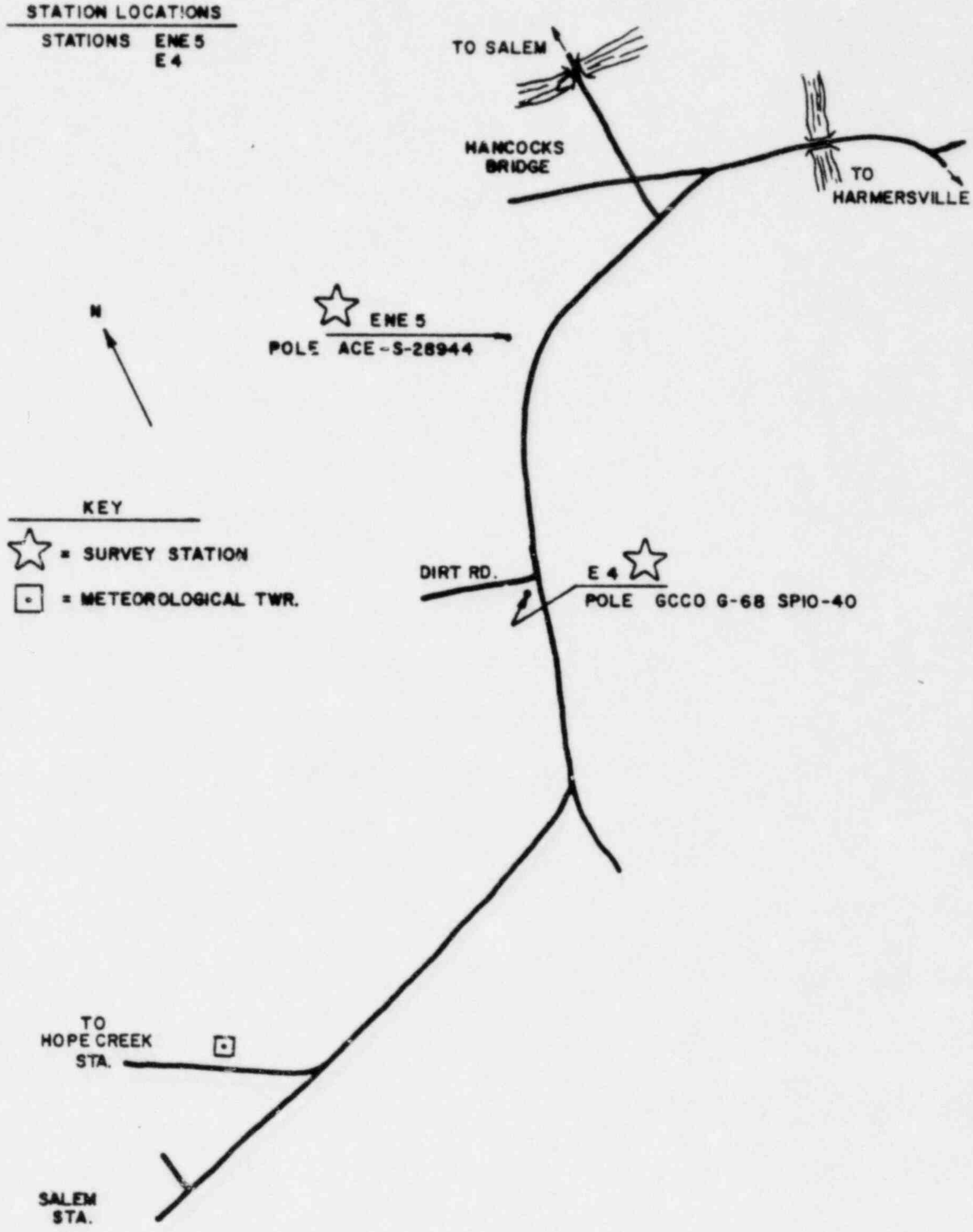
*Also environmental air location

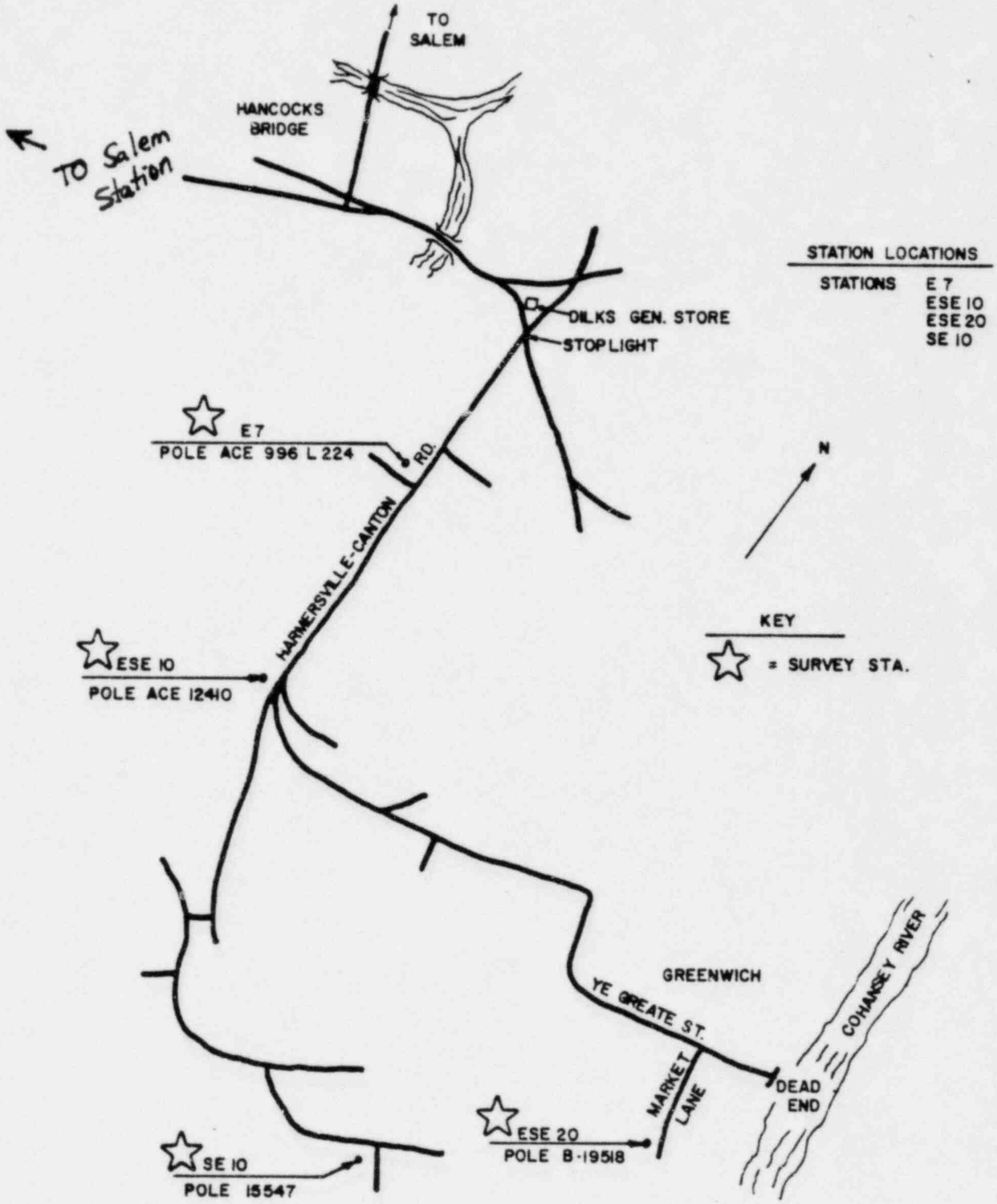
ATTACHMENT 5
OFF SITE EMERGENCY MONITORING STATIONS (continued)

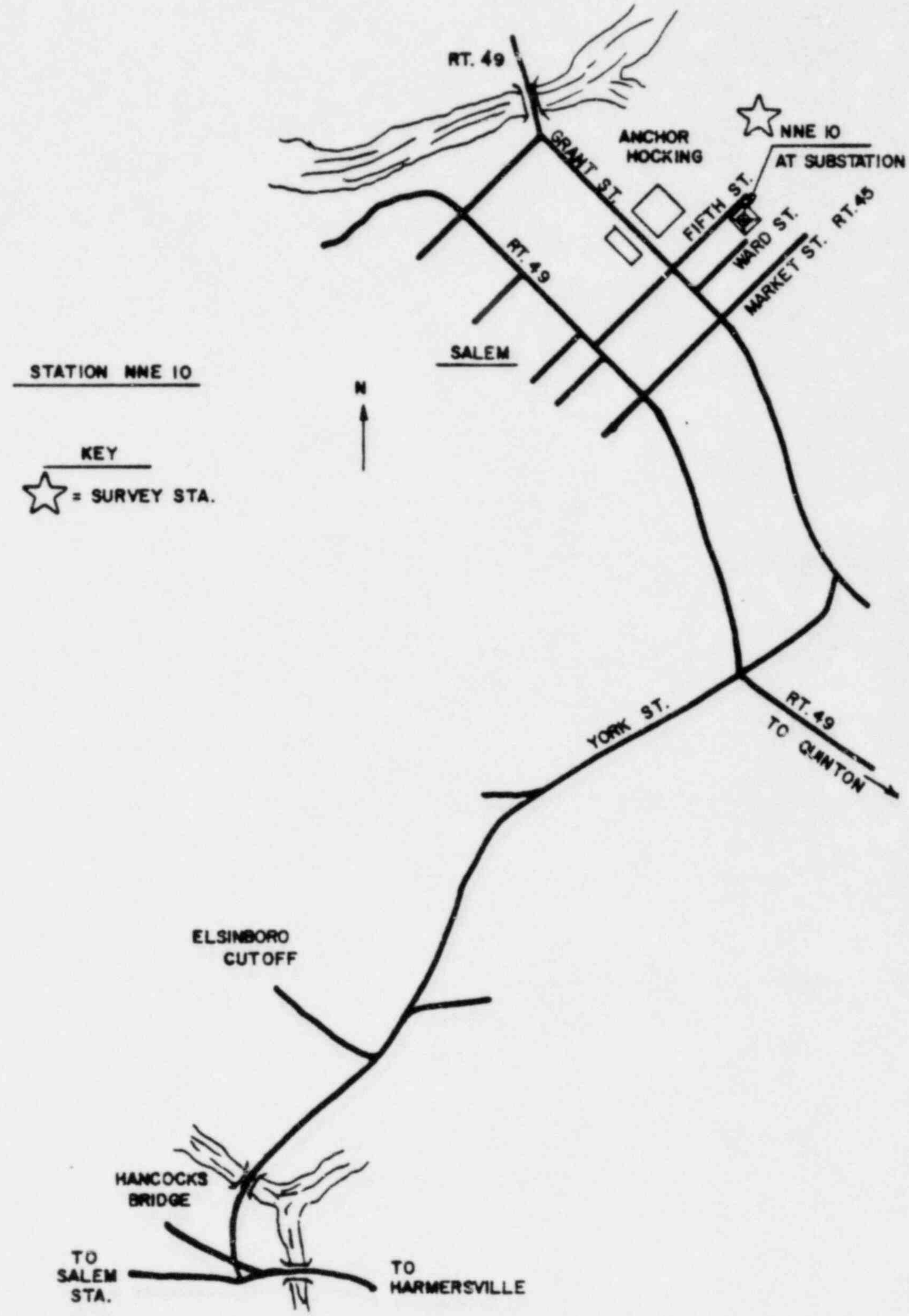
SECTOR	MILE	AZMUTH	SNGS ENV.	EMERGENCY * OLD	EMERGENCY * NEW	LOCATION
12	4.4	258°	12E1	None	WSW5	Thomas Landing
12	6.0	256°		None	WSW7	Matthews Corners (off Rt. 9) Rt. 299
12	7.7	241°		106	WSW10A	Pine Tree Corners, Rt. 13
12	9.4	241°	12F1	None	WSW10	Townsend Elementary School
12	11.9	262°		None	WSW20	Intersection 1.5 mi. West of Townsend Cemetary
13	4.2	275°	13E1	103	W5	Rt. 9 Appoquimimink River, Icth. Lab
13	6.0	266°	13F2	107	W7	Odessa, 2 blks. E of Rt. 13 on Rt. 299
13	9.9	165°	13F1	104	W10	Middletown, Icth. Assoc. Hdqtrs.
13	11.3	263°		None	W20	Rt. 299, 1.5 mi. W of Middletown
14	3.4	296°	14D1	102	WNW4	Bayview, Coast Guard Station Gate
14	4.1	296°		None	WNW5	Rt. 9 (90° turn), 0.7 mi. W of Bayview
14	6.7	294°	14F2	None	WNW7	Boyds Corner, Rt. 13
14	8.5	291°		None	WNW10	Cedar Lane
14	11.4	297°		None	WNW20	Summit Bridge (Town not bridge)
15	3.8	318°		None	NW4	Augustine Beach (0.2 mi. S), Rt. 9
15	5.5	314°	15F3	None	NW7	Biddle Corner Intersection, Port Penn Rd.
15	8.4	314°		None	NW10	S end St. Georges Bridge, Rt. 13
15	11.5	311°		None	NW20	Kirkwood, Delaware
16	4.2	330°	16E1	101	NNW5	Port Penn Sewage Plant*
16	5.9	337°		None	NNW7	Rt. 9 at Wooden Bridge
16	8.1	343°		100	NNW10	Delaware City, Office of Emerg. Planning
16	12.3	333°		None	NNW20	Rt. 13, Rt. 301 Fork

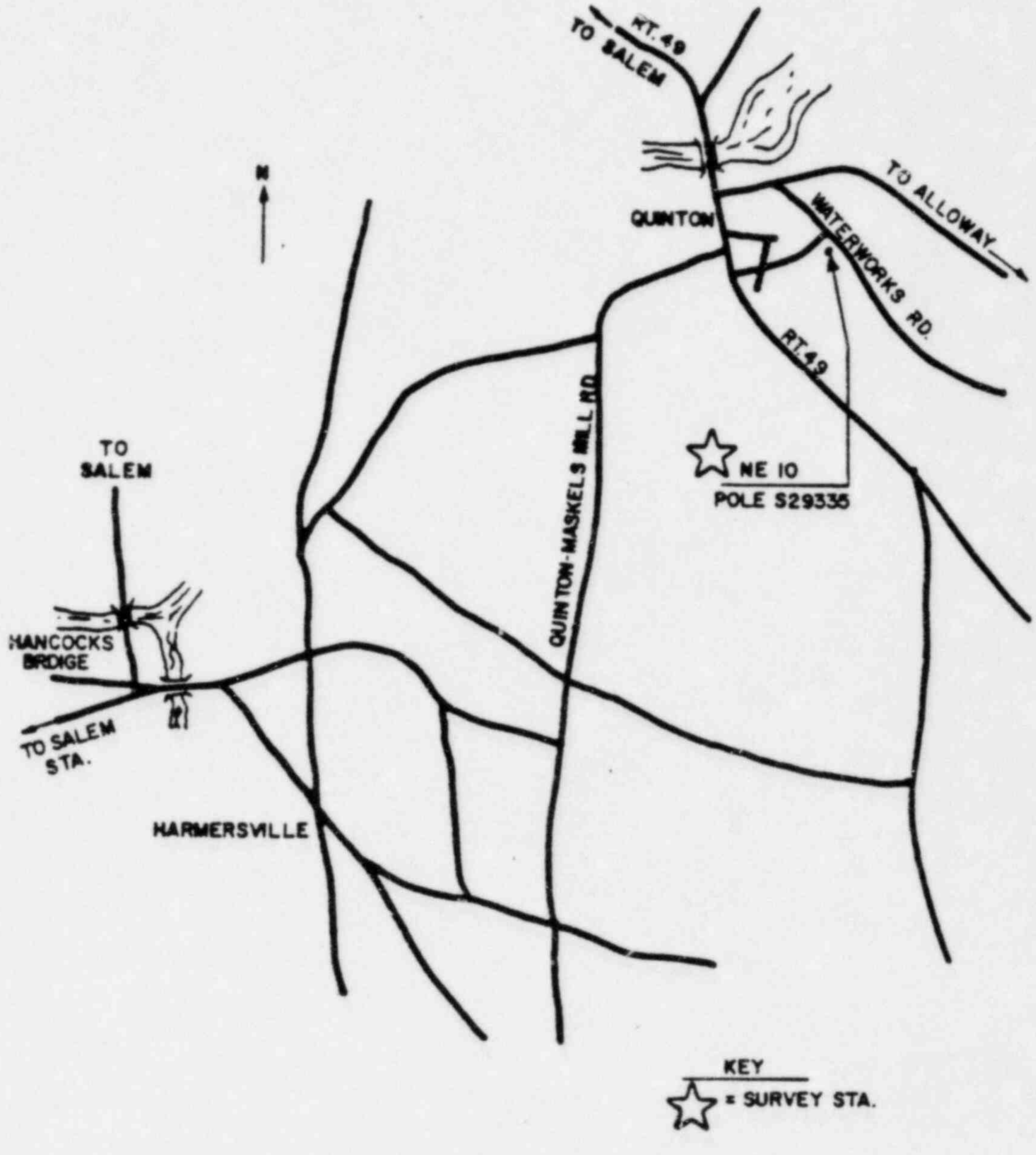
*Also environmental air location


STATION LOCATIONS
STATIONS NE7
N7
NNE7
NE7A
ELSINBORO INTERSECTION
SCH.
N7
UTILITY POLE
S25440 383-1
N
NNE 7
POLE BT-324-65
KEY
= SURVEY STATION
= TRANSMISSION TWR.
TO SALEM
NE7A
POLE 783
ELSINBORO CUT OFF
FARM
NE7
AT FIRE HOUSE
HANCOCKS BRIDGE
MUNICIPAL BLDG.
TO SALEM STATION
TO HARMRSVILLE

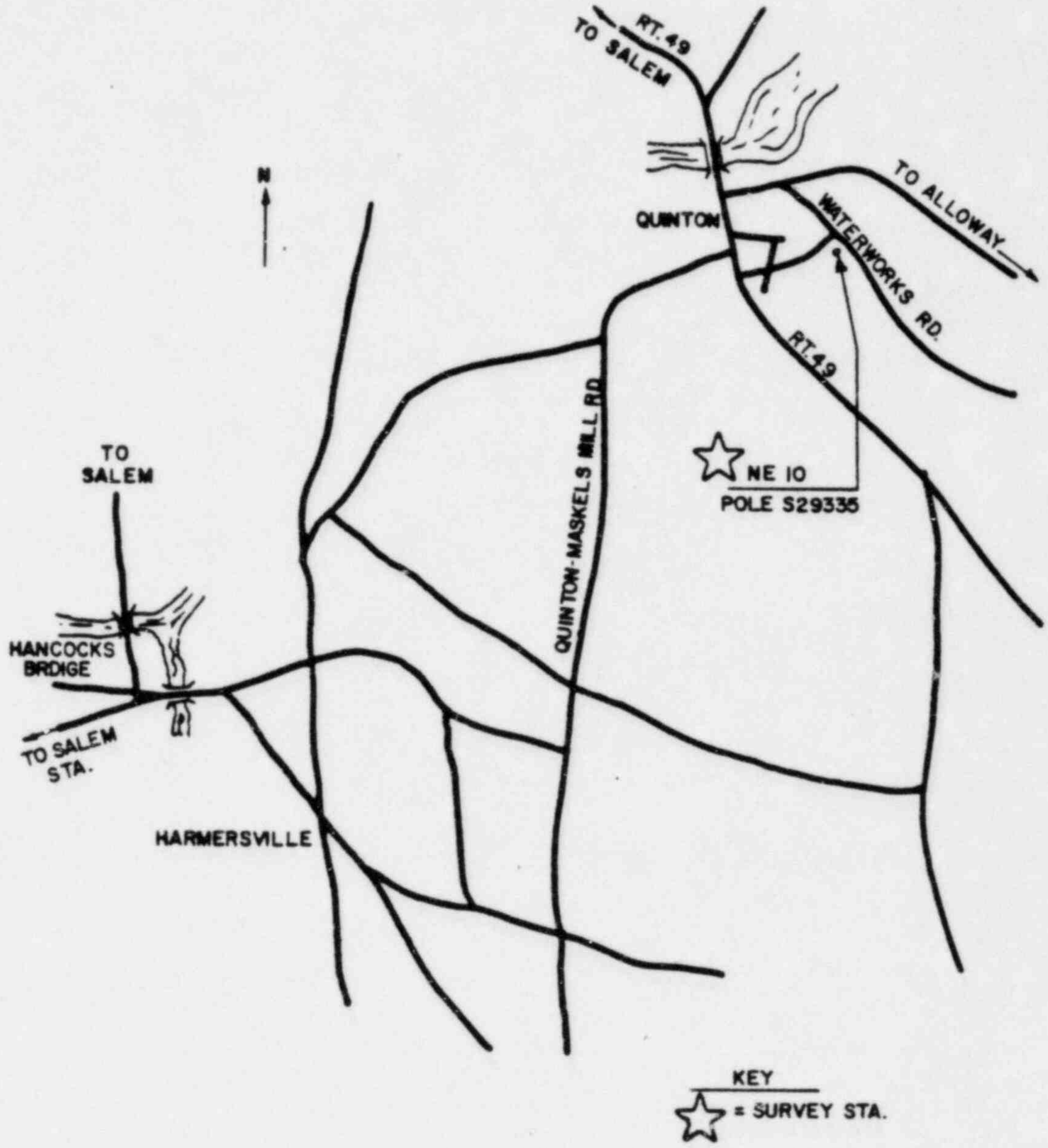

STATION LOCATIONS
STATIONS ENE 5
E 4
TO SALEM
HANCOCKS BRIDGE
TO HARMERSVILLE
N
ENE 5
POLE ACE-S-28944
KEY
= SURVEY STATION
= METEOROLOGICAL TWR.
DIRT RD.
E 4
POLE GCCO G-68 SPIO-40
TO HOPE CREEK STA.
SALEM STA.


TO SALEM
HANCOCKS BRIDGE
TO Salem Station
STATION LOCATIONS
STATIONS E 7
ESE 10
ESE 20
SE 10
DILKS GEN. STORE
STOPLIGHT
E7
POLE ACE 996 L 224
RD.
N
HARMERSVILLE-CANTON
KEY
= SURVEY STA.
ESE 10
POLE ACE 12410
COHANSEY RIVER
GREENWICH
YE GREATE ST.
MARKET LANE
DEAD END
ESE 20
POLE B-19518
SE 10
POLE 15547


RT. 49
ANCHOR HOCKING
NNE 10
AT SUBSTATION
GRANT ST.
FIFTH ST.
WARD ST.
MARKET ST. RT. 45
RT. 49
SALEM
STATION NNE 10
N
KEY
= SURVEY STA.
YORK ST.
RT. 49
TO QUINTON
ELSINBORO CUTOFF
HANCOCKS BRIDGE
TO SALEM STA.
TO HARMERSVILLE



STATION NE 10



STATION NE 10

DIRECTIONS

STATION N7

1. Proceed to Hancock's Bridge intersection.
2. Turn left and proceed 1.6 miles to Elsinboro turnoff.
3. Turn left on Elsinboro cutoff.
4. Follow road 1.7 miles to fork.
5. Take Right fork and proceed 0.2 miles to fork in road.
6. Take left fork and proceed 1.5 miles to Elsinboro intersection.

NOTE: Pole will be located left side of intersection.
Pole No. S25440 383-1

STATION NNE7

1. Proceed to Hancock's Bridge intersection.
2. Turn left and proceed 1.6 miles to Elsinboro turnoff.
3. Turn left on Elsinboro cutoff.
4. Follow road 1.7 miles to fork.
5. Take right fork and proceed 0.2 miles to second fork. This is location of Station #2.

NOTE: Pole will be loated directly across intersection.
Pole No. BT-324-65.

STATION NE7a

1. Turn left at Hancock's Bridge intersection towards Salem.
2. At 1.6 miles from intersection you pass the Elsinboro cutoff, disregard and proceed towards Salem.
3. Station #3 is 0.2 miles from Elsinboro at intersection.

NOTE: Pole I.D. is on the Salem side of intersection.

STATION NE7

1. Proceed down access road from main gate to Hancock's Bridge intersection (6 miles).
2. Turn left at Hancock's Bridge intersection and proceed 0.5 miles and turn left to fire station.

DIRECTIONS (continued)

STATION ENE5

1. Proceed from main gate, down access road, for 5.4 miles.

2. At curve, pull off to left side on old road and locate Pole No. ACE S-29844 (36).

STATION E4

1. From main gate, proceed 4 miles on access road.

2. Pole is located on left hand side of the road just past turn.

3. Pole has white air monitor box attached. Pole is No. GCCO G068 SP10-40.

STATION NNE10

1. Proceed out access road to Hancock's Bridge intersection.

2. Turn left and proceed 4.7 miles to light on Route 49.

3. Continue through light 0.5 miles to the end of the road.

4. Turn left and proceed two traffic lights.

5. At third traffic light (Anchor Hocking), turn right and proceed 0.2 miles to substation.

NOTE: Substation is located on the right hand side of the road. We do not have a key for substation.

STATION NE10

1. Proceed down access road to Hancock's Bridge intersection.

2. Continue through the intersection 0.3 miles and take the left cutoff.

3. Proceed straight through stop sign 2.6 miles.

4. At second stop sign, turn left.

5. Proceed 2.5 miles to Route 49.

6. Turn left on 49 and proceed 0.1 miles to traffic light.

7. Turn right at light and proceed 0.2 miles to Water Works Road.

8. Turn right at Water Works Road.

9. Proceed 0.3 miles to pumping station on right.

DIRECTIONS (continued)

NOTE: Pole is located in front of pumping station. Pole No. S29335.

STATION E7

1. Proceed down access road to Hancock's Bridge intersection.

2. Go through the intersection and keep bearing to your right towards Harmersville (1 mile).

3. At the blinking light (Harmersville intersection), turn right towards Canton.

4. Station #9 is 2.4 miles on the right on Harmersville-Canton Road.

NOTE: Pole is located on the right.
Pole No. ACE 996 L224.

STATION ESE10

1. Proceed down access road to Hancock's Bridge intersection.

2. Go through intersection and keep bearing to your right towards Harmersville (1 mile).

3. At blinking light (Harmersville intersection), turn right towards Canton.

4. 5.3 miles down the Harmersville-Canton Road you will come to the Gum Tree intersection (Station #10).

NOTE: Pole is located by the tree at the intersection on the right.
Pole No. ACE 12410.

STATION SE10

1. Proceed down access road to Hancock's Bridge intersection.

2. Go through intersection and keep bearing to your right towards Harmersville (1 mile).

3. At blinking light (Harmersville intersection), turn right towards Canton.

4. 5.3 miles down the Harmersville-Canton Road, you will come to the Gum Tree intersection.

5. Take the far right cutoff for 2.8 miles to Mill Road.

DIRECTIONS (continued)

STATION SE10 (continued)

6. Turn right and Mill Road is 0.4 miles at a fork.
7. Take left fork 0.3 miles to a second fork.
8. Take left fork, again proceed 0.5 miles to another intersection.
9. Turn left at intersection and proceed 1.2 miles to another intersection.
10. Turn right again and proceed 0.5 miles.

NOTE: Station is located 5 poles from the water. Pole No. 15547.

STATION ESE20

1. Proceed down access road to Hancock's Bridge intersection.
2. Go through the intersection and keep bearing to your right towards Harmersville (1 mile).
3. At blinking light (Harmersville intersection), turn right towards Canton.
4. At 5.3 miles on the Harmersville-Canton Road, you will come to the Gum Tree intersection (Station #10).
5. Take the middle road of the intersection 4.9 miles to Greenwich.
6. At Market Lane in Greenwich, turn right and proceed 0.7 miles to the intersection (Station #12).
7. Pole is located at the intersection on the right.
   Pole No. B-19518.

EMERGENCY PROCEDURE
EP IV-110-B
FIELD MONITORING
COORDINATED
BY EOF

ACTION LEVEL

When requested by the Emergency Response Manager or Radiological Support Manager (RSM).

RESPONSIBLE INDIVIDUAL

A. Radiological Assessment staff member as designated by RSM.

LIMITS OF AUTHORITY

1. Exposure in excess of 10CFR20.101 shall be approved in accordance with EP IV-106.

2. Re-entry into areas with suspected dose rates >100 mR/hr shall be approved by the Radiological Support Manager (RSM).

3. Change-out of the air samples or TLD's in the environment at stations requires the approval of the Radiation Protection Engineer or Radiological Emergency Manager and the Maplewood Research and Test Lab.

4. Issuance of Potassium Iodide (KI) tablets requires the approval of the Radiological Support Manager.

ACTION STATEMENTS

1. Upon the request to initiate an Emergency Radiation Survey obtain and record the following briefing information (available from a Radiological Assessment staff member):

   a) Wind Direction (towards) ____________________
   (from) ____________________

ACTION STATEMENTS (continued)

b) Areas or locations to be surveyed: ____________

____

____

____

c) Plant conditions that may affect the safety of the survev team or the survey results.

____

____

____

____

d) Enter team composition on Attachment 1, "Emergency Team Assignments".

2. Provide the Radiological Assessment staff member with the names of the team members assembled at the EOF. (Copy of "Emergency Team Assignments" will suffice).

3. Log each team member's name, badge number, dosimeter number, and dosimeter reading on the Dosimeter Log (Attachment 2), re-zero dosimeters if necessary. Any dosimeter readings and subsequent dosimeter resets should be recorded on the Dosimeter Log.

4. Field Survey Team(s) will be dispatched by a radio communicator within the REM office of the Emergency Operations Facility.

5. Brief each team leader on the incident and provide him/her with the following information from Step 1.

a) Wind direction from (meter reading +180° = direction toward)

ACTION STATEMENTS (continued)

b) Probable areas or locations to be surveyed.

c) Plant conditions that may affect the safety of the survey team or the survey results.

6. If it is suspected that the survey team will be exposed to significant quantities of radio-iodine, see Procedure EP I-15 for use of stable iodine.

NOTE

Approval of the Emergency Response Manager, acting on advice of the Radiological Support Manager, must be obtained prior to taking of Potassium Iodine (KI) tablets. The tablets are issued prior to departure from the EOF.

7. Ensure each team member has adequate protective clothing as required for the specific situation.

8. Assign a name to each team before dispatching vehicles. Use phonetic alphabet names for field team designations (e.g., alpha team, bravo team, foxtrot team, etc.).

9. Each Field Survey team will be provided with emergency equipment in kits and will be issued dosimeters and TLD's separately (separate issue for each individual).

NOTE

The minimum items required include:

1. Air Sampler
2. Dose Rate Meter
3. Count Rate Meter
4. SAM-2 or equivalent counting equipment

ACTION STATEMENTS (continued)

5. Particulate Filters
6. Charcoal or Silver Zeolite Cartridges
7. Communications Equipment (if not in vehicle)

See Attachment 5 for check-off list of Equipment. Field Team must check equipment inventory before being despatched to the field.

10. Dispatch each survey team to the appropriate survey vehicle. Perform a communications check between the vehicle and the EOF.

NOTE

If the vehicle is not radio-equipped, instruct the team to obtain a portable radio from Security at the entrance to the EOF.

11. While one team member is performing the radio communications check, the other team member should be performing an operational check of all emergency equipment (see Attachment 4 for instrument instructions). If the emergency equipment kit is equipped with a SAM-2 assay meter, set up instrument for warm-up and stabilization as per instructions.

12. Proceed to the first survey location (maps and directions to some probable survey sites can be found in Attachment 5 to EP IV-110-A). Insure the team is continously monitoring the radiation levels with a Beta/Gamma Survey instrument. Document the survey results on the Survey Maps and/or the Emergency Survey Log. Inform the EOF of any significant fluctuations in the survey results.

ACTION STATEMENTS (continued)

NOTE

Indicate beta/gamma survey data location by significant intersections or landmarks for data points not located at designated sampling locations.

13. Upon arrival at the first survey location, initiate an air sample, unless otherwise directed. Record the start times and the initial flow rate on the Emergency Survey Log (Attachment 3). Specific Instructions on surveys to be performed will be provided to the team from the EOF.

14. Special consideration should be given to current meteorological conditions when directing the field monitoring teams for plume tracking. This is especially necessary if wind speeds at Artificial Island are less than five miles per hour, for frequent wind shifts, if inversion conditions exist, or if backup meteorological data is used from the Wilmington Airport or some other offsite facility. Field teams should await instructions from the radio communicator at the EOF regarding plume tracking.

NOTE

The maximum flow rate is 2 SCFM for charcoal and 2 SCFM for Silver Zeolite cartridges.

15. During the collection of the air samples, monitor the radiation levels and record the results on the Emergency Survey Log. Inform the EOF of any new survey results while waiting for the air sample to finish collecting.

ACTION STATEMENTS (continued)

16. Refer to Section IV of the Instrument Instruction (Attachment 4) for the operation of the SAM-2. Perform Steps 6 through 8j.

17. Upon completion of the air sample collection, count the samples per Steps 8k - 9 of the SAM-2 operational instruction (Attachment 4). Document the calculations on the Emergency Survey Log. All samples shall be labeled with pertinent information and retained for future analysis. Remain in plume only to collect sample and perform surveys. Count samples in as low a background as possible.

NOTE

Samples should be checked for excessive dose rates. Any samples with a dose rate greater than 100 mR/hr should be stored in a remote, shielded corner of the vehicle.

18. Inform the EOF of the survey and air sample results.

19. For counting of charcoal of zeolite cartridges, repeat Steps 8j - 9 of the SAM-2 instructions (Section IV of Attachment 4) for each survey location.

20. If the radio should fail, see the Communications Section of this procedure (directly before signature sheet) for phone number of the EOF, Control Point, TSC and Control Room.

ACTION STATEMENTS (continued)

21. Upon completing the assigned survey request additional instructions from the EOF. If surveys are to be terminated:

    a) Log each team member's final dosimeter reading, the return time and the net exposure on the Dosimeter Log and the Dosimeter Cards.

    b) Inform the EOF when the team has arrived back at the EOF.

    c) Direct the team to return the equipment to the proper storage locations both within the kits and lockers.

    d) If appropriate, have the air samples analyzed for isotopic content.

22. As soon as possible, debrief the Radiological Assessment Staff member on the survey results.

ATTACHMENTS

1. Emergency Team Assignments
2. Dosimeter Log
3. Emergency Survey Log
4. Instrument Descriptions
5. Check-off list for Offsite Teams

COMMUNICATIONS

SSS Radio	TSC Radio	Control Room 1 No	Control Room 2 No	Control Point No	EOF-(REM)

*extensions on

Prepared By: James Clancy

Reviewed By: J M O'Conn ______ 9/10/82
Department Head ______ Date

Reviewed By: Cheryl A Sakenas for ______ 9-10-82
Nuclear Emergency Planning Engineer ______ Date

Reviewed By: Bruce W Legg ______ 9/13/82
Station Quality Assurance Review ______ Date
(if required see AP-VI-2)

SORC Meeting No.: 82-86 ______ 9/23/82
Date

Approved By: H. J. Midura ______ 9/23/82
General Manager - Salem Operations ______ Date

Approved By: Peter A. Moeller ______ 9/23/82
Manager - Nuclear Site Protection ______ Date

FIGURE 1

EMERGENCY TEAM ASSIGNMENTS

TEAM CODE	TEAM MEMBERS	ORIGINAL ASSIGNMENT	TIME OUT	TIME IN
ONE OR ALPHA	______ * ______ ______			
TWO OR BRAVO	______ * ______ ______			
THREE OR DELTA	______ * ______ ______			
FOUR OR FOXTROT	______ * ______ ______			

* DENOTES TEAM LEADER

EMERGENCY DOSIMETER LOG

TEAM LEADER: ______________________ TEAM CODE: ______________

NAME	BADGE NUMBER	DOSIMETER SERIAL NO.	TIME OUT	TIME IN	DATE	INITIAL READING	FINAL READING	NET READING

ATTACHMENT 3
EMERGENCY SURVEY LOG SHEET

TEAMS DESIGNATION ______________________ TEAM MEMBERS: ______________

____

____

INSTRUMENT SERIAL NUMBERS:

TELETECTOR__________ PRM-4__________ RADECO__________ PIC-6 __________

E-520______________ RO-2 __________ SAM-2__________

____

AIR SAMPLE CALCULATION

$$\mu Ci/cc = \frac{\text{Net Counts Per Minute}}{(\text{cubic feet})(2.832 \times 10^4\ cm^3/ft^3)(2.2 \times 10^6\ dpm/\mu Ci)(\text{Detector EFF})}$$

TYPE OF FILTER	(P) (SZ) (C)	(P) (SZ) (C)	(P) (SZ) (C)	(P) (SZ) (C)
LOCATION				
GAMMA DOSE RATE				
BETA DOSE RATE				
SAMPLE DATE				
SAMPLE START TIME				
SAMPLE STOP TIME				
Δt				
AVG. FLOW RATE				
VOLUME (ft^3)				
COUNT DATE				
COUNT TIME				
NCPM*				
÷EFF = DPM				
$\div 2.2 \times 10^6 = uCi$				
$\div ft^3 = uCi/ft^3$				
$\div 2.832 \times 10^4 = uCi/cm^3$				

*NCPM = Gross CPM - Background CPM at Analysis Location.
P = Particulate, SZ = Silver Zeolite, C = Charcoal

ATTACHMENT 4
INSTRUMENT OPERATION INSTRUCTIONS

I. OPERATION OF RO-2 (JUNO TYPE ION CHAMBER) SURVEY METER

A. DESCRIPTION

The Eberline RO-2/RO-2A is a 3" diameter air filled ion-chamber survey meter. It has four linear ranges; RO-2: 0-5, 0-50, 0-500 and 0-5,000 mR/hr, RO-2A: 0-50, 0-500, 0-5,000 and 0-50,000 mR/hr. The RO-2 and RO-2A utilize 3 and 4 NEDA 1604 9 volt batteries respectively, Its energy response is linear from 0.05 MeV to 6 MeV and can be operated in a temperature range of -40°F to +140°F. The detector's, outer wall is 200 mg/cm^2 and the inner wall is 7 mg/cm^2.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the function switch to BATT 1 and then to BATT 2 positions. The meter should read above the BATT cutoff line in both cases.

2. Turn the function switch to ZERO position. Check that the meter reads zero. If not, set it to zero with the ZERO knob. (The zero setting of the instrument may be checked in any radiation field by merely selecting the ZERO position.)

3. Set the function switch to the desired range of operation. Wait 10 seconds for full meter response. The switch position selected is the full scale reading of that range.

C. TO PERFORM A DOSE RATE SURVEY

1. When measuring beta or low energy gamma or X-ray emissions, open the sliding beta shield on the bottom of the case and face the bottom of the instrument toward the radiation source. To open

or close the shield, depress the friction release button on the left side of the case and manually move the slide or let it fall due to gravity. When the shield is open, protect the thin face against damage.

2. Hold RO-2 waist level (approximately 1 meter above ground).

3. Hold meter steady and note open window and closed window readings.

4. Record reading, location, date and time.

II. OPERATION OF PIC-6A ION CHAMBER SURVEY METER

A. DESCRIPTION

The Eberline PIC-6A is a 1/2" diameter 30 mg/cm^2 walled, gas filled ion chamber, portable survey meter. It has 6 logarithmic ranges: 1-10, 10-100, and 100-1000 mR/hr plus 1-10, 10-100 and 100-1000 R/hr. It utilizes 2 NEDA type 604 batteries (9 volts) and weighs about 3.3 pounds. Its energy response is linear from 0.8 to approximately 6 MeV, and it can be operated from -10°F to +140°F.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the function switch to BATT. The meter should read in the BATT OK region.

2. Set the function switch to the desired range. A single rotary switch selects the range to respond in either the mR/hr range or the R/hr range.

3. Wait 10 seconds for full meter response.

C. TO PERFORM A DOSE RATE SURVEY

1. Hold PIC-6A at waist level (approximately 1 meter above ground).

2. Hold meter steady and note closed window reading.

3. Hold meter steady and note open window reading.

4. Record readings, location, date and time.

III. OPERATION OF E-520 GM TUBE SURVEY METER

A. DESCRIPTION

The Eberline E-520 is an external GM tube probe plus internal tube portable survey meter. The external GM tube has 4 linear ranges of 0-0.2, 0-2, 0-20, and 0-200 mR/hr. It utilizes two "D" batteries and weighs approximately 4-1/2 lbs. Its energy response is linear from 0.2 to 2 MeV. With alkaline or NiCd batteries, it can be operated from -40°F to +140°F. The external detector outer wall is approximately 200 mg/cm^2 and the inner wall is 30 mg/cm^2. An external speaker is available for use with this meter.

B. GENERAL INSTRUMENT CHECKOUT

1. Turn the function switch to BATT. The meter should read in the BATT OK region.

2. Set the function switch to one of the five sensitivity ranges.

3. Wait 15 seconds for full meter response.

C. TO PERFORM A DOSE RATE SURVEY

NOTE

This GM tube survey meter may saturate (and read zero) in a radiation field in excess of 1000 R/hr.

NOTE

The high range detector (0-2000 mR/hr) is located in the meter case and not in the hand held probe.

1. Hold E-520 at waist level (approximately 1 meter above ground).

2. Hold meter steady and note closed window reading.

3. Hold meter steady and note open window reading.

4. Record readings, location, date and time.

IV. OPERATION OF SAM-2 DUAL SINGLE CHANNEL ANALYZER
(with 2" x 1/2" NaI crystal)

A. DESCRIPTION

The Eberline SAM-2 is a lightweight (7 lbs.) two channel gamma spectrometer which is stabilized to correct automatically for gain changes (caused by temperature changes, etc.). It can read out each channel independently or the sum or difference of both channels on either a scaler or ratemeter. It will operate from either a 110 volt AC outlet or its own 8 pound battery pack. It utilizes a 2" x 1/2" Sodium Iodide crystal which, with its lead

shield collar, weight about 8 pounds. This counting system is designed to operate from 32°F to 140°F. It has both a preset timer and a manual timer. It is fused for both AC and DC operation.

CAUTION

The Sodium Iodide probe is fragile and should be handled with care. The Sodium Iodide probe should not be taken through rapid temperature changes, it may crack if brought from 30° to 60° without some thermal wrapping to slow down temperature equilization.

B. OPERATION

1. Utilize a gamma survey meter (low range) to find as low a background area as practicable (0.5 mrem/hour) in which to perform the counting functions. If background is greater than 0.5 mrem/hour, provide shielding as necessary.

2. Plug cord into 115 VAC, 60 Hz power source or connect to battery power through BATTERY connector (pin 1 negative, pin 2 positive).

3. Connect detector.

4. Turn power switch to ON and, if battery pack is used, insure BATT OK light is on. Allow the instrument to warm up for at least 10 minutes. A 20 minute warm up period or longer will provide optimum stability results.

5. Set controls as follows:
   a) STABILIZER-ON (rear of instrument)
   b) H.V. ADJUST - 8.00 (or at least 1/3 of the way onto the high voltage plateau).

c) Both THRESHOLDS - 10.00

d) Both IN-OUT to OUT

e) DISPLAY - ON

f) TIMED-STOP-MAN - STOP

g) CH1 to +, CH2 to OFF

6. Press RESET-START switch. The display should be all zeros.

7. Operation Check

a) Set TIMED-STOP-MAN switch to TIMED.

b) Set COUNT TIME IN MINUTES switches to 1 and X.1. Press RESET-START switch. Unit should stop counting after 6 seconds, registering 4500 - 8500 counts (no background).

c) Under the above conditions, the rate meter should read 45000 to 85000 counts per minutes.

8. Counting Iodine-131

a) Care must be taken not to contaminate the detector with samples. The face of the detector may be covered with a thin plastic sheet (i.e., saran wrap, etc.) and fastened with a rubber band.

b) Set thresholds and windows, for both channels, to the values posted in the instrument case.

c) Set CH1 switch to "+" and CH1 WINDOW to "IN".

d) Set CH2 switch to "-" and CH2 WINDOW to "IN".

e) Set COUNT TIME to 1 minute (1 and X1). Set COUNT to "TIMED".

f) Press START button.

g) Count background for one minute. If background is greater than 500 cpm, provide additional shielding (if practicable). If the number is less than zero, as evidenced by a series of nines, then minor adjustments of the channel 2 window will correct this, usually clockwise to increase the count and counter-clockwise to decrease the count.

h) Place a Ba-133 source on the face of the detector and pres the reset-start button for one count.

i) Using the formula: $\frac{\text{cpm } 1.2}{\text{source dpm}}$ and the results from h, determine the efficiency. This number should be ± 10% of the I-131 EFF posted on the SAM-2 case.

NOTE

1.2 is a correction factor to allow for the difference in energy abundancies between Ba-133 and I-131.

j) Remove the source and count background for 5 minutes (set count time to 5 and X1), record this value.

k) Place saran wrapped samples on detector face and make 5 minute counts (divide by 5 to get cpm), record these values.

l) Carefully mark and save all samples for later laboratoary evaluation. Wrap samples in clean saran wrap or equivalent (e.g., surgical gloves) for storage. If sample is to be saved it must be properly identified and a log kept of sample information (Attachment B should suffice).

NOTE

Samples should be stored in a suitable area which will not cause a significant change in background radiation levels. If sample causes a high radiation area to be formed in the immediate area, then a suitable storage area should be used (e.g., lead bricks in rear of vehicle). After delivering samples to EOF, the samples should be stored in a locked storage area.

9. Calculate Airborne I^{131} activity as follows:

   a) Divide the Net cpm (background subtracted) by the efficiency factor from step i above to get a reading in dpm.
   b) Multiply the reading (in dpm) obtained in 9.a above, by 4.5 x 10^{-7} uCi/dpm to obtain a reading in uCi.
   c) Multiply the sampling time (minutes) times the sample flow rate (ft^3/min) times 2.832 x 10^{-4} cc/ft^3 to find the total sample volume (in cc).
   d) Divide the total I^{131} reading of step 9.b above (uCi) by the total sample volume (in cc) found in 9.c abo._ to get total activity in uCi/cc.
   e) Record the following information:
   Emergency Station No.______ Date/Time Sample Counted _________
   I^{131} Activity: ______uCi/cc Date/Tme Sample Taken ___________

10. Refer to Figure 4-1 to obtain thyroid dose rate.

11. Alternate Method
    Refer to Table 4-1 to determine a quick estimate of concentration and thyroid dose rate based on an assumed EFF.

12. Communicate SAM-2 results and derived dose rate to TSC.

V. OPERATION OF THE EBERLINE RM-14 COUNT RATE METER WITH PROBE (HP-210)

A. DESCRIPTION

The Eberline Radiation Monitor (RM-14) is a count rate meter which is commonly employed as a frisker at control points when used with a pancake type probe. For use as a count rate meter, a HP-210 pancake probe is employed. This instrument can be used to count particulate filter samples, charcoal or silver zeolites for I-131 concentration determinations. It should be noted that the gamma efficiency of the HP-210 probe is significantly le.. than that for the ED-19 probe (SAM-2). The HP-210 can also detect the beta emissions from I-131, however, the minimum detectable activity for I-131 using the HP-210 probe is considerably greater than that

obtained using SAM-2/RD-19 instrumentation. It should also be noted that the RM-14/HP-210 is incapable of discriminating between different energy isotopes. The use of silver zeolite for sample collection does improve this condition.

B. GENERAL INSTRUMENT CHECKOUT

1. Energize the RM-14 by plugging the power cord (which exits the instrument chassis at its rear) into a 120 VAC supply. Then switch the five (5) position rotary switch from "off" to one of the three (3) counting ranges (X1, X10, X100).

2. Connect the HP-210 probe detector using its coaxial cable to the terminal at the right hand corner of the face of the instrument.

3. Place the rotary switch to the "X10" position, flip on the test toggle switch to on (located on back of instrment chassis), the count rate should rise to 3600 cpm ± 10%. If the instrument "on test" reads in this range, the instrument should be in good working order.

4. When operating with batteries (no AC power available), turn rotary switch to "BATT" position to see if battery charge is within proper charge range (indicated on instrument scale).

C. COUNT RATE METER OPERATION

1. Using sample holder or generally applied counting geometry, record background count rate.

2. Using check source, read and record count rate.

3. Sample Type: Particulates: Place the filter in the holder or preferred geometry, then read and record count rate. Allow

instrument reading to stabilize for approximately 5 to 10 seconds. Charcoals and Silver Zeolites: Place the cartridge into the sample holder or preferred geometry, place the probe onto the cartridge, read, and record count rate.

Particulate Filters: $uCi/cc = \frac{\text{Net cpm}}{\text{sample volume } (ft^3)} \times 1.6E\text{-}11^* \times \frac{1}{\text{efficiency}}$

Cartridge Filters: $uCi/cc = \frac{\text{Net cpm}}{\text{sample volume} (ft^3)} \times 1.6E\text{-}11^* \times \frac{1}{\text{efficiency}}$

NOTE

Background and source checks should be made approximately once per hour or as appropriate between large number of sample counting runs.

*1.6E-11 is the product of the conversion factors for uCi/dpm and cc/ft^3

VI OPERATION OF THE RADECO H-809C PORTABLE AIR SAMPLER

A. DESCRIPTION

The Model H-809C portable battery powered air sampler is designed for collecting air samples in field areas where electrical power is not conveniently located. The Model H-809C consists of a dual-stage turbine blower directly co upled to a DC motor. Battery clip leads are supplied for attachment to a 12 or 24 volt battery.

B. TO OPERATE AIR SAMPLER

1. Place the iodine cartridge and filter paper into the standard RADECO filter holder. Screw the filter holder into the air sampler inlet.

2. Connect battery clips to behicle battery ensuring positive clip is attachead to positive terminal. Switch the sampler power switch to the "on" position.

3. Obtain a 40 cubic foot sample; approximately 4 cfm for 10 minutes. Read indicated flow rate on rotometer.

   NOTE: Smaller volume samples may be requested by the communicator at the EOF.

4. Turn off unit when sampling is complete.

5. After counting sample, place cartridge and filter paper into separate envelopes and mark each envelope with the following information:

Emergency Station No: ________________ Date: ____________________

Sample Start Time: __________ min Sample Stop Time: __________ min

Sample Flow Rate: _____________ ft^3/min Tech: ____________________

Record sample data on the Emergency Survey Log.

PSE&G FIELD SURVEY TEAM DATA
IODINE DOSE RATE CALCULATION

a) Sector and distance ________ b) Time of sample ________
c) Field team name ________ d) Instrument eff. (demical)* ________
e) DPM above background ________ f) Sample volume (ft^3) ________
g) (e) ÷ (f)x(1.6E-11)**x(1/eff)= ________ uCi I-131/cc
h) Child thyroid dose rate from graph ________ mrem/hr

* Efficiency obtained from calibration sticker on instrument.
The default value for efficiency is 0.025 (1/eff = 40)

** 1.6E-11 = (4.50 E-7 uCi/dpm) x (3.53E-5 cubic feet/cc)

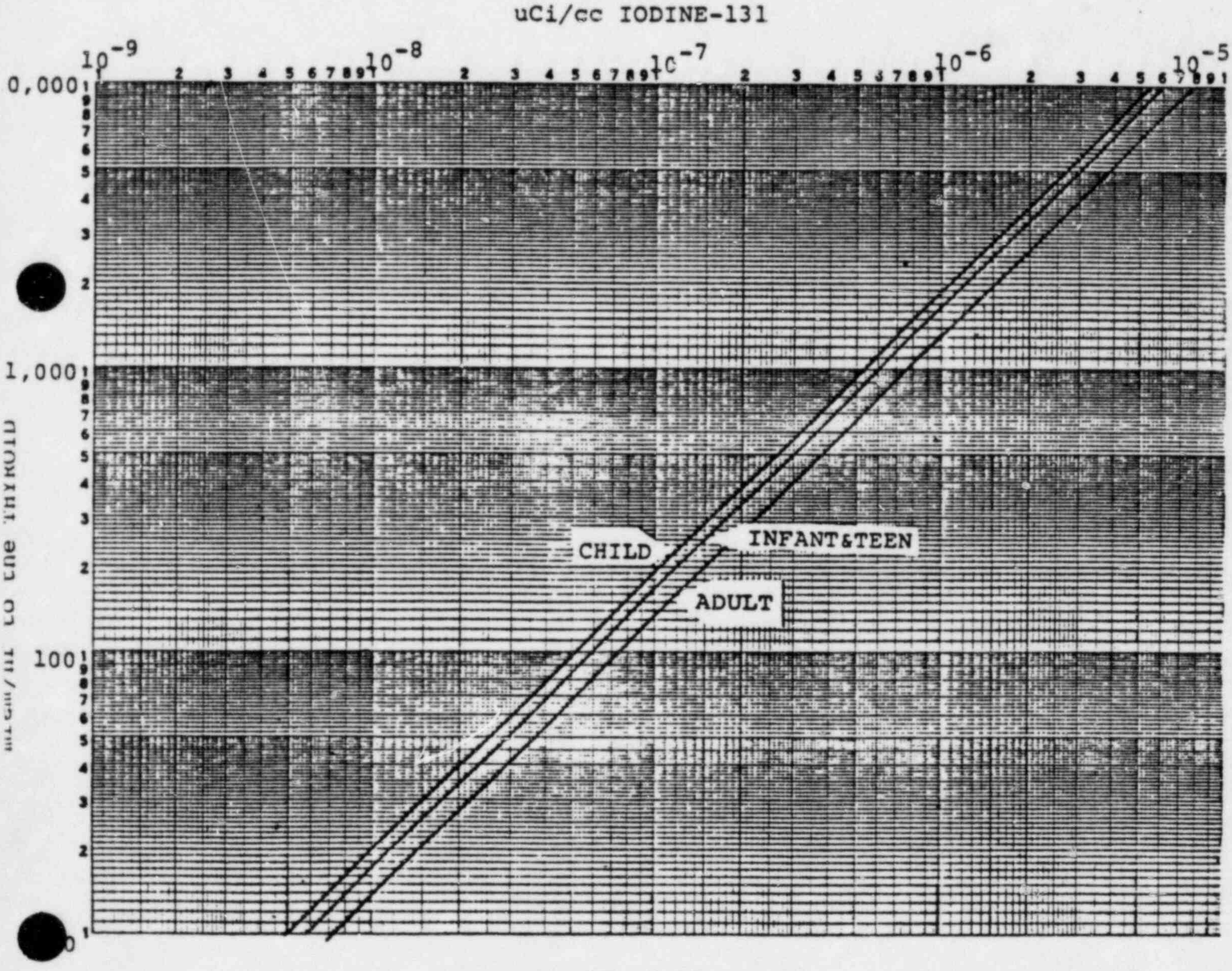


TABLE 4-1

SAM-2 cpm Above Background	µCi/cc* (assuming 1 ft^3 and 2.5% eff)	REM DOSE TO THYROID FOR 1 HOUR EXPOSURE			
		Child	Infant and Teen	Non-Occupational Adult	Working Adult
1×10^5	6.4 E-5	118	108	87	131
5×10^4	3.2 E-5	59	54	44	65
1×10^4	6.4 E-6	12	11	9	13
5×10^3	3.2 E-6	6	5	4	7
1×10^3	6.4 E-7	1.2	1.1	0.9	1.3
5×10^2	3.2 E-7	0.6	0.5	0.4	0.7
1×10^2	6.4 E-8	0.12	0.11	0.09	0.13
50	3.2 E-8	0.06	0.05	0.04	0.07
10	6.4 E-9	0.01	0.01	0.01	0.01

*To correct for actual sample volume divide tabulated µCi/cc value by the actual volume in cubic feet.

ATTACHMENT 5
CHECK-OFF LIST FOR OFF-SITE
MONITORING TEAMS

1. SAM-II Assay Meter Equipment (optional)

   a. SAM-II Meter ______
   b. Shielded RD-19 Detector ______
   c. Detector Cable ______
   d. Cigarette Lighter Power Cord ______

2. Two (2) Dose Rate Meters

   a. Ion Chamber - PIC-6A or RO-2 ______
   b. G-M Meter - E - 520 ______

3. Spare 9 Volt Transistor and "D" Cell Batteries ______

4. Low-Volume Air Sampler - Radeco H809C with Battery Cable Filter Holder ______

5. Charcoal Cartridges ______

6. Silver Zeolite Cartridges (OPTIONAL FOR DRILLS) ______

7. Filter/Smear Paper ______

8. Paper Coveralls ______

9. First Aid Kit ______

10. Procedure/Form Kit - Contains:

    a. Procedures EP-IV 110 A & B ______
    b. Multiple Copies of Attachment 2 ______
    c. Multiple Copies of Attachment 3 ______
    d. Pad of Paper ______
    e. Pen and Pencil ______
    f. KI Tablets ______

11. Shoe Covers (Protective) ______

12. Caps ______

13. Protective Gloves (Surgical or Rubber) ______

14. Small Envelopes for Used Filters ______

15. Masking Tape ______

16. Small Plastic Bags ______

17. Wipes (e.g., Handi-Wipes, Lab-Wipes) ______

18. Salem and Cumberland County and Wilmington Area Map ______

Above Issued in Kits

Separate Issue

a. Self-Reading Dosimeters ________________
b. TLD's ________________
c. Respirators ________________
d. Lead Blankets and/or Bricks ________________
e. Lantern Flashlights ________________
f. Dosimeter Charger ________________

EMERGENCY PROCEDURE
EP IV-111
EFFLUENT DOSE CALCULATIONS

ACTION LEVEL

This procedure shall be implemented upon the request of the Senior Shift Supervisor/EDO/ERM or the Radiation Protection staff.

The calculations shall normally be performed by the Radiation Protection personnel in the TSC or the Radiological Assessment Staff at the EOF. At the TSC, the primary individuals responsible for the initial calculations will be the Shift Radiation Protection Technician (Shift RPT) and the REP/ALARA Supervisor.

LIMITS OF AUTHORITY

Projected off-site dose estimates should be forwarded to the Senior Shift Supervisor/EDO/ERM, the Radiation Protection Engineer (RPE) and the Radiological Support Manager (RSM). Transmittal of the projected doses shall require the prior approval of the Senior Shift Supervisor, RPE, or RSM.

If re-entry into the affected area is required for effluent determination, consideration shall be given to the potential for encountering high dose rates. Approval of the Radiation Protection Engineer and the EDO shall be obtained prior to entering the penetration areas.

ATTACHMENTS

No. 1 - Xu/Q Value Determination
No. 2 - (a) & (b) Noble Gas/Iodine Dose Conversion Factor (K) vs. Decay Time

ATTACHMENTS (cont.)

No. 3 - R43 Concentration Conversion Factor vs. Decay Time

No. 4 - Default Values for Low/High Plant Vent Monitors

No. 5 - Containment Monitor R21 Response vs. Dispersion Factor

No. 6 - Survey Meter Response vs. Main Steam Activity

No. 7 - Unit Analysis of Off-Site Dose Calculations

No. 8 - Dose Calculation Sheet

ACTION STATEMENTS

1. Contact the Control Room and obtain a briefing on the incident and identify the probable pathways for release of radioactive material.

2. Determine which sections of this procedure are appropriate for the particular release.

TYPE OF RELEASE	PAGE
A. Releases from PLANT VENT (Elevated Release)	
1. Unit #1	3
2. Unit #2	7
B. Unmonitored releases from: (Ground Release)	11
1. POWER OPERATED RELIEFS	
2. AUTOMATIC RELIEFS	
3. STEAM DRIVEN AUX FEEDWATER PUMPS	
C. Releases due to CONTAINMENT LEAKAGE (Ground Release)	14
D. Release Rate Calculation*	Attachment 8

*See top left corner of Attachment 8 for release rate determination calculation.

A.1 PLANT RELEASE FROM UNIT NO. 1

A.1.1 Contact the Control Room and ensure that 1R-11A, 1R-12A and 1R-12B are in the "Plant Vent" mode. If they were not, allow sufficient time for the channel readings to stabilize.

A.1.2 Record the following plant parameters for subsequent calculations.

PARAMETER	METER NUMBER	VALUE AFTER METER HAS BEEN IN THE PLANT MODE FOR TIME, TX	VALUE WHEN METER IS FIRST PUT IN PLANT MODE	VALUE AT SELECTED TIME
a. Low Range Gaseous Release Rate	1R-12A			________cpm
b. High Range Gaseous Release Rate	R-43			________mr/hr
c. Iodine Release Rate	1R-12B	________cpm (Cx) ________time (Tx)	________cpm (Co) ________time (To)	
d. Plant Vent (1) Flow Rate				________ cfm
e. Δ Temp(2)(4) at Elevation ________(ft)				Δt________C°
f. Elevation				________ ft
g. Wind Speed (3)(4)(5)				________mph
h. Wind Direction (4)(5) (from)				________°
i. Shutdown Time				________hr
j. Transport Distance for Calculation				________mi

NOTES:

(1) If plant vent flow rate is unobtainable or cannot be estimated, assume 125,000 cfm.

(2) If the (300'°C)-(33'°C) is unobtainable to determine the Δt use the (150'°C)-(33'°C) reading. If this is unavailable refer to Note 4 and note chosen elevation.

(3) If the wind speed is unobtainable, assume 5 mph.
Use Elevation 300' data for an elevated release.
Use Elevation 33' data for a ground release.

(4) Backup meteorological data from Wilmington Airport (302-323-2280 or NAWAS Line) including wind speed, wind direction and an estimated stability class. If the estimated stability class is not available, assume conditions to be stable.

(5) Average data over 15 minute period from the strip chart recorder in the control room.

A.1 PLANT RELEASE FROM UNIT NO. 1 (continued)

NOBLE GAS CONTRIBUTION TO WHOLE BODY DOSE RATE

A.1.3 Low range or default values (Attachment 4)

$$\frac{(1R\text{-}12A)(\text{Plant Vent Flow Rate})(Xu/Q)(\text{Noble Gas Dose Conversion Factor})(5E\text{-}4)}{(\text{Wind Speed})} = \_\_\_\_\_ \text{ mrem/hr}$$

$$\frac{(a\quad)(b\quad)(c\quad)(d\quad)(5E\text{-}4)}{(e\quad)} = \_\_\_\_\_ \text{ mrem/hr}$$

OR

A.1.4 High Range (R-43)

$$\frac{(R\text{-}43)(\text{Plant Vent Flow Rate})(Xu/Q)(\text{Noble Gas Dose Conversion Factor})(1.05E+3)}{(\text{Wind Speed})(\text{Concentration Conversion Factor})} = \_\_\_\_\_ \text{ mrem/hr}$$

$$\frac{(f\quad)(b\quad)(c\quad)(d\quad)(1.05E+3)}{(e\quad)(g\quad)} = \_\_\_\_\_ \text{ mrem/hr}$$

NOTE

a. 1R-12A in cpm, or equivalent cpm value from Attachment 4.
b. Plant vent flow rate in ft^3/min.
c. Xu/Q value from Attachment 1. $(1/m^2)$
d. Dose conversion factor from Attachment 2. $\left(\frac{mrem/hr}{\mu Ci/m^3}\right)$
e. Wind speed in miles per hour.
f. R-43 reading in mR/hr.
g. Concentration conversion factor in $\frac{mrem/hr}{\mu Ci/cc}$ Attachment 3.

Calculated By ________________ Date ______ Time ______

Reviewed By ________________ Date ______ Time ______

A.1 PLANT RELEASE FROM UNIT NO. 1 (continued)

IODINE CONTRIBUTION TO THYROID DOSE COMMITMENT

A.1.5 Determine the rate of increase of iodine activity.

a) Low Range Monitor 1R-12B

$$\frac{cpm}{min} = \frac{Cx-Co}{Tx-To} = \frac{(\qquad)-(\qquad)}{(\qquad)-(\qquad)} = \frac{(\qquad)cpm}{(\qquad)min} = (\qquad)\frac{cpm}{min}$$

NOTE

Refer to Step A.1.2(c).

OR

b) Using Default Values

Use Attachment 4 to determine the appropriate equivalent cpm/min.

______________ cpm/min

A.1.6 Equation for 50 year thyroid dose commitment rate

$$\frac{\frac{cpm}{min}\ (\text{Plant Vent Flow Rate})(Xu/O)(\text{Iodine Dose Conversion Factor})(3.5E-7)}{(\text{Wind Speed})} = \_\_\_\_\_ \ mrem/hr$$

$$\frac{(a\qquad)(b\qquad)(c\qquad)(d\qquad)(3.5E-7)}{(e\qquad)} = \_\_\_\_\_ \ mrem/hr$$

NOTE

a. cpm/min from Step A.1.5 (a or b).

b. Plant vent flow rate in ft^3/min.

c. Xu/O from Attachment 1. $(1/m^2)$

d. Dose conversion factor from Attachment 2(b). $\left(\frac{mrem/hr}{\mu Ci/m^3}\right)$

e. Wind speed in miles per hour.

Calculated By ______________________ Date ______ Time ______

Reviewed By ______________________ Date ______ Time ______

A.1 PLANT RELEASE FROM UNIT NO. 1 (continued)

IODINE CONTRIBUTION TO THYROID DOSE COMMITMENT (continued)

A.1.7 To obtain dose commitment, multiply dose commitment rate by the hours exposed to that rate, (e.g., 15 mrem/hr X 5 hours exposure = 75 mrem-50 year dose commitment).

Calculated By ______________________________ Date ______ Time ________

Reviewed By ______________________________ Date ______ Time ________

A.2 PLANT RELEASE FROM UNIT NO. 2

A.2.1 Contact the Control Room and obtain the following plant parameters for subsequent calculations.

PARAMETER	METER NUMBER	VALUE AFTER METER HAS BEEN IN THE PLANT MODE FOR TIME, TX	VALUE WHEN METER IS FIRST PUT IN PLANT MODE	VALUE AT SELECTED TIME
a. Low Range Gaseous Release Rate	2R-41C			____cpm
b. High Range Gaseous Release Rate	R-43			____mr/hr
c. Iodine Release Rate	2R-41B	____cpm (Cx) ____time (Tx)	____cpm (Co) ____time (To)	
d. Plant Vent (1) Flow Rate				____ cfm
e. Δ Temp(2)(4)				Δt____C°
f. Elevation				____ ft
g. Wind Speed (3)(4)(5)				____mph
h. Wind Direction (4)(5) (from)				____°
i. Shutdown Time				____hr
j. Transport Distance for Calculation				____mi

NOTES:

(1) If plant vent flow rate is unobtainable or cannot be estimated, assume 125,000 cfm.

(2) If the (300'°C)-(33'°C) is unobtainable to determine the t use the (150'°C)-(33'°C) reading. If this is unavailable refer to Note 4.

(3) If the wind speed is unobtainable, assume 5 mph.
Use Elevation 300' data for an elevated release.
Use Elevation 33' data for a ground release.

(4) Backup meteorological data from Wilmington Airport (302-323-2280 or NAWAS Line) including wind speed, wind direction and an estimated stability class. If the estimated stability class is not available, assume conditions to be stable.

(5) Average data over 15 minute period from the strip chart recorder in the control room.

A.2 PLANT RELEASE FROM UNIT 2 (continued)

WHOLE BODY DOSE RATE DUE TO NOBLE GAS

A.2.2 Low range or default values (Attachment 4)

$$\frac{(\text{2R-41C})(\text{Plant Vent Flow Rate})(\text{Xu/Q})(\text{Noble Gas Dose Conversion Factor})(2.8E-5)}{(\text{Wind Speed})} = \_\_\_\_ \text{ mrem/hr}$$

$$\frac{(a\qquad)(b\qquad)(c\qquad)(d\qquad)(2.8E-5)}{(e\qquad)} = \_\_\_\_ \text{ mrem/hr}$$

OR

A.2.3 High Range (R-43)

$$\frac{(\text{R-43})(\text{Plant Vent Flow Rate})(\text{Xu/Q})(\text{Noble Gas Dose Conversion Factor})(1.05E+3)}{(\text{Wind Speed})(\text{Concentration Conversion Factor})} = \_\_\_\_ \text{ mrem/hr}$$

$$\frac{(f\qquad)(b\qquad)(c\qquad)(d\qquad)(1.05E+3)}{(e\qquad)(g\qquad)} = \_\_\_\_ \text{ mrem/hr}$$

NOTE

a. 2R-41C in cpm, or equivalent cpm value from Attachment 4.
b. Plant vent flow rate in ft^3/min.
c. Xu/Q value from Attachment 1. ($1/m^2$)
d. Dose conversion factor from Attachment 2(a). $\frac{mrem/hr}{uCi/m^3}$
e. Wind speed in miles per hour.
f. R-43 reading in mR/hr.
g. Concentration conversion factor in $\frac{mrem/hr}{uCi/cc}$ Attachment 3.

Calculated By ______________________ Date ______ Time ________

Reviewed By ______________________ Date ______ Time ________

A.2 PLANT RELEASE FROM UNIT 2 (continued)

THYROID DOSE COMMITMENT DUE TO IODINE

A.2.4 Determine the rate of increase of iodine activity.

a) Low Range Monitor 2R-41B

$$\frac{cpm}{min} = \frac{Cx-Co}{Tx-To} = \frac{(\quad\quad)-(\quad\quad)}{(\quad\quad)-(\quad\quad)} = \frac{(\quad\quad)cpm}{(\quad\quad)min} = (\quad\quad)\frac{cpm}{min}$$

NOTE

Refer to Step A.1.2(c).

OR

b) Using Default Values

Use Attachment 4 to determine the appropriate equivalent cpm/min.

__________ cpm/min

A.2.5 Equation for 50 year thyroid dose commitment rate

$$\frac{\frac{cpm}{min}\ (\text{Plant Vent Flow Rate})(Xu/Q)(\text{Iodine Dose Conversion Factor})(3.35E-7)}{(\text{Wind Speed})} = \_\_\_\_\_\ \text{mrem/hr}$$

$$\frac{(a\quad\quad)(b\quad\quad)(c\quad\quad)(d\quad\quad)(3.35E-7)}{(e\quad\quad)} = \_\_\_\_\_\ \text{mrem/hr}$$

NOTE

a. cpm/min from Step A.2.4 (a or b).
b. Plant vent flow rate in ft^3/min.
c. Xu/Q from Attachment 1. ($1/m^2$)
d. Dose conversion factor from Attachment 2(b). $\frac{mrem/hr}{uCi/m^3}$
e. Wind speed in miles per hour.

Calculated By ______________________ Date _____ Time ________

Reviewed By ______________________ Date ________ Time __________

A.2 PLANT RELEASE FROM UNIT 2 (continued)

THYROID DOSE RATE DUE TO IODINE (continued)

A.2.6 To obtain dose commitment, multiply dose commitment rate by the hours exposed to that rate, (e.g., 15 mrem/hr X 5 hours exposure = 75 mrem-50 year dose commitment).

Calculated By ______________________ Date ______ Time ________

Reviewed By ______________________ Date ______ Time ________

B. RELEASE RATE DETERMINATION FROM UNMONITORED STEAM RELEASE POINTS

B.1 If control room personnel have determined a primary leak exists in one or more steam generators by one or more of the following indications:

a) Air Ejector High Radiation Alarm
b) Uncontrolled increasing level in Steam Generator
c) Increasing steam pressure in one Steam Generator
d) High Activity alarm in the steam generator blowdown system with or without an isolation

then the Senior Shift Supervisor shall initiate monitoring of the affected steam lines upstream of the isolation valves to estimate the microcurie content per cc of steam in the affected steam lines. This action is required if the potential exists for a relief valve lifting, a power operated relief being opened or the operation of the steam driven Aux. Feed Pump attached to the affected Steam Generator (11 & 13)(21 & 23).

B.2 Prior to radiation protection personnel entering the penetration areas to measure the contact dose rate on the affected steam lines, the Senior Shift Supervisor/EDO and the Senior Representative from radiation protection will evaluate and determine the potential for high radiation areas being encountered in the penetration areas for the following reasons:

a) Reactor malfunction resulting in fuel damage
b) LOCA resulting in fission products being released to containment resulting in radiation streaming through containment penetration.

B.3 If any of the above conditions are present, specific action points must be established in accordance with EP I-17 to determine the following requirements.

a) Total dose accumulation for operation
b) Maximum dose rate field to enter
c) The types of dosimeters and instruments to use
d) The type of protective clothing and equipment to be used

B.4 Enter affected penetration area or location and measure the contact dose rate on the affected steam line or Aux. Feed Pump exhaust line.

a) The contact dose rate measurement can be made with any dose rate instrument having a range of 0.1 to at least 10,000 mR/hr.
b) If it is expected that the background in the affected penetration area will be greater than 10 mR/hr a dose rate instrument with a shielded probe should be used.
c) Dose rates should be taken at the indicated location marked on each steam line.
d) Record the contact dose rate on pipe.

____________ mR/hr

B.5 Use the contact dose rate corrected for background radiation to determine the uCi/cc concentration in the pipe of concern from Attachment 6.

____________ μCi/cc

B.6 Use the following flow rates to determine steam release rates:

a) Power operated relief valve	450,000 lb/hr
b) Relief Valve	800,000 lb/hr each
c) Aux. Feed Pump exhaust	50,000 lb/hr

B. RELEASE RATE DETERMINATION FROM UNMONITORED STEAM RELEASE POINTS (continued)

B.7 Multiply the µCi/cc from B.5 and the proper flow rate in lb/hr from B.6 to determine release rate in µCi/sec.

(µCi/cc)(lb/hr)(3.3) = µCi/sec

(a)(b)(3.3) = ______ µCi/sec

a. uCi/cc from Step B.5.
b. lb/hr from Step B.6.

B.8 Whole body dose rate due to noble gas releases

$$\text{mrem/hr} = \frac{(\mu\text{Ci/sec})(\text{Xu/Q})(\text{DCF})(2.22)}{(\text{Wind Speed - El.33'})}$$

$$\text{mrem/hr} = \frac{(a\qquad)(b\qquad)(c\qquad)(2.22)}{(d\qquad)}$$

NOTE

a. uCi/sec from B.7.
b. Xu/Q in $1/m^2$ from Attachment 1.
c. Dose conversion factor from Attachment 2(a). $\frac{\text{mrem/hr}}{\mu\text{Ci/m}^2}$
d. Wind speed in miles per hour (EL. 33').

B.9 Document total run time for the steam driven Aux. Feed Pump.

B.10 Document the total period of time the relief and power operated relief valves were open on the affected steam generator.

B.11 The number of times the relief and power operated relief valves are open on the affected steam generators are limited as per Emergency Instruction I-4.7.

Calculated By______________________ Date________ Time ________

Reviewed By______________________ Date________ Time ________

C. RELEASES FROM CONTAINMENT LEAKAGE

NOTE

This dose determination assumes a design basis containment leak rate (La). Actual containment leak rates may be more or less. This dose determination is a postulation and should be used as such. Field monitoring results are preferable.

C.1 Contact the control room and obtain the reading on the high range containment radiation monitor either R-44 (Unit 1) or 2R-21 (Unit 2).

___________ R/hr

C.2 Using Attachment No. 5, correlate the meter reading to the vertical axis and determine the base X/Q from the horizontal axis.

___________ base X/Q

C.3 Determine the actual Xu/Q using Attachment 1.

___________ actual Xu/Q

C.4 Determine the 24 hour dose.

$$\frac{(\text{Actual Xu/Q})(2.22)}{(\text{Wind Speed - El. 33'})(\text{Base X/Q})} = \text{24 hour dose in rem}$$

$$\frac{(a\qquad)(2.22)}{(b\qquad)(c\qquad)} = \qquad \text{rem}$$

NOTE

a. Acutal Xu/Q from Attachment 1.
b. Windspeed in miles per hour (El. 33').
c. Base X/Q from Attachment 5 (correlated to containment monitor).

Calculated By____________________________ Date_______ Time _______

Reviewed By____________________________ Date_______ Time _______

NOTE

Forward all completed forms to the Nuclear Emergency Planning Engineer. Attach other completed EP's or attachments used.

Prepared By: James Clancy

Reviewed By: [signature] 9/13/82
Department Head / Date

Reviewed By: Cheryl Asakenas for 9-13-82
Nuclear Emergency Planning Engineer / Date

Reviewed By: B.S. Bruce Legg 9/13/82
Station Quality Assurance Review (if required see EP VI-2) / Date

SORC Meeting No.: 82-86 J. Gallagher 9/23/82
Date

Approved By: H. J. Midura 9/23/82
General Manager - Salem Operations / Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection / Date

ATTACHMENT 1
Xu/O VALUE DETERMINATION

Select the Xu/O values that correspond to the stability class as determined by the Δ temperature, distance from the site and the release point (ground or elevated).

1. USE THE Δ TEMPERATURE VALUE FROM THE METEOROLOGICAL TOWER TO DETERMINE STABILITY CLASS.

Primary Instrument

300 ft. - 33 ft. temperature (°C)

UNSTABLE	NEUTRAL	STABLE
	-1.3	-0.5

NOTE

UNSTABLE IS ≤ -1.3°C

NEUTRAL IS > -1.3°C ≤ -0.5°C

STABLE IS > -0.5°C

Backup Instrument

150 ft. - 33 ft. temperature (°C)

UNSTABLE	NEUTRAL	STABLE
	-0.6	-0.2

NOTE

UNSTABLE IS ≤ -0.6°C

NEUTRAL IS > -0.6°C ≤ -0.2°C

STABLE IS > -0.5°C

2.

DISTANCE		GROUND LEVEL RELEASE (E-6/m²)			ELEVATED LEVEL RELEASE (E-6/m²)		
METERS	MILES	UNSTABLE	NEUTRAL	STABLE	UNSTABLE	NEUTRAL	STABLE
1000	0.62	15	61.39	244.8	18.28	45.1	*
1270 MEA	0.79	9.95	41.5	227	12.4	42.2	**
2000	1.2	4.64	22.49	168.0	6.13	27.99	.017
3000	1.9	2.32	12.20	113.3	3.12	17.26	.793
4000	2.5	1.42	7.86	81.7	1.92	11.72	3.54
5000	3.1	.968	5.58	62.3	1.31	8.55	7.22
6000	3.7	.708	4.21	49.5	.963	6.56	10.48
7000	4.4	.543	3.32	40.5	.740	5.23	12.81
8000	4.9	.432	2.70	34.0	.589	4.28	14.26
8045 LPZ	5.0	.42	2.5	33.3	.57	4.06	14.3
9000	5.6	.353	2.25	29.0	.481	3.50	15.02
10000	6.2	.294	1.91	25.2	.402	3.06	15.29
11000	6.8	.250	1.65	22.1	.341	2.65	15.23
12000	7.5	.215	1.44	19.6	.294	2.32	14.95
13000	8.1	.187	1.27	17.6	.256	2.05	14.55
14000	8.7	.165	1.13	15.9	.225	1.83	14.06
15000	9.3	.146	1.02	14.4	.200	1.65	13.54
16000 EPZ	9.9	.131	.952	13.2	.179	1.49	13.01

MEA - Minimum Exclusion Area

LPZ - Low Population Zone

EPZ - Emergency Planning Zone

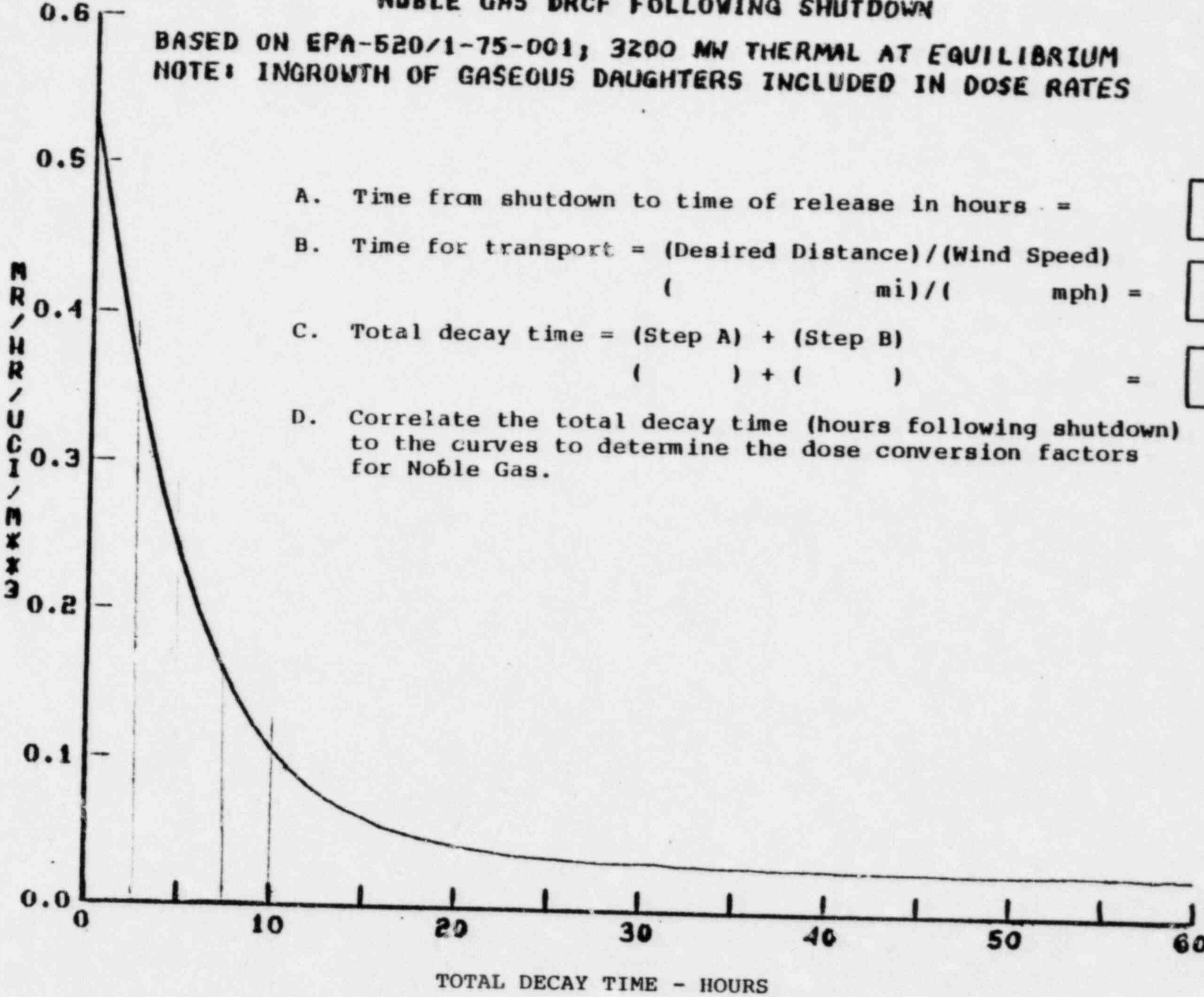
*Value of Xu/O for 1000 meters distance = 5.33E-16/m²

**Value of Xu/O for 1270 meters distance = 1.35E-12/m²

Distance______ Xu/O = _______ E-6/m² (ground) Xu/Q = _______ E-6/m² (elevated)

NOBLE GAS DRCF FOLLOWING SHUTDOWN

BASED ON EPA-520/1-75-001; 3200 MW THERMAL AT EQUILIBRIUM
NOTE: INGROWTH OF GASEOUS DAUGHTERS INCLUDED IN DOSE RATES



A. Time from shutdown to time of release in hours = [hr]

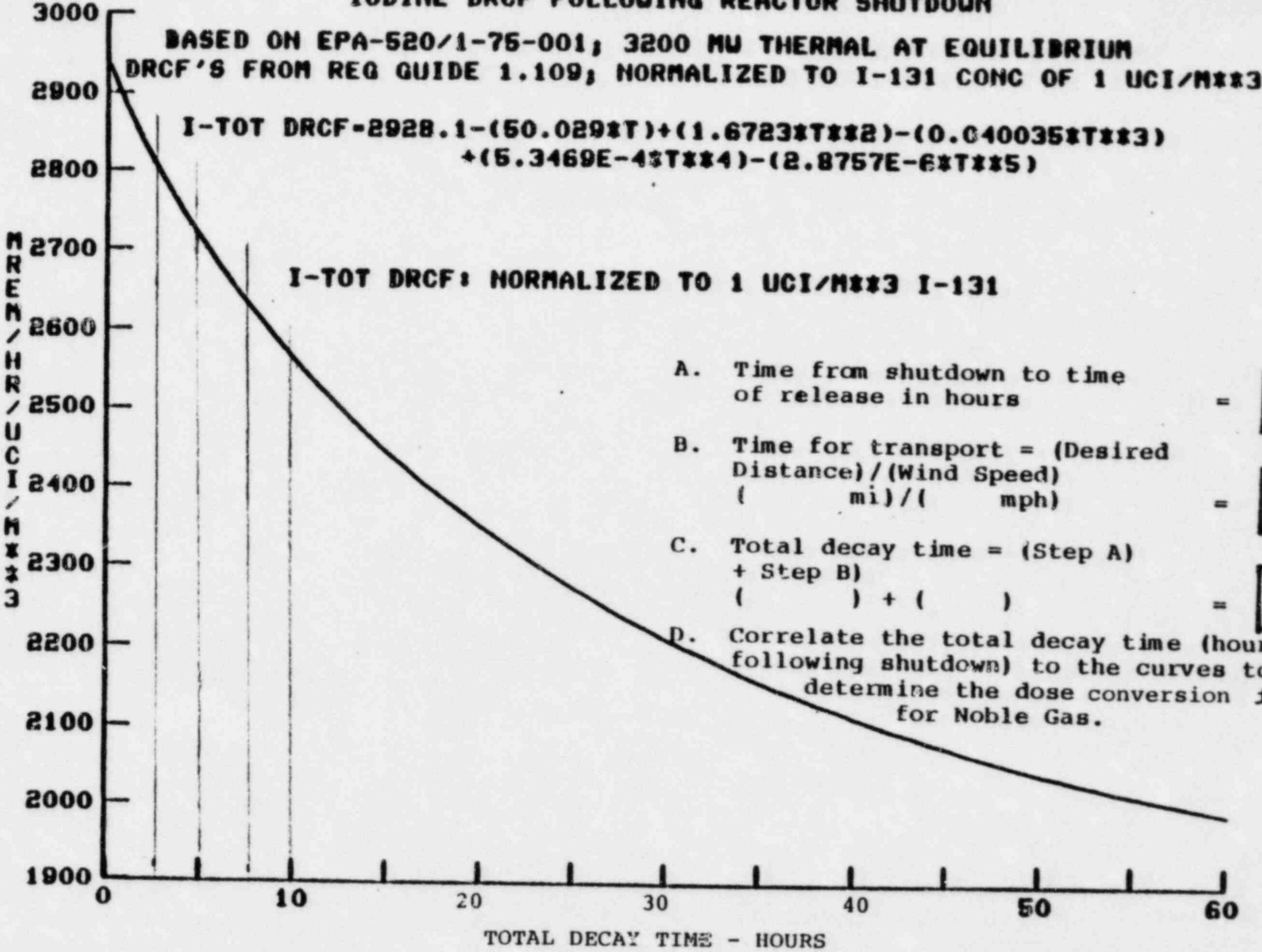
B. Time for transport = (Desired Distance)/(Wind Speed)
(mi)/(mph) = [hr]

C. Total decay time = (Step A) + (Step B)
( ) + ( ) = [hr]

D. Correlate the total decay time (hours following shutdown) to the curves to determine the dose conversion factors for Noble Gas.

Attachment 2 (b)

IODINE DRCF FOLLOWING REACTOR SHUTDOWN



A. Time from shutdown to time of release in hours = [hr]

B. Time for transport = (Desired Distance)/(Wind Speed)
(mi)/(mph) = [hr]

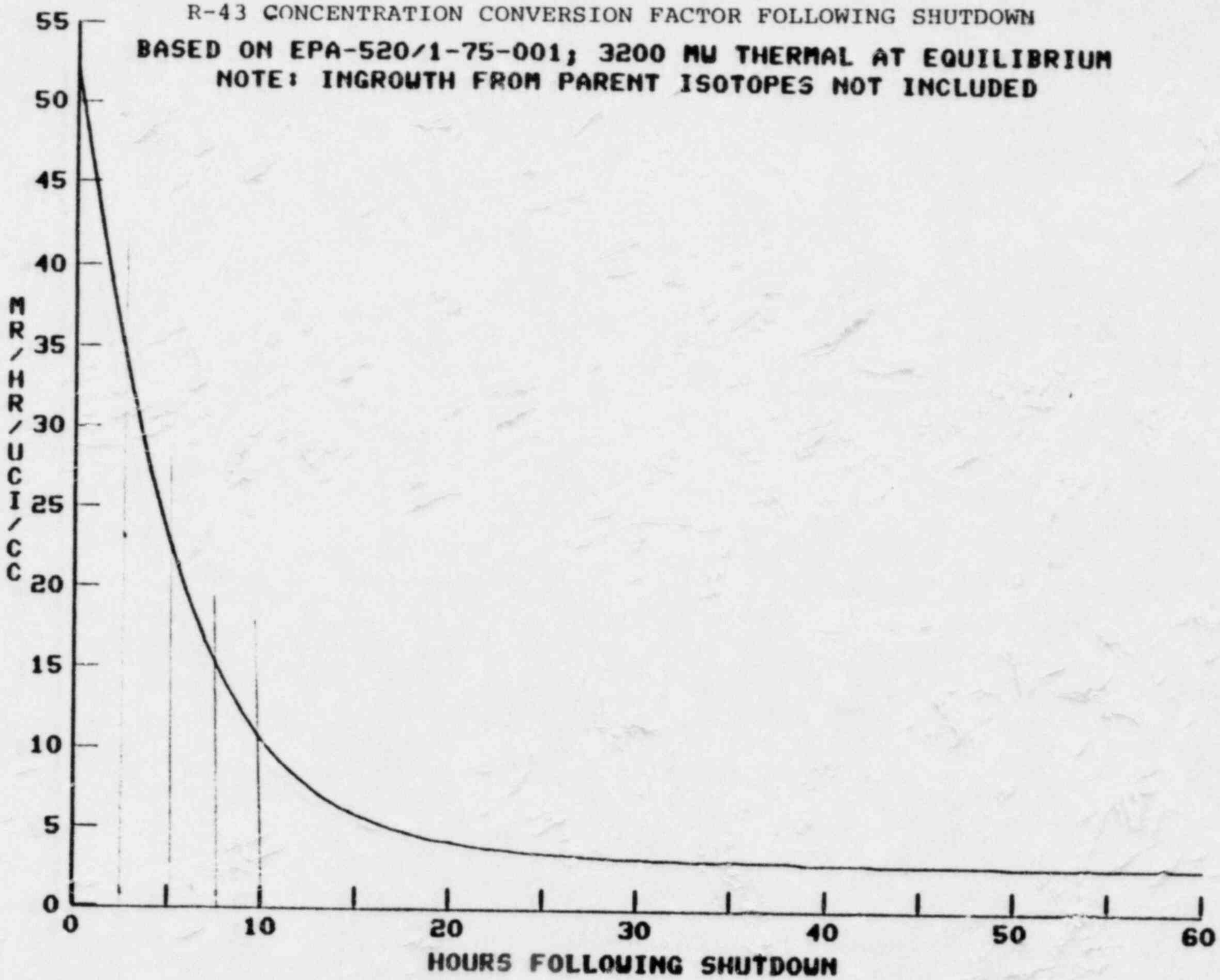
C. Total decay time = (Step A) + Step B)
( ) + ( ) = [hr]

D. Correlate the total decay time (hours following shutdown) to the curves to determine the dose conversion factors for Noble Gas.

Attachment 3

R-43 CONCENTRATION CONVERSION FACTOR FOLLOWING SHUTDOWN

BASED ON EPA-520/1-75-001; 3200 MW THERMAL AT EQUILIBRIUM
NOTE: INGROWTH FROM PARENT ISOTOPES NOT INCLUDED



ATTACHMENT 4
DEFAULT VALUES FOR LOW/HIGH PLANT VENT MONITORS

Read the below accident description and determine which case is applicable. From the table select the appropriate release rates (cpm).

CASE I LOCA

A LOCA assuming severe core damage - fuel melting (Regulatory Guide 1.4 assumptions) 100% of noble gases and 25% of the iodines contained in the core are assumed released to the containment. The containment initially leaks at the maximum design leak rate.

CASE II LOCA

Primary coolant leaks at a rate fast enough to increase the temperature of the core to the point where there is damage to the fuel rods. For this case, it is assumed that all the gap activity (the gases contained between the fuel and fuel rod) is released to the containment. The containment is assumed to initially leak at the maximum design leak rate. In this accident, it is up to the Senior Shift Supervisor or Emergency Duty Officer (EDO) to assume that there has been no fuel melting. If there is any question, a CASE I LOCA should be assumed.

CASE III DECAY TANK RUPTURE

This procedure is used only if actual radiological monitoring equipment is unavailable for release evaluation (monitors out of service, read off scale, etc.).

CASE IV FUEL HANDLING ACCIDENT

Any activity occurring as a result of a fuel handling accident is normally drawn into the Fuel Handling Building Ventilation System and vented to the plant vent for release. The process monitors are used to monitor these releases; however, should these monitors be out of service or off scale, this technique is used to evaluate off-site dose.

CASE V STEAM GENERATOR TUBE RUPTURE

The activity released during a minor tube rupture can be determined using vent monitors and normal procedures. This procedure addresses the steam generator tube rupture as analyzed in the FASR. This accident is set apart from others because of the inability to consult radiation monitors to determine the activity release rate. Therefore, this is the primary procedure to determine the activity release rate resulting from a steam generator tube rupture.

ATTACHMENT 4 (continued)

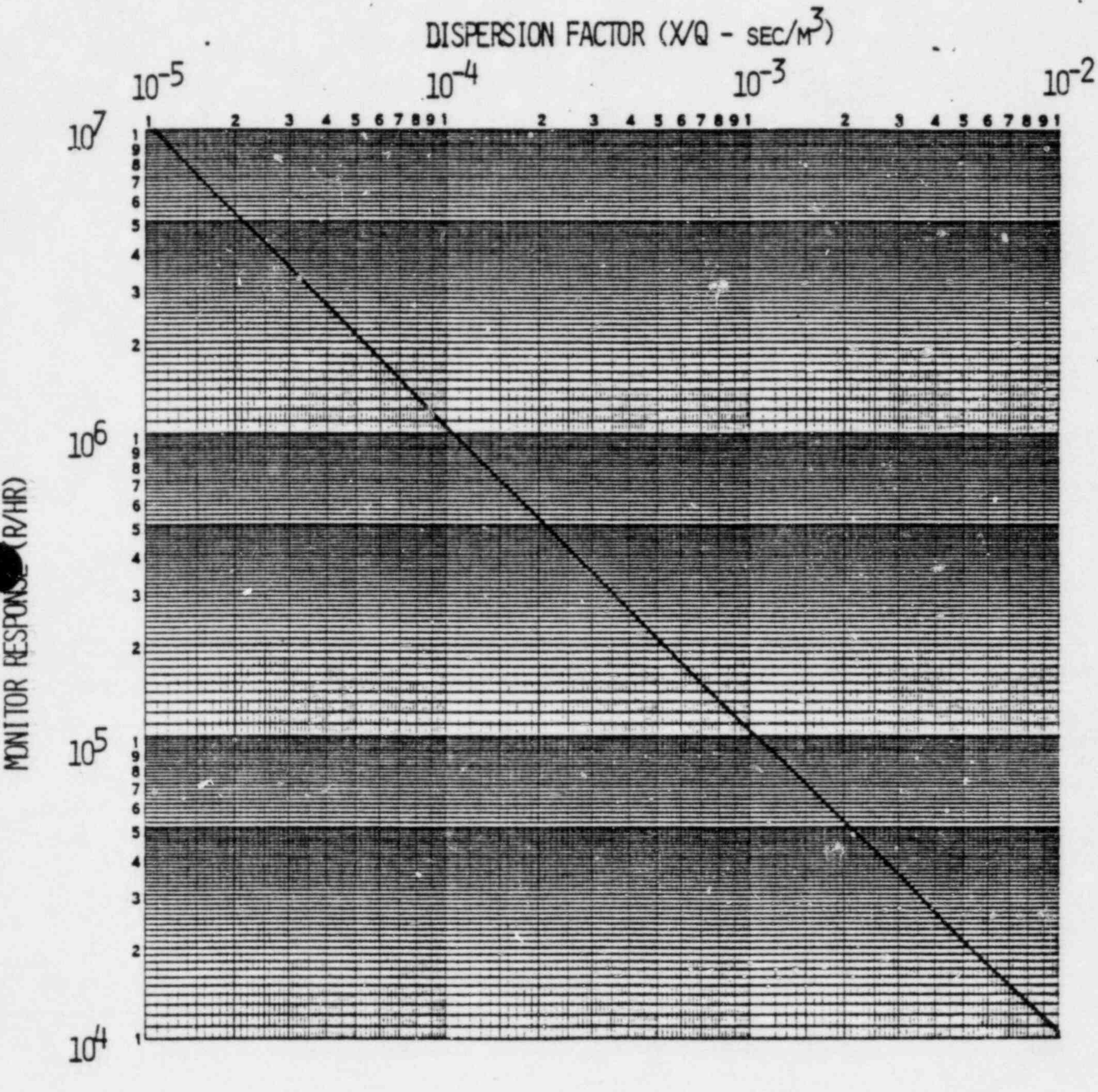
ACCIDENT CLASS	EQUIVALENT NOBLE GAS RELEASE RATE CPM		EQUIVALENT IODINE ACTIVITY INCREASE RATE CPM/MIN	
	UNIT 1	UNIT 2	UNIT 1	UNIT 2
I(1)	2.42 E^5	4.34 E^6	9.35 E^6	9.73 E^6
II(1)	7.82 E^2	1.40 E^4	1.45 E^5	1.51 E^5
III(1)	1.25 E^5	2.24 E^6	NO RELEASE	NO RELEASE
IV(1)	9.9 E^4	1.78 E^6	1.22 E^6	1.27 E^6
V(2)	1.42 E^4	2.54 E^5	3.3 E^6	3.50 E^6

(1) Use actual or estimated plant vent flow (cfm) as provided in the procedure.

(2) Case V is assumed not released through the plant vent so use a flow of 125,000 cfm for this calculation.

ATTACHMENT 5

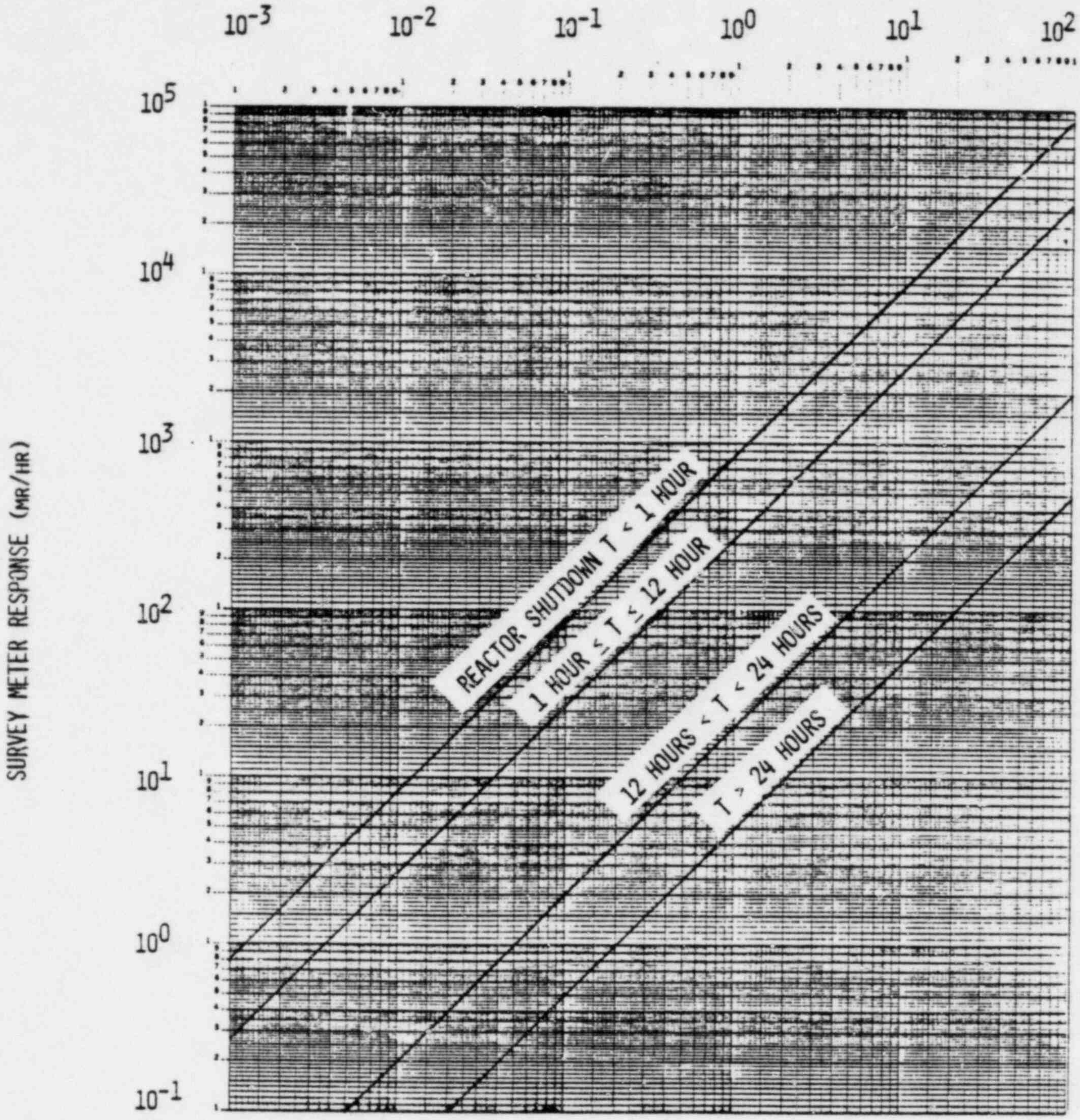
CONTAINMENT MONITOR (1R-44/2R-21) VS DISPERSION FACTOR



NOTE

OFFSITE DOSE OF 1 REM IN 24 HOURS FOLLOWING A LOCA AS DETERMINED BY R-21 RESPONSE AND X/Q.

ATTACHMENT 6
SURVEY METER RESPONSE VS. MAIN STEAM LINE CONCENTRATION



CONCENTRATION IN MAIN STEAM LINES
µCi/cc @ 1005 PSIA*

*TO CONVERT TO µCi/LB MULTIPLY BY 1.20E4

ATTACHMENT 7
UNIT ANALYSIS OF OFF-SITE DOSE CALCULATIONS

A.1.3 Unit 1 Low Range Noble Gas

$$\frac{\left(cpm \cdot \frac{uCi/cc}{2.1E6\ cpm}\right)\left(\frac{ft^3}{min} \cdot \frac{2.832E4cc}{ft^3} \cdot \frac{1\ min}{60\ sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)} = 5E-4$$

A.1.4 Unit 1 High Range Noble Gas (R-43)

$$\frac{(mr/hr)\left(\frac{ft^3}{min} \cdot \frac{2.832E4cc}{ft^3} \cdot \frac{1\ min}{60\ sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)\left(\frac{mr/hr}{uCi/cc}\right)} = 1.05E3$$

A.1.6 Unit 1 Iodine

$$\frac{\left(\frac{cpm}{min} \cdot \frac{uCi/cc}{3.0E9\ cpm/min}\right)\left(\frac{ft^3}{min} \cdot \frac{2.832E4cc}{ft^3} \cdot \frac{1\ min}{60\ sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)} = 3.5E-7$$

A.2.2 Unit 2 Low Range Noble Gas

$$\frac{\left(cpm \cdot \frac{uCi/cc}{3.75E7\ cpm}\right)\left(\frac{ft^3}{min} \cdot \frac{2.832E4cc}{ft^3} \cdot \frac{1\ min}{60\ sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)} = 2.8E-5$$

A.2.3 Unit 2 High Range Noble Gas (R-43)

$$\frac{(mr/hr)\left(\frac{ft^3}{min} \cdot \frac{2.832E4cc}{ft^3} \cdot \frac{1\ min}{60\ sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)\left(\frac{mr/hr}{uCi/cc}\right)} = 1.05E3$$

A.2.5 Unit 2 Iodine

$$\frac{\left(\frac{cpm}{min} \cdot \frac{uCi/cc}{3.13E9\ cpm/min}\right)\left(\frac{ft^3}{min} \cdot \frac{2.832E4cc}{ft^3} \cdot \frac{1\ min}{60\ sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)} = 3.35E-7$$

B.7 Release Rate From Unmonitored Steam

$$\frac{1.20E4\ cc/lb}{3.6E3\ sec/hr} = 3.3$$

B.8 Whole Body Dose Rates From Release Rate

$$\frac{\left(\frac{uCi}{sec}\right)\left(\frac{1}{m^2}\right)\left(\frac{mrem/hr}{uCi/m^3}\right)}{\left(mph \cdot \frac{0.45\ m/sec}{mph}\right)} = 2.22$$

Monitoring Reading ______

DOSE CALCULATION SHEET
SNGS - UNIT ______

PAGE ______ CALC. DATE ______ CALC. TIME ______

RELEASE RATE FROM RMS --uCi/sec--

Q Release Rate = [RMS] * [Sensit & Unit Constant] * [Release Flow Rate]

DISCHARGES FROM PLANT VENT

IODINE: If R41B is offscale use Att. 4 EP, IV-111

______ cpm/m R41B or R12B ______ const (h) see note ______ vent flow cfm = ______ uCi/sec (a)

NOBLE GAS: If R41C is offscale use R43 channel use Att. 3, EP IV-111 for I term (Remember to divide by I term) If R43 is offscale use Att. 4, EP IV-111

( ) cpm R41C or R12A ( ) const (J) see note ( ) vent flow cfm = ______ uCi/sec (b)

( ) mr/hr R43 + ( ) const (I) ( ) vent flow cfm (4.72E2) = ______ uCi/sec (b)

DISCHARGES FROM ATMOSPHERIC RELIEF VALVES

LIST DECAY TIME: ______
Using Attach. 3 of EP IV-111
List mrem/hr / uCi/cc for this time ______ k

( ) mr/hr ÷ ( ) k => ______ uCi/cc

Survey Inst.

( ) uCi/cc (3.3) ( ) lb/hr = ______ uCi/sec (c)

USING CONTAINMENT MONITORS TO ESTIMATE OFFSITE DOSE FROM LEAKAGE. USE EP IV-111 Attachment #5.

______ R/hr R21 or R44A, B => Base X/Q to yield 1R in 24 hrs. (d)

Note: For Unit 1 (J) = 2.25E-4; Unit 2 (J) = 1.42E-5
For Unit 1 (h) = 1.57E-7; Unit 2 (h) = 1.51E-7

Stop: Does the release rate seem reasonable? If chemistry can take a sample of the vent, compare their reported uCi/cc value with the first two terms above.

Discharges which on the average exceed 3600 Ci/hr 1Ci/s (noble gases) are cause for concern. Discharges which on the average exceed 7 uCi/sec (25 mCi/hr) of iodine are cause for concern.

ATMOSPHERIC DISPERSION AT LOCATION OF INTEREST ---sec/m³--- (See Att. 1)

Stability? = ______
Ground or Elevated? = ______

(Xu/Q)(2.22) / wind speed mph = X/Q

@ MEA ( )(2.22) / ( ) = ______ (d)

@ LPZ ( )(2.22) / ( ) = ______ (e)

@ EPZ ( )(2.22) / ( ) = ______ (f)

@ ______ meters ( )(2.22) / ( ) = ______ (g)

Xu/Q (E-6/m²) Ground

°C/ @300-30 ft.	<-1.3 unstab	neut	>-0.5 stab
MEA	9.95	41.5	227
LPZ	0.42	2.5	33.3
EPZ	0.13	0.95	13.2

Xu/Q (E-6/m²) Elevated

°C/ @300-30 ft.	<-1.3 unstab	neut	>-0.5 stab
MEA	12.4	42.2	*
LPZ	0.57	4.06	14.3
EPZ	0.179	1.49	13.0

Stop: If the wind speed (mph) and stability has not changed you may use the same values in subsequent calculations.

* 1.35E-12/m²

DOSE CONV. FACTOR DCF --mrem/hr-- / uCi/m³ (See Att. 2) => DOSE TO MAN AT THE LOCATION OF INTEREST

Iodine - Thyroid Dose Rate => H = Q * (X/Q) * (DCF)

@ MEA ( ) uCi/sec (a) ( ) sec/m³ (d) ( ) DCF = ______ Dose Rate (mrem/hr)

@ LPZ ( ) uCi/sec (a) ( ) sec/m³ (e) ( ) DCF = ______ Dose Rate @ t_1= ______

@ EPZ ( ) uCi/sec (a) ( ) sec/m³ (f) ( ) DCF = ______ Dose Rate @ t_2= ______

@ ___ ( ) uCi/sec (a) ( ) sec/m³ (g) ( ) DCF = ______ Dose Rate @ t_3= ______

Noble Gas - Whole Body Dose Rate => H = Q (X/Q) (DCF)

@ MEA ( ) uCi/sec (b or c) ( ) sec/m³ (d) ( ) DCF = ______ Dose Rate (mrem/hr)

@ LPZ ( ) uCi/sec (b) ( ) sec/m³ (e) ( ) DCF = ______ Dose Rate @ t_1= ______

@ EPZ ( ) uCi/sec (b or c) ( ) sec/m³ (f) ( ) DCF = ______ Dose Rate @ t_2= ______

@ ___ ( ) uCi/sec (b or c) ( ) sec/m³ (g) ( ) DCF = ______ Dose Rate @ t_3= ______

Whole Body Dose - Containment Leakage

@ MEA (______ ÷ ______) = ______ (Base X/Q / X/Q@MEA) (d) REM in 24 hrs.

@ LPZ (______ ÷ ______) = ______ (Base X/Q / X/Q@LPZ) (e) REM in 24 hrs.

@ EPZ (______ ÷ ______) = ______ (Base X/Q ÷ X/Q@EPZ) (f) REM in 24 hrs.

@ ___ (______ ÷ ______) = ______ (Base X/Q ÷ X/Q@___) (g) REM in 24 hrs.

Stop: If the whole body dose rate exceeds 0.5 rem/hr alert the REM. If the thyroid dose rate exceeds 7.5 rem/hr alert the REM. The doses calculated are future doses. List the arrival time for all calculations.

Arrival time (hrs)* t_1 = distance to location (miles) / (wind speed in mph)

$t_2 = 2t_1$

*multiply by 60 to get arrival time in minutes.

White - Dose Integrator; Canary - Status Board Attendant; Pink - State Communications; Goldenrod - Dose Calculator

NCA:srd

Rev.2

M P82 43/16 1/2

EMERGENCY PROCEDURE
EP IV-112
EMERGENCY OPERATIONS FACILITY - RADIOLOGICAL ASSESSMENT

ACTION LEVEL

This procedure shall be implemented when the Radiological Support Manager has determined that his/her staff is ready to assume the responsibilities for off-site surveys, determining dose rates, doses, dose projections, and making Protective Action Recommendations.

RESPONSIBLE INDIVIDUALS

Radiological Support Manager (RSM) and Radiological Assessment Staff.

ACTION STATEMENTS

1. Responsibilities of Radiological Assessment Staff

   a. **Radiological Support Manager (RSM)** - The RSM has the ultimate responsibility for making protective action recommendations to the ERM and keeping the ERM informed with regard to dose estimates and field measurements. The RSM is not given specific duties within the RSM office other than decision-making so that he can freely assess the plant status, dose calculations, off-site field data, and projections. It is the responsibility of the RSM to assure that the overall requirements of radiological assessment are met. Delegation of responsibility and authority to meet the goals of the assessment team is an important element of the RSM function. The primary responsibility of the RSM is to ascertain whether or not protective action is indicated by the radiological status within the Emergency Planning Zone (EPZ). Additionally,

the RSM is charged with ensuring that "Station Status Checklist" information is transmitted to the states of Delaware and New Jersey.

b. **Assistant Radiological Support Manager (ARSM)** - The ARSM has the responsibility to directly assist the RSM in the discharge of the prescribed RSM duties. The ARSM serves as both an alternate and "relief" RSM. In the event of a prolonged emergency, it may be necessary to rotate the RSM and ARSM through the RSM duty. The ARSM should assist the RSM and the radiological assessment staff in performing analyses for any special problems which may arise.

c. **Radiological Assessment Staff** - The Radiological Assessment Staff peforms multiple functions within the RSM office which include dose calculations, dose integrations, dose projection, field data calculations, attending the status boards, off-site team deployment planning, and source-term calculations. For long term recovery considerations, the Radiological Assessment Staff may assist the RPE at the station.

   i. **Dose Calculation Staff** - The dose calculation function can be filled by a minimum of two staff members. One staff member must dedicate all of his time to dose rate calculations based on RMS monitor readings or release rates. The second dose calculation team member can verify dose calculation results and perform dose integrations and projections. Additionally, one staff member will complete the station status checklist form and ensure that it is forwarded for transmittal to the states.

   ii. **Status Board Attendant** - One staff member will update the status boards and the dose/RMS event history boards. The status boards highlight the latest RMS,

meteorological, and dose calculation data. The event history boards allow the Radiological staff and observers a quick glance at what has been happening and provides the ability to spot questionable anomalies. If necessary, the Status Board Attendant can complete the Station Status Checklist form.

iii. **Off-Site Team Coordinator** - The staff member who is assigned the duty of Off-site Team Coordinator gathers field data from the radio communicator and from the state communicators. These data are plotted on the Emergency Planning Zone (EPZ) Map located in the RSM area. Based on meteorological data, plant release data, plume extent estimates, and accumulated field data, the Off-site Team Coordinator shall determine the most prudent deployment of field teams to provide timely and relevant information to the RSM for protective action considerations. The Off-site Team Coordinator shall provide deployment instructions to the radio communicator (dispatcher) and field team personnel.

iv. **Radio Communicator** - The radio communicator assists in communicating deployment instructions to the Off-site field monitoring teams and responding to questions from these teams. To eliminate confusion in the RSM office, the radio communicator should generally limit his conversation to the off-site teams by radio and the Off-site Team Coordinator who will be located adjacent to the communicator. The radio communicator is responsible for maintaining a log of all offsite field team activities.

v. **Phone Communicators** - The function of the phone communicators is of vital importance to the overall function of radiological assesssment. One communica-

tor is assigned to receive information from the TSC or Control Room. This communicator provides the team with the data necessary to perform the dose calculations and assessments in a timely manner. Only selected RMS data (necessary for dose calculations) and "Station Status Checklist" data need to be received by phone. The phone communicators who speak directly with the states of Delaware and New Jersey have the responsibility to make sure that any protective action recommendations to be transmitted to the states have been approved by the RSM and the Emergency Response Manager (ERM). With regard to other transmitted data such as calculated dose rates and "Station Status Checklist" information, any questions should be directed to a radiological dose assessment team member (Status board attendant, team coordinator, dose calculator, etc.) and not the RSM. The primary responsibility of the phone communicator to the states is to clearly transmit data in a timely fashion and to accept questions from the states. Answers to questions may be handled by the communicators if the correct answer is obvious to the communicator; otherwise, the questions should be referred to the ARSM or staff members.

vi. **Runner** - The primary function of the runner is to carry information from location to location both within the RSM area and throughout the EOF.

2. Station Status Checklist

Once the EOF has been officially activated and the Emergency Coordinator function has been transferred to the Emergency Response Manager (ERM), the Radiological Support Manager shall be responsible for filling out and sending the "Station Status Checklist" (See EPI-2, EPI-3, and EPI-4) to the states of Delaware and New Jersey. This information transmittal shall normally be done through the two phone communicators assigned to the state communications in the REM office. The types of information to be routinely compiled for the "Station Status Checklist" include 1) time and date of incident (shutdown, if applicable); 2) current accident clasification, 3) basis for classification (i.e., EAL's),4) description of systems involved, 5) meteorological data, 6) Noble gas and iodine release rates, and 7) estimated duration of release. (See Attachment 1). This information should be compiled onto the "Station Status Checklist" by a dose assessment staff member as soon as sufficient data is available. Both the individual who received the checklist information from the plant and a Radiological Assessment Staff Member shall review the status information to identify any significant anomalies.

3. Dose Calculations

In addition to the routinely updated "Station Status Checklist" (Attachment 1) a "Supplemental Station Status Checklist" should be transmitted to the states completed to a pratical level with available information (See Attachment 2). During the initial stages at the EOF during an emergency, it may be practical to transmit calculated dose

rates to the States. Other information such as isotopic mixes, contamination levels, and estimated impact times may be transmitted as this information becomes available.

Using procedures EP IV-111, EP IV-113, or EP IV-114, dose rates should be calculated as soon as updated Radiation Monitoring System (RMS) data becomes available. At least one person from the Radiological Assessment Staff should be dedicated strictly to performing dose calculations. This position may be rotated to allow team members rest periods.

4. Special Problems

Special Problems will be performed by Radiological Assessment Staff member(s) and the Assistant RSM. It is anticipated that special problems outside the routinely anticipated dose calculations may require attention. In this event, attention can be given to these problems without diverting the attention of the dose calculation staff members. If available, a meteorologist will assist the assessment staff in plume extent estimation.

5. Field Team Deployment

Since off-site dose rate and air concentration data may represent the most accurate picture with regard to plume status, deployment of field teams is a vital role to be played by a Radiological Staff member. One member of the staff will be assigned to the Team Coordinator position. A description of the duties and responsibilities of this Radiological Assessment team member and others is provided later in this procedure.

6. Status Boards and Data Sheets

Status Boards and Sheets are updated and/or circulated to keep staff members, observers, and other EOF participants informed on a timely basis. Availability of both current calculated and measured dose assessment data provides for a well informed assessment staff and reduces unnecessary conversation and questioning within the EOF. (See Attachments).

7. Radiation Monitor System (RMS) Data

The RMS system includes numerous process and area radiation monitors. For simplicity at the EOF, the RMS is divided into two (2) categories, namely "Selected" dose calculation RMS data and "Other" RMS data. The "Selected" RMS data includes the iodine and Noble gas vent monitors for Units 1 and 2 (namely, R12A, R12B, R41B, R41C), the high range R-43 monitor, the containment monitors (R44 and R21), the letdown R-31 monitor, R11A, and R41A. "Selected" RMS data will be routinely transmitted from the TSC by phone.

The "Other" process and area monitors are useful in assessment of plant status and providing a basis for judging the validity of key monitor readings. "Other" RMS data will be transmitted by other means such as telecopy or by phone if time permits.

8. Field Team Data

Measured whole body dose rates and iodine-131 activities will be radioed from PSE&G field teams back to the EOF as soon as practical. Additionally, field data from state

(Delaware and New Jersey) teams will be phoned in through the state communicators. These data will be processed through the dose calculation staff and the status board attendant.

9. Communications with Plant

The RSM office will maintain communication with a liaison within the Technical Support Center (TSC). Additionally, a line to the Control Room may also be available. A line will also be available such that the RSM or staff members can speak with the Radiation Protection Engineer or a Chemistry Department representative. A spare phone can be employed to enlist labor force or equipment support from other utilities and mobilize other support capabilities.

10. Dosimetry and TLD Issuance

a. Post two TLD Control badges and two self-reading dosimeters at two separate locations (one of each at each locale) in the EOF.

b. Issue one TLD and one self-reading dosimeter to each off-site field monitoring team member and any other personnel who may enter a significant radiation field.

c. In the event that the EOF is in the middle of a plume which warrants evacuation of the EPZ sector, issuance of TLD's and self-reading dosimeters to all EOF personnel should be made.

11. Access Control

Access to the EOF will be controlled by security force members. If there is a significant likelihood of contam-

ination being introduced into the EOF (as determined by the RSM staff), contamination control shall be instituted. A Step-off-pad (SOP) with a stachion/barricade set-up should be instituted. An RM-14/HP-210 frisker should be set up at the entrance to the EOF and used to screen all personnel entering the EOF. A Radiological Assessment Staff member will brief the security guard on ensuring that the frisker is properly used. Contaminated foot apparel (if any) shall be removed prior to entrance.

12. Posting

The front entrance to the EOF shall be the main throroughfare. Posting of a guard at side or rear entrances during off-site field team preparation shall be permitted. Otherwise these other doors shall be locked and posted to indicate that the front entrance is the only entrance. If areas of the EOF become contaminated for some reason, these areas should be cordoned off and posted as is reasonable considering circumstances at that time.

13. Evacuation Criteria

Consideration of EOF evacuation should be made based on the following criteria:

Whole Body Dose Rate (within Facility)	Consider Evacuation
500-2500 mR/hr	within 2 hours
2500-5000 mR/hr	within 1 hour
greater than 5000 mR/hr	immediately

It should be noted that the EOF need not be evacuated at the same time as the surrounding populace (based on EP IV-108).

14. Access to RSM Area

Only personnel on official business shall enter the RSM area. Status sheets can be posted to update other interested personnel.

ATTACHMENTS

Number 1 - Station Status Check List
Number 2 - Supplemental Station Status Check List
Number 3 - Dose Assessment Data Status Board
Number 4 - Centerline Plume Dose Rate Status Board
Number 5 - Centerline Plume Integrated Doses Status Board
Number 6 - Dose Calculation Sheet
Number 7 - PSE&G Field Survey Team Data - Iodine Dose Rate Calculation
Number 8 - Post Accident RMS Assessment Data
Number 9 - Semi-log Data Plotting Board
Number 10 - Other Area/Process RMS Data
Number 11 - PSE&G/NJ/Delaware Field Monitoring Data Form
Number 12 - Dose Assessment Data Sheet
Number 13 - SNGS - Operational Status Board - Emergency

Prepared By: James Clancy

Reviewed By: [signature] 9/10/82
Department Head Date

Reviewed By: Cheryl A. Lakenas for 9-10-82
Nuclear Emergency Planning Engineer Date

Reviewed By: Bruce Lig 9/12/82
Station Quality Assurance Review Date
(if required see EP VI-2)

SORC Meeting No.: 82-86 J. Gallagher 9/23/82
Date

Approved By: [signature] 9/23/82
General Manager - Salem Operations Date

Approved By: Peter B. Walker 9/23/82
Manager - Nuclear Site Protection Date

ATTACHMENT 1

STATION STATUS CHECK LIST

Salem Generating Station Unit No. ____________________________

Transmitted By: Name ______________________ Position: ________________

1. Date and Time of Incident: Date_________ Time ________ (24 hr clock)

2. Accident Classification: Unusual Event Alert (Circle One)

   Site Area Emergency General Emergency

3. System Involved:

   (A) ( ) Reactor; or

   (B) ( ) Radioactive Waste System: (Circle One) Gaseous Liquid; or

   (C) ( ) Fuel Handling: (Circle One) Fuel Handling Bldg. Containment

4. Cause of Incident:

   Primary Initiating Condition used for declaration of event
   EPI-0 Part __________, and/or
   Significant Event No. ___________
   Detailed Description of the event ______________________________

   ____

   ____

   ____

5. Is Reactor Tripped: (Circle One) YES NO Date:______ Time:_______

6. Gaseous Release: (Circle One) YES NO

   (A) Release Terminated: (Circle One) YES NO

   (B) Anticipated or Known Duration of Release ________________ Hours

   (C) Type of Release: (Circle One) GROUND ELEVATED

   (D) Wind Speed: ____MPH Wind Direction: (Toward) _________________
   Divide by 2 to get ________M/Sec (From) ___________________
   (Compass Points)

   (E) Stability Class: ( ) Unstable ( ) Neutral ( ) Stable

   (F) Release Rate Iodine ______________________CI/Sec.

   (G) Release Rate Noble Gas: __________________CI/Sec.

(Figure 9)

7. Liquid Release: (Circle One) YES NO

   (A) Release Terminated: (Circle One) YES NO

   (B) Anticipated or Known Duration of Release ____________ Hours

   (C) Estimated Concentration ____________________ PICO Curies/Liter

   (D) Release Rate ______________________________ Liters/Hour

8. Recommended Off-site Actions (As Soon As Data Is Available): Use Attached Worksheet

9. Status Checklist Data Relayed To New Jersey State __________(Date) __________________ (Time), To:_____________________________(Name)

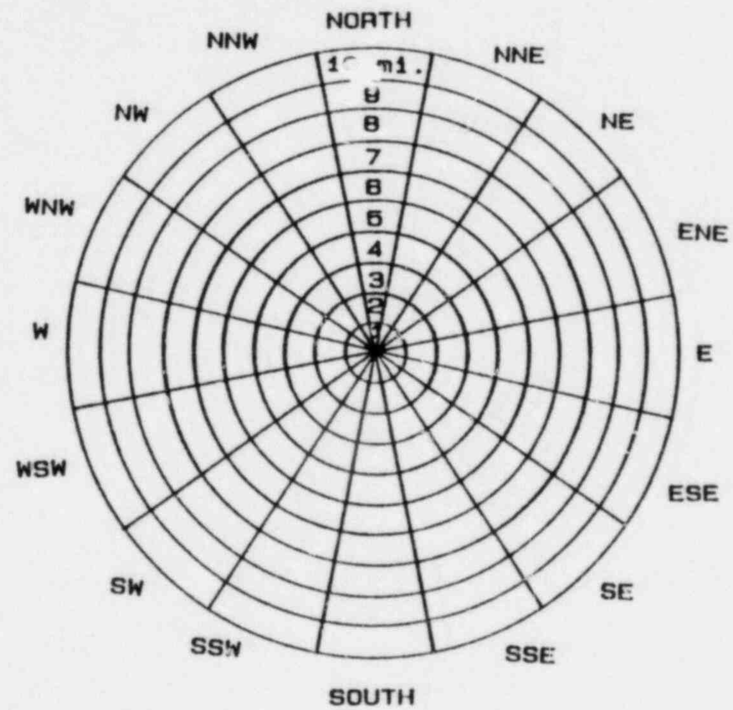
   Status Checklist Data Relayed to Delaware State ____________(Date) ___________________(Time), To:_____________________________(Name)

10. Proceed to Supplemental Station Status Checklist (Addendum 2) if Information and Time Allow

    Supplemental Checklist Attached: YES NO

11. _____________________________Date_______________Time_________________
    Received By

RECORDER WIND FROM	COMPASS DIRECTION FROM
348 3/4° to 11 1/4°	N
11 1/4° to 33 3/4°	NNE
33 3/4° to 56 1/4°	NE
56 1/4° to 78 3/4°	ENE
78 3/4° to 101 1/4°	E
101 1/4° to 123 3/4°	ESE
123 3/4° to 146 1/4°	SE
146 1/4° to 168 3/4°	SSE
168 3/4° to 181 1/4°	S
181 1/4° to 213 3/4°	SSW
213 3/4° to 236 1/4°	SW
236 1/4° to 258 3/4°	WSW
258 3/4° to 281 1/4°	W
281 1/4° to 303 3/4°	WNW
303 3/4° to 326 1/4°	NW
326 1/4° to 348 3/4°	NNW



RECOMMENDED PROTECTIVE ACTIONS WORKSHEET

Designate areas and/or sectors with recommended protective actions symbols as follows:

S - Take shelter   F - Food, water and milk control   E - Evacuate

O - Other (specify) ____________________

Time ____________ Wind Direction ____________ (from) Wind Speed ____________

Completed by: ____________________ Reviewed by: ____________________ Emer. Coord./SSS/EDO/ERM

ATTACHMENT 2
SUPPLEMENTAL STATION STATUS CHECKLIST

NOTE

The intent of this attachment is to provide a uniform format for data transmission between state and company personnel knowledgeable in radiation dose assessment. Examples are: 1) New Jersey Bureau of Radiation Protection, 2) Delaware's Accident Assessment Advisory Group, 3) the Radiation Emergency Manager at the EOF, and 4) the Radiation Protection Engineer at the TSC.

Reactor and Unit No. ______________________________

Transmitted From TSC/EOF By: Name ____________________ Position: ____________

Time Of Reactor Shutdown: ______________________________

Time Of Release To Containment: ______________________________

Time of Release From Site: ______________________________

AIRBORNE RELEASES: Actual ____________________ Potential ____________

NOTE: RELEASE (ELEVATED OR GROUND LEVEL)

IODINES

ELEVATED RELEASE (Ci/sec)	GROUND LEVEL RELEASE (Ci/sec)

SPECIFY IF DATA IS AVAILABLE

I-131	________	________
I-132	________	________
I-133	________	________
I-134	________	________
I-135	________	________

NOBLE GASES

ELEVATED RELEASE (CI/sec)	GROUND LEVEL RELEASE (Ci/sec)

SPECIFY NUCLIDES IF AVAILABLE

Kr - 85	________	________
Kr - 85 m	________	________
Kr - 87	________	________
Kr - 88	________	________
Kr - 133	________	________
Kr - 133 m	________	________
Kr - 135	________	________
Kr - 135 m	________	________

PARTICULATE RELEASE: Actual ____________________ Potential ____________________

PARTICULATES

ELEVATED RELEASE (Ci/sec)		GROUND LEVEL RELEASE (Ci/sec)
I-131	________	________
Cs - 137	________	________
Sr - 89	________	________
Sr - 90	________	________
	________	________
	________	________
	________	________

ESTIMATE OF SURFACE RADIOACATIVE CONTAMINATION:

Location In-Plant Onsite Offsite	Radionuclide Composition	Activity $dpm/100cm^2$ Exposure Rate mR/Hr

Additional Remarks:

EXPOSURE/DOSE RATE MEASUREMENTS AND ESTIMATES:

Location	Sector (1 - 16)	Zones (0 - 10)	Exposure (R/hr)	Dose Rate (rem/hr)	Dose (Rem)	
					WB	Child Thyroid
Site Boundary						
Plume Centerline Peak						
2 Miles						
5 Miles						
10 Miles						

Other Locations: ______________________
(Describe)

____

____

____

____

____

____

*Measured ____________ Calculated ____________

ESTIMATED IMPACT TIMES:

AIRBORNE/PARTICULATE RELEASES

Location (Distance mi) (or description)	Sector	Zone(s)	Time To Impact: Hr Min (circle)

WATERBORNE RELEASES

Location (Distance Mi): Public Water Intake, Beach Private (circle)	Time To Impact: Hr Min (circle)

DOSE ASSESSMENT DATA

TIME												
PLANT VENT FLOW RATE (CPM)												
WIND SPEED (MPH) 300' ELEV												
WIND SPEED (MPH) 150' ELEV												
WIND DIRECTION (FROM) 300' ELEV												
WIND DIRECTION (FROM) 150' ELEV												
ΔTEMP (°C) 300'-33' ELEV												
ΔTEMP (°C) 150'33' ELEV												
STABILITY CLASS												
R 11A (CPM)												
R 12A (CPM)												
R 12B (CPM)												
R 43 mR/hr												
R 41A (CPM)												
R 41B (CPM)												
R 41B-H (CPM)												
R-41C (CPM)												
R 41C-H (CPM)												
R 45A (CPM)												
R 45B (CPM)												
R 45C (CPM)												
R 21 (R/hr)												
R 31 (CPM)												
CUMULATAVE CURIES RELEASED NOBLE GAS (IODINE)												

℄ PLUME DOSE RATES (millirem/hour)													
TIME OF MONITOR READING	TIME OF ARRIVAL AT RECEPTOR	MEA				LPZ				EPZ			
		WHOLE BODY		THYROID		WHOLE BODY		THYROID		WHOLE BODY		THYROID	
		PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED

℄ PLUME INTEGRATED DOSES (millirem)													
TIME OF MONITOR READING	TIME TO WHICH DOSE IS INTEGRATED	MEA				LPZ				EPZ			
		WHOLE BODY		THYROID		WHOLE BODY		THYROID		WHOLE BODY		THYROID	
		PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED	PROJECTED	MEASURED

DOSE CALCULATION SHEET
SNGS - UNIT ______

Monitoring Reading ______

PAGE ______ CALC. DATE ______ CALC. TIME ______

RELEASE RATE FROM RMS --uCi/sec--

Q Release Rate = [RMS] * [Sensit & Unit Constant] * [Release Flow Rate]

DISCHARGES FROM PLANT VENT

IODINE: If R41B is offscale use Att. 4 EP, IV-111

______ cpm/m R41B or R12B × ______ const (h) see note × ______ vent flow cfm = ______ uCi/sec (a)

NOBLE GAS: If R41C is offscale use R43 channel use Att. 3, EP IV-111 for I term (Remember to divide by I term) If R43 is offscale use Att. 4, EP IV-111

(______) cpm R41C or R12A (______) const (j) see note (______) vent flow cfm = ______ uCi/sec (b)

(______) mr/hr R43 ÷ (______) const (I) (______) vent flow cfm (4.72E2) = ______ uCi/sec (b)

DISCHARGES FROM ATMOSPHERIC RELIEF VALVES

LIST DELAY TIME: ______
Using Attach. 3 of EP IV-111
List mrem/hr / uCi/cc for this time ______ k

(______) mr/hr ÷ (______) k => ______ uCi/cc

Survey Inst.

(______) uCi/cc (3.3) (______) lb/hr = ______ uCi/sec (c)

USING CONTAINMENT MONITORS TO ESTIMATE OFFSITE DOSE FROM LEAKAGE. USE EP IV-111 Attachment #5.

______ R/hr R21 or R44A, B => ______ Base X/Q to yield 1R in 24 hrs. (d)

Note: For Unit 1 (j) = 2.25E-4; Unit 2 (j) = 1.42E-5
For Unit 1 (h) = 1.57E-7; Unit 2 (h) = 1.51E-7

Stop: Does the release rate seem reasonable? If chemistry can take a sample of the vent, compare their reported uCi/cc value with the first two terms above.

Discharges which on the average exceed 3600 Ci/hr 1Ci/s (noble gases) are cause for concern. Discharges which on the average exceed 7 uCi/sec (25 mCi/hr) of iodine are cause for concern.

ATMOSPHERIC DISPERSION AT LOCATION OF INTEREST ---sec/m³--- (See Att. 1)

Stability? = ______
Ground or Elevated? = ______

(Xu/Q)(2.22) / wind speed mph = X/Q

@ MEA (______)(2.22) / (______) = ______ (d)

@ LPZ (______)(2.22) / (______) = ______ (e)

@ EPZ (______)(2.22) / (______) = ______ (f)

@ ______ meters (______)(2.22) / (______) = ______ (g)

Xu/Q (E-6/m²) Ground			
°C/ @300-30 ft.	<-1.3 unstab	neut	>-0.5 stab
MEA	9.95	41.5	227
LPZ	0.42	2.5	33.3
EPZ	0.13	0.95	13.2

Xu/Q (E-6/m²) Elevated			
°C/ @300-30 ft.	<-1.3 unstab	neut	>-0.5 stab
MEA	12.4	42.2	*
LPZ	0.57	4.06	14.3
EPZ	0.179	1.49	13.0

Stop: If the wind speed (mph) and stability has not changed you may use the same values in subsequent calculations.

* 1.35E-12/m²

DOSE CONV. FACTOR DCF --mrem/hr-- / uCi/m³ (See Att. 2) => DOSE TO MAN AT THE LOCATION OF INTEREST

Iodine - Thyroid Dose Rate => H = Q * (X/Q) * (DCF)

@ MEA (______) uCi/sec (a) (______) sec/m³ (d) (______) DCF = ______ Dose Rate (mrem/hr)

@ LPZ (______) uCi/sec (a) (______) sec/m³ (e) (______) DCF = ______ Dose Rate @ t_1= ______

@ EPZ (______) uCi/sec (a) (______) sec/m³ (f) (______) DCF = ______ Dose Rate @ t_2= ______

@ ____ (______) uCi/sec (a) (______) sec/m³ (g) (______) DCF = ______ Dose Rate @ t_3= ______

Noble Gas - Whole Body Dose Rate => H = Q (X/Q) (DCF)

@ MEA (______) uCi/sec (b or c) (______) sec/m³ (d) (______) DCF = ______ Dose Rate (mrem/hr)

@ LPZ (______) uCi/sec (b) (______) sec/m³ (e) (______) DCF = ______ Dose Rate @ t_1= ______

@ EPZ (______) uCi/sec (b or c) (______) sec/m³ (f) (______) DCF = ______ Dose Rate @ t_2= ______

@ ____ (______) uCi/sec (b or c) (______) sec/m³ (g) (______) DCF = ______ Dose Rate @ t_3= ______

Whole Body Dose - Containment Leakage

@ MEA (______ (Base X/Q + ______ X/Q@MEA) (d)) = ______ REM in 24 hrs.

@ LPZ (______ (Base X/Q + ______ X/Q@LPZ) (e)) = ______ REM in 24 hrs.

@ EPZ (______ (Base X/Q + ______ X/Q@EPZ) (f)) = ______ REM in 24 hrs.

@ ____ (______ (Base X/Q + ______ X/Q@ ____) (g)) = ______ REM in 24 hrs.

Stop: If the whole body dose rate exceeds 0.5 rem/hr alert the REM. If the thyroid dose rate exceeds 7.5 rem/hr alert the REM. The doses calculated are future doses. List the arrival time for all calculations.

Arrival time (hrs)* t_1 = distance to location (miles) / (wind speed in mph)

$t_2 = 2t_1$

*multiply by 60 to get arrival time in minutes.

White - Dose Integrator; Canary - Status Board Attendant; Pink - State Communications; Goldenrod - Dose Calculator

NCA:srd

PSE&G FIELD SURVEY TEAM DATA
IODINE DOSE RATE CALCULATION

a) Sector and distance ________ b) Time of sample ____________

c) Field team name ____________ d) Instrument eff. (demical)* ________

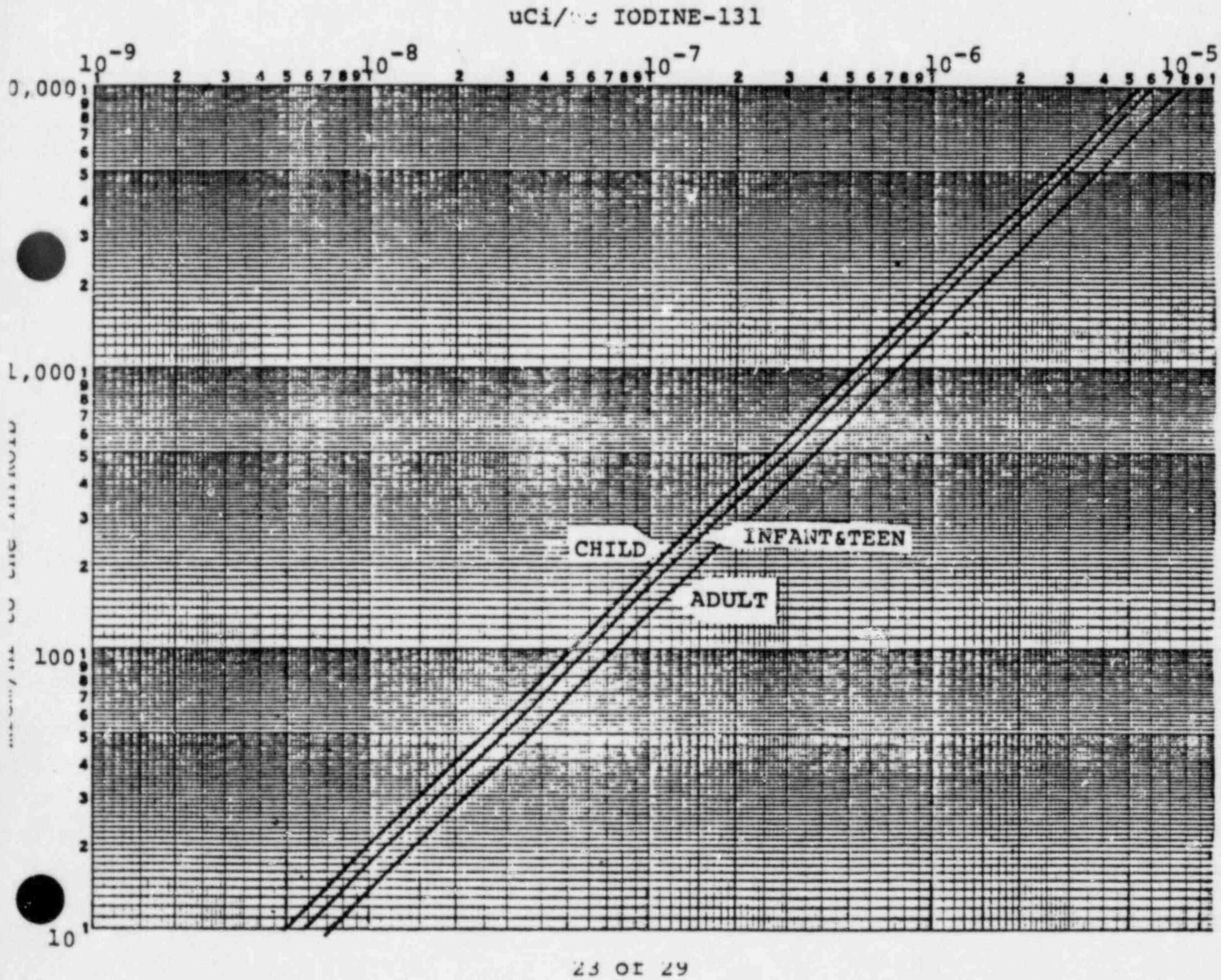
e) DPM above background ________ f) Sample volume (ft^3) ____________

g) (e) ÷ (f)x(1.6E-11)**x(1/eff)= ______________ uCi I-131/cc

h) Child thyroid dose rate from graph ________ mrem/hr

* Efficiency obtained from calibration sticker on instrument.
The default value for efficiency is 0.025 (1/eff = 40)

** 1.6E-11 = (4.50 E-7 uCi/dpm) x (3.53E-5 cubic feet/cc)



POST ACCIDENT RMS ASSESSMENT DATA

Salem Generating Station

Date_______________

Time_______________

Unit No. ___________

PLANT VENT FLOW RATE ______________ CFM

WIND SPEED	______ EL. 300	______ EL. 150
WIND DIRECTION (FROM)	______ EL. 300	______ EL. 150
Δt(°C)	______ (300'-33')	______ (150'-33')

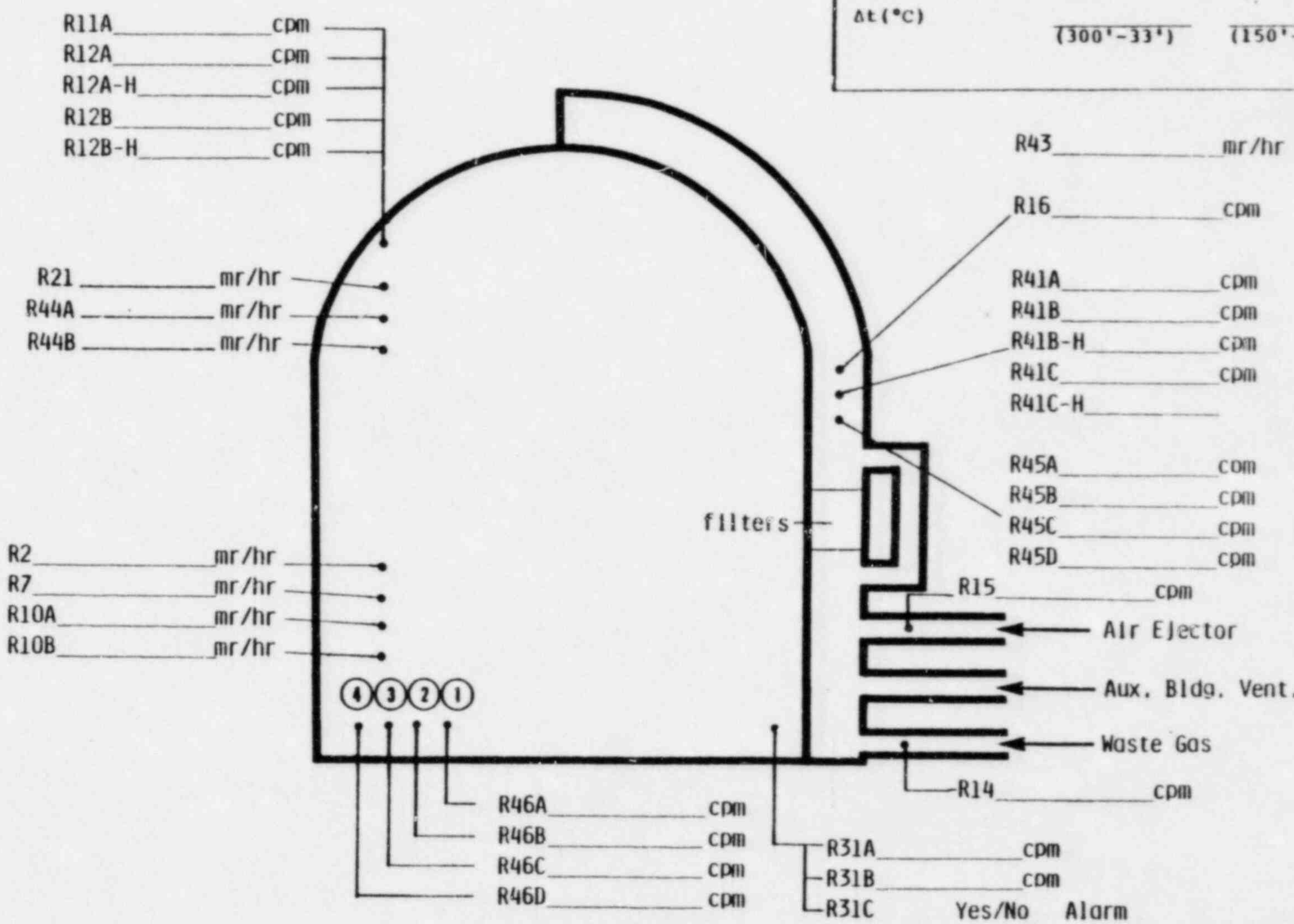
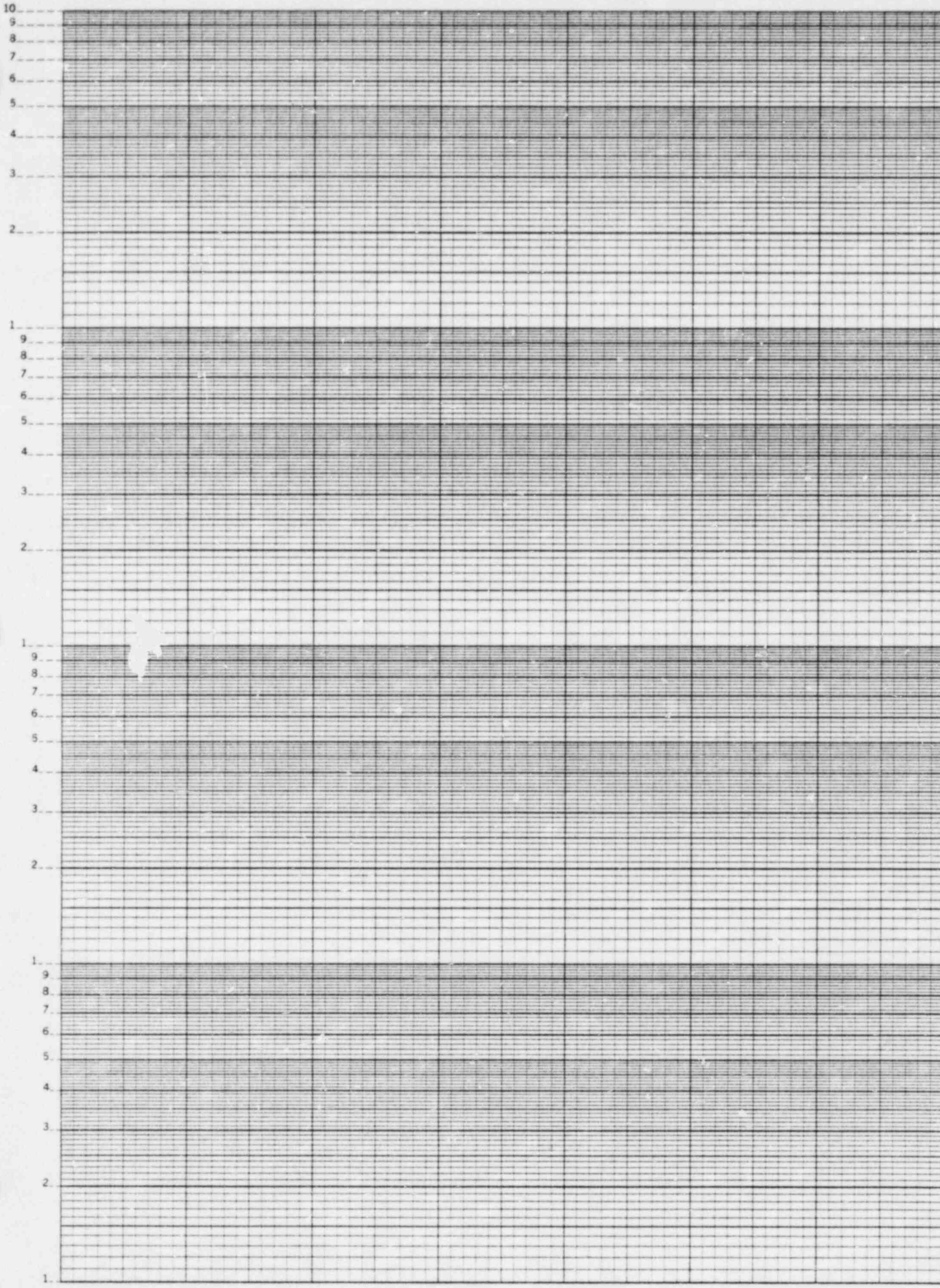


FIGURE 4

REV. 1



46 6010

K+E SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

OTHER AREA/PROCESS RMS DATA

AREA CHANNELS (mR/hr)

NAME		TIME
R1A	CONTROL ROOM	____
R3	RADIOCHEM LAB	____
R4	CHARGING PUMP AREA	____
R5	FUEL HANDLING BUILDING	____
R6A	SAMPLING ROOM	____
R9	FUEL HANDLING BUILDING	____
R20B	COUNTING ROOM	____
R23	CONTROL ROOM (PSE&G)	____
R34	MECHANICAL PEN (EL. 100)	____
R40	CONDENSATE FILTER	____
____	____	____
____	____	____
____	____	____
____	____	____

PROCESS CHANNELS (CPM)

R1B	CONTROL ROOM INTAKE DUCT	____
R19A	NO. 1 S.G. BLOWDOWN	____
R19B	NO. 2 S.G. BLOWDOWN	____
R19C	NO. 3 S.G. BLOWDOWN	____
R19D	NO. 4 S.G. BLOWDOWN	____
____	____	____
____	____	____
____	____	____
____	____	____

FIGURE 5

PSE&G/NJ/DELAWARE FIELD MONITORING DATA FORM

Time	Location	Team*	Whole Body Dose Rate (mR/hr)	Iodine Conc.**	Sample Type***	Thyroid Dose Rate (mrem/hr)
				________ net cpm ________ min ________ ft^3/min ---------------- ________ µCi/cc		
				________ net cpm ________ min ________ ft^3/min ---------------- ________ µCi/cc		
				________ net cpm ________ min ________ ft^3/min ---------------- ________ µCi/cc		
				________ net cpm ________ min ________ ft^3/min ---------------- ________ µCi/cc		
				________ net cpm ________ min ________ ft^3/min ---------------- ________ µCi/cc		

*List name for PSE&G teams, or state designation for New Jersey (NJ) or Delaware (D).

**Report net cpm, counting time, and flow rate.

***Particulate (P), Silver Zeolite (SZ), or Charcoal (C).

DOSE ASSESMENT DATA SHEET

DATE ________ UNIT__________ TIME OF READING_________

Plant Vent Flow Rate (CFM) ______________

Wind Speed (MPH) ________ or ________
EL-300' EL-150'

Wind Direction (FROM) ______ or ______
EL-300' EL-150'

Δ Temp (°C) ________ or ________
300'-33' 150'-33'

Release Level (circle one) Elevated / Ground

R11 A ________________ cpm

R12 A ________________ cpm

R12 B ________________ cpm ; ________ cpm @ ____
last reading time

R43 ________________ mR/hr

R41 A ________________ cpm

R41 B ________________ cpm ; ________ cpm @ ____
last reading time

R41 C ________________ cpm

R21 (Unit 2) ________________ R/hr

R44 (Unit 1) ________________ R/hr

R31 ________________ cpm

____

____

____

____

Steam Line _____
Survey Instrument________ mR/hr

Steam Release______________ lbs/hr
(Flow Rate)

*obtain cpm/min from CRT display if available (note cpm/min units)

SNGS OPERATIONAL STATUS BOARD - EMERGENCY

DATE/TIME OF UPDATE: ______________________ / ______________________
2400 HRS

UNIT NO. ______________________

I. PRIMARY COOLANT SYSTEM

a. Th - LOOP 1 ________ °F

b. Th - LOOP 2 ________ °F

c. Th - LOOP 3 ________ °F

d. Th - LOOP 4 ________ °F

e. T_{AVG} (AUCTIONEERED) ________ °F

f. PRZ. PRESS. ________ PSIG

g. PZR. LEVEL (HOT) ________ %

h. SUBCOOLING MARGINS

ΔP ________ PSIG

ΔT ________ °F

i. RCS FLOW

☐ FORCED ☐ NATURAL

j. RCP's IN SERVICE (CIRCLE)

1 2 3 4

k. RCS BORON ________ PPM

l. NEUTRON FLUX ________ CPS

II. SECONDARY COOLANT SYSTEM

a. NO. 1 S.G. LEVEL (WIDE) ________ %

b. NO. 2 S.G. LEVEL (WIDE) ________ %

c. NO. 3 S.G. LEVEL (WIDE) ________ %

d. NO. 4 S.G. LEVEL (WIDE) ________ %

e. NO. 1 S.G. PRESS. ________ PSIG

f. NO. 2 S.G. PRESS. ________ PSIG

g. NO. 3 S.G. PRESS. ________ PSIG

h. NO. 4 S.G. PRESS. ________ PSIG

i. NO. 1 S.G. FEED FLOW ________ %

j. NO. 2 S.G. FEED FLOW ________ %

k. NO. 3 S.G. FEED FLOW ________ %

l. NO. 4 S.G. FEED FLOW ________ %

III. CONTAINMENT INTEGRITY

a. CONT. PRESSURE ________ PSIG

b. CONT. TEMP (AVG) ________ °F

c. CONT. DEW POINT ________ °F

d. CONT. H_2 CONCEN. ________

e. CONT. ISOLATION STATUS

☐ ΦA ☐ ΦB

IV. SAFETY INJECTION SYSTEM

a. CENTRIFICAL CHRG. PUMP FLOW ________ GPM

b. S.I. PUMP FLOW ________ GPM

c. RHR PUMP FLOW ________ GPM

d. R.W.S.T. LEVEL ________ FEET

e. S.I. ACTUATION

☐ YES ________ ☐ NO ________
2400 HRS

V. C.V.C.S.

a. LETDOWN FLOW ________ GPM

b. CHARGING FLOW ________ GPM

VI. SIGNIFICANT PLANT EVENTS

ITEM	TIME

Figure 3

EMERGENCY PROCEDURE
EP IV-113
COMPUTERIZED DOSE CALCULATIONS

ACTION LEVEL

This procedure may be used in lieu of the manual dose calculation procedures.

RESPONSIBLE INDIVIDUAL

An individual familiar with the Nuclear Data 6620 system (normally the Shift RPT).

ACTION STATEMENTS

1. Contact the Control Room and obtain the necessary information for the respective unit. This information can be compiled onto the Dose Assessment Data Sheet (Attachment 3 of EP IV-112).

    WIND SPEED (mph)
    WIND DIRECTION (degrees, from)
    DELTA T (°C)
    ELEVATED OR GROUND RELEASE
    TIME FROM START OF INCIDENT (hrs)
    NOBLE GAS MONITOR (cpm) - Unit 1 (1R-12A);
    Unit 2 (2R-41C)
    HIGH RANGE GAS MONITOR (mr/hr) - R-43
    INITIAL cpm FROM IODINE MONITOR - Unit 1 (1R-12B);
    Unit 2 (2R-41B)
    FINAL cpm FROM IODINE MONITOR - Unit 1 (1R-12B);
    Unit 2 (2R-41B)
    TIME BETWEEN READINGS - (minutes)
    Unit 1 (1R-12B); Unit 2 (2R-41B)

ACTION STATEMENTS

2. Ensure a valid user is signed on the computer and that the Decwriter terminal settings are correct (these settings are listed on the acustic coupler used with the terminal).

   Dial

   Type in: WHO (return)

3. If the system indicates a user is signed on, proceed to Step 4. If the system response is "NO USER SIGNED ON"

   Type in: HEL 10 (return)

4. Type in: R BASIC (return)

5. Response: MIDAS BASIC VOL-01

   READY

   Type in: OLD (return)

6. Response: OLD FILE NAME - -

   Type in: DOSCAL.ALL (return)

7. Response: READY

   Type in: RUN (return)

ACTION STATEMENTS

8. Response:

ALL (TODAY'S DATE MIDAS BASIC V01-01)

THE FOLLOWING PROGRAMS ARE AVAILABLE TO YOU:

PROGRAM	PURPOSE
1	EFFLUENT DOSE CALCULATIONS
2	DOSE COMMITMENTS BASED ON WHOLE BODY COUNTS
3	I-131 EQUIVALENCE CALC-USING GELI ANALYSIS
4	DOSE COMMITMENTS BASED ON AIR SAMPLE DATA
5	UNMONITORED RELEASES FROM: POWER OPERATED RELIEF VALVES STEAM DRIVEN AUX FEED PUMP SAFETY RELIEFS
9	TO EXIT PROGRAM

Type in: 1 (FOR EFFLUENT DOSE CALCULATIONS)

There will be a pause of about 20 seconds.

9. Proceed to answer the questions with a carriage return (CR) after each entry. The answers below are examples, use actual values.

Response: ENTER YOUR NAME (EXAMPLE: J.R. DOE)
Type in: J. R. DOE (CR)

ACTION STATEMENTS

Response: ENTER THE CURRENT TIME OF DAY (EXAMPLE: 2230)

Type in: 2230 (CR)

Response: ENTER THE SALEM UNIT NUMBER (1 or 2)

Type in: 1 (CR)

Response: ENTER THE WIND SPEED IN MPH

Type in: 2 (CR)(IF UNKNOWN ENTER 5)

Response: ENTER THE WIND DIRECTION (IN DEGREES FROM)

Type in: 200 (CR)

Response: ENTER THE DELTA TEMP

Type in: 1 (CR) (IF UNKNOWN ENTER 1)

Response: ENTER 300 IF YOU'RE USING THE 300 FT. METER OR 150 FOR THE 150 FT. METER

Type in: 300 (CR)

Response: IS THE RELEASE FROM PLANT VENT (ELEVATED) OR FROM THE GROUND? ENTER E FOR ELEVATED OR G FOR GROUND

Type in: E (CR)

Response: ENTER THE PLANT VENT FLOW RATE IN CFM

Type in: 65000 (CR)(IF INOPERABLE USE 125,000)

Response: ENTER THE TIME IN HOURS SINCE SHUTDOWN

Type in: 2.5 (CR)

Response: NOTE:

ENTER THE CPM ON 1R-12A, IF OFF-SCALE OR INOP ENTER 0 (ZERO)(1)

IF YOU WISH TO USE THE VALUES FOR THE FIVE ACCIDENT CLASSES, ENTER 0 (ZERO) FOR THE REQUIRED METER READINGS:

Type in: 12000 (CR)

(1) 1R-12A for Unit 1, 2r41C will be requested for Unit 2.

ACTION STATEMENTS

NOTE: IF 0 (ZERO) ENTERED FOR 1R-12A or 2R-41C, A VALUE FOR R-43 (MR/HR) WILL BE REQUESTED. IF 0 (ZERO) ALSO ENTERED FOR R-43, THE DESCRIPTION AND DEFAULT VALUES FOR THE 5 ACCIDENT CATEGORIES WILL BE PRINTED OUT AND YOU MUST ENTER THE EQUIVALENT GASEOUS CPM FOR THE APPROPRIATE TYPE OF ACCIDENT.

Response: (For Unit 1)

ACCIDENT TYPE	EQUIVALENT CPM
1	2.42 E5
2	7.82 E2
3	1.25 E5
4	9.9 E4
5	1.42 E4

ENTER THE EQUIVALENT CPM/MIN FOR THE APPROPRIATE ACCIDENT CLASS:

Type in: (VALUE FOR APPROPRIATE ACCIDENT CLASS)(CR)

ACTION STATEMENTS

Response: ENTER THE INITIAL CPM FROM 1R-12B.
IF INOP OR OFF-SCALE ENTER 0 (ZERO)(2).
Type in: 10 (CR)
Response: ENTER THE CURRENT CPM ON 1R-12B(2)
Type in: 100 (CR)

NOTE: IF 0 (ZERO) IS ENTERED FOR THE INITIAL 1R-12B (IODINE MONITOR) THE DEFAULT VALUES BASED ON THE 5 ACCIDENT CATEGORIES WILL BE PRINTED OUT AND YOU MUST ENTER THE EQUIVALENT CPM/MIN FOR THE APPROPRIATE TYPE OF ACCIDENT.

Response: (For Unit 1)

ACCIDENT TYPE	EQUIVALENT CPM
1	9.35 E6
2	1.45 E5
3	NO RELEASE
4	1.22 E6
5	3.3 E6

ENTER THE EQUIVALENT CPM/MIN FOR THE APPROPRIATE ACCIDENT CLASS:

Type in: (VALUE FOR APPROPRIATE ACCIDENT CLASS)(CR)
Response: ENTER THE ELAPSED TIME (IN MINUTES) BETWEEN READINGS 1R-12B
Type in: 10 (CR)
Response: ARE YOUR ENTRIES CORRECT? (Y/N)
Type in: Y (CR)

(2) 1R-12B for Unit 1, 2R-4B will be requested for Unit 2

NTS

WILL BE A PAUSE OF ABOUT 20 SECONDS.

se: THE FOLLOWING CALCULATIONS ARE FOR
ASSUMING AN ELEVATED RELEASE:

: 12000 R-43: 0 VENT FLOW: 65000
: 1 INIT 1R-12B: 10 FINAL 1R-12B: 100
OR COLLECTION: 10

VENT MILES	WB DOSE IN MREM/HR	THY DOSE IN MREM/HR	MINS FOR PLUME TO TRAVEL DIST
310752	8.06881E-06	2.86314E-08	9.32256
621504	7.94761E-06	2.85648E-08	18.6451
78931	7.88217E-06	2.85292E-08	23.6793
932256	7.82642E-06	2.84989E-08	27.9677
24301	1.30989E-03	4.83372E-06	37.2902
55376	.0145613	5.44685E-05	46.6128
86451	.0591803	2.24459E-04	55.9354
17526	.142428	5.47889E-04	65.2579
48602	.255604	9.97538E-04	74.5805
79677	.38123	1.50988E-03	83.903
10752	.503816	2.02561E-03	93.2256
41827	.61369	2.50552E-03	102.548
72902	.705899	2.92752E-03	111.871
0397[illegible]	.778525	3.28086E-03	121.193
350[illegible]	.831791	3.56319E-03	130.516
66128	.869154	3.78608E-03	139.838
97203	.891379	3.94992E-03	149.161
	.89232	3.96026E-03	150
28278	.901681	4.06613E-03	158.484
59354	.90248	4.14329E-03	167.806
90429	.894874	4.18440E-03	177.12[illegible]

ACTION STATEMENTS

DISTANCE FROM VENT IN METERS	IN MILES	WB DOSE IN MREM/HR	THY DOSE IN MREM/HR	MINS FOR PLUME TO TRAVEL DIST
10000	6.21504	.881642	4.20066E-03	186.451
10500	6.52579	.863111	4.19223E-03	195.774
11000	6.83654	.841267	4.16746E-03	205.096
11500	7.1473	.816326	4.12645E-03	214.419
12000	7.45805	.789563	4.07475E-03	223.741
12500	7.7688	.761641	4.01513E-03	233.064
13000	8.07955	.733171	3.95036E-03	242.387
13500	8.3903	.703734	3.87775E-03	251.709
14000	8.70106	.6744	3.80275E-03	261.032
14500	9.01181	.654672	3.72809E-03	270.354
15000	9.32256	.616639	3.64835E-03	279.677
15500	9.63331	.58826	3.56895E-03	288.999
16000(3)	9.94407	.560967	3.49356E-03	298.322

THE MAXIMUM DOSE RATES ARE CALCULATED TO BE AT:

THYROID: 10000 METERS
WHOLE BODY: 9000 METERS

BASED ON YOUR INPUT THE PLUME IS CURRENTLY TRAVELING TOWARDS THE NORTH (OR 20 DEGREES) AT 2 MILES PER HOUR.

(3) This is approximately the EPZ.

ACTION STATEMENTS

THE CURRENT CURIE PER SECOND RELEASE RATES ARE:

IODINES: 9.18450E-08
GASEOUS: .1755

DATE OF CALCULATION: (TODAY'S DATE) TIME OF CALCULATION: 2230 DATA ENTERED BY: J.R. DOE

PLEASE WAIT 20 SECONDS . . . .

DO YOU WANT A PRINTOUT OF THE Y PLANE PLUME PARAMETERS? Y/N

Type in: Y (CR)

Response: PLUME PARAMETERS FOR 10% OF CENTERLINE DOSE

DISTANCE FROM SITE		DISTANCE FROM CENTERLINE		PLUME WIDTH
IN METERS	IN MILES	IN METERS	IN MILES	IN DEGREES
1000	.621504	253.999	.157861	28.4546
1270	.78931	306.055	.190214	27.0519
2000	1.24301	436.15	.271069	24.5617
3000	1.86451	598.393	.371904	22.5216
4000	2.48602	748.925	.46546	21.1726
5000	3.10752	891.31	.553953	20.1796
6000	3.72902	1027.52	.638608	19.4016
7000	4.35053	1158.8	.7202	18.7664
8000	4.97203	1286	.799256	18.2323
8045	5	1291.64	.802761	18.2102
9000	5.59354	1409.75	.876163	17.7735
10000	6.21504	1530.5	.951209	17.3725

ACTION STATEMENTS

DISTANCE FROM SITE IN METERS	IN MILES	DISTANCE FROM CENTERLINE IN METERS	IN MILES	PLUME WIDTH IN DEGREES
11000	6.83654	1648.61	1.02462	17.0174
12000	7.45805	1764.39	1.09657	16.6993
13000	8.07955	1878.05	1.16722	16.4118
14000	8.70106	1989.81	1.23668	16.15
15000	9.32256	2099.83	1.30505	15.9098
16000	9.94407	2208.24	1.37243	15.6883

11. The program will return to Step 8. You may run the program again.

12. To exit and terminate the program:

    Type in: 9 (CR)

    Response: DO YOU WISH TO EXIT THIS PROGRAM? (Y/N)

    Type in: Y (CR)

    BYE (CR)
    BYE 10 (CR)

    Response: SIGNED OFF

Prepared By: Revised by Jeffrey Kotsch / James Clancy

Reviewed By: James M. Bl[illegible] 9/10/82
Department Head Date

Reviewed By: Cheryl A Sakenas for 9-10-82
Nuclear Emergency Planning Engineer Date

Reviewed By: [illegible] 9/13/82
Station Quality Assurance Review Date
(if required see EP VI-2)

SORC Meeting No.: 82-86 J. Gallagher 9/23/82
Date

Approved By: [illegible] 9/23/82
General Manager - Salem Operations Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection Date

EMERGENCY PROCEDURE
EP IV-114
COMPUTERIZED DOSE CALCULATIONS ON PROGRAMMABLE CALCULATOR (TI-59)

ACTION LEVEL

This procedure may be used in lieu of the manual dose calculation procedures.

RESPONSIBLE INDIVIDUAL

An individual familiar with the Texas Instruments TI-59 programmable calculator (normally a Shift RPT or EOF assessment team member).

ACTION STATEMENTS

PART A
DOSE CALCULATIONS FOR PRE-SELECTED LOCATIONS
(MEA, LPZ, EPZ, OR 5.5 10, AND 13 Km LOCATIONS)

1. Contact the Control Room (or TSC) and obtain the necessary information for the respective unit. This information can be compiled onto the Dose Assessment Data sheet (Attachment 3, EP IV-112).

   WIND SPEED (mph)
   WIND DIRECTION (degrees, from)
   DELTA TEMPERATURE (ΔT, °C)
   TIME FROM START OF INCIDENT (hrs)
   NOBLE GAS MONITOR (cpm) - Unit 1 (1R-12A); Unit 2 (2R-41C)
   HIGH RANGE MONITOR (mR/hr) - R-43
   INITIAL READING FROM IODINE MONITOR (cpm) - Unit 1 (1R-12B); Unit 2 (2R-41B)
   FINAL (OR MOST RECENT) READING FROM IODINE MONITOR (cpm) - Unit 1 (1R-12B); Unit 2 (2R-41B)
   TIME BETWEEN READINGS ON IDOINE MONITOR (minutes) - Unit 1 (1R-12B); Unit 2 (2R-41B)

PART A (continued)

2. Prepare programmable calculator TI-59 for use:

   a) Lock TI-59 calculator securely into printer cradle (PC-100).
   b) Turn printer power on, then turn calculator power on.
   c) Select the Salem 1 or 2 (appropriate) MET-RMS-DOSE calculation cards (two cards - three sides) for the distances of interest (i.e., MEA, LPZ, EPZ or 5.5, 10 13 Km).
   d) Prior to card reading, press 3 Op (2nd tier) 17. (The number 719.29 should appear on display.) Then press CLR. Press CLR before reading any card side.
   e) Read all appropriate program card sides (cards are to be inserted into slot on right hand side of TI-59). This program is contained on three (3) sides of two (2) cards. If the calculator display blinks following the attempt to read the cards, the card has not been read. Press CLR and reinsert this card side until number designated of card side is shown on display without flashing.
   f) After reading all appropriate program cards, initialize calculator by pressing 2nd A.

3. RUN DATA ON PROGRAM (see example - Attachment 1).

   a) Enter wind direction from which the wind blows (degrees AZIMUTH), then press A.

NOTE

The direction the wind blows towards will also automatically printout.

PART A (continued)

b) Enter the wind speed (mph) then press R/S.

c) Enter station delta temperature (ΔT), then press R/S.

d) Select type of release, Press 0 for ground level release, or 1 for elevated release (plant vent), then press R/S.

NOTE

The calculator will now pause for 5 to 10 seconds and then print three numbers with exponents representing the X/Q values for the three program distances (i.e., MEA, LPZ, and EPZ).

e) Following this calculator printout, enter the plant vent flow rate in cubic feet per minute (cfm), then press B. (Default value for flow rate is 125,000 cfm).

f) Select type of data to be introduced: for low range vent monitors or FSAR Design Basis Accident (DBA), enter 0; for high range monitors, press 1, then press R/S.

g) If 0 (zero) is selected above enter the appropriate Noble Gas Monitor reading (cpm), or DBA cpm equivalent then press R/S; if 1 (one) is selected above, enter mR/hr reading from R-43 as actually read on the instrument, then press R/S. After the actual R-43 value is introduced then enter the R043 concentration conversion factor from Attchment 4 and press R/S. This entry is only required if the high range choice is made. DBA (design basis accident) classes and cpm equivalents are given in Attachment 5.

PART A (continued)

h) Enter the initial iodine monitor reading (cpm), or 0 for DBA cpm equivalent, then press R/S.

i) Enter the latest iodine monitor reading (cpm), then press R/S. If off-scale, use DBA default values - these defaults can be used with R-43 readings (see Attachment 5 for DBA default values).

j) Enter the amount of time lapse (delta time) between the iodine monitor reading time (t_0) and latest reading time (t_1) in minutes, then press R/S.

NOTE

For DBA default or zero readings use one (1) minute.

k) After calculator finishes printing (eight lines of numbers in exponential form taking 10 to 20 seconds), enter the appropriate Noble Gas Dose Rate Conversiion Factor (DRCF). See Attachment 2 for decay time versus factor graphic. After entering this factor, press C.

NOTE

The eight lines of output represent Noble Gas and iodine source terms and calculated concentrations (see Attachment 1).

l) Enter the appropriate Iodine Dose Rate Conversion Factor (see Attachment 3), then press R/S.

PART A (continued)

m) This completes the dose calculation program, (e.g., the dose rates for whole body and thyroid are printed out for the MEA, LPZ, and EPZ). To reinitialize calculator, press CLR, then press 2nd A. To sign off, press CLR and then turn off calculator first and then the printer.

NOTE

1. Because program enters only one decay time for the three distances from plant release, only one of the distances is decay corrected for the proper transient time using Attachments 2 and 3 for the Noble Gas and iodine dose conversion factors. For more accurate transient time input on other distances, rerun program with transient time for desired distance.

2. Be sure to partition (3 OP 17) before reading cards.

3. Be sure that all card sides are read properly.

4. Be sure to initialize calculator (2nd A) before data entry.

5. ALL KEYBOARD ENTRIES REQUIRE CLOSINC STATEMENT: THIS STATEMENT IS R/S for all entries except wind direction (press A), plant vent flow rate (follow with B), and the Noble Gas Dose Rate Conversion Factor (then press C).

ATTACHMENT 1
EXAMPLE PROBLEM FOR TI-59 CALCULATIONS

EXAMPLE

GIVEN: a) Meteorological data is as follows:
wind direction (from) = 230° at 300' Elevation
wind speed = 1 mph
T = 0.5°C

b) Unit 1 Containment monitor 1R12B reads 1500 cpm now.
Five minute ago, this monitor was reading 50 cpm.

c) Plant vent flow rate = 68,000 cfm

d) Monitor 1R-12A reads 500,000 cpm

d) Reactor has been shut down for two hours

SOLVE: a) What are the whole body and thyroid dose rates for the MEA, LPZ, EPZ distances of 5.5, 10 and 13 kilometers.

ANSWERS:

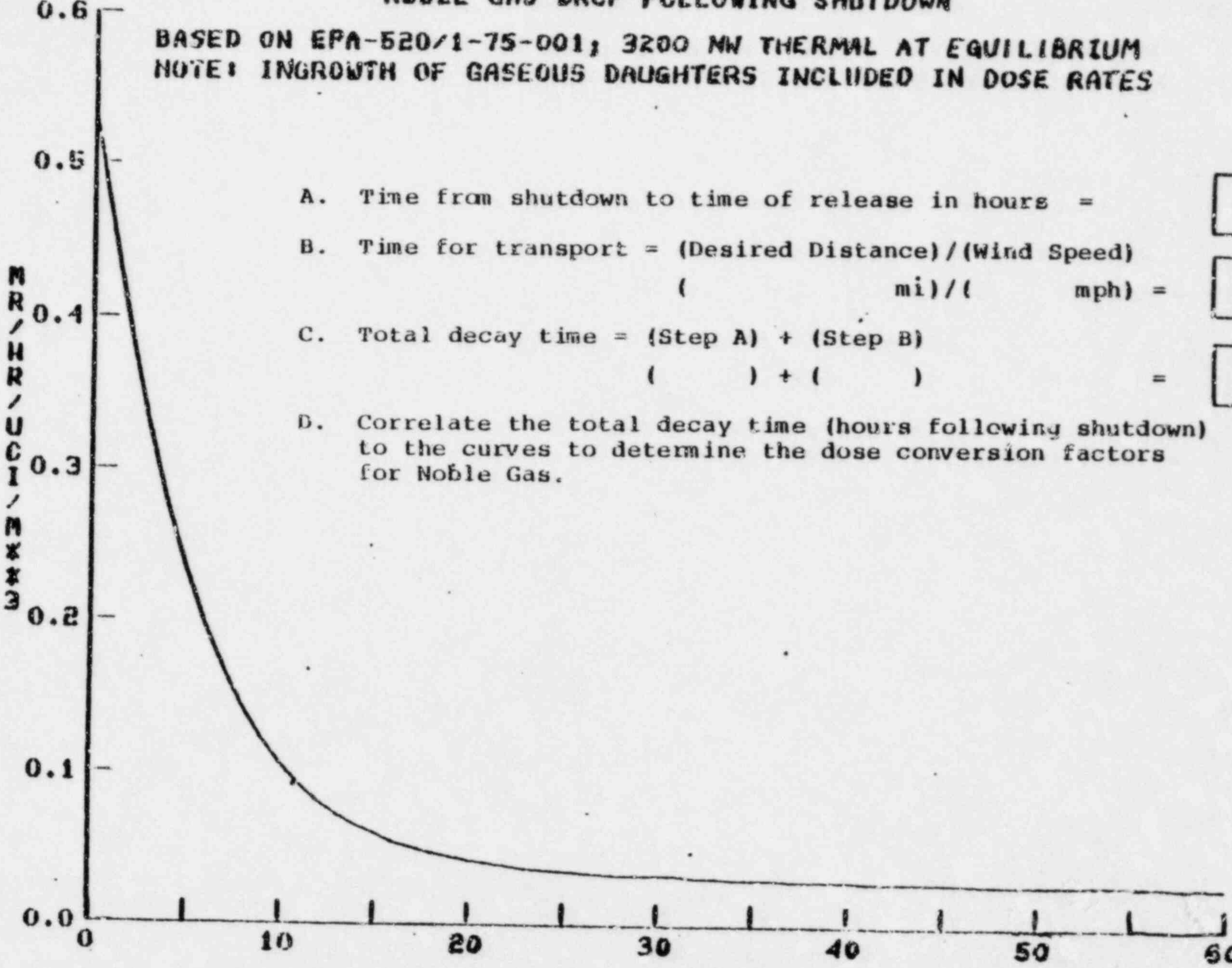
	(mrem/hr)	
DISTANCE	WHOLE BODY	THYROID
MEA km	288	0.805
LPZ 10km	27.8	0.077
EPZ 13km	10.2	0.028

PRINTOUT FOR EXAMPLE PROBLEM (TI-59)

INPUT Explanation	Press	TI-59 PRINTOUT	OUTPUT	UNITS Units
3a. wind direction (from)	A	230.		(°)
		50.	Wind direction (towards)	(°)
3b. wind speed	R/S	1.		(mph)
3c. Δ temperature	R/S	-0.5		(°C)
3d. elevated release	R/S	1.		
		9.4398712-05	MEA X/Q	(sec/m^3)
		9.0819613-06	LPZ X/Q	(sec/m^3)
		3.3330351-06	EPZ X/Q	(sec/m^3)
3e. station vent flow	B	68000.		(cfm)
		32096000.	Vent flow	(in cc/se
3f. low range monitor choice	R/S	0.		
3g. noble gas monitor	R/S	5.05		(cpm)
3h. initial iodine monitor readir	R/S	50.		(cpm)
3i. current iodine monitor reading	R/S	1500.		(cpm)
3j. delta time between iodine readings	R/S	5.		(minutes)
		7.638848 06	Noble Gas Source	(μCi/sec)
		3.0995107 00	Iodine Source Term	(μCi/sec)
		7.2109741 02	NG-MEA conc.	(μCi/m^3)
		6.9375722 01	NG-LPZ conc.	(μCi/m^3)
		2.5460548 01	NG-EPZ conc.	(μCi/m^3)
		2.9258982-04	I-MEA conc.	(μCi/m^3)
		2.8149637-05	I-LPZ conc.	(μCi/m^3)
		1.0330778-05	I-EPZ conc.	(μCi/m^3)
3k. dose rate conv. factor-Noble Gas (NG)	C	0.4		(-)
3l. dose rate conv. factor-iodine	R/S	2750.		(-)
		288.4389635	WB Dose Rate	(mrem/hr)
		27.7502889	WB Dose Rate	(mrem/hr)
		10.18421933	WB Dose Rate	(mrem/hr)
		.8046220004	Thyroid 5.5 Dose Rate	(mrem/hr)
		.0774115005	Thyroid 10 Dose Rate	(mrem/hr)
		.0284096394	Thyroid 13 Dose Rate	(mrem/hr)

NOBLE GAS DRCF FOLLOWING SHUTDOWN

BASED ON EPA-520/1-75-001; 3200 MW THERMAL AT EQUILIBRIUM
NOTE: INGROWTH OF GASEOUS DAUGHTERS INCLUDED IN DOSE RATES



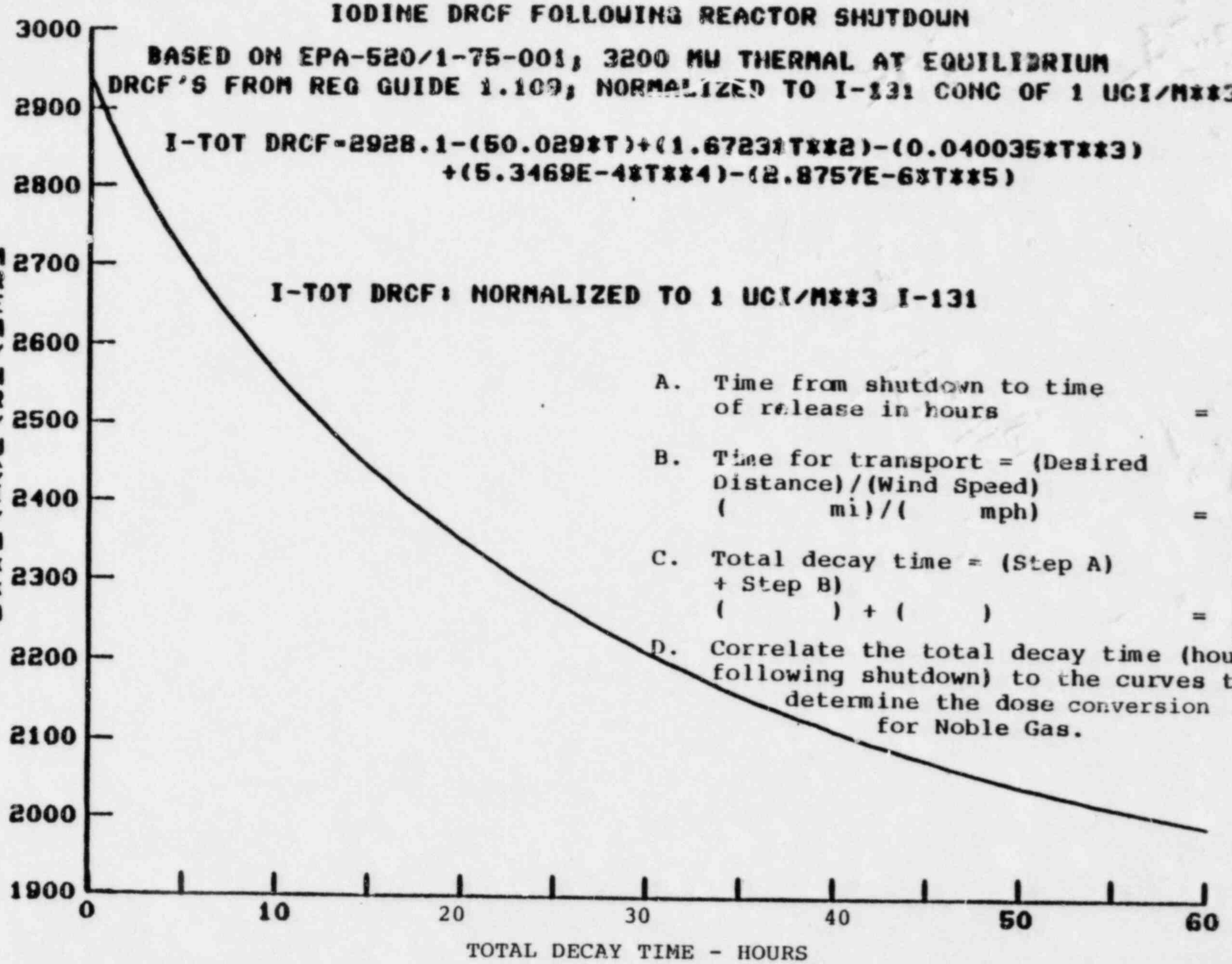
A. Time from shutdown to time of release in hours = [hr]

B. Time for transport = (Desired Distance)/(Wind Speed)
(mi)/(mph) = [hr]

C. Total decay time = (Step A) + (Step B)
( ) + ( ) = [hr]

D. Correlate the total decay time (hours following shutdown) to the curves to determine the dose conversion factors for Noble Gas.

Attachment 3



A. Time from shutdown to time of release in hours = [hr]

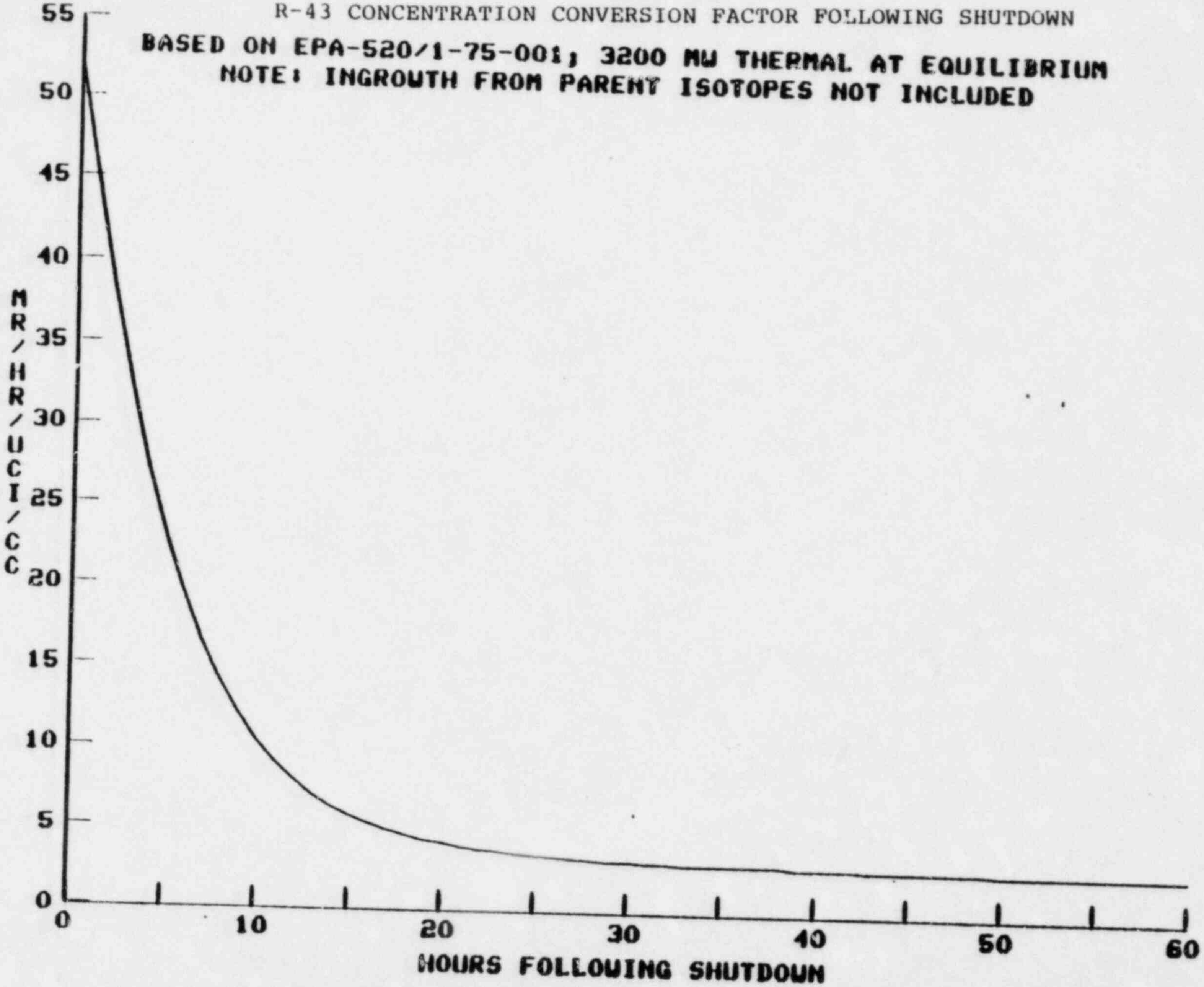
B. Time for transport = (Desired Distance)/(Wind Speed)
(mi)/(mph) = [hr]

C. Total decay time = (Step A) + Step B)
( ) + ( ) = [hr]

D. Correlate the total decay time (hours following shutdown) to the curves to determine the dose conversion factors for Noble Gas.

Attachment 4

R-43 CONCENTRATION CONVERSION FACTOR FOLLOWING SHUTDOWN



ATTACHMENT 5
DEFAULT VALUES FOR LOW/HIGH PLANT VENT MONITORS

Read the below accident description and determine which case is applicable. From the table select the appropriate release rates (cpm).

CASE I LOCA

A LOCA assuming severe core damage - fuel melting (Regulatory Guide 1.4 assumptions) 100% of Noble Gases and 25% of the iodines contained in the core are assumed released to the containment. The containment initially leaks at the maximum design leak rate.

CASE II LOCA

Primary coolant leaks at a rate fast enough to increase the temperature of the core to the point where there is damage to the fuel rods. For this case, it is assumed that all the gap activity (the gases contained between the fuel and fuel rod) is released to the containment. The containent is assumed to initially leak at the maximum design leak rate. In this accident, it is up to the Senior Shift Supervisor or Emergency Duty Officer (EDO) to assume that there has been no fuel melting. If there is any question, a Case I LOCA should be assumed.

CASE III DECAY TANK RUPTURE

This procedure is used only if actual radiological monitoring equipment is unavailable for release evaluation (monitors out of service, read off scale, etc.).

CASE IV FUEL HANDLING ACCIDENT

Any activity occurring as a result of a fuel handling accident is normally drawn into the Fuel Handling Building Ventilation System and vented to the plant vent for release. The process monitors are used to monitor these releases; however, should these monitors be out of service or off scale, this technique is used to evaluate off-site dose.

CASE V STEAM GENERATOR TUBE RUPTURE

The activity released during a minor tube rupture can be determined using vent monitors and normal procedures. This procedure addresses the steam generator tube rupture as analyzed in the FSAR. This accident is set apart from others because of the inability to consult radiation monitors to determine the activity release rate. Therefore, this is the primary procedure to determine the activity release rate resulting from a system generator tube rupture.

ACCIDENT CLASS	EQUIVALENT NOBLE GAS RELEASE RATE CPM		EQUIVALENT IODINE ACTIVITY INCREASE RATE (CPM/MIN)	
	Unit 1	Unit 2	Unit 1	Unit 2
I(1)	2.42 E^5	4.34 E^6	9.35 E^6	9.73 E^6
II(1)	7.82 E^2	1.40 E^4	1.45 E^5	1.51 E^5
III(1)	1.25 E^5	2.24 E^6	NO RELEASE	NO RELEASE
IV(1)	9.9 E^4	1.78 E^6	1.22 E^6	1.27 E^6
V(2)	1.42 E^4	2.54 E^5	3.3 E^6	3.50 E^6

(1) Use actual or estimated plant vent flow (cfm) as provided in the procedure.

(2) Case V is assumed not to be released through the plant vent so use a flow of 125,000 cfm for this calculation.

PART B

DOSE CALCULATIONS BASED ON RELEASE RATE OR FIELD MEASUREMENT (OPTIONAL) FOR ANY LOCATION

1. Contact the Control Room or TSC or EOF field team coordinator. Obtain the necessary information form the respective unit.

   a. Noble Gas Release Rate in Curies per second (can be calculated from RMS data using Part A of this procedure).
   b. Wind speed in miles per hour (mph), direction and stability class.

2. Based on the time since shutdown and the plant conditions affecting the release, determine the Noble Gas and iodine dose rate conversion factors (DRCF) from Attachments 6 and 7, and estimate the duration of exposure.

3. Prepare programmable calculator TI-59 for use:

   a. Lock TI-59 Calculator into printer cradle (PC-100).
   b. Turn printer on, then calculator power on.
   c. Select the Release Rate Dose Calculation Cards (two cards - three sides).
   d. Prior to card reading, partition the TI-59 by pressing 3 Op (2nd tier) 17. (The number 719.29 should appear on display.) Then press CLR. Press CLR before reading any card side.
   e. Read all three sides from the two program cards. If the calculator display blinks following the attempt to read the card side, the card side has not been read. Press CLR and reinsert this card side until number designation of card side is shown on display without flashing.

PART B (continued)

f. After reading all three (3) card sides, initialize calculator by pressing 2nd A.

4. Data Entry

a. Enter distance in miles for which dose rates and dose commitments are desired and press A (e.g., if dose calculations for a location 10 miles from the station are desired, press 10 A).
b. Enter appropriate Xu/Q (Attachment 11), then press B (program code inserts exponent of 10^{-6}; if Xu/Q = 6.1 x 10^{-6}, then simply enter 6.1).
c. Enter Noble Gas release rate (Qn) in Curies/second (Ci/sec), then press C.
d. Enter Iodine release rate (Qi) in Ci/sec then press D.
e. Enter wind speed in miles per hour (mph), then press E.
f. If available, enter field measured iodine concentration (XI) in Ci/m^3 (same as (uCi/cc), then press A' (press 2nd A).
g. If available, enter field measured whole body dose rate in R/hr, then press B' (press 2nd B). If not available enter zero, then press 2nd A.
h. Enter estimated duration of release in hours and minutes with decimal point, then press C' (press 2nd C).
i. Divide value of DRCF for Iodine from Attachment 7 by 1000 to correct to appropriate units (rem-m^3/Ci/hr, and enter this value, then press D' (press 2nd D).
j. Multiply value of DRCF for Noble Gas from Attachment 6 by 10 to correct to appropriate units (rem-m^3/Ci/hr), and enter this value, then press E' (2nd E).

PART B (continued)

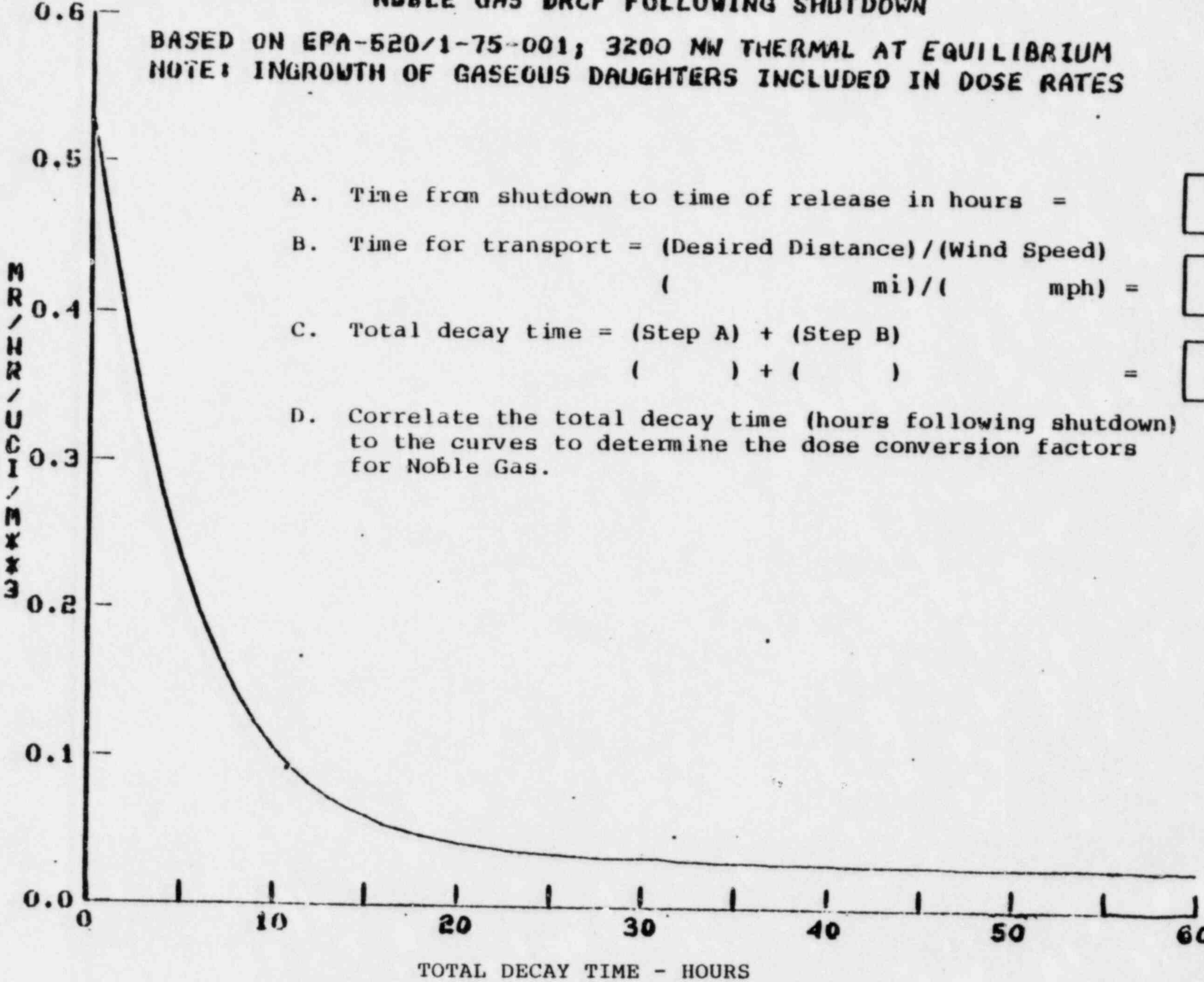
5. Running Program

   a. Press R/S and program will run.
   b. Example printout is shown on Attachment 8. Initial data entries should first be logged on data log sheet (Attachment 9). Results should be logged onto calculation sheet (Attachment 10).

Attachment 6

NOBLE GAS DRCF FOLLOWING SHUTDOWN

BASED ON EPA-520/1-75-001; 3200 MW THERMAL AT EQUILIBRIUM
NOTE: INGROWTH OF GASEOUS DAUGHTERS INCLUDED IN DOSE RATES



MULTIPLY THIS NUMBER BY 10 FOR PART (B)

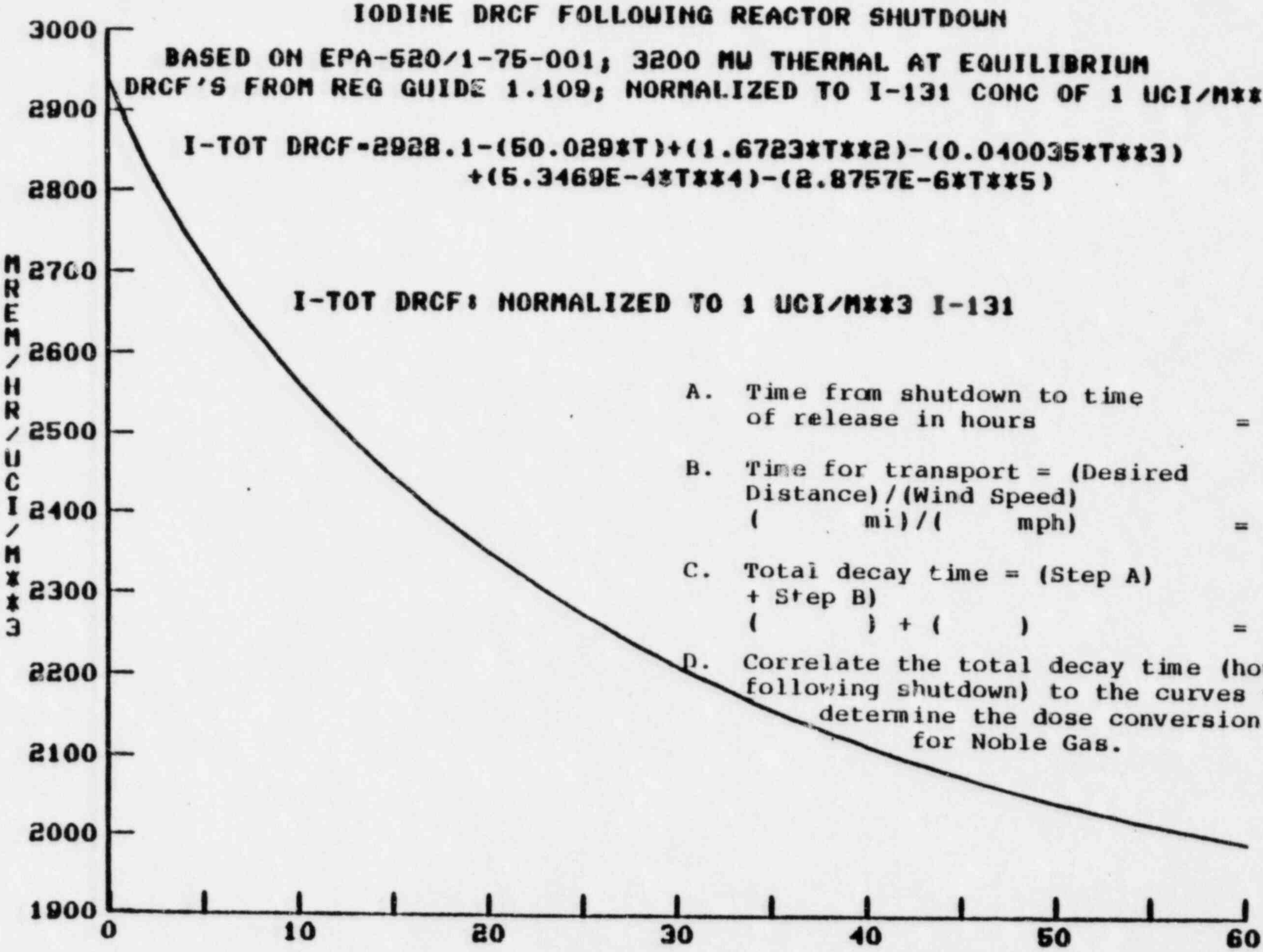
A. Time from shutdown to time of release in hours = [hr]

B. Time for transport = (Desired Distance)/(Wind Speed)
(mi)/(mph) = [hr]

C. Total decay time = (Step A) + (Step B)
( ) + ( ) = [hr]

D. Correlate the total decay time (hours following shutdown) to the curves to determine the dose conversion factors for Noble Gas.

Attachment 7



DIVIDE THIS NUMBER BY 1000 FOR PART (B)

A. Time from shutdown to time of release in hours = [hr]

B. Time for transport = (Desired Distance)/(Wind Speed) (mi)/(mph) = [hr]

C. Total decay time = (Step A) + Step B) ( ) + ( ) = [hr]

D. Correlate the total decay time (hours following shutdown) to the curves to determine the dose conversion factors for Noble Gas.

ATTACHMENT 8
EXAMPLE PRINTOUT OF DOSE CALCULATIONS BASED ON RELEASE RATE

	TIME	
Distance from Site (miles)	3.00 00	A1
Distance from Site (meters)	4.83 03	A2
X_u/Q ($1/M^2 \times 10^{-6}$)	3.20 00	B
Wind speed (u) in meters/second	2.25 00	C
Plume Travel Time (ETA) hrs. min.	360.00-03	D
Dispersion X/Q ($1/m^2$)	1.42-06	E
Iodine Release Rate (Ci/sec)	1.20 00	F1
Noble Gas Release Rate (Ci/sec)	100.00 00	F2
Dispersion Model Projected Iodine Concentration at distance A	1.71-06	G1
Dispersion Model Projected Noble Gas Concentration at distance A	142.22-06	G2
Measured Iodine concentrations (if any) (uCi/cc)	0.00 00	G'1
Measured Noble Gas Exposure Rate (R/hr) (if any)	0.00 00	G'2
Dose Rate Conversion Factor-Iodine (rem-m^3/Ci-hr)	5.60 00	H1
Dose Rate Conversion Factor-Noble Gas (rem-m^3/Ci-hr)	3.30 00	H2
Calculated Thyroid Dose Rate-Model	9.56 00	I1
Calculated Whole Body Dose Rate-Model	46.93-03	I2
Thyroid Dose Rate-Field Data (if any)	0.00 00	I'1
Whole Body Dose Rate-Field Data (if any)	0.00 00	I'2
Estimated Duration of release (hrs.min.) (3.30 = 3 hours, 30 minutes)	3.30 00	J
Calculated Thyroid Dose Commitment-Model	33.45 00	K1
Calculated WB Dose Commitment-Model	164.27-03	K2
Thyroid Dose Commitment-Field Data	0.00 00	K'1
Whole Body Dose Commitment-Field Data	0.00 00	K'2

	INPUT CHECK	
Distance in miles	3.00 00	A
$X_u/Q \times 10^{-6}$	3.20 00	B
Noble Gas Release Rate (Ci/sec)	100.00 00	C
Iodine Release Rate (Ci/sec)	1.20 00	D
Wind Speed in mph	5.00 00	E
Measured Iodine Field Conc. (if any)	0.00 00	A'
Measured Field Exposure Rate (if any)	0.00 00	B'
Estimated Duration of Release (hrs/min)	3.30 00	C'
Iodine DRCF $\times 10^6$ (rem-m^3/Ci-hr)	5.60 00	D'
Noble Gas DRCF $\times 10^2$ (rem-m^3/Ci-hr)	3.30 00	E'

ATTACHMENT 9
PROGRAM DATA FORM RELEASE RATE DOSE CALCULATION

TIME OF DATA 24 HOUR CLOCK	(A) DISTANCE FROM SITE (MILES)	(B) Xu/Q* x 10^{-6}	(C) NOBLE GAS RELEASE RATE (Ci/sec)	(D) IODINE RELEASE RATE (Ci/sec)	(E) WIND SPEED (mph)	(A') MEASURED** FIELD IODINE CONCENTRATION (µCi/cc)	(B') MEASURED** FIELD EXPOSURE RATE (R/hr)	(C') ESTIMATED DURATION OF RELEASE (hrs/min)	(D') IODINE*** DRCF x 10^6 (rem-m^3/Ci hr)	(E') NOBLE*** GAS DRCF x 10^2 (rem-m^3-Ci hr)

INITIALS ____________________

NOTES: *Taken from Attachament 11
**If available
***Taken from Attachments 6 and 7

ATTACHMENT 10
CALCULATION SHEET FOR ABSORBED DOSE RATES AND DOSE COMMITMENTS
(AIRBORNE RELEASES)

DATE ___________ TIME ___________ (24 HR CLOCK)

PREPARED BY ____________________

A DISTANCE FROM SITE A1 MILES A2 METERS	D PLUME TRAVEL TIME T (hr.min) ETA	G CALCULATED ATMOSPHERIC CONCENTRATION X (Ci/m3)	G' MEASURED ATMOSPHERIC CONCENTRATION (Ci/m3) / NOBLE GAS EXPOSURE RATE (R/hr)	I CALCULATED DOSE RATE FROM DISPERSION MODEL (rem/hr) **	I' DOSE RATE BASED ON FIELD MEASUREMENT (rem/hr) **	K CALCULATED DOSE COMMITMENT FROM DISPERSION MODEL (rem)**	K' DOSE COMMITMENT BASED ON FIELD MEASUREMENT (rem)**
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2
A1		G1	G'1	I1	I'1	K1	K'1
A2		G2	G'2 R/hr	I2	I'2	K2	K'2

NOTE: THE TOTAL DECAY TIME IS THE SUM OF THE TIME FROM REACTOR SHUTDOWN UNTIL THE TIME OF PLUME ARRIVAL. NO CREDIT WILL BE TAKEN FOR I DEPLETION FROM THE PLUME OR DECAY IN TRANSIENT.

LETTERS CORRESPOND TO LETTERS IN OUTPUT OF PROGRAM

*NUMBER FOLLOWING LETTER IS INTERPRETED AS FOLLOWS: 1 (ONE) = IODINE; 2 (TWO) = NOBLE GAS

**NUMBER FOLLOWING LETTER IS INTERPRETED AS FOLLOWS: 1 (ONE) = THYROID; 2 (TWO) = WHOLE BODY

ATTACHMENT 11
Xu/O VALUE DETERMINATION

Select the Xu/O values that correspond to the stability class as determined by the Δ temperature, distance from the site and the release point (ground or elevated).

1. USE THE Δ TEMPERATURE VALUE FROM THE METEOROLOGICAL TOWER TO DETERMINE STABILITY CLASS.

Primary Instrument

300 ft. - 33 ft. temperature (°C)

UNSTABLE | NEUTRAL | STABLE

-1.3 -0.5

NOTE

UNSTABLE IS ≤ -1.3°C

NEUTRAL IS > -1.3°C ≤ -0.5°C

STABLE IS > -0.5°C

Backup Instrument

150 ft. - 33 ft. temperature (°C)

UNSTABLE | NEUTRAL | STABLE

-0.6 -0.2

NOTE

UNSTABLE IS ≤ -0.6°C

NEUTRAL IS > -0.6 ≤ -0.2°C

STABLE IS > -0.2°C

2.

DISTANCE		GROUND LEVEL RELEASE ($E-6/m^2$)			ELEVATED LEVEL RELEASE ($E-6/m^2$)		
METERS	MILES	UNSTABLE	NEUTRAL	STABLE	UNSTABLE	NEUTRAL	STABLE
1000	0.62	15	61.39	244.8	18.28	45.1	*
1270 MEA	0.79	9.95	41.5	227	12.4	42.2	**
2000	1.2	4.64	22.49	168.0	6.13	27.99	.017
3000	1.9	2.32	12.20	113.3	3.12	17.26	.793
4000	2.5	1.42	7.86	81.7	1.92	11.72	3.54
5000	3.1	.968	5.58	62.3	1.31	8.55	7.22
6000	3.7	.708	4.21	49.5	.963	6.56	10.48
7000	4.4	.543	3.32	40.5	.740	5.23	12.81
8000	4.9	.432	2.70	34.0	.589	4.28	14.26
8045 LPZ	5.0	.42	2.5	33.3	.57	4.06	14.3
9000	5.6	.353	2.25	29.0	.481	3.50	15.02
10000	6.2	.294	1.91	25.2	.402	3.06	15.29
11000	6.8	.250	1.65	22.1	.341	2.65	15.23
12000	7.5	.215	1.44	19.6	.294	2.32	14.95
13000	8.1	.187	1.27	17.6	.256	2.05	14.55
14000	8.7	.165	1.13	15.9	.225	1.83	14.06
15000	9.3	.146	1.02	14.4	.200	1.65	13.54
16000 EPZ	9.9	.131	.952	13.2	.179	1.49	13.01

MEA - Minimum Exclusion Area

LPZ - Low Population Zone

EPZ - Emergency Planning Zone

*Value of Xμ/O for 1000 meters distance = $5.33E-16/m^2$

**Value of Xμ/O for 1270 meters distance = $1.35E-12/m^2$

Distance______ Xμ/O = _______ $E-6/m^2$ (ground)   Xμ/O = _______ $E-6/m^2$ (elevated)

NOTE: Other locations EP IV-11 1

Prepared By: James Clancy

Reviewed By: J M O'Connor 9/10/82
Department Head — Date

Reviewed By: Cheryl A. Erkenas 9-10-82
Nuclear Emergency Planning Engineer — Date

Reviewed By: Bruce W. Lea 9/13/82
Station Quality Assurance Review — Date
(if required see SP VI-2)

SORC Meeting No.: 82-86 J. Gallagher 9/23/82
Date

Approved By: H. J. Midura 9/23/82
General Manager - Salem Operations — Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection — Date

EMERGENCY PROCEDURE
EP IV-118
HIGH ACTIVITY SAMPLE ANALYSIS

ACTION LEVEL

Any requirement to analyze a sample which has an exposure rate of 20 mR/hr at a distance of 8 inches. (Refer to EP IV-301 or EP IV-302, as appropriate.)

RESPONSIBLE INDIVIDUAL

A Technical Supervisor of Radiation Protection or Chemistry shall be responsible for implementing this procedure.

LIMITS ON AUTHORITY

Prior to proceeding with high activity sample analysis, dose estimates shall be evaluated. Approval of the Senior Shift Supervisor/EDO is required prior to analysis of any samples that may result in exposures in excess of 10CFR20. 101 limits.

ACTION STATEMENTS

1. Evaluate the analysis request for relative priority. If a result is not essential, consider its postponement until backup instrumentation arrives.

2. Notify the Chemistry or Radiation Protection Counting Rooms that a high activity sample is to be analyzed.

ACTION STATEMENTS (continued)

NOTE

Normally, the Chemistry Counting Room would be designated the "hot" lab. In the event of an accident, the Radiation Protection Counting Room is more likely to retain a low background. Inform requestors where to deliver samples. A separate procedure shall be used for sample collection and handling until it is delivered to the appropriate counting facility.

3. Determine sample quantities awaiting analysis and consider establishing relative priorities for each before the backlog gets excessive. Samples and data for evaluating Protective Action Guides should get the highest priority.

4. Ensure designated counting lab is prepared for sample arrival and don protective clothing, which, at a minimum, shall consist of lab coat and either one pair of rubber or two pairs of Latex (Surgeon's) gloves.

5. Ensure extremity TLD's are properly worn as required by REP instructions.

6. On receipt, survey the sample (preferably with a Teletector) and store in lead pigs, if available, apart from occupied areas, for exposure reduction.

ACTION STATEMENTS (continued)

7. Record survey data on Attachment 1 and calculate dose estimates for extremity using contact gamma dose rate and use general area radiation levels for whole body estimates. When calculating dose estimates, approximate times for sample analysis are fifteen (15) minutes for the first sample and six (6) minutes for successive samples. Calculate dose estimates on Attachment 1.

8. Handle all samples with tongs or tweezers.

9. Continue monitoring background radiation levels for marked increases.

10. Continue to monitor your exposure. Use pocket dosimeters and calculations and continue updating exposure status. If doses exceed or are likely to exceed previous determined limits contact the Dose Assessment/ALARA Supervisor (located at the TSC, ext. 3309, 3310).

11. Sample Reduction (to obtain samples of 20 mR/hr at 8 inches for GeLi Analysis):

ACTION STATEMENTS (continued)

a) Divide 20 mR/hr by the gamma dose rate at 8 inches to get reduction factors, e.g.,

$$\frac{20 \text{ mR/hr}}{500 \text{ mR/hr}} = \frac{1}{25}$$

and multiply the sample weight by the reduction factor to get maximum desirable portion of sample. For example, if the above sample weight is 50 grams,

$$\frac{1}{25} \times 50 \text{ grams} = 2 \text{ grams}$$

you will have to use no more than 2 grams of the sample for ultimate counting. This ensures dead time losses of less than 10% for samples counted at 8" from the detector.

b) Iodine Filters

Work in vented, filtered hood. Place clean paper on scale for each weighing operation. Determine desired fraction and weight of portion of original sample and separate from balance of filter contents. Remove a similar amount of sample media in a plastic bag. To this bag, add the portion of the sample, twist and seal, and shake. Return contents to (or place bag and contents into) an unused

ACTION STATEMENTS (continued)

container and tape. Discard remaining sample media and conister into radioactive waste. What remains is a diluted sample in identical geometry to the original. Seal in bag or saran wrap. Proceed with standard laboratory counting methods and ensure you account for lost counts from sample reduction and dead time.

c. Particulate Filter

Work in a vented, filtered hood. Place clean paper on scale for each weighing operation. Determine what portion of the sample is to be used as per section "a" and cut out a slice (like a pie slice). Seal in plastic bag or saran wrap and count. Proceed with standard laboratory methods and ensure that you account for lost counts from sample reduction and dead time.

12. Lead filters of various thicknesses may be used in lieu of sample reduction to reduce the instrument dead time to an acceptable level (>10%).

13. Wrap sample in clean saran wrap or equivalent for storage. If sample is to be saved it must be properly identified and a log kept of sample information.

ACTION STATEMENTS (continued)

NOTE

Samples should be stored in a suitable area which will not cause significant change to background radiation levels. If sample causes a high radiation area to be formed in the immediate area then a storage facility should be used which is capable of being locked. (Possible storage rooms would include the Source Room - 100' El. Service Building or Gamma Calibrator Room - 100' El. Auxiliary Building.)

14. Report results to requetor and the Dose Assessment/ALARA Supervisor.

15. Keep track of your exposure.

16. Monitor lab for contamination and airborne radioactivity. Decon as necessary.

ATTACHMENTS

Dose Assessment/Sample Size Reduction Worksheet

COMMUNICATIONS NETWORK

Dose Assessment/ALARA Supervisor (TSC)	Chemistry Lab	Radiation Protection Lab
3309 3310	3060	3209

NOTE

Forward all completed forms to the Nuclear Emergency Planning Engineer. Attach other completed EP's or attachments used.

Prepared By: Revised by James Clancy

Reviewed By: [signature] 9/13/82
Department Head Date

Reviewed By: Charles A Bunge for
Nuclear Emergency Planning Engineer Date

Reviewed By: [signature] 9/13/82
Station Quality Assurance Review Date
(if required see EP VI-2)

SORC Meeting No.: 82-86 [signature] 9/23/82
Date

Approved By: [signature] 9/23/82
General Manager - Salem Operations Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection Date

ATTACHMENT 1
DOSE EVALUATION AND SAMPLE SIZE REDUCTION WORKSHEET

1. DATE ______________________ TIME ______________________

2. SAMPLE INFO: (a) LOCATION ______________________

(b) LOCATION ______________________

(c) LOCATION ______________________

(d) LOCATION ______________________

(e) LOCATION ______________________

3. PREVIOUS EXPOSURE DATA

NAME/SS#	QUARTER TO DATE WHOLE BODY	QUARTER TO DATE EXTREMITY
a.		
b.		
c.		
d.		

4. Use a dose limit of 1000 mrem whole body or 10,000 mrem extremity. If you anticipate exceeding these, contact the Dose Assessment/ ALARA Supervisor at the TSC. If you anticipate exceeding 1500 mrem whole body or 15,000 mrem extremity, obtain permission of the Dose Assessment/ALARA Supervisor and the Senior Shift Supervisor/EDO.

5. Estimate time required to get results (e.g., 15 minutes for first sample, 6 minutes for each successive one) and dose:

SAMPLE	GENERAL AREA MR/HR X TIME = W/B DOSE	CONTACT MR/HR X TIME = EXTREMITY DOSE
A	(1/4)	(1/4)
B	(1/10)	(1/10)
C	(1/10)	(1/10)
D	(1/10)	(1/10)

6. Calculate Sample Reduction Factor:

$\frac{20 \text{ mr/hr}}{\text{mr/hr at 8"}}$ = R.F. R.F. X WEIGHT = REQUIRED PORTION OF SAMPLE

A.

B.

C.

D.

EMERGENCY PROCEDURE
EP IV-122
EMERGENCY STAFFING GUIDE

ACTION LEVEL

This procedure is to be followed whenever the Radiation Protection Organization is implemented, normally by order of the Senior Shift Supervisor/EDO.

RESPONSIBLE INDIVIDUAL

The Radiation Protection Engineer or the Senior Radiation Protection Supervisor shall assure the Radiation Protection Emergency Organization is implemented and adequately staffed.

LIMITS ON AUTHORITY

The Radiation Protection Engineer/Senior Radiation Protection Supervisor has the authority to request additional personnel as required to meet Radiation Protection emergency staffing requirements. Staffing sources are company personnel and/or contractor supplied personnel.

ACTION STATEMENTS

TIME	INITIAL	
_____	_______	1. Determine the potential length of the emergency and follow the suggested staffing guide.

<1 hour	- No additional staffing
<6 hours	- Call all available normal staff to Station
<24 hours	- Provide coverage using available staff on an overtime basis

ACTION STATEMENTS

TIME	INITIAL		
_____	_____	>24 hours <7 days	- Place normal staff on 12 hour shifts, alert contracting agencies that additional personnel may be required
		>7 days	- Staff through company and contractor personnel as required by conditions

_____ _____ 2. EP IV-101, Technical Support Center Activition, shall be used for all notifications within the Radiation Protection organization.

_____ _____ 3. Assistance for equipment and personnel requests can be processed by the Office Administrator or through the Emergency Response Manager's office.

_____ _____ 4. Complete staffing for outage conditions (Attachment 2) is recommended for emergency conditions lasting greater than 7 days.

_____ _____ 5. The required staffing will be placed on shifts on an as needed basis. Shift scheduled will be set up so as to provide for the best utilization of available personnel.

ACTION STATEMENTS

TIME	INITIAL	
_____	_______	6. The normal processing time for contractor personnel when they arrive on site is one week. Previously trained contractor personnel should be requested when possible.

NOTE

As a result of the rapid increase in personnel, assure that adequate supervision and coordinating personnel are available.

_____	_______	7. A partial list of Radiation Protection contractors is provided in Attachment 1.

ATTACHMENTS

1. List of Radiation Protection Contracting Companies
2. Radiation Protection Department Emergency Staffing
3. Radiation Protection Department - TSC Staffing

COMMUNICATIONS NETWORK

CONTROL POINT TSC TRAINING MAIN GATE RP OFFICE

DISCUSSION

In an emergency situation, there are many tasks that are required to be done. Through the effective use of available and incoming personnel, these tasks can be performed in the most efficient manner possible.

Many personnel, not trained in Radiation Protection, can be used to fill various required positions with minimal training.

NOTE

Forward all completed forms to the Nuclear Emergency Planning Engineer. Attach other completed EP's or attachments used.

Prepared By: Revised By James Clancy

Reviewed By: ______________________ 9/13/82
Department Head — Date

Reviewed By: Cheryl A Sakinas 9-13-82
Nuclear Emergency Planning Engineer — Date

Reviewed By: ______________________ 9/13/82
Station Quality Assurance Engineer — Date

SORC Meeting No.: 82-86 J Gallagher 9/23/82
Date

Approved By: H. J. Midura 9/23/82
General Manager - Salem Operations — Date

Approved By: Peter A. Moeller 9/23/82
Manager - Nuclear Site Protection — Date

ATTACHMENT 1

RADIATION PROTECTION CONTRACTING COMPANIES

Allied Nuclear . . . .

Applied H.P. . . . .

Bartlett Nuclear . . . .

*Hydro Nuclear Services . . . .

IRM . . . .

Numanco . . . .

NSS . . . .

*Rad Services, Inc. . . . .

*Currently have contracts at Salem

A more complete list of contracting companies supplying services and material can be found in EP IV-212.

ATTACHMENT 2
RADIATION PROTECTION DEPARTMENT EMERGENCY STAFFING

OPERATIONS	RPT's	ASST'S	HELPERS	CLERKS	SUPV'RS	DECON/ LAUNDRY
Control Point	6	12	12		2	
Containment	3	9	3			
Auxiliary Building		12	3			
Operating Unit	3	6	3			
Rad Waste	3	3			2	45
REP Room	3	3	3			
Dosimetry					2	
Dosimetry	3	3				
Counting Room		3	3			
Equipment					2	
Instruments	3	3	3			
Respirators		3	6			
Administration				8	2	
TOTAL	24	57	36	8	10	45

135 Rad Protection Personnel

45 Decon Personel

(This staffing assumes 3 complete shifts.)

ATTACHMENT 3
RADIATION PROTECTION DEPARTMENT
TECHNICAL SUPPORT CENTER STAFFING

RPE/SENIOR RADIATION PROTECTION SUPERVISOR

TSC SURVEYS	DOSE ASSESSMENT	SHORT TERM ENVIRONMENTAL MONITORING	PHONE TALKERS CONTROL ROOM	E.O.F.	CONTROL POINT	RADIO
Radiation Protection Assistant	Radiation Protection Supervisor	Shift Radiation Protection Technician	TSC RPH/ Clerk	TSC RPH/ Clerk	TSC RPH/ Clerk	TSC RPH/ Clerk

Telecopier

RPH/Clerk

RADIATION PROTECTION DEPARTMENT

Technical Support Center Interim Staffing

SHORT TERM ENVIROMENTAL MONITORING	PHONE TALKER
Shift Radiation Protection Technician	Control Room to TSC

EMERGENCY PROCEDURE
EP IV-301
INTERIM POST-ACCIDENT PRIMARY COOLANT SAMPLING

APPLICATION

After a reactor accident in which a significant fraction of the core fission-product inventory is released, normal sampling will not be possible because of the extremely high radiation fields. The Sentry High Radiation Sampling System will be used for obtaining diluted and undiluted samples and performing certain in-line analyses during accident and conditions. Until this system is operational, the interim post-accident sampling system can be used to withdraw a single diluted reactor coolant sample under accident conditions. Either of two (2) reactor coolant hot legs or either of the RHR's can be sampled utilizing the Interim System.

Sampling is performed by purging a temporary sample line from the outlet of a sample cooler to a shielded waste bottle. A four-way valve captures approximately 0.09 ml of the sample in this line. When the valve is rotated 90°, dilution water flushes the sample in to a serum vial. The 1:100 diluted is used for hydrogen and boron analyses. The gas phase is analyzed for hydrogen and fission gas and the liquid phase is analyzed for boron and other fission products.

The procedure considers fission gas, hydrogen, and the high radiation fields. Design bases of the interim system are provided in Attachment 1.

APPARATUS

Details for fabrication and a list of material required for the interim system are provided in Attachment 2.

PRECAUTIONS

1) Post-accident reactor coolant is extremely radioactive. Gases released from the sampling operation will be mostly hydrogen and fission gases. Airborne fission gases could result in extremely high radiation fields and hydrogen collected in waste bottles without an inert cover gas may result in an explosive mixture. The relatively small amount of halogen gases can cause very significant contamination problems.

2) Avoid cross-contamination by disposing of labware as radioactive waste. Any droplets of liquid from this operation will result in high surface contamination.

3) Frequently change rubber gloves when diluting and analyzing samples.

NOTE

Normally, the Chemistry Counting Room would be designated the "hot" lab. In the event of an accident, the Radiation Protection Counting Room is more likely to retain a low background. Inform requestors where to deliver samples. A separate procedure shall be used for sample collection and handling until it is delivered to the appropriate counting facility.

PREREQUISITES

TIME INITIAL

A. RADIATION PROTECTION

_______ 1. Verify that Radiation Protection has a high range (0 - 1000 R/hr) survey meter for surveying all sampling and analysis operations.

PREREQUISITES

TIME INITIAL

A. RADIATION PROTECTION (continued)

______ 2. Verify all personnel are wearing protective clothing, required respirators, and dosimetry as specified by Radiation Protection.

______ 3. Verify that all personnel have been thoroughly briefed by Radiation Protection as per EP IV-106, "ALARA Task Review Instructions".

B. FUME HOOD PREPARATION

______ 1. Remove all non-essential equipment from the fume hood which is to be used for sample dilutions and anayses.

______ 2. Assemble a body shield in the fume hood using lead bricks. A stack of 2 x 4 x 8 inch lead bricks, five high and three long will supply adequate shielding.

______ 3. Place a metal tray within the fume hood to contain all dilution and anaysis liquids.

______ 4. Place a box of tissue inside the fume hood.

______ 5. Tape a yellow poly bag within the fume hood with the top of the bag cut approximately two inches. The bag is to be used for containing all solid waste material generated during dilution operations.

______ 6. Place a strip of blotter paper in front of the fume hood and tape the edge to the floor.

PREREQUISITES

TIME INITIAL

B. FUME HOOD PREPARATION (continued)

______ 7. Place several pairs of rubber gloves on the lip of the fume hood in a position to permit easy and fast donning.

______ 8. Prepare a shielded waste container for disposal of waste sample solutions.

C. FUME HOOD APPARATUS AND REAGENTS

1. Verify the following apparatus and reagents are available for performing boron analysis.

______ a) Fisher Accumet pH meter
______ b) Three (3) Nalgene 30-ml plastic beakers filled with 4.5 ml of demineralized water
______ c) Eppendorf or Oxford 1-ml pipette and tips
______ d) Oxford adjustable 1-5 ml pipette and tips
______ e) Oxford 500 ul piette and tips
______ f) Demineralized water
______ g) Fluoroborate Specific Ion Electrode
______ h) Plastic Single Junction Reference Electrode
______ i) Stopwatch for timing analyses
______ j) Saturated Sodium Fluoride Solution
______ k) 10 N Sulfuric Acid
______ l) 20 ppm Boron standard
______ m) Magnetic stirrer and microstirring bar
______ n) Current calibration curve

2. Soak the electrodes in demineralized water for at least 10 minutes, or as long as possible prior to use.

PREREQUISITES (continued)

TIME INITIAL

C. FUME HOOD APPARATUS AND REAGENTS (continued)

______ 3. Standardize the fluoroborate system using the relative millivolt mode as detailed in Procedure PD-3.2.080.

4. Verify the following apparatus is available for performing gas sampling and dilution.

______ a) Snare for sample transfer
______ b) 1 cc and 5 cc gas syringes
______ c) 67 cc gas dilution bulb
______ d) 5 cc gas counting vials
______ e) Plastic wrap

5. Verify the following apparatus and reagents are available for performing liquid sampling and dilution.

______ a) Crucible tongs
______ b) Tweezers
______ c) 25 µl Oxford pipette and tips
______ d) 100 µl Oxford pipette and tips
______ e) 250 µl Oxford pipette and tips
______ f) 500 µl Oxford pipette and tips
______ g) Liquid counting vials, fulled with 10 ml of demineralized water
______ h) Plastic wrap
______ i) 100 ml volumetric flask, filled with demineralized water

PREREQUISITES (continued)

TIME INITIAL

D. GAS CHROMATOGRAPH

_____ 1. Place several lead bricks on the lab bench near the gas chromatograph for sample shielding.

_____ 2. Verify that a sufficient supply of argon carrier gas is available to the gas chromatograph.

_____ 3. Verify that the gas chromatograph is in a standby condition with a current calibration check performed prior to initiating sampling.

4. Verify the following items are available near the gas chromatograph.

_____ a) 100 and 1000 ul gas syringes
_____ b) Yellow poly bag containing absorbent material
_____ c) Cord or tape
_____ d) Snare and tongs
_____ e) Calibration curve

E. POST-ACCIDENT SAMPLING SYSTEM

1. Open or check open the following valves:

_____ a) Valve #1
_____ b) Valve #2
_____ c) Valve #4
_____ d) Gas vent line isolation valve

_____ 2. Align Valve #3 to the horizontal position.

PREREQUISITES (continued)

TIME INITIAL

______ 3. Back purge the waste bottles with an inert gas for a minimum of five minutes.

______ 4. Close Valve #2 and #4.

______ 5. close the gas vent line isolation valve.

______ 6. Secure inert gas supply.

7. Verify the following items are available for the Post-Accident Sampling System:

______ a) Lab jack
______ b) 5 cc syringe with needle
______ c) 20 cc syringe
______ d) Stopwatch
______ e) Wood block with sample bottle
______ f) Adjustable wrench
______ g) 7/16 inch open end wrench
______ h) 11/16 inch open end wrench

PROCEDURE

TIME INITIAL

A. SAMPLING TEAM NO. 1

______ 1. Enter the primary sample room and verify that the reactor coolant sampling system is isolated at the containment penetration valves, 1(2)SS104 and 1(2)SS33.

PROCEDURE (continued)

TIME INITIAL

______ 2. Check for green closed indication lights for valves 11(21)SS32, 13(23)SS32, 11(21)SS22, and 12(22)SS22 on Panel 307-1(2).

______ 3. Attach the syringe containing 15 ml of DM water to the sample dilution line. Ensure that the diluter valve, Valve #3, is in the up/down position. Force enough water from the syringe to allow water to flow from the hypodermic needle in a solid stream at the needle tip. Ensure that 9.0 ml of water remains in the syringe.

NOTE

See Figure 1 in Attachment 2 for valve identification.

______ 4. Switch the diluter valve, Valve #3, to the horizontal position to accept sample flow when the isolation valves are opened.

______ 5. Position the sample vial in the wooden block holder into position under the needle at the diluter valve. Use a lab jack or other supporing objects as appropriate.

______ 6. Visually verify that the needle has punctured the septum. Evacuate the Wheaton sample bottle with a gas syringe.

PROCEDURE (continued)

TIME INITIAL

______ 7. Step back from the sample station and carefully position the syringe in the designated holder with the sample dilution line fully extended from the sample station.

______ 8. Actuate the switch to raise the sample transfer dumbwaiter to the sample room position. If the equipment is inoperable, notify supervision to have a carrier on standby to hand carry the sample to the laboratory.

______ 9. Close or check closed valve 1(2)SS245 and 1(2)SS35.

______ 10. Open the reactor coolant primary sample sink Valve No. 1(2)SS46 to relieve pressure on the sample line. Break the sample line connection on the outlet of the sample cooler and reconnect the temporary line of the emergency sampling system.

CAUTION

When reconnection is made, use extreme care not to cross-thread the fitting. The connection should be tightened securely to avoid any leakage of the highly radioactive liquid flowing through this line.

______ 11. Inspect the sampling system. Ensure all fittings are tight.

PROCEDURE (continued)

TIME INITIAL

______ 12. If either RHR is to be sampled, proceed to Step 14.

______ 13. If either RCS hot leg is to be sampled, request the Control Room operator to open the containment isolation valves, 1(2)SS104 and 1(2)SS33. Open Valves No. 1, 1(2)SS35, and No. 2. Open the reactor coolant sample panel isolation valve 11(21)SS32 or 13(23)SS32, depending on which hot leg is to be sampled. Check for red light open position indication at sample panel 307-1(2). Proceed to Step 16.

MONITOR DOSE RATES

______ 14. For a RHR heat exchanger outlet sample, open valve 1(2)SS24.

______ 15. Open Valves No. 1 and No. 2. Open RHR Heat Exchanger Outlet Sample Isolation Valve 11(21)SS22, depending on which heat exchanger is to be sampled. Check for red light open position indication at sample panel 307-1(2).

MONITOR DOSE RATES

______ 16. Crack open Valve No. 4. Rapidly adjust the flow rate to approximately 0.42 gpm on the flow meter. Observe the flow meter from outside the cubical using the mirror mounted on the opposite wall.

PROCEDURE (continued)

TIME INITIAL

______ 17. Note the time that flow was established and immediately exit the sample room. Relay the sample time to Team No. 2 so that the sample can be collected after a three minute purge.

B. SAMPLING TEAM NO. 2

______ 1. After the sample line has purged to waste for approximately three minutes, isolate the sample by rotating the diluter valve (Valve No. 3) 90° and immediately deliver 9.0 ml of water using the syringe, and secure flow with Valve No. 4, then rotate Valve No. 3 90° using the valve reach rods.

______ 2. Observe the flow meter using the wall mounted mirror and verify no flow.

______ 3. If RCS is sampled, close reactor coolant sample panel isolation valve 11(21)SS32 or 13(23)SS32, if RHR heat exchanger outlet is sampled, close RHR sample isolation valve 11(21)SS22 or 12(22)SS22 and immeidately exit the sampling room.

______ 4. Immediately after exiting, notify the Control Room operator to close containment isolation valves 1(2)SS104 and 1(2)SS33 for RCS sample.

PROCEDURE (continued)

TIME INITIAL

C. HYDROGEN ANALYSIS AND TRANSFER - TEAM NO. 3

______ 1. Immediately lower the septum bottle from the needle. Hold the wooden block with one hand during this operation.

______ 2. Place the sample behind several lead bricks on the lab bench near the gas chromatograph.

______ 3. Using a gas syringe, withdraw a 100 µl or 1 ml aliquot directly from the serum bottle.

CAUTION

Keep the needle tip well above the liquid level so that only the gas is withdrawn.

NOTE

Assuming a 0.09 ml diluter value volume and a 8.0 ml serum bottle gas space, the following hydrogen concentrations should be expected:

cc H_2/kg	% H_2
100	0.11
500	0.56
1000	1.12
2000	2.25
5000	5.62

PROCEDURE (continued)

TIME INITIAL

______ 4. Inject the sample into the gas chromatograph and record the aliquot in Step No. 1 of the Dissolved Hydrogen Data Calculation Sheet in Attachment No. 3

NOTE

A 100 µl injection will result in approximately 1.4 µCi of gaseous activity being released by the gas chromatograph to the room one hour after the accident.

______ 5. Place the sample vial into a yellow poly bag containing absorbent material. Tie the bag closed with cord or use tape to close the bag.

______ 6. Leave the sample room or chemistry laboratory and notify laboratoary personnel that the sample is ready for dilutions and analysis.

______ 7. After approximately 20 minutes, have one person enter the primary sample room and collect the chromatograph for evaluation.

______ 8. Calculate the approximate hydrogen concentration using the Dissolved Hydrogen Data Calculation Sheet in Attachment No. 3

______ 9. After several days or when Radiation Protection determines conditions are safe, open the gas vent valve and allow the highly radioactive gases in the bottle to escape into the operating fume hood.

PROCEDURE (continued)

TIME INITIAL

D. ANALYSIS AND SAMPLE DILUTION

1. Initial Operations

_______ a) Using a snare, transfer the sample behind the lead bricks inside the fume hood.

_______ b) Remove the wooden block from the poly bag and place the block behind the lead bricks.

_______ c) Take radiation readings at the front of the fume hood.

NOTE

Steady the wooden block with one hand as appropriate while withdrawing samples from the vial.

2. Gaseous Activity

_______ a) Withdraw a 1.0 cc gas aliquot from the gas in the serum bottle using a 5 cc syringe. Inject the sample aliquot into a 67 cc gas dilution bulb.

_______ b) Evacuate a gas counting vial. Inject a 1.0 cc aliquot (or smaller) of the diluted gas into the vial for counting.

_______ c) Record the injected aliquot (cc) in Step No. 3 of the Gaseous Activity Data Calculation Sheet.

PROCEDURE (continued)

TIME INITIAL

______ d) Wrap the counting vial in plastic wrap.

NOTE

The vial will contain a 0.14 µCi under worse case conditions.

______ e) Analyze the sample for fission gas activity.

NOTE

If the dead time on the MCA is excessive, increase the lower level discriminator setting to bias out ^{133}Xe activity and recount. Prepare a second sample for ^{133}Xe using a 0.1 cc aliquot from the 67 dilution bulb with the lower level discriminator at the normal setting.

______ f) Calculate the gaseous activity level using the Gaseous Activity Data Calculation Sheet in Attachment No. 3.

3. Isotopic Liquid Sample Analysis

NOTE

Ensure that the hydrogen results are acceptable before proceeding with this step.

PROCEDURE (continued)

TIME INITIAL

______ a) Hold the wooden block with one hand and remove the septum cap using crucible tongs. Lower the glass shield on the fume hood and remove the septum using tweezers. Discard the septum cap and septum as radioactive waste. Close the fume hood.

______ b) After approximately five minutes, open the fume hood. Pipette a 25 µl aliquot into the previously filled 100 ml volumetric flask. Discard the tip as radioactive waste. Cap the flask and carefully mix.

______ c) Pipette 100 to 500 ul of the second dilution into the previously filled counting vial and discard the tip. Cap the vial and wrap with plastic wrap. Record the aliquot volume pipetted into the counting vial in Step No. 3 of the Liquid Activity Data Calculation Sheet.

______ d) Remove the vial from the hood and wrap plastic wrap a second time.

______ e) Count the sample on the MCA.

______ f) Calculate the original sample activity using the Liquid Activity Data Calculation Sheet in Attachment No. 3.

PROCEDURE (continued)

TIME INITIAL

4. Sample for Boron Analysis

_______ a) Carefully place the tip of the 500 µl pipette into the serum bottle and pipette 500 µl of the sample to each of the 30 ml beakers containing 4.5 ml water. Discard the pipette tip as radioactive waste.

_______ b) Analyze the duplicate samples for boron using procdure PD-3.2.080.

_______ c) Calculate the ppm boron in the original sample using the Boron Data Calculation Sheet in Attachment No. 3.

5. Wrap sample in clear saran wrap or equivalent for storage. If sample is to be saved it must be properly identified and a log kept of sample information.

NOTE

Samples should be stored in a suitable area which will not cause significant change to background radiation levels. If sample causes a high radiation area to be formed in the immediate area then a storage facility should be used which is capable of being locked. (Possible storage rooms would include the Source Room - 100' El. Service Building or Gamma Calibrator Room - 100' El. Auxiliary Building.)

CALCULATIONS

See Attachment No. 3.

ACCEPTANCE CRITERIA

N/A

REFERENCES

NUREG 0578 and NRC Clarification letters dated October 13, 1979.

NOTE

Forward all completed forms to the Nuclear Emergency Planning Engineer. Attach any referenced completed EP's or attachments.

Prepared By: James Clancy

Reviewed By: [signature] 9/10/82
Department Head — Date

Reviewed By: Cheryl Dakenas for — 9-10-82
Nuclear Emergency Planning Engineer — Date

Reviewed By: [signature] 9/13/82
Station Quality Assurance Review — Date
(if required see EP VI-2)

SOPC Meeting No.: 82-86 [signature] 9/23/82
Date

Approved By: [signature] 9/23/82
General Manager - Salem Operations — Date

Approved By: [signature] 9/23/82
Manager - Nuclear Site Protection — Date

ATTACHMENT 1
DESIGN BASES FOR INTERIM SAMPLING SYSTEM

PARAMETER	VALUE
Number of post-accident sample	1
Hydrogen	2000 cc/kg
Radioactivity in diluted sample	900 uCi
Dose rate of diluted sample:	
Unshielded: 1350 R/hr at 1 cm; 356 mR/hr at 2 ft.	
Shielded with 2 inch lead: 67 R/hr contact; 18 mR/hr at 2 ft.	
Purge Volume:	
Inactive purge	3.0 gal., max
Post-accident liquid	1.26 gal., max
Maximum total of gas generation in waste	10400 cc @ 25C
Estimated pressure in waste gas container	31 psia
Dose rate of:	
Waste with 1.26 gal. in sand-packed drum @ 10 ft. with 4 in. of lead and 9 in. of concrete.	94 mR/hr
4 ft. of 1/8 in. sample line @ 2 ft. with equivalent of 2 in. of lead.	238 mR/hr
6 ft. of 1 in. Tygon vent line for gases @ 4 ft. from waste bottle with no shielding, 1 hr after accident:	
No Dilution	55.9 R/hr
1.3 Dilution	18.6 R/hr

Three teams are required to perform the entire sampling operation. Each team consists of a Chemistry sampler and a Radiation Protection person.

ATTACHMENT 2
FABRICATION AND MATERIALS NEEDED FOR THE INTERIM SAMPLING SYSTEM

1. Design

Fgiures 1 through 4 illustrate the basic sampling design.

2. Fabrication

Fabricate the interim post-accident sampling system as illustrated in Figures 1 through 4. Ensure that the following are taken into account.

(1) Purge the waste liquid and gas bottle with inert to provide an inert atmosphere during post-accident sampling, as the explosive limit for hydrogen could be exceeded.

(2) Measure the active volume of the four-way diluter valve prior to installation. This may be accomplished by filling the valve with a 100 ppm chloride standard solution and diluting with 9.0 ml of water to make a 1 ppm sample for analysis using the sepctrophotometric chloride method. Perform three measurements and calculate the average volume of the diluter valve from:

$$V_d = (\text{Avg. ppm chloride measured}) \times 9.0\ \text{ml}/100\ \text{ppm}$$

(3) Pack the diluter valve and associated piping in three inches of lead shot.

(4) Drill a wooden block approximately two feet long at one end so that the Wheaton sample bottle fits with approximately one inch extended above the top of the block. Glue the bottle into the block holder.

3. List of Materials

Obtain the following materials for fabricating the interim post-accident sampling system:

1. Waste Bottles, 5 gal. 2
2. Steel drums 2
3. Lead bricks, 2 x 4 x 8 in. 144
4. Lead Shot . . . . As Required
5. Tygon® tubing, 1 in. . . . . As Required
6. Isolation valve for vent 1
7. 1/8 in. OD 0.035 in ID SS caps tubing for sample lines . . . . As Required
8. 40 in. reach rod for valves 1
9. 20 cc syringe with Luer-Loc tip graduation to 0.2 ml (Hamilton No. 1020TSS) 1
10. Hypodermic needle, point style No. 2 16 gauge x 4 in. (Hamilton No. N17116) 2
11. Lab Jack, 3 x 3 in. base, or appropriate support material for wood block 1
12. Whitey 4-way ball valve (SS-43YHF2 3-43-00125) 1
13. Vent line outlet isolation valve 1
14. Radiarm, 60 in. (Atomic Products No. 010-060) 1
15. Radiarm, 48 in. (Atomic Products No. 010-048) 1

ATTACHMENT 2
(continued)

INTERIM SAMPLING SYSTEM
(continued)

16. Wheaton sample vials, 16 ml (No. 224806) . . . . Case
17. Wheaton open top screw caps (No. 240515) . . . . Case
18. Wheaton solid screw caps (No. 18-425) . . . . Case
19. Wheaton septa, 13 x 20 (No. 240585) . . . . Case
20. CTFE tube fittings ans washer -
    1/4 x 20 for 1/8 in. OD tubing (Hamilton No. 88807) . . . . Pack of 10
    Spare washers (Hamilton No. 88826) . . . . Pack of 10
21. CTFE female Luer connector 1/4 x 28 0.060 in. bore (Hamilton No. 32834) 2
22. Male Luer connector 1/4 x 28 0.060 in. bore (Hamilton No. 328825) 2
23. TFE tubing, 1/8 in. OD x 1/16 in. ID (Hamilton No. 88922) . . . . 10 ft.
24. Flanging tool kit (Hamilton No. 88821) 1
25. Wood block with bore for 16 ml Wheaton sample bottle, 24 in. long 2

SAMPLING AND DILUTION

1. Lead bricks, 2 x 4 x 8 in. 24
2. Crucible tongs modified with red rubber hose over tips 1
3. Tweezers 1
4. Volumetric flask, 100 ml 1
5. Eppendorf or Oxford micro pipetting system with disposable tips for 25, 100, and 50 ul . . . 2
6. Eppendorf or Oxford macro pipetting system with assorted tips for 1 and 4 ml 1
7. Nalgene beakers, plastic, 30 ml in holders 4
8. Waste bottle, shielded with funnel in top 1
9. Wash bottle 1
10. Gas dilution buld, 67 cc with septum 1
11. Gas counting vials 2
12. Liquid counting vials 2
13. Plastic wrap . . . . 1 roll
14. Mirror 1
15. Poly bags . . . . As Required
16. Snare 2
17. 5 cc Hamilton gas syringe (Hamilton No. 1005TLL). 1
18. 1 cc Hamilton gas syringe (Hamilton No. 1001TLL). 1
19. Hypodermic needles, [illegible]int style No. 2 (22 guage x 2 in. No. N722) 4

ATTACHMENT 3

STEP	RECORD
1. Microliters of sample injected into the gas chromatograph.	______
2. Chromatograph peak area in millimeters.	______
3. Microliters of H_2 corresponding to peak area.	______
4. Divide microliters in Step No. 3 by microliters in Step No. 1 and multiply by 100 to determine % H_2.	______
5. Multiply % H_2 in Step No. 4 by 900 to yield ccH_2/Kg.	______

FORMULA

$$ccH_2/Kg = \frac{\% H_2 \times 10^{-2} \times V_g \text{ (cc)}}{V_d\text{(ml)} \times 10^{-3}\text{(Kg/ml)}}$$

Where: 10^{-2} converts percent to a decimal

V_g = 8 cc, serum bottle gas space

V_d = 0.09 ml, diluter valve volume

10^{-3} converts ml to kg

REDUCED FORMULA

$ccH^2/Kg = \% H^2 \times 889$

ATTACHMENT 3
(continued)

STEP	RECORD
1. Microcuries/cc of isotope measured.	______
2. Multiply Step No. 1 value by 3.0×10^4.	______
3. Record aliquot injected into the counting vial (cc).	______
4. Divide Step No. 2 value by Step No. 3 value to yield uCi/ml.	______

FORMULA

$$\text{Gaseous activity, uCi/ml} = \frac{V_g(cc) \times V_2(cc) \times V_4(cc)}{V_d(ml) \times V_1(cc) \times V_3(cc)}$$

Where: V_g = 8 cc, serum bottle gas space

V_2 = 67 cc, dilution bulb volume

V_4 = 5 cc, counting vial volume

V_d = 0.09 ml, diluter valve volume

V_1 = 1.0 cc, aliquot injected into dilution valve

V_3 = X cc, aliquot injected into counting vial

REDUCED FORMULA

$$\text{uCi/ml 1} = \text{uCi/cc} \times \frac{29{,}778}{V_3}$$

ATTACHMENT 3
(continued)

STEP | RECORD

1. Microcurires/ml of isotope measured. ________
2. Multiply Step No. 1 value by 4.0×10^6. ________
3. Record aliquot volume (ml) pipetted into counting vial. ________
4. Divide Step No. 2 value by Step No. 3 value to yield uCi/ml. ________

FORMULA

$$\text{Liquid Activity (uCi/ml)} = \frac{\mu\text{Ci/ml measured} \times V_1(\text{ml}) \times V_3(\text{ml}) \times V_5(\text{ml})}{V_d(\text{ml}) \times V_2(\text{ml}) \times V_4(\text{ml})}$$

Where: V_1 = 9.0 ml, syringe water volume

V_3 = 100 ml, volumetric flask volume

V_5 = 10 ml, counting vial volume

V_d - 0.09 ml, diluter valve volume

V_2 = 0.025 ml, aliquot delivered to volumetric flask

V_4 = x ml, aliquot pipetted into counting vial

REDUCED FORMULA

$$\text{uCi/ml} = \text{uCi/ml measured} \times \frac{4.0 \times 10^6}{V_4}$$

ATTACHMENT 3
(continued)

STEP | RECORD

1. Boron concentration measured (ppm). ________

2. Multiply Step No. 1 value by 1,000 to yield ppm boron in sample. ________

FORMULA

$$\text{ppm Boron Concentration} = \text{ppm Boron measured} \times \frac{V_1(ml) \times V_3(ml)}{V_d(ml) \times V_2(ml)}$$

Where: V_1 = 9.0 ml, syringe water volume

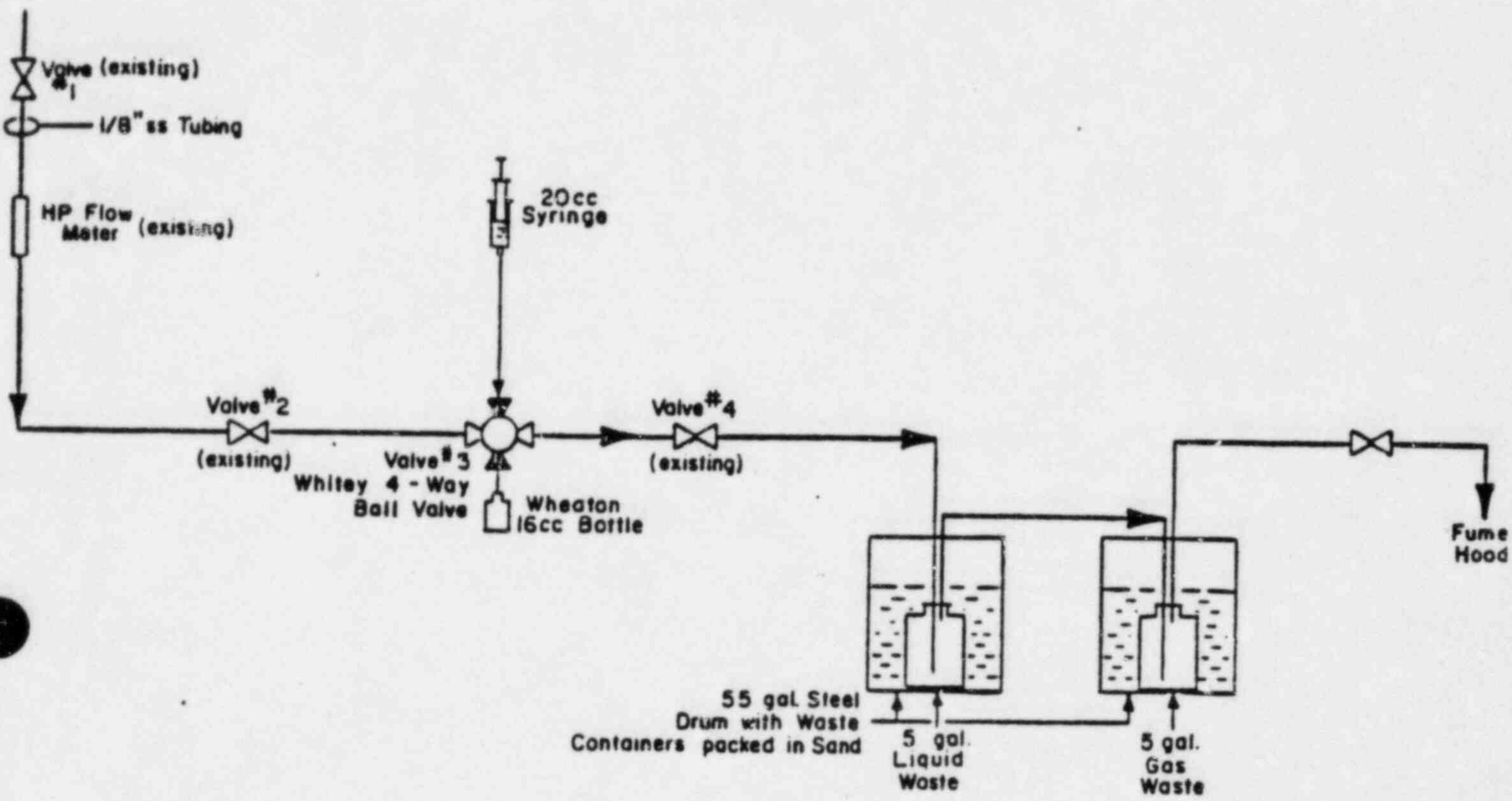
V_3 = 5.0 ml, final sample volume

V_d = 0.09 ml, diluter valve volume

V_2 - 0.50 ml, sample aliquot

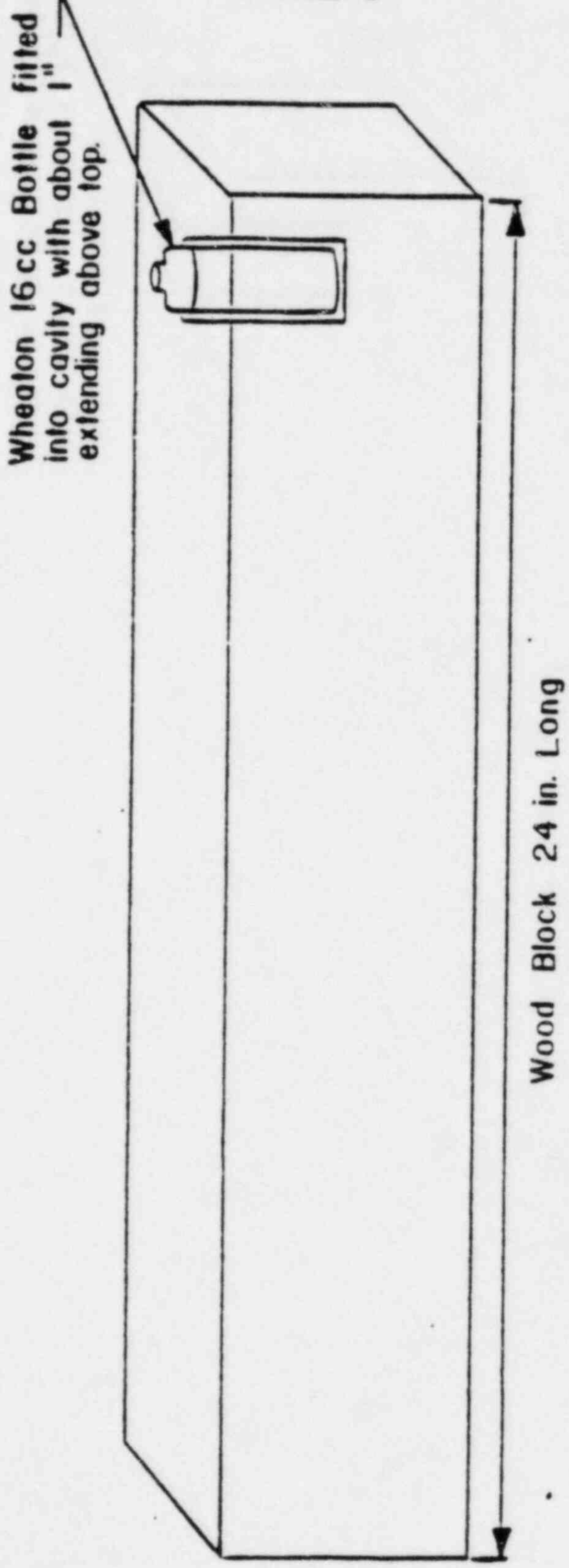
REDUCED FORMULA

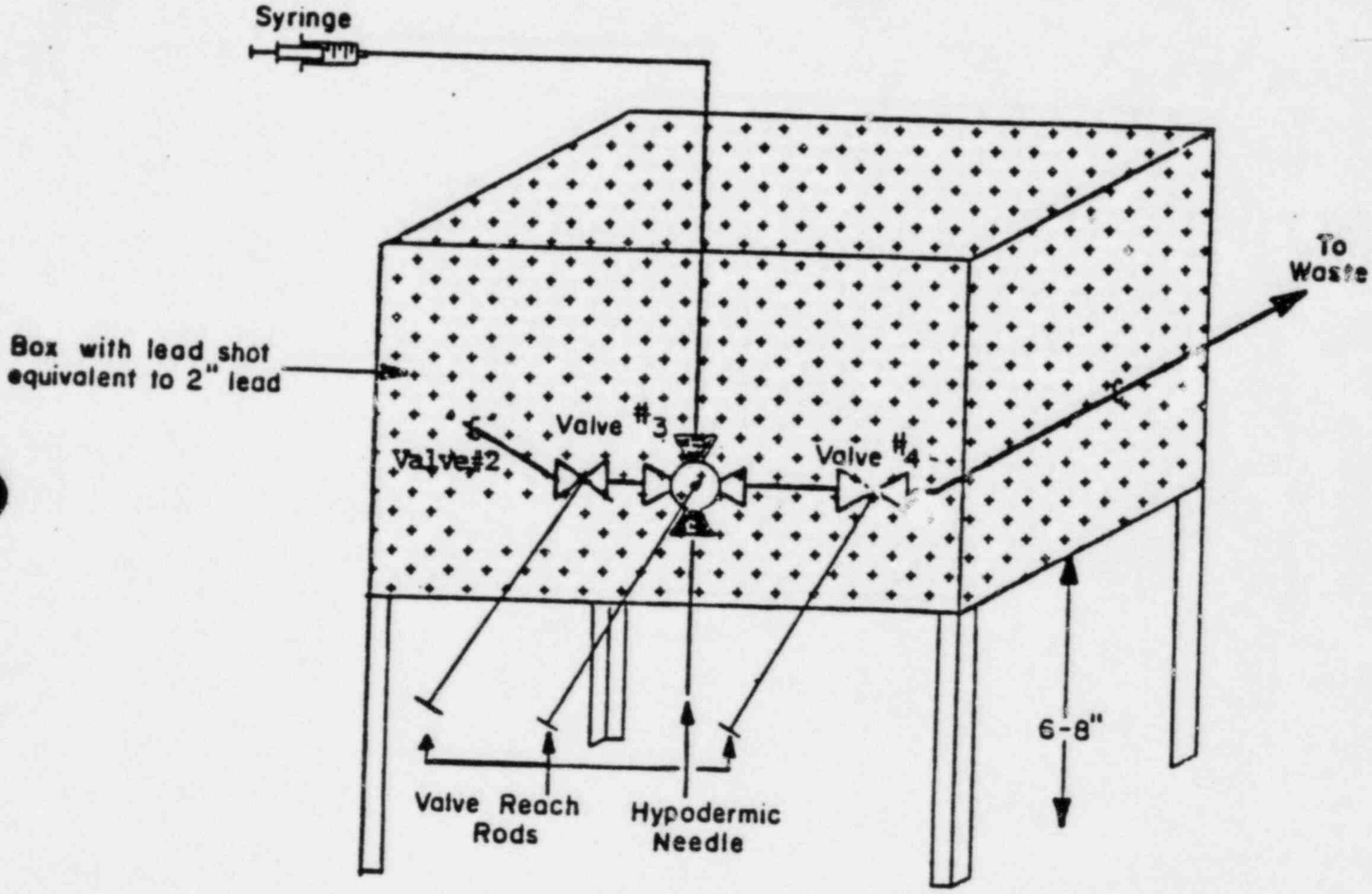
ppm Boron concentration = ppm Boron measured x 1,000



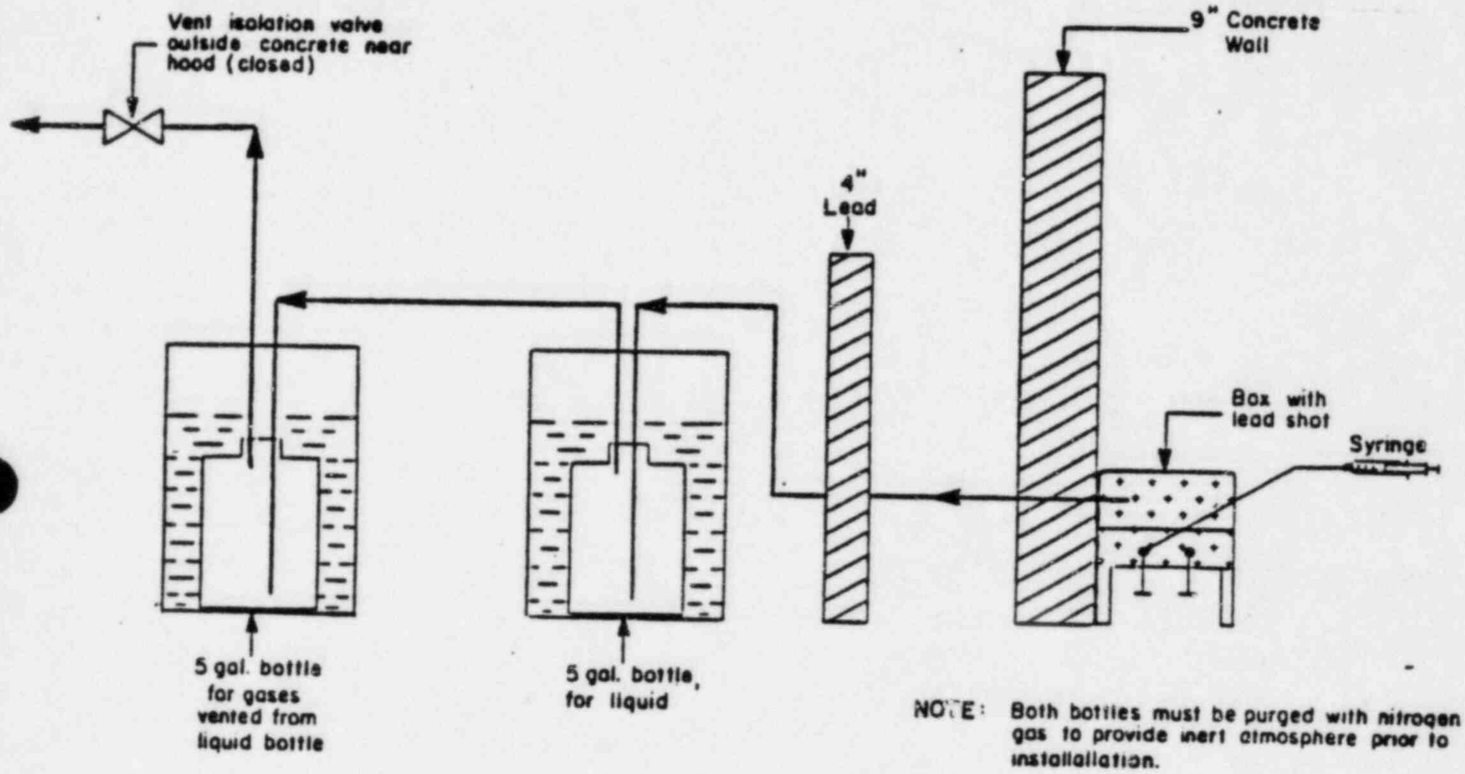
FLUID FLOW PATH
FIGURE 1

WHEATON BOTTLE HOLDER
FIGURE 2





FOUR-WAY VALVE ARRANGEMENT
FIGURE 3



WASTE CONTAINER
FIGURE 4

No. 108
U.S. NRC, Dir. of NRR
Washington, D.C. 20555
Mr. S.A. Varga, Chief, Oper.
Reactors BR#1, Div. of Licensing

SALEM GENERATING STATION
EMERGENCY PLAN
EMERGENCY PLAN PROCEDURES INDEX
SEPTEMBER 30, 1982

SECTION V - ENGINEERING DEPARTMENT EMERGENCY PROCEDURES

REV. NO.

SECTION VI - PLAN ADMINISTRATION

SECTION VII - PUBLIC INFORMATION

ADDENDUM

FIGURES

EMERGENCY PROCEDURE
ADDENDUM 1
MASTER PHONE LIST
EMERGENCY ASSISTANCE AND NOTIFICATION

INDEX

Prepared By: C.A. Burge

Reviewed By: CABurge for — 9/20/82
EMERGENCY PLANNING ENGINEER — DATE

Approved By: Peter A. Moeller 9/22/82
MANAGER - NUCLEAR SITE PROTECTION — DATE