

**ENTERGY NUCLEAR NORTHEAST  
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DOCUMENT TRANSMITTAL AND RECEIPT ACKNOWLEDGEMENT FORM**

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**FROM:** CATHY IZYK - EMERGENCY PLANNING DEPARTMENT

**SUBJECT:** EMERGENCY PLAN AND IMPLEMENTING PROCEDURES

Enclosed are revisions to your assigned copy of the JAFNPP Emergency Plan and Implementing Procedures. Please remove and **DISCARD** the old pages. Insert the attached, initial and date this routing sheet and return the completed routing sheet to ***Cathy Izyk in the Emergency Planning Department within 15 days.*** If this transmittal is not returned within 15 days, your name will be removed from the controlled list.

<b>VOLUME 1 Update List Dated JANUARY 24, 2003</b>			
DOCUMENT	PAGES	REV. #	INITIALS/DATE
SECTION 4	REPLACE ALL	18	

<b>VOLUME 2 Update List Dated JANUARY 24, 2003</b>			
DOCUMENT	PAGES	REV. #	INITIALS/DATE
EAP-4.1	REPLACE ALL	15	

A045

# EMERGENCY PLAN IMPLEMENTING PROCEDURES/VOLUME 2

## UPDATE LIST

CONTROLLED COPY # **34**

Date of Issue: January 24, 2003

Procedure Number	Procedure Title	Revision Number	Date of Last Review	Use of Procedure
N/A	TABLE OF CONTENTS	REV. 19	02/98	N/A
IAP-1	EMERGENCY PLAN IMPLEMENTATION CHECKLIST	REV. 28	08/02	Continuous
IAP-2	CLASSIFICATION OF EMERGENCY CONDITIONS	REV. 23	08/02	Continuous
EAP-1.1	OFFSITE NOTIFICATIONS	REV. 46	08/02	Informational
EAP-2	PERSONNEL INJURY	REV. 26	01/03	Informational
EAP-3	FIRE	REV. 23	08/02	Informational
EAP-4	DOSE ASSESSMENT CALCULATIONS	REV. 31	08/02	Reference
EAP-4.1	RELEASE RATE DETERMINATION	REV. 15	01/03	Reference
EAP-5.1	DELETED (02/94)			
EAP-5.2	DELETED (04/91)			
EAP-5.3	ONSITE/OFFSITE DOWNWIND SURVEYS AND ENVIRONMENTAL MONITORING	REV. 9	08/02	Informational
EAP-6	IN-PLANT EMERGENCY SURVEY/ENTRY	REV. 16	06/02	Informational
EAP-7.1	DELETED (02/94)			
EAP-7.2	DELETED (02/94)			
EAP-8	PERSONNEL ACCOUNTABILITY	REV. 59	12/02	Reference
EAP-9	SEARCH AND RESCUE OPERATIONS	REV. 10	08/02	Informational
EAP-10	PROTECTED AREA EVACUATION	REV. 16	08/02	Informational
EAP-11	SITE EVACUATION	REV. 18	08/02	Informational
EAP-12	DOSE ESTIMATED FROM AN ACCIDENTAL RELEASE OF RADIOACTIVE MATERIAL TO LAKE ONTARIO	REV. 11	04/02	Reference
EAP-13	DAMAGE CONTROL	REV. 14	06/02	Informational
EAP-14.1	TECHNICAL SUPPORT CENTER ACTIVATION	REV. 22	04/02	Informational
EAP-14.2	EMERGENCY OPERATIONS FACILITY ACTIVATION	REV. 20	04/02	Informational
EAP-14.5	OPERATIONAL SUPPORT CENTER ACTIVATION AND OPERATION	REV. 14	03/00	Informational

# EMERGENCY PLAN IMPLEMENTING PROCEDURES/VOLUME 2 UPDATE LIST

Date of Issue: January 24, 2003

Procedure Number	Procedure Title	Revision Number	Date of Last Review	Use of Procedure
EAP-14.6	HABITABILITY OF THE EMERGENCY FACILITIES	REV. 14	10/98	Informational
EAP-15	EMERGENCY RADIATION EXPOSURE CRITERIA AND CONTROL	REV. 11	06/02	Informational
EAP-16	PUBLIC INFORMATION PROCEDURE	REV. 6	02/98	Informational
EAP-16 2	JOINT NEWS CENTER OPERATION	REV. 0	02/02	Informational
EAP-17	EMERGENCY ORGANIZATION STAFFING	REV. 103	12/02	Informational
EAP-18	DELETED (12/93)			
EAP-19	EMERGENCY USE OF POTASSIUM IODINE (KI)	REV. 21	04/01	Informational
EAP-20	POST ACCIDENT SAMPLE, OFFSITE SHIPMENT AND ANALYSIS	REV. 9	06/02	Reference
EAP-21	DELETED (12/85)			
EAP-22	DELETED (02/98)			
EAP-23	EMERGENCY ACCESS CONTROL	REV. 11	06/02	Informational
EAP-24	EOF VEHICLE AND PERSONNEL DECONTAMINATION	REV. 9	06/02	Informational
EAP-25	DELETED (02/94)			



## REVISION SUMMARY SHEET

REV. NO.

- 15
  - On Attachment 3 in the Note section changed the following items: added (1298 cc/sec) after 1.5% per day and changed RO-13 to RO-15 and changed the containment leak rate from ~ 1,437 to ~1,569.
  - Also, on attachment three deleted reference to Tech Spec's per section 3.2.a, volume 1B because of implementation of the ITS Program and a referenced the document Offsite Dose Calculation Manual (ODCM).
  - Also in attachment three in the box Attachment 4 Location on Graph - containment volume was changed to 7.4.8E-9cc.
- 14
  - Added wording to note in attachment 3
  - Made editorial corrections from (Hr) to (hr), (MI/HR) to (MPH) and bolded THEN's
  - Changed reference from page 8 to page 7 on attachment 2.
- 13
  - Changes are made due to Improved Technician Specification (ITS) program.
  - On Attachment 1, page one added words "([CTS] Technical Specifications, Appendix B, Section 3.2.a.1 [ITS] 5.5.4)"
- 12
  - On Attachment 11, page 1 of 2 and 2 of 2, changed Noble Gas Vent release to 1432 and changed Noble Gas Stack release to 333. On page 24, added step 3 to show determination for obtaining setpoint release rates that are described in the ODCM.

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## 1.0 PURPOSE

This procedure provides instructions for manually estimating release rates in the event of an accidental release of radioactivity to the environment.

## 2.0 REFERENCES

### 2.1 Performance References

None

### 2.2 Developmental References

2.2.1 EAP-5.3, ONSITE/OFFSITE DOWNWIND SURVEYS AND ENVIRONMENTAL MONITORING

2.2.2 EAP-42, OBTAINING METEOROLOGICAL DATA

2.2.3 NUREG-0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

2.2.4 JAF FSAR Chapter 14

2.2.5 EAP-4, DOSE ASSESSMENT CALCULATIONS

2.2.6 High Range Containment Monitor Response to Post Accident Fission Product Releases - James A. FitzPatrick Nuclear Power Plant, SL-4370, Sergeant Lundy, May 1985

## 3.0 INITIATING EVENTS

3.1 An emergency classification has been declared as defined in IAP-2, and

3.2 A release of radioactivity exceeding technical specifications is suspected or underway.

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4.0 PROCEDURE

## 4.1 Release Rate Determination

**NOTE:** Use Attachment 11 to calculate the percent of Tech. Spec. in order to determine if the Tech. Spec. release rate has been exceeded and for completion of the NRC Event Notification Worksheet, EAP-1.1, Attachment 6.

## 4.1.1 Low Range Effluent Monitor calculation

- A. Record date, time and name of individual performing calculations in upper right-hand corner of Attachment 1.
- B. Record observed gross count rate with appropriate units for the Reactor Building (RxB), Refuel Floor (RF), Radwaste (RW), Turbine Building (TB) and/or Stack. This data may be obtained from the EPIC computer. IF computer points are unavailable, Control Room AND/OR local monitors can be used for this data.

**NOTE:** For stack releases, it is important to determine whether any dilution fan is operating.

- C. For **Building Vent Releases**, multiply the gross count rate (cpm) by the default K factor listed in table on following page, until updated K factors are available based on recent chemistry sample data.



D. For **Stack Releases**, multiply the gross count rate (cps) by the default K factor listed below, unless an updated K factor is available based on recent Chemistry sample data.

Monitor	K Factor	Normal Flow RatesBased on (cfm)
Reactor Bldg. (Pt. 3337)	3.2E-1 μCi/sec/cpm	61,000
Refuel Floor (Pt. 3338)	3.7E-1 μCi/sec/cpm	70,000
Radwaste Bldg. (Pt. 3340)	1.7E-1 μCi/sec/cpm	32,500
Turbine Bldg. (Pt. 3339)	5.6E-1 μCi/sec/cpm	107,000
Stack (Pt. 3336)	6.0E-1 μCi/sec/cps	6,600
<p><b>IF</b> flow rates differ from the Normal Flow Rates listed above, <b>THEN</b> a correction to the K factor is necessary as follows:</p> $K_{(\text{corrected})} = \left[ \frac{\text{New Flow Rate}}{\text{Normal Flow Rate}} \right] \times \left[ K \text{ Factor}_{(\text{listed})} \right]$		

**NOTE:** The accuracy of ventilation flow rate indications at the low end of an instrument range should be confirmed with appropriate instrument calibration procedures.

E. An estimate of the iodine release rate can be obtained by multiplying the I/NG ratio from a chemistry sample by the NG release rate. **IF** a chemistry sample is not available, **THEN** the iodine release rate can be estimated by multiplying a default I/NG ratio by the NG release rate. For default release rates and I/NG ratio, refer to Attachment 12.

F. **IF** the low range effluent monitors are inoperative or off-scale, **THEN** the appropriate high range effluent monitor must be used.

#### 4.1.2 High Range Effluent Monitor (HREM) Calculation

A. Record date, time and individual performing calculation in upper right-hand corner of Attachment 2.

B. Record observed dose rate for the Stack, Turbine Building (TB) and/or Radwaste (RW). This data may be obtained from the EPIC computer. **IF** computer points are unavailable, **THEN** Control Room monitors can be used for this data.

**NOTE:** For stack releases, it is important to determine whether any dilution fan is operating.

C. Multiply the dose rate by the K factor listed below.

**NOTE:** These conversion constants are based on normal flow rates listed below. A conversion factor of 0.45 ( $\mu\text{Ci/cc}$ )/(mR/hr) was applied to the normal flow rate. This value is given by General Electric and is based on the monitor response to Xe-133.

HREM	K FACTOR	NORMAL FLOW RATES (cfm) *
<b>STACK</b>		
One SGT train operating	1.40 (Ci/sec)/(mR/hr)	based on 6,600
One SGT train and one stack dilution fan operating	2.54 (Ci/sec)/(mR/hr)	based on 12,000
<b>TURBINE BLDG</b>	22.6 (Ci/sec)/(mR/hr)	based on 107,000
<b>RADWASTE BLDG</b>	6.85 (Ci/sec)/(mR/hr)	based on 32,500
<p><b>*IF</b> flow rates differ from the Normal Flow Rates listed above, <b>THEN</b> a correction to the K factor is necessary as follows:</p> $K_{(\text{corrected})} = \left[ \frac{\text{New Flow Rate}}{\text{Normal Flow Rate}} \right] \times \left[ K \text{ Factor}_{(\text{listed})} \right]$		

- D. An estimate of the iodine release rate can be obtained by multiplying the I/NG ratio from a chemistry sample by the NG release rate. **IF** a chemistry sample is not available, **THEN** the iodine release rate can be estimated by multiplying a default I/NG ratio by the NG release rate. For default release rates and I/NG ratios, refer to Attachment 12.
- E. A back calculated release rate may be estimated from field survey data in lieu of or in addition to the estimate from low and high range effluent monitors.

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4.1.3 Back Calculations from Downwind Survey Dose Rate Data using EDAMS

A. Start the EDAMS program and from the EDAMS icons, select "EDAMS".

NOTE: The mouse does NOT work in this DOS Sub-routine.

B. Select "Release Rate Calculations".

C. Select "James A. FitzPatrick".

D. Select "Back calculate".

E. Enter the time survey data was obtained (24-hour format).

F. Enter a number representing one of the accident types listed.

G. Enter the wind speed (MPH).

H. Enter "E" for elevated/stack or "G" for ground/vent release.

I. Enter the stability class (A - G).

J. Enter the three (3) foot closed window reading from the ion chamber (mR/hr).

K. Enter the downwind distance that the above reading was obtained. (Use 0.87 miles if the reading is taken at the site boundary.)

L. Hit the F9 key to calculate. Record or print the results.

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4.1.4 Release Rate Estimation Using Containment High Range Radiation Monitor Data

- A. Record date, time and individual performing calculations in upper right-hand corner of Attachment 3.
- B. Record containment rad monitor I.D. (i.e., either 27-RE-104 A or B) in Column 1 or an average of the two.
- C. Record the containment rad monitors average reading (dose rate) or the individual monitor reading (dose rate) in Column 2. Obtain readings from EPIC.
- D. Record the time the containment rad monitor dose rate was observed in Column 3.
- E. Record the time of shutdown in Column 4.
- F. Determine the time in hours after shutdown that the containment radiation monitor reading was taken (Column 4 - Column 3) and record in Column 5.

**NOTE:** Ensure that credit is taken for any dilution provided to the value calculated in step 4.1.4.G prior to it entering the effluent pathway to the environment (i.e. dilution by Reactor Building volume, etc.).

G. Determine and record in Column 6 the calculated concentration in containment for the time after shutdown reading using the curves in Attachment 4 and the following core damage estimates:

Attachment 4 Location on Graph	Calculated Concentration* (Ci/cc)
Area above Case #1	5.20E-2
Area between Case #1 and Case #2	3.45E-2
Area between Case #2 and Case #3	1.09E-2
Area between Case #3 and Case #4	3.30E-4
Area between Case #4 and Case #5	1.91E-5
Area between Case #5 and Case #6	1.91E-6
Area below Case #6	Normal
*Concentrations derived using EAP-44 estimates of core inventory and a containment volume of 7.42E+9cc (i.e. drywell and torus gas space volume).	

H. Determine the expected flow rate (cc/sec) to the environment and record in Column 7. Assistance from TSC engineering staff may be necessary in determining flow rates.

I. Determine the estimated release rate by multiplying Column 6 by Column 7. Record in Column 8.

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**NOTE:** EPIC provides release rates based on default K factors and normal flow rates.

4.1.5 Obtaining Release Rate Using EPIC

- A. Call up the Radioactivity Release Control (RRC) display on EPIC.
- B. Obtain and record release rate data from RRC display for release pathway of concern.

4.2 Default Accident Source Terms

4.2.1 Various types of design basis accidents have been analyzed and source terms estimated. Refer to Attachment 12 for estimated values.

4.2.2 In addition, source term estimates have been developed based on differing amounts of core damage for accidents resulting in leakage of activity through the drywell boundary.

- A. Attachments 5 through 10 provide correlation between stack source term estimates for given containment leak rates and containment high range radiation monitor readings.
- B. These attachments can be used to project what a release rate may be given a break in containment and containment failure imminent.
- C. These source terms are only estimates and should be input with the understanding of the assumptions used in their development.
- D. The source terms correspond to test cases in the Sergeant Lundy study "High Range Containment Monitor Response to Post Accident Fission Product Release" and are plotted on Attachments 5 through 10. These graphs are based on calculation JAF-89-003 filed in the original procedure EAP-4 master file.

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#### 4.3 Unmonitored Release

All likely release pathways are monitored. If there is a release through an unmonitored pathway, the release should be evaluated based on a source term (area monitors, process monitors, and/or local grab samples, as appropriate) or back calculations from downwind readings as described in Section 4.1.3 of this procedure.

#### 5.0 ATTACHMENTS

1. FLOW CHART TO DETERMINE RELEASE RATE FROM LOW RANGE EFFLUENT MONITORS
2. FLOW CHART TO DETERMINE RELEASE RATE FROM HIGH RANGE EFFLUENT MONITORS (HREM)
3. WORK SHEET TO DETERMINE RELEASE RATE FROM CONTAINMENT RAD MONITORS
4. FITZPATRICK HRCRM READINESS
5. 1.5% LEAKAGE SOURCE TERM ESTIMATE
6. 10% LEAKAGE SOURCE TERM ESTIMATE
7. 25% LEAKAGE SOURCE TERM ESTIMATE
8. 50% LEAKAGE SOURCE TERM ESTIMATE
9. 100% LEAKAGE SOURCE TERM ESTIMATE
10. CASTASTROPHIC LEAKEAGE SOURCE TERM ESTIMATE
11. CALCULATION METHOD FOR DETERMINING PERCENT OF TECHNICAL SPECIFICATION FOR NRC EVENT NOTIFICATION WORKSHEET
12. ANALYZED ACCIDENT TYPES



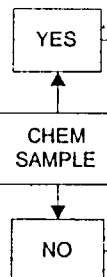
# FLOW CHART TO DETERMINE RELEASE RATE FROM LOW RANGE EFFLUENT MONITORS

Page 1 of 1

DATA Rx B \_\_\_\_\_ (cpm) RF \_\_\_\_\_ (cpm) RW \_\_\_\_\_ (cpm)  
Stack \_\_\_\_\_ (cps) TB \_\_\_\_\_ (cpm)

DATE  
TIME  
NAME

Rx B (cpm)	EPIC Pt ID 3337	(cpm) x ( * ) = RR (μCi/s) _____ x ( ) = _____
Refuel Floor (cpm)	EPIC Pt ID 3338	(cpm) x ( * ) = RR (μCi/s) _____ x ( ) = _____
Radwaste (cpm)	EPIC Pt ID 3340	(cpm) x ( * ) = RR (μCi/s) _____ x ( ) = _____
Turbine Building (cpm)	EPIC Pt ID 3339	(cpm) x ( * ) = RR (μCi/s) _____ x ( ) = _____
Stack (cps)	EPIC Pt ID 3336	(cps) x ( * ) = RR (μCi/s) _____ x ( ) = _____



Actual Iodine Release Rate (RR)  
(Actual I/NG Ratio) x RR(NG) = RR(Iodine) Ci/sec  
\_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_ Ci/sec

Estimated Iodine Release Rate (RR)  
( \*\* ) x RR(NG) = RR(Iodine) Ci/sec  
\_\_\_\_\_ x \_\_\_\_\_ = \_\_\_\_\_ Ci/sec

Noble Gas Release Rate RR(NG)  
RR (μCi/sec) ÷ 1.0E6 = RR(NG) Ci/sec  
\_\_\_\_\_ ÷ 1.0E6 = \_\_\_\_\_ Ci/sec

Refer to Section 4.1 1 C\*and D for additional guidance

Monitor	K Factor *	Normal Flow Rates Based on (cfm)
Reactor Bldg (Pt. 3337)	3.2E-1 μCi/sec/cpm	61,000
Refuel Floor (Pt 3338)	3.7E-1 μCi/sec/cpm	70,000
Radwaste Bldg (Pt. 3340)	1.7E-1 μCi/sec/cpm	32,500
Turbine Bldg. (Pt. 3339)	5.6E-1 μCi/sec/cpm	107,000
Stack (Pt. 3336)	6.0E-1 μCi/sec/cps	6,600

IF flow rates differ from the Normal Flow Rates listed above,  
THEN a correction to the K factor is necessary as follows:

$$K \text{ (corrected)} = \frac{\text{New Flow Rate}}{\text{Normal Flow Rate}} \times K \text{ Factor (listed)}$$

Iodine / Noble Gas Ratio	RATIOS **
Loss of Coolant Accident	2.98E-03
Control Rod Drop	9.93E-03
Refueling Accident	1.24E-04
Steam Line Break Single Phase	1.79E+01
Steam Line Break Two Phase	1.79E+01
Containment Design Basis Accident	2.13E-02

**NOTE:** The accuracy of ventilation flow rate indications at the low end of an instrument range should be confirmed with appropriate instrument calibration procedures.

# FLOW CHART TO DETERMINE RELEASE RATE FROM HIGH RANGE EFFLUENT MONITORS (HREM)

Page 1 of 1

DATA: Stack \_\_\_\_\_ (mR/hr)

TB \_\_\_\_\_ (mR/hr) RW \_\_\_\_\_ (mR/hr)

Stack (HREM), EPIC 1 SBGT Train Pt. I.D. (mR/hr) 1191	(mR/hr) (1.40) * = RR (Ci/s)
	(1.40) =

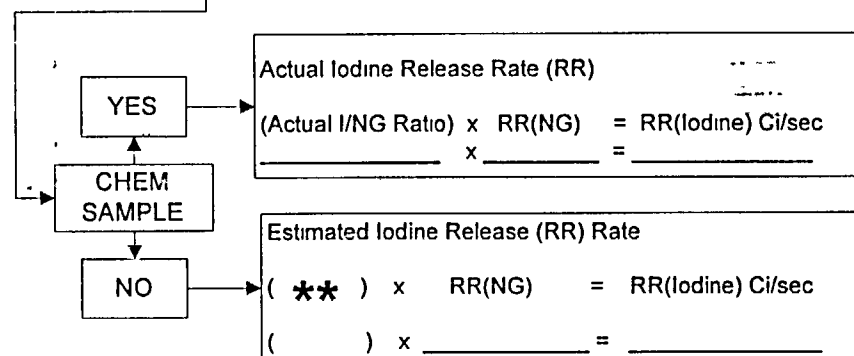
Stack (HREM) EPIC 1 SBGT Pt. I.D. 1 Fan 1191 (mR/hr)	(mR/hr) (2.54) * = RR (Ci/s)
	(2.54) =

TB EPIC (HREM) Pt. I.D. (mR/hr) 1194	(mR/hr) (22.6) * = RR (Ci/s)
	(22.6) =

Radwaste EPIC (HREM) Pt. I.D. (mR/hr) 1195	(mR/hr) (6.85) * = RR (Ci/s)
	(6.85) =

DATE:
TIME:
NAME:

Noble Gas Release Rate RR (NG)  
(Ci/sec)



\* Based on G. E. Data for monitor response  
under normal flow rates listed on page 8

Iodine / Noble Gas Ratio	RATIOS **
Loss of Coolant Accident	2.98E-03
Control Rod Drop	9.93E-03
Refueling Accident	1.24E-04
Steam Line Break Single Phase	1.79E+01
Steam Line Break Two Phase	1.79E+01
Containment Design Basis Accident	2.13E-02

WORK SHEET TO DETERMINE RELEASE RATE FROM CONTAINMENT RAD MONITORS

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DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ NAME: \_\_\_\_\_

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6		Column 7		Column 8
Containment Rad Monitor I.D.	Containment Rad Monitor Dose Rate (R/hr)	Time of Reading	Time of Shutdown	Time of Reading After Shutdown (hr) $\Delta T$	Calculated Concentration in containment (Ci/cc)		Expected Flow Rate to Environment * (cc/sec)		Estimated Release Rate (Ci/sec)
						X		=	
						X		=	

\*To convert cfm to cc/sec, multiply cfm by 472 from CRC handbook of Chemistry and Physics, 64th Edition, pg. F-308.

Attachment 4 Location on Graph	Calculated Concentration* (Ci/cc)
Area above Case #1	5.20E-2
Area between Case #1 and Case #2	3.45E-2
Area between Case #2 and Case #3	1.09E-2
Area between Case #3 and Case #4	3.30E-4
Area between Case #4 and Case #5	1.91E-5
Area between Case #5 and Case #6	1.91E-6
Area below Case #6	Normal
*Concentrations derived using EAP-44 estimates of core inventory and a containment volume of 7.48E+9cc (i.e. drywell and torus gas space volume).	

**NOTE:**

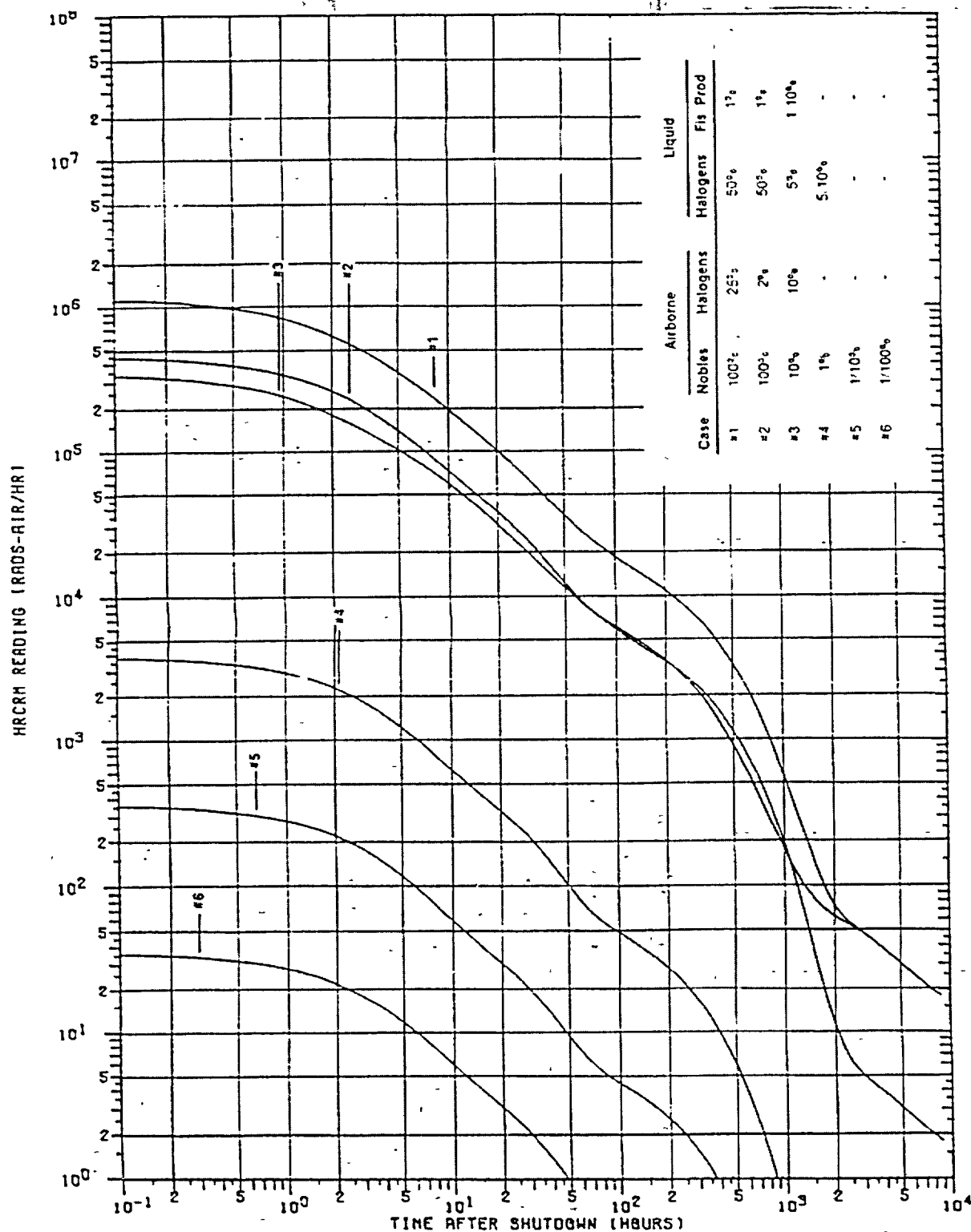
The Primary Containment and Reactor Building leak rate default value is 1.5% per day (1298 cc/sec). The as-left Primary Containment leak rate calculated after RO-15 was approximately 1,569 scf/day (11 CFM or 514.4 cc/sec).

The dose rate at the site boundary is 500 mr/yr whole body from noble gas, 1,500 mr/yr for any organ from iodines and particulates with half lives greater than 8 days, per Offsite Dose Calculation Manual (ODCM)

The current total as-left Primary Containment leakage can be found in the last run of ST-39B attachment 7. The last run ST-39B is in a binder in the bottom drawer of the middle file cabinet in the Operations file area adjacent to the Control Room. Attachment 7 is used to update the leakage totals subsequent to a complete run of ST-39B (i.e., forced outage LLRTs). The most recently dated forms of attachment 7 will contain the current as-left Minimum Pathway leakage and Maximum Pathway leakage. These numbers will provide the least and most amount of leakage projected for all Primary Containment leakage pathways. These numbers are reported in Standard Liters per Minute (SLM). To convert to cc/sec, as required in EAP-4.1, divide SLM by 28.31 to get CFM, then multiply CFM by 472 to get cc/sec.

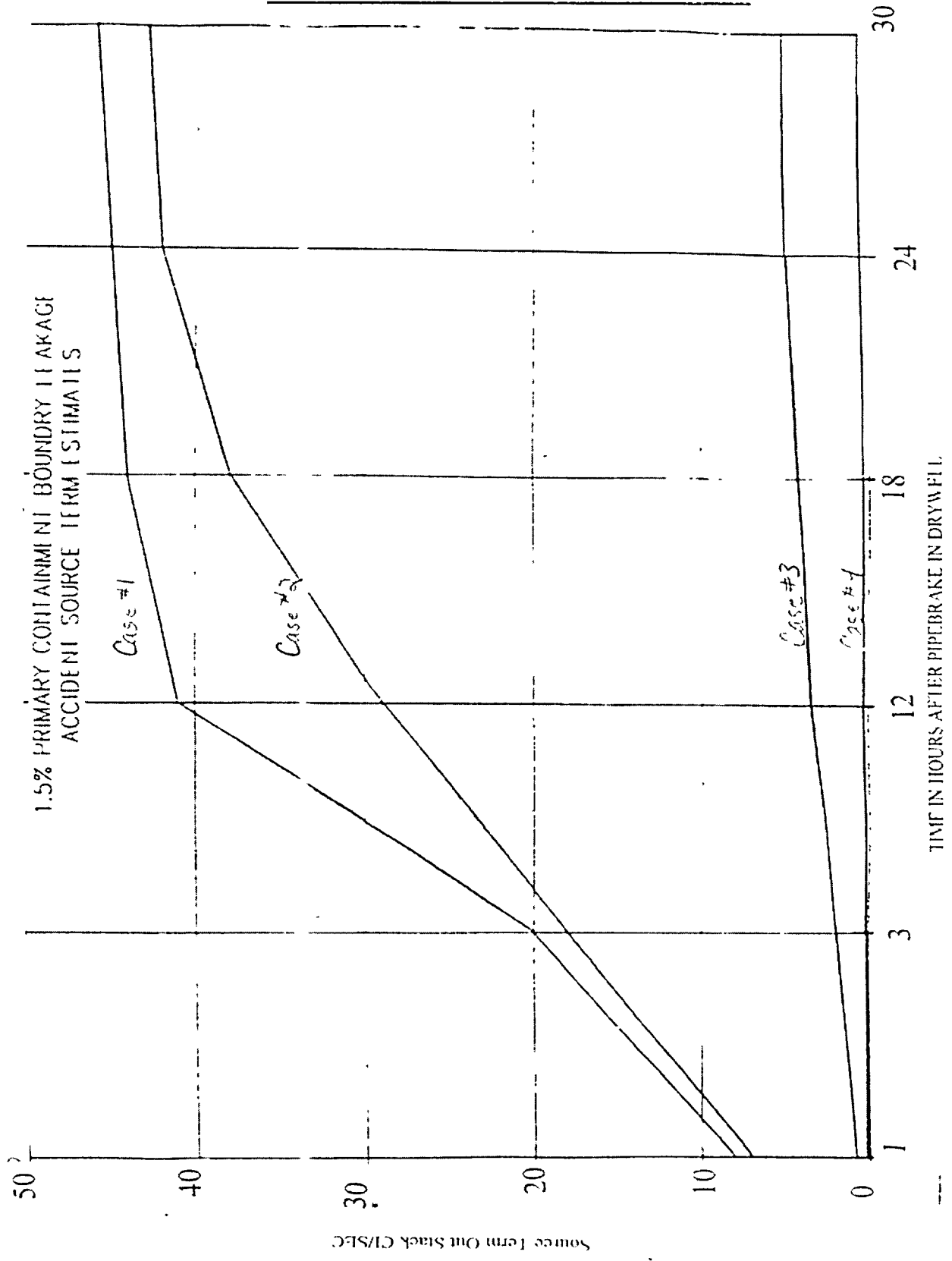
**Attachment 4**  
**FITZPATRICK HRCRM READINGS**

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FITZPATRICK - HRCRM READINGS

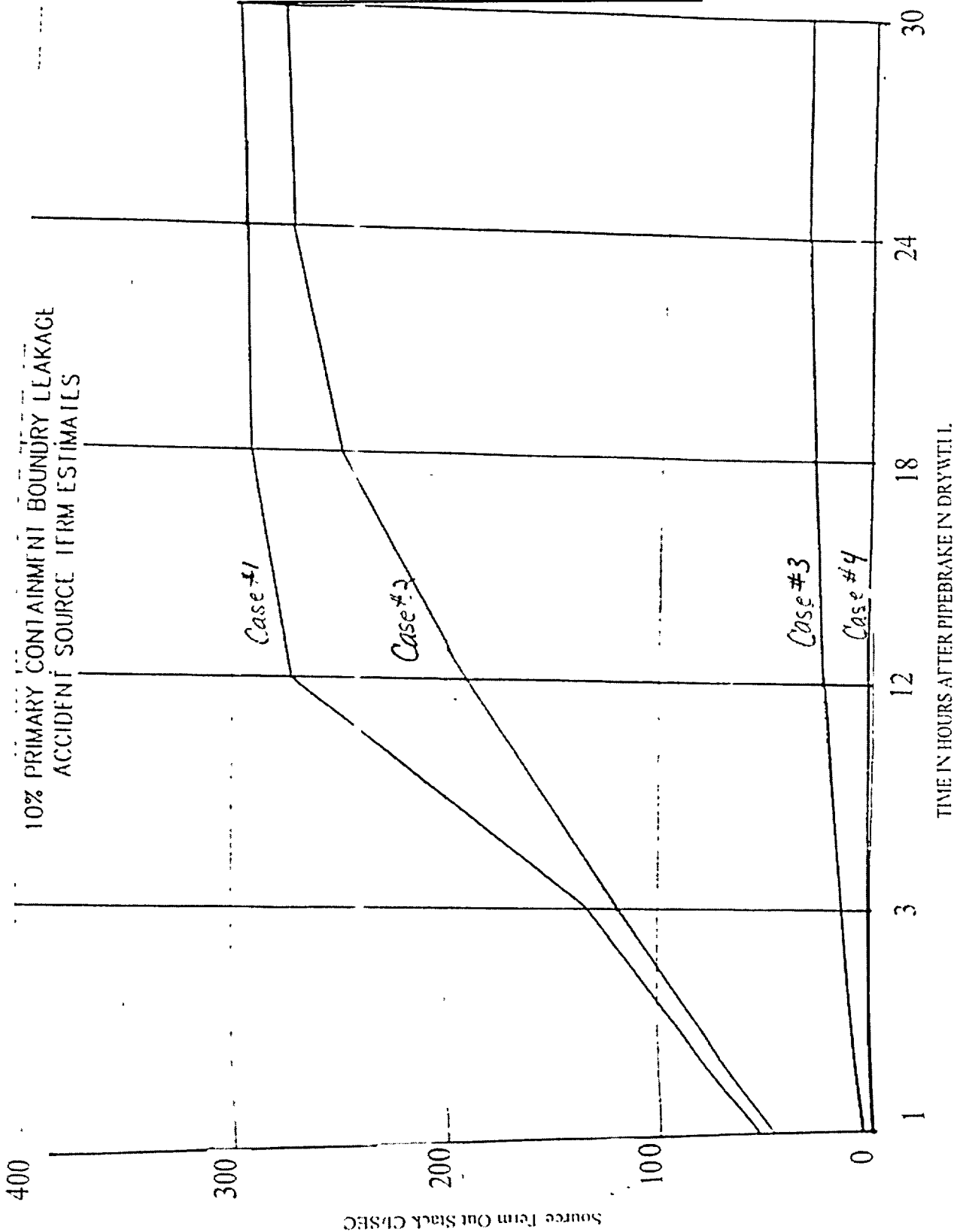
Attachment 5  
1.5% LEAKAGE SOURCE TERM ESTIMATE

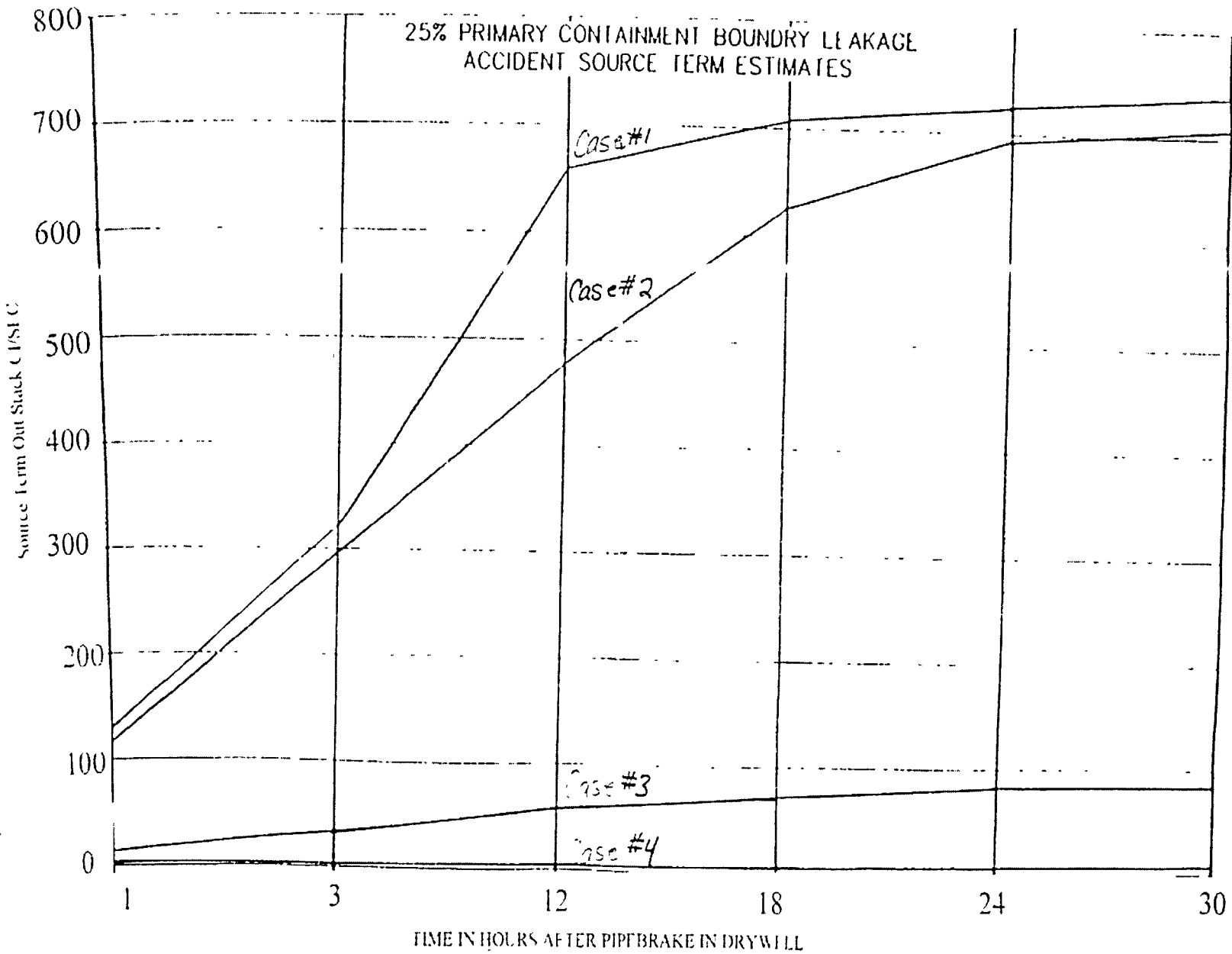


Attachment 6

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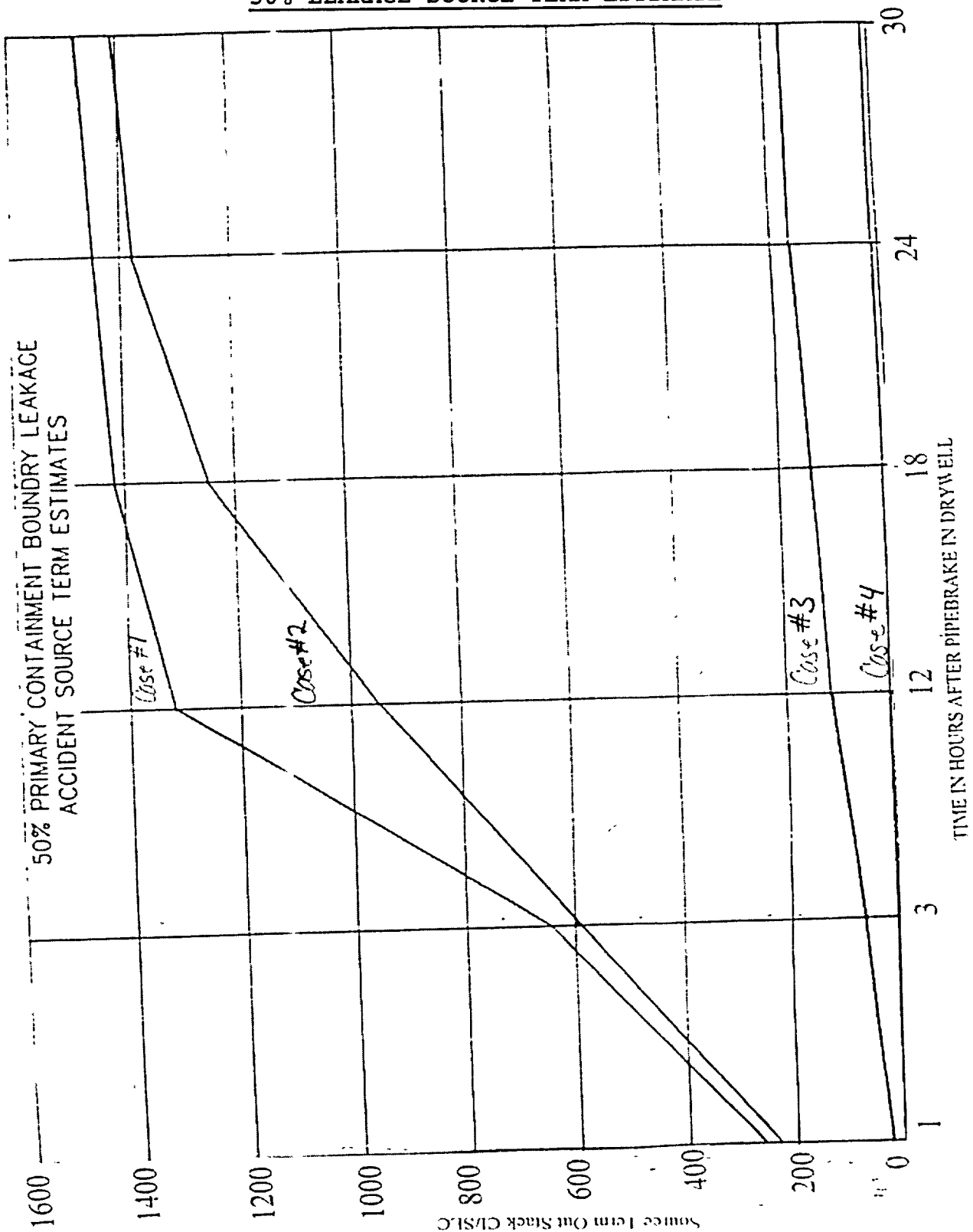
10% LEAKAGE SOURCE TERM ESTIMATE



25% LEAKAGE SOURCE TERM ESTIMATE

Attachment 8  
50% LEAKAGE SOURCE TERM ESTIMATE

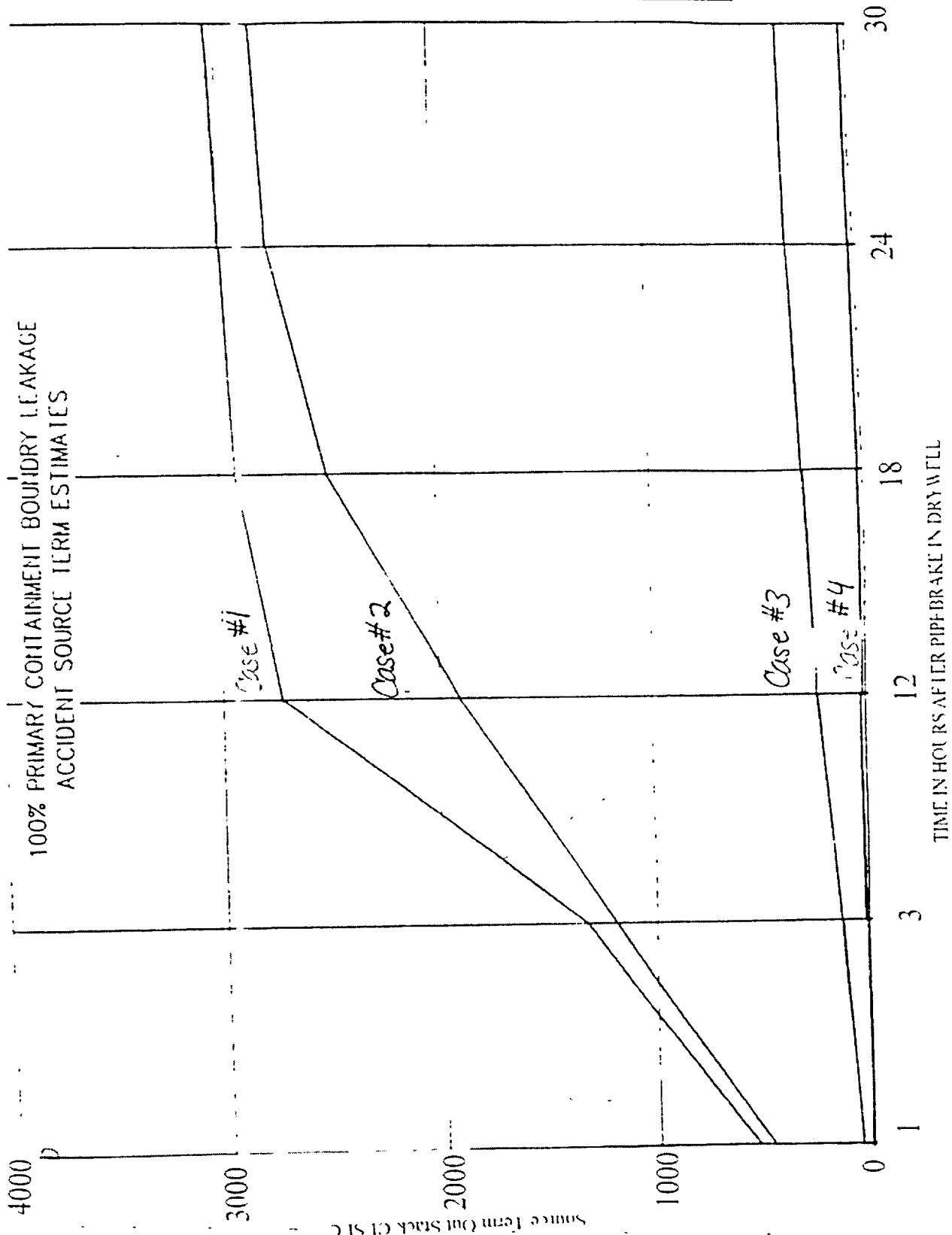
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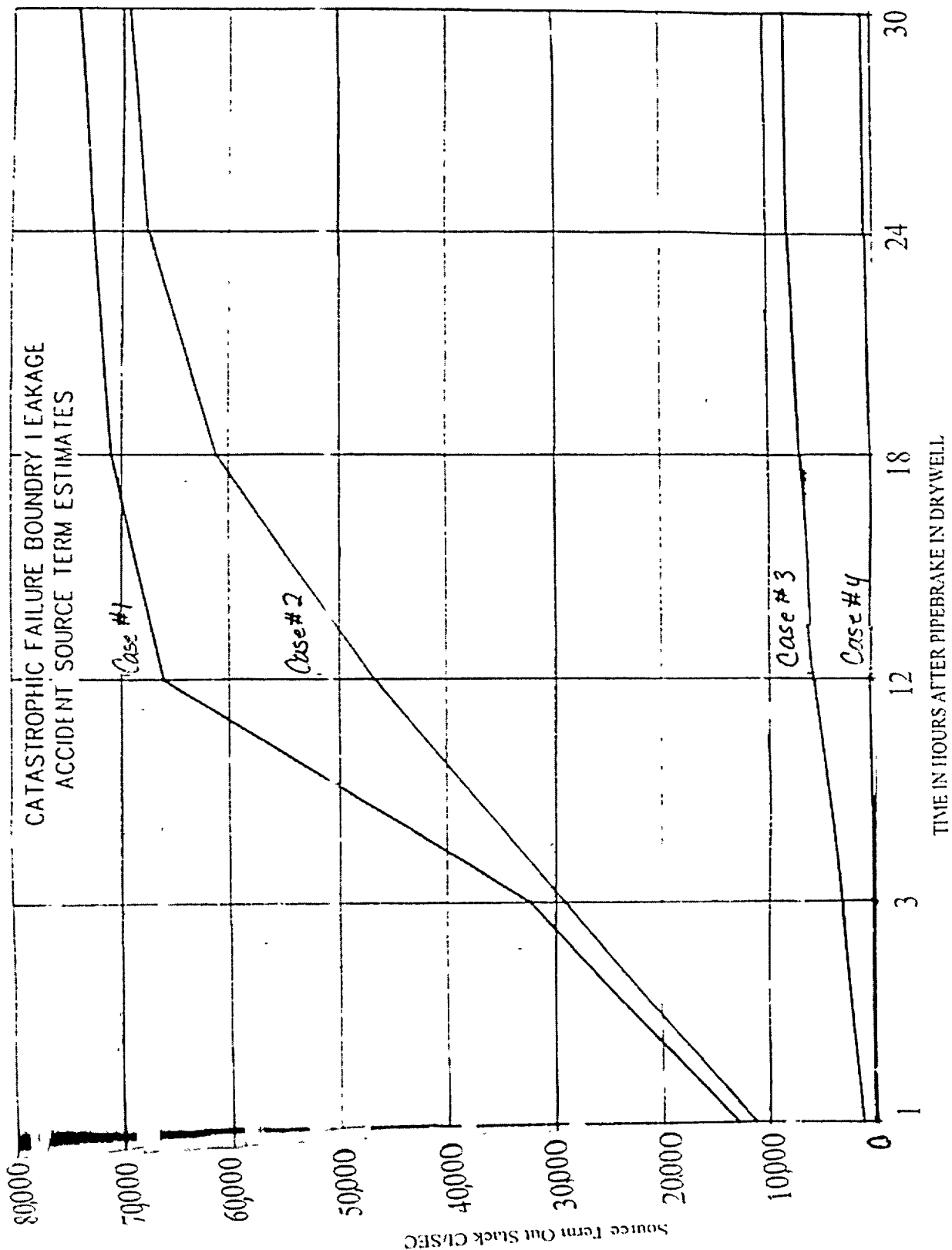
Attachment 9  
100% LEAKAGE SOURCE TERM ESTIMATE

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Attachment 10  
CATASTROPHIC LEAKAGE SOURCE TERM ESTIMATE

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## Attachment 11

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CALCULATION METHOD FOR DETERMINING PERCENT OF TECHNICAL SPECIFICATION  
FOR NRC EVENT NOTIFICATION WORKSHEET

1. The formula for calculating the percent of Technical Specification of Airborne releases was derived from the JAF Offsite Dose Calculation Manual, Revision 7.

The following assumptions apply:

The release Technical Specification limit of 500 mrem/year ([CTS] Technical Specifications, Appendix B, Section 3.2.a.1 [ITS] 5.5.4) was used as the basis for the noble gas instantaneous release limit.

The Technical Specification of 1,500 mrem/year to any organ ([CTS] Technical Specifications, Appendix B, Section 3.2.a.2 [ITS] 5.5.4) was used as the basis for the radioiodine, tritium and eight day particulate instantaneous release limit

The most conservative  $X/q$  ( $4.83E-7$  sec/ $m^3$ ) for ground based receptors at the site boundary was used for all cases and is the FSAR defined accident  $X/q$ .

All assumptions and conservatism of the ODCM were applied.

2. As a result of these assumptions and conservatism, these formulae should be used only to estimate the initial percent of Technical Specifications as required by the NRC Event Notification Worksheet (EAP-1.1, Attachment 6). As more detailed source term and meteorological data become available, a more accurate determination of percent Technical Specification should be performed.
3. Technical Specification release rates for stack and vent noble gas releases are obtained from the setpoint release rates for these points described in the ODCM.
4. Calculation method for determining the initial percent of Technical Specifications for NRC Event Worksheet (use calculation worksheet on next page).

For Noble Gas Vent Release:

$$\% \text{ T.S.} = RR_{NG} (\text{Ci/s}) \times 1432$$

For Noble Gas Stack Release:

$$\% \text{ T.S.} = RR_{NG} (\text{Ci/s}) \times 333$$

Where  $RR_{NG}$  = noble gas release rate in curies per second

1432 = 100% divided by vent setpoint release rate of 0.0698 Ci/sec

333 = 100% divided by stack setpoint release rate of 0.3 Ci/sec

These equations assume an instantaneous release rate, ODCM dose conversion factors, and historical meteorological data.

For Gross Liquid Release excluding Tritium:

$$\% \text{ T.S.} = F_L (\text{gal/m}) \times C_L (\mu\text{Ci/ml}) \times 2120$$

Where  $F_L$  = flow rate in gallons per minute

$C_L$  = concentration of liquid effluent in  $\mu\text{Ci/ml}$

2120 = unit and dose conversion factor

For iodine, tritium and particulates with half-lives greater than 8 days:

$$\% \text{ T.S.}_{\text{iodine and particulate}} = RR_{\text{iodine}} (\text{Ci/sec}) \times 40.48$$

$$\% \text{ T.S.}_{\text{tritium}} = RR_{\text{tritium}} (\text{Ci/sec}) \times 0.32$$

Total % T.S. =  $\Sigma$  % T.S. for all release points

**CALCULATION METHOD FOR DETERMINING PERCENT OF TECHNICAL  
SPECIFICATION FOR NRC EVENT NOTIFICATION WORKSHEET**

**Noble Gas Vent Release**

$$\% \text{ T.S.} = \text{RR}_{\text{NG}} \times 1432$$

$$\% \text{ T.S.} = [\text{RR}_{\text{NG}} \quad \quad \quad] \text{ Ci/s} \times 1432$$

$$\% \text{ T.S.} = \quad \quad \quad$$

**NOTE:**

100% NG Vent Release = 0.0698 ci/sec

100% NG Stack Release = 0.3 ci/sec

**Noble Gas Stack Release**

$$\% \text{ T.S.} = \text{RR}_{\text{NG}} (\text{Ci/s}) \times 333$$

$$\% \text{ T.S.} = [\text{RR}_{\text{NG}} \quad \quad \quad] \text{ Ci/s} \times 333$$

$$\% \text{ T.S.} = \quad \quad \quad$$

**NOTE:**

If % TS ≥ 100 - Fill out Part II Form

This is indication of a release in progress

**Gross Liquid Release excluding Tritium**

$$\% \text{ T.S.} = F_L \times C_L (\mu\text{Ci/ml}) \times 2120$$

$$\% \text{ T.S.} = [F_L \quad \quad \quad] \text{ gal/m} \times [C_L \quad \quad \quad] \mu\text{Ci/ml} \times [2120]$$

$$\% \text{ T.S.} = \quad \quad \quad$$

**Iodine and Particulate with half lives greater than 8 days**

$$\% \text{ T.S.}_{\text{I\&P}} = \Sigma \text{RR}(\text{Ci/s})_{\text{I\&P}} (\text{all vents}) \times 40.48$$

$$\% \text{ T.S.}_{\text{I\&P}} = [(\text{RR}_{\text{I\&P}} \quad \quad \quad) \text{ Ci/s} + (\text{RR}_{\text{I\&P}} \quad \quad \quad) \text{ Ci/s} +$$

stack T.B. vent

$$\text{RR}_{\text{I\&P}} \quad \quad \quad) \text{ Ci/s} + (\text{RR}_{\text{I\&P}} \quad \quad \quad) \text{ Ci/s} +$$

Rx Bldg vent Refuel Floor

$$(\text{RR}_{\text{I\&P}} \quad \quad \quad) \text{ Ci/s}] \times 40.48$$

Radwaste Bldg

$$\% \text{ T.S.}_{\text{I\&P}} = (\text{RR}_{\text{I\&P}} \quad \quad \quad) \text{ Ci/s} \times 40.48$$

total vents

$$\% \text{ T.S.}_{\text{I\&P}} = \quad \quad \quad$$

**Tritium**

$$\% \text{ T.S.}_{\text{Tritium}} = \Sigma \text{RR}(\text{Ci/s})_{\text{Tritium}} (\text{all vents}) \times 0.32$$

$$\% \text{ T.S.}_{\text{Tritium}} = [(\text{RR}_{\text{Tritium}} \quad \quad \quad) \text{ Ci/s} + (\text{RR}_{\text{Tritium}} \quad \quad \quad) \text{ Ci/s} +$$

stack T.B. vent

$$(\text{RR}_{\text{Tritium}} \quad \quad \quad) \text{ Ci/s} + (\text{RR}_{\text{Tritium}} \quad \quad \quad) \text{ Ci/s} +$$

Rx Bldg vent Refuel Floor

$$(\text{RR}_{\text{Tritium}} \quad \quad \quad) \text{ Ci/s}] \times 0.32$$

Radwaste Bldg

$$\% \text{ T.S.}_{\text{Tritium}} = (\text{RR}_{\text{Tritium}} \quad \quad \quad) \text{ Ci/s} \times 0.32$$

total vents

$$\% \text{ T.S.}_{\text{Tritium}} = \quad \quad \quad$$

**Where:**

RR = release rate (Ci/sec)

F<sub>L</sub> = Flow Rate (gal/m)C<sub>L</sub> = Concentration of liquid effluent (μCi/ml).

**ATTACHMENT 12**  
**ANALYZED ACCIDENT TYPES**

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New Accident Names/Analyzed Accidents per Attachment A of EAP-4		Loss of Coolant Accident	Control Rod Drop	Refueling Accident	Steam Line Break Two Phase	Steam Line Break	LOCA - Engineered Safety Feature Component Leakage
		loca jaf	crd jaf	rfa jaf	slb2 jaf	slb2 jaf	esf jaf
OLD EDAMS Accident Name Used		Loss of Coolant Accident	Control Rod Drop	Refueling Accident		Steam Line Break Two Phase	Containment Design Basis Accident
Analyzed Release Point		Elevated	Ground	Elevated	Ground	Ground	Elevated
Nuclide		LOCA	CRD	RFA	SLB1	SLB2	CDBA
NOBLE GASES (Ci/sec)	Kr 83M	1.353E+00	1.577E-03	6.117E-03	1.517E-05	1.517E-05	1.154E-02*
	Kr 85M	2.906E+00	3.386E-03	8.839E-02	2.725E-05	2.725E-05	1.508E-04
	Kr 85	1.301E-01	1.156E-04	1.604E-01	8.917E-08	8.917E-08	3.658E-09
	Kr 87	5.572E+00	6.494E-03	1.432E-05	8.917E-05	8.917E-05	0.000E+00
	Kr 88	7.894E+00	9.200E-03	2.777E-02	8.917E-05	8.917E-05	0.000E+00
	Kr 89	9.817E+00	1.144E-02	0.000E+00	5.800E-04	5.800E-04	0.000E+00
	<i>Kr subtotal</i>	<i>2.767E+01</i>	<i>3.221E-02</i>	<i>2.827E-01</i>	<i>8.008E-04</i>	<i>8.008E-04</i>	<i>1.508E-04</i>
	Xe131m	6.825E-02	7.953E-05	8.783E-02	6.692E-08	6.692E-08	7.994E-05*
	Xe133m	9.942E-01	1.159E-03	1.048E+00	1.292E-06	1.292E-06	1.934E-03
	Xe133	2.386E+01	2.781E-02	2.833E+01	3.658E-05	3.658E-05	2.769E-02
	Xe135	3.081E+00	3.589E-03	6.522E+00	9.833E-05	9.833E-05	1.952E-01
	Xe135m	4.494E+00	5.239E-03	3.578E-01	1.158E-04	1.158E-04	5.686E-01
	Xe137	2.094E+01	2.440E-02	0.000E+00	6.692E-04	6.692E-04	0.000E+00
	Xe138	1.988E+01	2.316E-02	0.000E+00	3.975E-04	3.975E-04	0.000E+00
	<i>Xe subtotal</i>	<i>7.332E+01</i>	<i>8.544E-02</i>	<i>3.635E+01</i>	<i>1.319E-03</i>	<i>1.319E-03</i>	<i>7.934E-01</i>
	<i>Noble Gas (NG) subtotal</i>	<i>1.010E+02</i>	<i>1.176E-01</i>	<i>3.663E+01</i>	<i>2.120E-03</i>	<i>2.120E-03</i>	<i>7.936E-01</i>
IODINES (Ci/sec)	I131	3.406E-02	1.323E-04	1.299E-03	9.808E-04	9.808E-04	1.918E-03
	I132	4.975E-02	1.933E-04	1.680E-03	7.628E-03	7.628E-03	2.803E-03
	I133	7.119E-02	2.766E-04	1.346E-03	6.536E-03	6.536E-03	4.011E-03
	I134	7.839E-02	3.044E-04	0.000E+00	1.380E-02	1.380E-02	4.417E-03
	I135	6.725E-02	2.612E-04	2.233E-04	9.075E-03	9.075E-03	3.789E-03
	<i>Iodine subtotal</i>	<i>3.006E-01</i>	<i>1.168E-03</i>	<i>4.548E-03</i>	<i>3.802E-02</i>	<i>3.802E-02</i>	<i>1.694E-02</i>
PARTICULATES (Ci/sec)	CS137	3.583E-03	1.671E-05	1.769E-04	1.198E-05	1.198E-05	2.019E-04
	TE132	8.178E-03	0.000E+00	0.000E+00	6.900E-04	6.900E-04	4.606E-04
	SR 89	2.132E-03	0.000E+00	0.000E+00	1.489E-04	1.489E-04	1.201E-04
	SR 90	2.228E-04	0.000E+00	0.000E+00	1.126E-05	1.126E-05	1.255E-05
	Ba140	4.094E-03	0.000E+00	0.000E+00	4.358E-04	4.358E-04	2.306E-04
	La140	4.336E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.443E-06
	<i>Particulate subtotal</i>	<i>1.83E-02</i>	<i>1.67E-05</i>	<i>1.77E-04</i>	<i>1.30E-03</i>	<i>1.30E-03</i>	<i>1.03E-03</i>
RELEASE RATE TOTALS (Ci/sec)		<b>1.01E+02</b>	<b>1.19E-01</b>	<b>3.66E+01</b>	<b>4.14E-02</b>	<b>4.14E-02</b>	<b>8.12E-01</b>
Accident Duration Used for EDAMS		<b>8 hours</b>	<b>4 hours</b>	<b>2 hours</b>	<b>2 hours</b>	<b>2 hours</b>	<b>2 hours</b>
TOTAL Release Assumed (Ci)		<b>2.92E+06</b>	<b>1.71E+03</b>	<b>2.64E+05</b>	<b>2.98E+02</b>	<b>2.98E+02</b>	<b>5.84E+03</b>
RATIOS		Loss of Coolant Accident	Control Rod Drop	Refueling Accident	Steam Line Break Two Phase	Steam Line Break	LOCA - Engineered Safety Feature Component Leakage
	Iodine / Noble Gas Ratio	2.98E-03	9.93E-03	1.24E-04	1.79E+01	1.79E+01	2.13E-02
	Noble gas / Iodine Ratio	3.36E+02	1.01E+02	8.05E+03	5.58E-02	5.58E-02	4.69E+01
	Noble Gas / Particulate Ratio	5.53E+03	7.04E+03	2.07E+05	1.63E+00	1.63E+00	7.72E+02
	Iodine / Particulate Ratio	1.65E+01	6.99E+01	2.57E+01	2.93E+01	2.93E+01	1.65E+01
	NG / Particulate + Iodine Ratio	3.17E+02	9.93E+01	7.75E+03	5.39E-02	5.39E-02	4.42E+01