

**SUBJECT:**

Protective Action Recommendations Based on Plant Conditions.

**PURPOSE AND SCOPE:**

Using plant conditions as a bases, this bases document was written to evaluate the radiological consequences to members of the general public within the EPZ following a variety of severe accidents. It provides plant staff with a method of recommending Protective Actions based on plant conditions.

**RESULTS:**

Attachment 1 contains the front end (no protective actions included) of an event status tree based on the assumptions and data used in this analysis. It starts with event trees for containment releases with varying degrees of core damage. Steam Generator Tube Ruptures and Containment Bypass events are similarly analyzed.

The data from the event status trees was then entered into version 2 of the NRC's RASCAL computer program. The results are tabulated in Appendix A-FF of Attachment 1. The results were analyzed to determine the appropriate protective actions that would be recommended based on the plant conditions. These results were substituted into the status tree. The resulting tree is documented in Attachment 2. Since many of the protective action recommendations were the same for differing degrees of the same event, an attempt was made to consolidate events where, regardless of the conditions, the protective actions would be the same. A generic consolidated status tree is documented in Attachment 3.

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(Signature/Title/Date)

**CHECKLIST**

Purpose & Scope	<input checked="" type="checkbox"/>
Results	<input checked="" type="checkbox"/>
Assumptions	<input checked="" type="checkbox"/>
References	<input checked="" type="checkbox"/>
Attachments	<input checked="" type="checkbox"/>
Analysis	<input checked="" type="checkbox"/>

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KDP-ZZ-00007

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RESULTS (cont'd):

The final results of this analysis are documented as a consolidated site specific status tree in Attachment 4. Up to this point in the analysis, generic terms for various plant conditions were being used in the event status trees. These terms were replaced with Callaway Plant specific values and set points identified in the body of this analysis.

The final decision tree incorporates a precautionary protective action of sheltering 5 miles down wind and in a 2 mile radius when plant conditions do not warrant a protective action recommendation based on potential dose consequences. This precautionary measure is based on the General Emergency declaration and provides a means for the public to go indoors and monitor EBS broadcasts. It was also moved to the beginning of the status tree to allow Control Room staff more time to evaluate plant conditions.

Additionally, the decision tree allows protective actions to be upgraded by Dose Assessment personnel if a dose calculation has been performed and the doses to the general public are projected to exceed the EPA protective action guides.

The decision tree also allows upgrading protective action recommendations based on security events that include a loss of shutdown capability.

ASSUMPTIONS:

1. No credit is taken for decay of radionuclides that are held-up in the containment building or other structures prior to their release. This is a conservative assumption.
2. Protective Action Recommendations based on Plant Conditions will be made for the 2 mile, 5 mile, and 10 mile down wind distances. No plume exposure protective actions will be necessary beyond 10 miles.
3. Steam generator tubes are assumed to be partition predicated on the efficiency of the Steam Generator Moisture Separators in removing iodines from the steam phase of a steam generator tube rupture release.
4. Average meteorological conditions are assumed to exist during the release. This is consistent with NRC guidance (ref. 1).
5. A one (1) hour release duration was assumed. This is consistent with NRC guidance (ref. 1).
6. All releases are assumed to be ground level releases since all possible release points are effectively lower than two and one-half times the height of adjacent solid structures.
7. Building wake effect was used in the RASCAL program.



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REFERENCES:

1. "Source Term Estimation During Incidents Response to Severe Nuclear Power Plant Accidents", USNRC Nureg-1228, October 1988.
2. "RTM-93, Response Technical Manual", USNRC Nureg/BR-0150, Vol. 1, Rev. 3, November 1993.
3. "RASCAL Version 2.0 User's Guide", USNRC Nureg/CR-5247 PNL-8454, Vol. 1, Rev. 1, February 1993.
4. "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", USNRC Nureg-0654, FEMA-REP-1, Rev. 1, November 1980.
5. "The MESORAD Dose Assessment Model", USNRC Nureg/CR-4000, Vol. 1, March 1985.
6. "MESOI Version 2.0: An Interactive Mesoscale Lagrangian Puff Dispersion Model with Deposition and Decay", USNRC Nureg/CR-3344, 1993.
7. "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents", EPA-400-R-92-001, October 1991.
8. "Classification of Emergencies", EIP-ZZ-00101, Rev. 17, June 1994.
9. "Protective Action Recommendations", EIP-ZZ-00212, Rev. 12, April 1994.
10. "Criteria for Protective Action Recommendations for General Emergencies", USNRC IE Information Notice No. 83-28, May 1983.
11. "PWR Dry Containment Issue Characterization", USNRC Nureg/CR-5567, August 1990.
12. "Radionuclide Release Under Specific LWR Accident Conditions, Volume VI PWR-Large, Dry Containment Design (Zion Plant)", USNRC BMI-2104, Volume VI, July 1984.
13. "Best Estimate SGTR Iodine and Noble Gas Releases thru the Steam Generator PORV", Union Electric Calculation ZZ-342, Rev. 0, June 1994.
14. "Callaway Plant Final Safety Analysis Report - Site Addendum", Rev. 0L-0, June 1986.
15. "Callaway Plant Final Safety Analysis Report", Rev. 0L-2, June 1988.



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ATTACHMENTS:

Attachment 1a-e	Front-End Status Tree
Attachment 1-Appendix A-FF	RASCAL Tabular Outputs
Attachment 2a-e	Status Tree With Protective Actions
Attachment 3a-d	Consolidated Generic Status Tree
Attachment 4a-d	Consolidated Site Specific Status Tree

ANALYSIS:

I. General

This bases document provides a method for making protective action recommendations based on Plant Conditions. During the early phase of an accident, plant parameters can be monitored to determine the extent of core damage and the likeliness of losing fission product barriers. By identifying these parameters and using consequent analysis, pre-planning can be performed so that emergency personnel can use these parameters to make the appropriate protective action recommendations. This can be done, quite possibly before a release has occurred, and without the need for lengthy dose assessment calculations.

The current method of making protective action recommendations using plant conditions is very limited and is based on Nureg 0654 EAL Methodology (ref. 4). A more recent document (ref. 1) has been written which allows a more detailed analysis of the radiological consequences of a severe accident. Using this document and plant specific parameters that can be monitored during a severe accident, protective action recommendations can be developed based on these consequences.

Protective action recommendations based on plant parameters have many advantages. Plant parameters can be easily monitored from the Control Room by shift personnel. Also, since dose calculations and radiological consequences to the general public from a variety of accident cases can be evaluated during the planning stages, a shift dose assessment person, computer, program and procedures for performing complex dose calculations can be eliminated. Additionally, because of the ability to immediately monitor plant conditions and make protective actions based on them, protective actions can be implemented often times before a release is underway. Where an evacuation is recommended, this would





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allow county and State emergency workers time to evacuate the general public before plume arrival. This could result in a reduction of dose to the public and possibly eliminate evacuating them through the plume. This is significant since an evacuation can take up to four (4) hours to implement. It is prudent, therefore, to evacuate the general public, should the conditions warrant, before a release is underway. Waiting until a release is underway, then evaluating the radiological consequences based on effluent monitors, and then evacuating the general public through a radioactive plume is unwise from a dose savings standpoint and is not recommended by federal guidance (ref. 3).

II. Bases Source Documents

A. Nureg 1228

Various documents were used for this analysis. Much of the philosophy was derived from Nureg-1228 (ref. 1). In fact, Nureg-1228 was used as a template for developing the event trees in this document, with only slight modifications. Nureg-1228 uses a combination of core conditions, containment conditions, holdup times, and leak rates to determine the release source term. It also takes into consideration reduction mechanisms such as filtration, partitioning, and containment sprays. These parameters were all evaluated and used as appropriate. The dominant release pathways from Nureg-1228 were also adopted and used in this evaluation. Nureg-1228 uses the MESORAD computer code (ref. 5) as a transport model for projecting doses at various downwind locations. Since only doses at 1 mile are calculated in Nureg-1228, and the units are in Rem Whole Body rather than Total Effective Dose Equivalent, a decision was made to not use the dose results from Nureg-1228.

B. RASCAL

A decision was made to use version 2 of the NRC RASCAL Model (ref. 3) for actual data report generation. RASCAL incorporates source term estimations from plant conditions using Nureg-1228 methodology and uses transport subroutines derived from MESORAD and MESOI (ref. 6). It also incorporates dose conversion factors similar to those used in EPA-400-R-92-001 (ref. 7) and uses effective dose terminology consistent with the new EPA-400 protective action guide levels. Although RASCAL uses a reactor power level of 3411 Mw thermal for the Callaway Plant in determining source terms, the 7% difference in Callaway's actual rated power level of 3454 Mw thermal is not significant enough to change the PARs.

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### C. NUMARC EALs

Nureg-1228 provides generic guidance for using plant condition parameters which are not site specific. An attempt was made to interpret data from the guidance and make it Callaway specific based on parameters that are monitored by our plant computer system. During this effort, the NUMARC based EALs (ref. 8) provided a source of data for plant conditions. Their respective setpoint limits or numeric values could be easily applied and monitored by CR shift personnel. With the exception of core conditions, which determine the initial source term, the majority of the plant parameters affecting the fission product barriers are documented in the NUMARC EALs. A decision was made to adopt the EAL values for this document, where appropriate, since shift personnel are familiar with them and are trained in their use. Additionally, the values used in the EALs are well documented and have been reviewed and approved by the NRC. Also, the shift crew would normally be evaluating them during an emergency.

### D. NUREG 0654

The current guidance for protective action recommendations used in EIP-ZZ-00212 (ref. 9) is based on EALs in Nureg-0654 (ref. 4) and IE Information Notice No. 83-28 (ref. 10). These documents establish protective actions for downwind locations at a distance of either 2 miles, 5 miles, or 10 miles. Additionally, when a downwind distance is provided, a radius distance less than the downwind distance is also provided. This radius protective action is conservative and takes into consideration the dose consequences to the public should a wind direction change occur. This concept and relationship is prudent and is adopted in this analysis.

### III. Core Conditions

Four core conditions are discussed in Nureg-1228. These include:

1. Normal fuel pin leakage (normal operating temperature 600°F)
2. Fuel cladding rupture release (gap release) (1300° - 2100°F)
3. Grain boundary release (>3000°F)
4. Melt (in vessel) release (>4500°F)

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RASCAL uses the following core conditions:

1. Normal RCS activity
2. Reactor coolant 100X normal
3. Gap release
4. In-vessel severe core damage
5. Vessel melt through

Although Nureg-1228 describes the five core conditions used by RASCAL, the status trees in Nureg-1228 are based on: Fuel Cladding Rupture Release (gap release), Grain Boundary Release, and Melt (in vessel) Release. Nureg-1228 further states that it would be difficult to specifically identify the Grain Boundary Release from the Melt (in vessel) release.

For this reason, it was decided to use the RASCAL core condition of In-Vessel severe core damage (Nureg-1228 In-Vessel Melt Release), and the remaining terminology and core conditions used by RASCAL.

A. Vessel Melt Through

Vessel melt through is referred to in Nureg-1228 as Reactor Vessel Melt-through (ex-vessel meltings), where the core eventually melts through the bottom of the reactor vessel and onto the containment floor. Since this occurs well beyond the temperature range of the core exit thermocouples, temperature is not used as an indicator for this type of accident. For a large dry containment (Zion), average core temperature is approximately 3984°F. Peak core temperature is greater than 5152°F (Table 6.3, ref. 12). At this high temperature, containment hydrogen levels of greater than 6% (Figure B-10, ref. 2) would be observed. Additionally, containment high range area radiation monitor (CHARM) readings above 1,000,000 R/hr (400,000 R/hr Containment Sprays On) would be observed (Table B-7, ref. 2).



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B. Severe Core Damage

Fuel melt and severe core damage starts when the peak core temperature reaches 4130°F (Table 6.1, ref. 12), and average core temperature is between 1978°F and 2335°F (Table 6.3, ref. 12). A value of 2000°F will be used in this analysis. This is conservative and within the range of Callaway Plant's core exit thermocouples (0-2300°F) (Table 7A-3, ref. 14). At this temperature, containment hydrogen levels of greater than 2% (Figure B-10, ref. 2) would be observed. Additionally, CHARM monitor readings above 30,000 R/hr (10,000 R/hr Containment Sprays On), would be observed (Table B-7, ref. 2).

C. Gap Release

Gap release is referred to in Nureg-1228 as fuel cladding rupture/gap release. This occurs when the temperature of fuel cladding reaches a temperature >1300°F (Fig. B-1, ref. 2) and results in the failure of the fuel cladding barrier. As a result, fission products are released from the gap area into the reactor coolant system. Because this temperature is within the range of the core exit thermocouples, they will be used as an indicator of this event. Since this temperature could occur if the core becomes uncovered for longer than 15 minutes (Figure B-2, ref. 2) RVLIS readings will be used as an indicator of this core condition. Core uncover <40%, and core exit thermocouple readings >1200°F are already evaluated in Emergency Operating Procedures CSF-1, Critical Safety Function Status tree, and FR-C.1, Response to Inadequate Core Cooling. Since inadequate core cooling is specified in CSF-1 and FR-C.1, and the values identified are site specific, entry into FR-C.1 will be used as an indicator meeting this condition. Additionally, Containment High Range Area Radiation Monitor readings above 300 R/hr (100 R/hr Containment Sprays On), would be observed (Table B-7, ref. 2).

D. Normal and 100X Normal Activities

Nureg-1228 analyzes a steam generator tube rupture event for a release of normal and 100X spike coolant (Figure 5.4A, ref. 1). The results indicate that protective actions would not be warranted for members of the general public at any distance down wind from the plant. Additionally, RASCAL was used to project doses based on normal RCS activity and 100X RCS activity. The results indicate that no protective actions are necessary for accidents with these levels of activity. See Attachment 2-D.



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#### IV. Release Pathways

Three release paths are used by RASCAL. Depending on the path selected, appropriate release rates and reduction mechanisms can be selected. The three general pathways are:

1. Containment Failure
2. Containment Bypass
3. Steam Generator Tube Rupture

##### A. Containment Failure

For the containment failure, the release path is assumed to be from the Reactor Coolant System into the containment atmosphere and then directly to the environment through a leak greater than 1 ft<sup>2</sup>.

##### B. Containment Bypass

Containment Bypass events are reactor coolant system leaks into a low pressure system located outside of containment. These systems are normally separated from RCS by check valves or isolation valves. The release pathway would bypass the containment atmosphere and release reactor coolant system activity directly into other buildings or the auxiliary building.

##### C. SGTR

For steam generator tube ruptures, the release path from the reactor coolant system is through the ruptured tubes and into the secondary system. Depending on the status of the secondary system, numerous release paths would be available. If the MSIV is closed, the release could be through the monitored PORV or the unmonitored safety relief valves. If the MSIV is open or closed, the release could be through the turbine driven auxiliary feed pump which is a monitored discharge path. If the condenser is available, the release could be through the condenser air removal system which is filtered and monitored by radiation monitoring instruments.





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V. Release Rate

A. Containment

For the containment failure release path, three general flowrates are used in the RASCAL and Nureg-1228 analysis to transport containment activity into the environment.

1. Containment Design Leakage (0.1%/day)
2. Containment Isolation Failure (100%/day)
3. Catastrophic Containment Failure (100%/hr)

Design leakage for the Callaway Plant is 0.2%/day for the first 24 hours (Table 15.6-6, ref. 15). RASCAL uses 0.1%/day. All dose results generated from RASCAL for this leakage were doubled to account for this difference.

Nureg-1228 identifies containment isolation failure as a failure to isolate one or more penetrations and failures involving the signal that actuates containment isolation. The bases for the 100%/day leakage is the corresponding failure of a 40-inch diameter containment purge isolation valve or ventilation system isolation valve disk to body leak.

Nureg-1228 identifies catastrophic containment failure as catastrophic failure of the containment to a hole greater than one (1) square foot. This failure mode would result in a significant drop in containment pressure, and result in the release of a large fraction of the fission products in the containment atmosphere in a short time period.

B. Containment Bypass

Containment bypass flow rates are based on a loss of containment isolation signal (CISA or CISB) or failure of containment isolation valves or check valve and a simultaneous LOCA affecting a low pressure system (interfacing LOCA). Indications for this event would be containment pressure or sump level not increasing with a LOCA. Flowrates would be dependent on the location of the leak, size of the leak, and pressure of the RCS system. RASCAL attempts to quantify this flowrate using containment design flowrates, containment purge isolation status and catastrophic containment failure indications. These are appropriate for a containment release event, but not for a bypass event. To be conservative, all containment bypass events in this analysis are analyzed using the 100%/hour or 100%/day flowrate.



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C. Steam Generator Tube Rupture

For SGTR release rates, Nureg-1228 uses the following plant status parameters to calculate release rates:

1. One (1) tube at full pressure
2. One (1) CCP pump at low pressure

Nureg-1228 Table 4.10 (ref. 1) calculates doses for one (1) steam generator tube at full pressure, and doses for one (1) tube at low pressure using a single charging pump flow. The release rate for one (1) ruptured steam generator tube at low pressure using a single charging pump flow assumes that following the initial steam generator tube rupture, operators will cool-down and depressurize the primary system. This assumption is valid and should take approximately one hour (SGTR Help Screen, ref. 3).

VI. Reducing Mechanisms

A. Filtration System

For containment bypass events into the auxiliary building, the release will be filtered by the Auxiliary/Fuel Building emergency exhaust filter trains. If this system is not operating, the release will be unfiltered.

B. Containment Spray

Containment sprays are used for containment cooling and to remove fission products released into the containment atmosphere following an accident. Containment spray is very effective at removing particulates and aerosols, especially elemental and particulate iodines. This mechanism is not effective at removing noble gases or organic forms of iodine. For releases into containment, this analysis evaluates whether containment spray is on or off.

C. SGTR Partitioning/Non-Partitioning

In a best estimate analysis performed by the Union Electric Licensing and Fuels Department (ref. 13), a reduction factor of  $1E-2$  for SGTR removal mechanisms was conservatively assumed based on steam generator moisture separator removal of entrained iodines and a reference to a Westinghouse document that concluded that

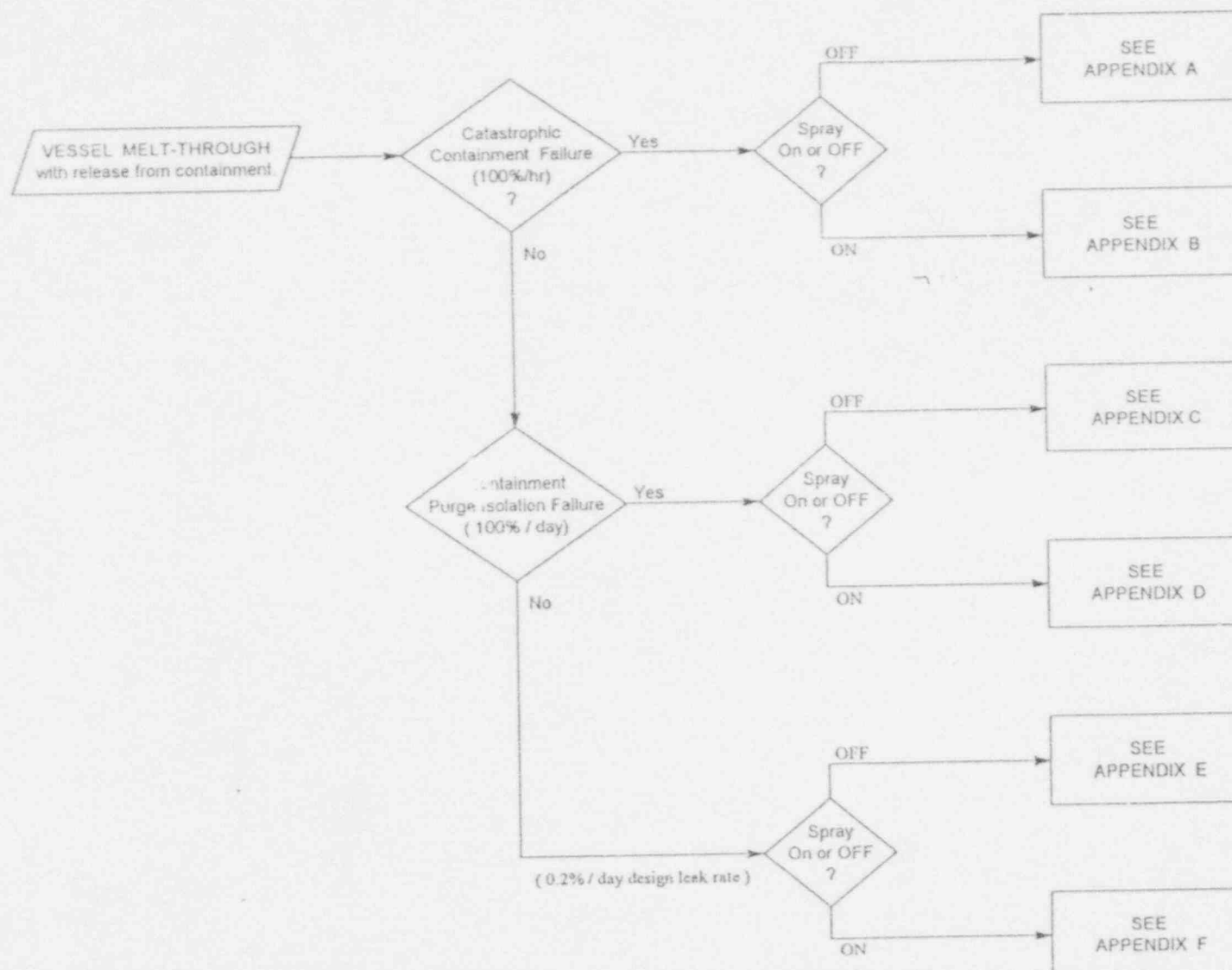
except for a few seconds immediately after a reactor trip, the SG tube bundle remains covered with several feet of low void fraction mixture. Nureg-1228 and RASCAL use a reduction factor of  $2.0E-2$  for steam generator tube rupture events that are considered partitioned. Partitioning means that the tube rupture is below the water/water-steam phase region where much of the particulates are removed. Since the value of  $2E-2$  used by Nureg-1228 and RASCAL for partitioning is more conservative than the value used in ref. 13, the default value used in the RASCAL program will be used for all SGTR cases.

#### VII. Meteorological Inputs

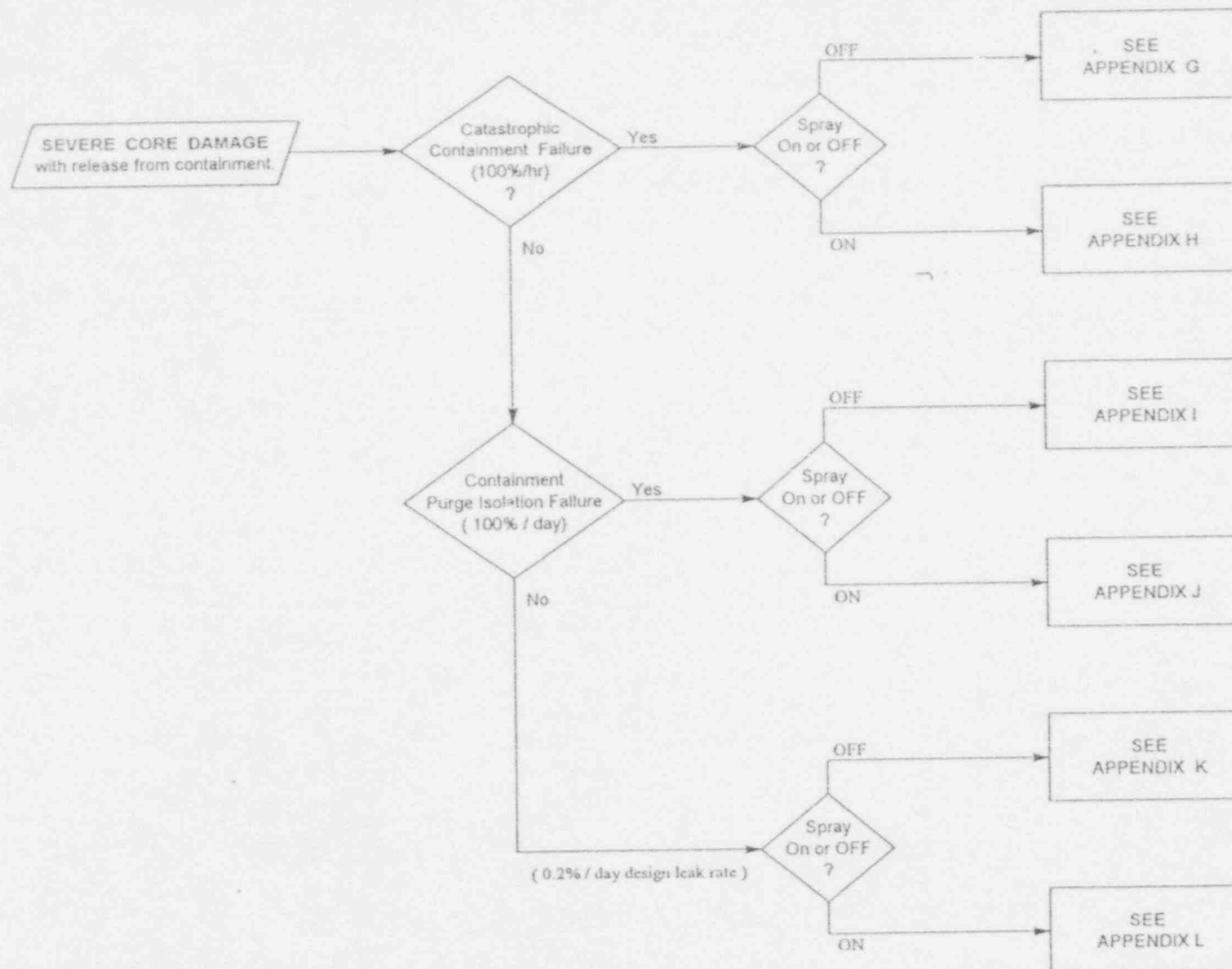
Since meteorological data can vary significantly from time to time, trying to pre-define a set of meteorological conditions to use in determining radiological consequences to the public is difficult, if not impossible. Using worst case meteorological data would result in overly conservative results. Nureg-1228 uses average meteorological conditions (4 m/sec wind speed and a D stability class), and assumes a ground level release to derive event tree doses. Therefore, average meteorological data of 3.5 m/sec and an E stability class (Table 2.3-17, ref. 14) for the Callaway plant are used in this analysis. Additionally, mixing layer depth is not mentioned in the Nureg-1228 analysis. Since a value is necessary for the RASCAL input, an average value of 237 meters for mixing layer depth using an E stability class (ref. 3) is used.

#### VIII. Holdup Time and Release Duration

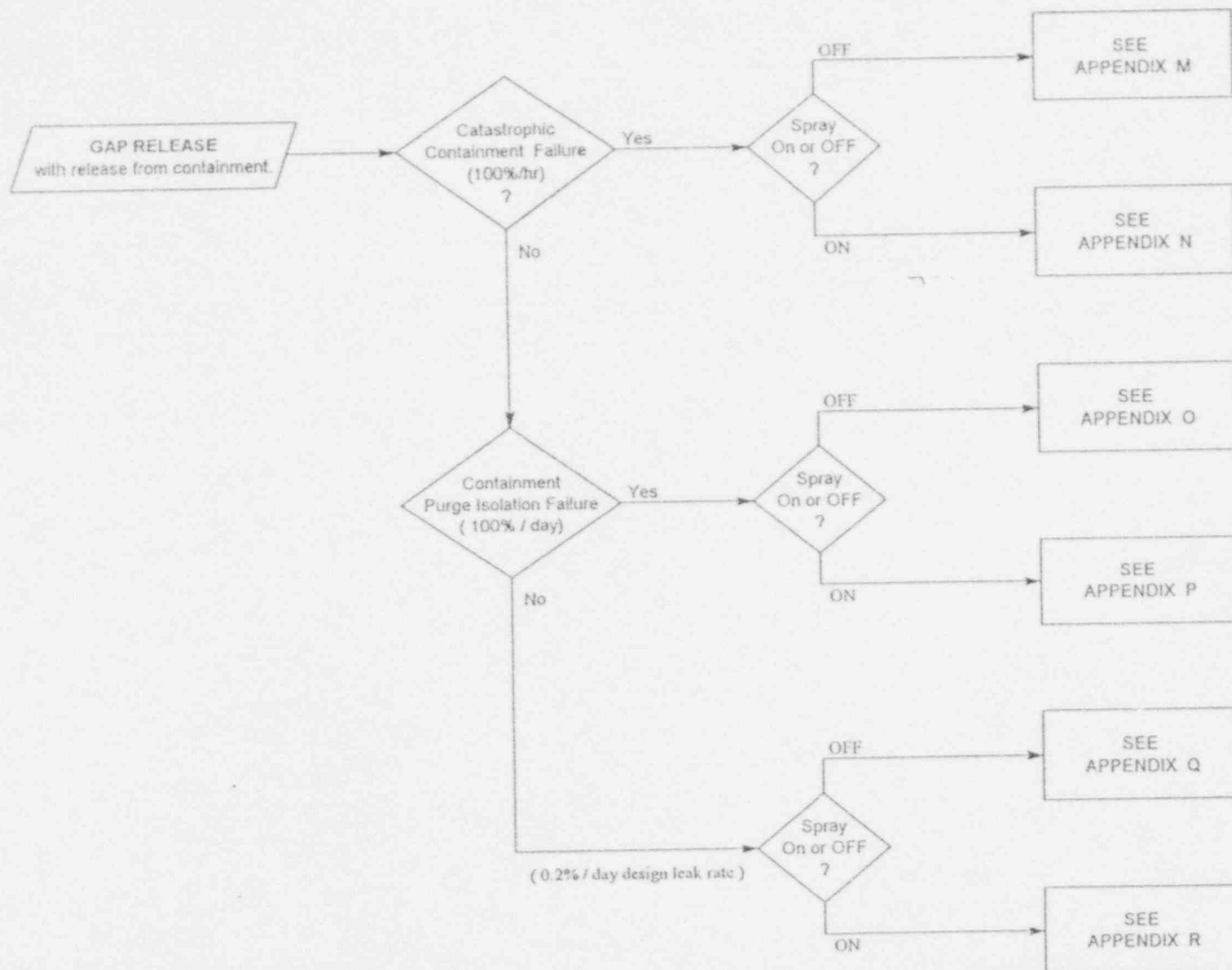
The event status trees in Nureg-1228 incorporates reduction mechanisms that include decay of radionuclides due to holdup time in containment. .5 hr, 2-12 hr, and 24 hr holdup times are used in the evaluation. This analysis assumes no containment holdup time. This simplifies the decision flowchart and is a conservative assumption. A one hour release duration is used in this analysis and is consistent with the release duration in Nureg-1228.

VESSEL MELT-THROUGH WITH CONTAINMENT RELEASE

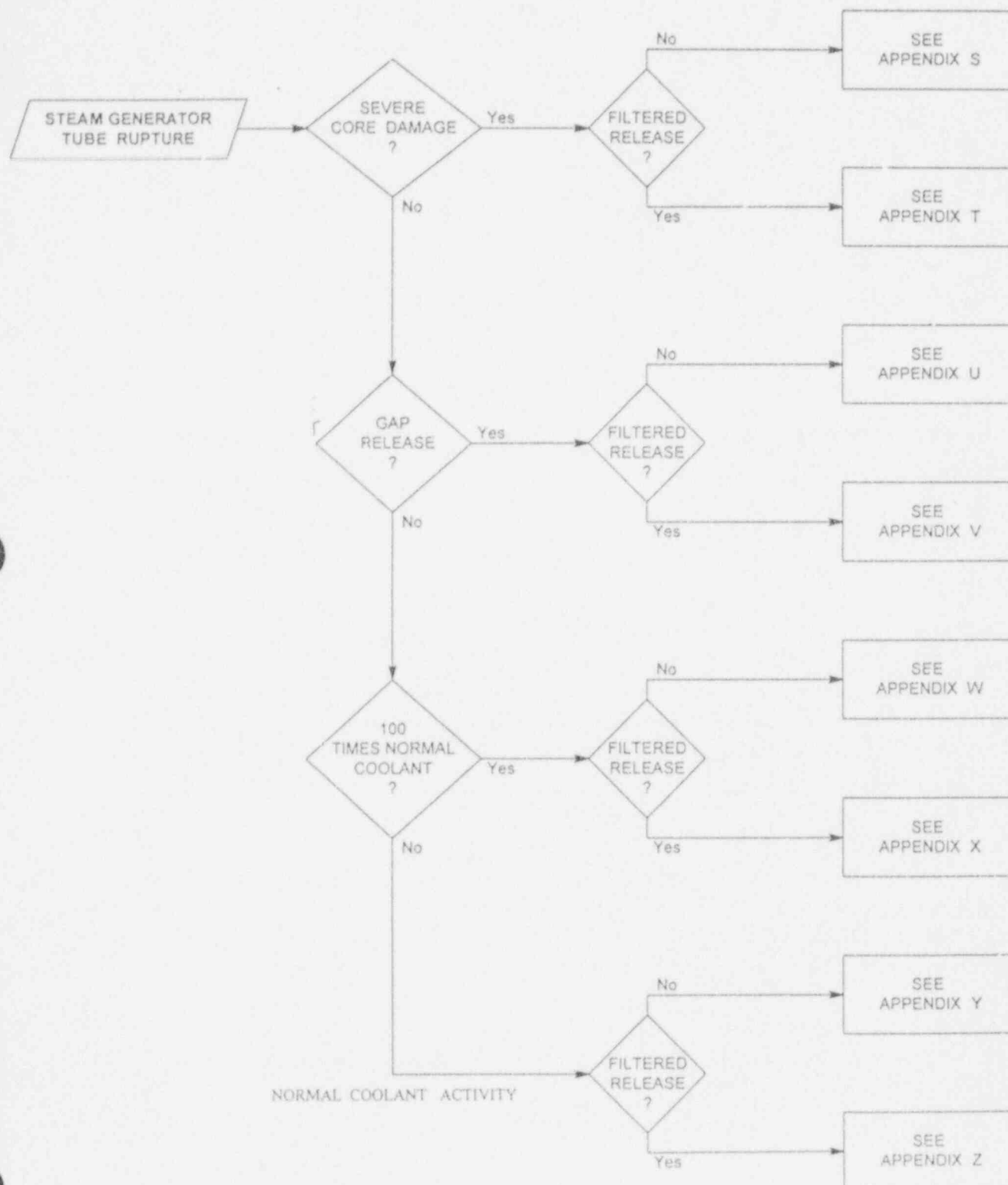
18 9/16/99

SEVERE CORE DAMAGE WITH CONTAINMENT RELEASEJSD  
9/16/94

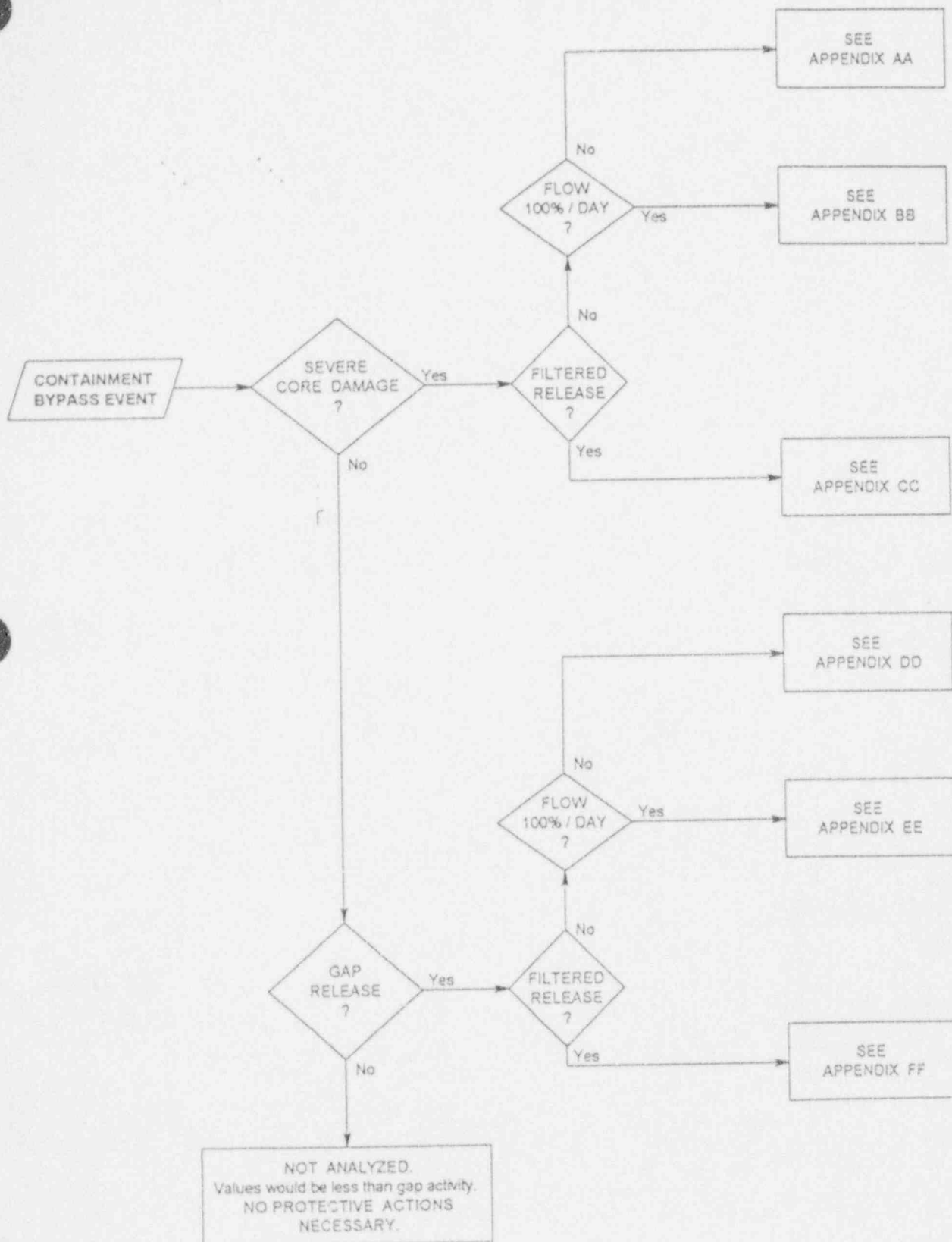


GAP RELEASE WITH CONTAINMENT RELEASE178  
9/12/94

A 9/16/94

STEAM GENERATOR TUBE RUPTURE

9/16/94

CONTAINMENT BYPASS EVENT

9/6/94

Summary of ST-DOSE inputs

03/02/94 10:38

Title: EIP-ZZ-00212 BASES APPENDIX A

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	3 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: VESSEL MELT THROUGH

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 100%/HOUR

Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	3.7E+03	2.2E+03	1.3E+03	5.5E+02
Total EDE (EPA)	4.3E+04	2.5E+04	1.5E+04	5.9E+03
Thyroid (EPA)	5.4E+05	3.1E+05	1.8E+05	7.4E+04
Acute Lung	2.8E+04	1.6E+04	9.4E+03	3.8E+03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	2.5E+03	1.4E+03	8.4E+02	3.4E+02
Cloud Shine	1.1E+03	6.8E+02	4.1E+02	2.2E+02
Initial Ground Shine	1.2E+02	6.0E+01	2.5E+01	0.0E+00
4-Day Ground Shine	5.9E+03	3.4E+03	2.0E+03	8.0E+02
CEDE Inhalation	3.5E+04	2.0E+04	1.2E+04	4.9E+03

NOTE: All values below 1.0E-03 have been set to zero.

9/16/94

Summary of ST-DOSE inputs 08/02/94 10:51

TRACER: EIP-ZZ-00212 BASES APPENDIX B Straight-Line Plume  
Plant & Unit: CALLAWAY UNIT 1  
Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix	precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH	E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions  
Containment Failure; Large, Dry, or Subatmospheric Containment  
Core Condition: VESSEL MELT THROUGH  
Reactor Power: 3411 Mw(t)  
Sprays: ON  
Leak Rate: 100%/HOUR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	5.4E+02	3.2E+02	1.9E+02	9.7E+01
Total EDE (EPA)	2.2E+03	1.3E+03	7.7E+02	3.3E+02
Thyroid (EPA)	2.2E+04	1.3E+04	7.4E+03	3.0E+03
Acute Lung	1.1E+03	6.4E+02	3.8E+02	1.5E+02

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.0E+02	5.9E+01	3.5E+01	1.4E+01
Cloud Shine	4.3E+02	2.6E+02	1.6E+02	8.3E+01
Initial Ground Shine	1.2E+01	5.8E+00	2.4E+00	0.0E+00
4-Day Ground Shine	3.5E+02	2.0E+02	1.2E+02	4.6E+01
CEDE Inhalation	1.5E+03	8.4E+02	5.0E+02	2.0E+02

NOTE: All values below 1.0E-03 have been set to zero.



9/16

Summary of ST-DOSE inputs

08/02/94 10:52

TID: EIP-ZZ-00212 BASES APPENDIX C

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure: Large, Dry, or Subatmospheric Containment

Core Condition: VESSEL MELT THROUGH

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 100%/DAY

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.5E+02	8.6E+01	5.1E+01	2.2E+01
Total EDE (EPA)	1.7E+03	9.8E+02	5.8E+02	2.3E+02
Thyroid (EPA)	2.2E+04	1.2E+04	7.4E+03	3.0E+03
Acute Lung	1.1E+03	6.4E+02	3.8E+02	1.5E+02

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	9.9E+01	5.7E+01	3.4E+01	1.4E+01
Cloud Shine	4.5E+01	2.7E+01	1.7E+01	8.7E+00
Initial Ground Shine	4.8E+00	2.4E+00	9.9E-01	0.0E+00
4-Day Ground Shine	2.4E+02	1.4E+02	8.0E+01	3.2E+01
CEDE Inhalation	1.4E+03	8.2E+02	4.8E+02	1.9E+02

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 10:53

9/16/97

Title: EIP-ZZ-00212 BASES APPENDIX D

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: VESSEL MELT THROUGH

Reactor Power: 3411 Mw(t)

Sprays: ON

Leak Rate: 100%/DAY

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	2.2E+01	1.3E+01	7.8E+00	3.9E+00
Total EDE (EPA)	8.9E+01	5.2E+01	3.1E+01	1.3E+01
Thyroid (EPA)	8.7E+02	5.0E+02	3.0E+02	1.2E+02
Acute Lung	4.4E+01	2.6E+01	1.5E+01	6.1E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	4.1E+00	2.4E+00	1.4E+00	5.6E-01
Cloud Shine	1.7E+01	1.0E+01	6.3E+00	3.3E+00
Initial Ground Shine	4.6E-01	2.3E-01	9.7E-02	0.0E+00
4-Day Ground Shine	1.4E+01	8.0E+00	4.7E+00	1.8E+00
CEDE Inhalation	5.9E+01	3.4E+01	2.0E+01	8.0E+00

NOTE: All values below 1.0E-03 have been set to zero.

(P8) 9/16/94

Summary of ST-DOSE inputs

08/02/94 12:30

TID EIP-ZZ-00212 BASES APPENDIX E

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix	precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE	
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: VESSEL MELT THROUGH

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 0.1%/DAY (TYPICAL DESIGN)

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.5E-01	8.6E-02	5.1E-02	2.2E-02
Total EDE (EPA)	1.7E+00	9.8E-01	5.8E-01	2.3E-01
Thyroid (EPA)	2.2E+01	1.2E+01	7.4E+00	3.0E+00
Acute Lung	1.1E+00	6.4E-01	3.8E-01	1.5E-01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	9.9E-02	5.7E-02	3.4E-02	1.4E-02
Cloud Shine	4.5E-02	2.7E-02	1.7E-02	8.7E-03
Initial Ground Shine	4.8E-03	2.4E-03	0.0E+00	0.0E+00
4-Day Ground Shine	2.4E-01	1.4E-01	8.0E-02	3.2E-02
CEDE Inhalation	1.4E+00	8.2E-01	4.8E-01	1.9E-01

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs 08/02/94 12:29

9/16/94

Time: EIP-ZZ-00212 BASES APPENDIX F Straight-Line Plume  
Plant & Unit: CALLAWAY UNIT 1  
Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions  
Containment Failure: Large, Dry, or Subatmospheric Containment  
Core Condition: VESSEL MELT THROUGH  
Reactor Power: 3411 Mw(t)  
Sprays: ON  
Leak Rate: 0.1%/DAY (TYPICAL DESIGN)

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	2.2E-02	1.3E-02	7.8E-03	3.9E-03
Total EDE (EPA)	8.9E-02	5.2E-02	3.1E-02	1.3E-02
Thyroid (EPA)	8.7E-01	5.0E-01	3.0E-01	1.2E-01
Acute Lung	4.4E-02	2.6E-02	1.5E-02	6.1E-03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	4.1E-03	2.4E-03	1.4E-03	0.0E+00
Cloud Shine	1.7E-02	1.0E-02	6.3E-03	3.3E-03
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	1.4E-02	8.0E-03	4.7E-03	1.8E-03
CEDE Inhalation	5.9E-02	3.4E-02	2.0E-02	8.0E-03

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs 08/02/94 12:31

Title: EIP-ZZ-00212 BASES APPENDIX G Straight-Line Plume  
Plant & Unit: CALLAWAY UNIT 1  
Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions  
Containment Failure; Large, Dry, or Subatmospheric Containment  
Core Condition: IN-VESSEL SEVERE CORE DAMAGE (>30 min)  
Reactor Power: 3411 Mw(t)  
Sprays: OFF  
Leak Rate: 100%/HOUR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0
Acute Bone Total	1.6E+03	9.4E+02	5.6E+02	2.5E+02
Total EDE (EPA)	1.8E+04	1.0E+04	6.0E+03	2.4E+03
Thyroid (EPA)	2.8E+05	1.6E+05	9.6E+04	3.8E+04
Acute Lung	8.8E+03	5.1E+03	3.0E+03	1.2E+03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	7.7E+02	4.4E+02	2.6E+02	1.0E+02
Cloud Shine	7.8E+02	4.7E+02	2.9E+02	1.5E+02
Initial Ground Shine	6.6E+01	3.3E+01	1.4E+01	0.0E+00
4-Day Ground Shine	2.4E+03	1.4E+03	8.2E+02	3.2E+02
CEDE Inhalation	1.4E+04	8.2E+03	4.9E+03	2.0E+03

NOTE: All values below 1.0E-03 have been set to zero.



20 7/16/94

## Summary of ST-DOSE inputs

08/02/94 12:33

Title: EIP-ZZ-00212 BASES APPENDIX H

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions

Containment Failure: Large, Dry, or Subatmospheric Containment

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Reactor Power: 3411 Mw(t)

Sprays: ON

Leak Rate: 100%/HOUR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	4.6E+02	2.7E+02	1.7E+02	8.5E+01
Total EDE (EPA)	1.2E+03	7.2E+02	4.3E+02	1.9E+02
Thyroid (EPA)	1.1E+04	6.5E+03	3.8E+03	1.5E+03
Acute Lung	3.5E+02	2.0E+02	1.2E+02	4.8E+01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	3.5E+01	2.0E+01	1.2E+01	4.8E+00
Cloud Shine	4.1E+02	2.5E+02	1.5E+02	8.0E+01
Initial Ground Shine	9.5E+00	4.7E+00	2.0E+00	0.0E+00
4-Day Ground Shine	2.1E+02	1.2E+02	6.9E+01	2.7E+01
CEDE Inhalation	6.2E+02	3.5E+02	2.1E+02	8.4E+01

NOTE: All values below 1.0E-03 have been set to zero.

9/16/94

## Summary of ST-DOSE inputs

08/02/94 12:34

Title: EIP-ZZ-00212 BASES APPENDIX I

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90	8 MPH E	237 M
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions

Containment Failure: Large, Dr., or Subatmospheric Containment

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 100%/DAY

## Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	6.4E+01	3.8E+01	2.2E+01	1.0E+01
Total EDE (EPA)	7.0E+02	4.0E+02	2.4E+02	9.7E+01
Thyroid (EPA)	1.1E+04	6.5E+03	3.8E+03	1.5E+03
Acute Lung	3.5E+02	2.0E+02	1.2E+02	4.8E+01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	3.1E+01	1.8E+01	1.0E+01	4.2E+00
Cloud Shine	3.1E+01	1.9E+01	1.1E+01	6.0E+00
Initial Ground Shine	2.6E+00	1.3E+00	5.5E-01	0.0E+00
4-Day Ground Shine	9.8E+01	5.6E+01	3.3E+01	1.3E+01
CEDE Inhalation	5.7E+02	3.3E+02	1.9E+02	7.8E+01

NOTE: All values below 1.0E-03 have been set to zero.

## Summary of ST-DOSE inputs

08/02/94 12:35

Time: EIP-ZZ-00212 BASES APPENDIX J

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Reactor Power: 3411 Mw(t)

Sprays: ON

Leak Rate: 100%/DAY

## Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.8E+01	1.1E+01	6.6E+00	3.4E+00
Total EDE (EPA)	4.9E+01	2.9E+01	1.7E+01	7.7E+00
Thyroid (EPA)	4.5E+02	2.6E+02	1.5E+02	6.2E+01
Acute Lung	1.4E+01	8.1E+00	4.8E+00	1.9E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.4E+00	8.1E-01	4.8E-01	1.9E-01
Cloud Shine	1.6E+01	9.9E+00	6.1E+00	3.2E+00
Initial Ground Shine	3.8E-01	1.9E-01	7.9E-02	0.0E+00
4-Day Ground Shine	8.3E+00	4.8E+00	2.8E+00	1.1E+00
CEDE Inhalation	2.5E+01	1.4E+01	8.4E+00	3.4E+00

NOTE: All values below 1.0E-03 have been set to zero.

9/16/94

## Summary of ST-DOSE inputs

08/02/94 12:36

TID: EIP-ZZ-00212 BASES APPENDIX K

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M

Building Wake: Y

Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E		237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure: Large, Dry, or Subatmospheric Containment

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 0.1%/DAY (TYPICAL DESIGN)

## Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0
Acute Bone Total	6.4E-02	3.8E-02	2.2E-02	1.0E-02
Total EDE (EPA)	7.0E-01	4.0E-01	2.4E-01	9.7E-02
Thyroid (EPA)	1.1E+01	6.5E+00	3.8E+00	1.5E+00
Acute Lung	3.5E-01	2.0E-01	1.2E-01	4.8E-02

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	3.1E-02	1.8E-02	1.0E-02	4.2E-03
Cloud Shine	3.1E-02	1.9E-02	1.1E-02	6.0E-03
Initial Ground Shine	2.6E-03	1.3E-03	0.0E+00	0.0E+00
4-Day Ground Shine	9.8E-02	5.6E-02	3.3E-02	1.3E-02
CEDE Inhalation	5.7E-01	3.3E-01	1.9E-01	7.8E-02

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs 08/02/94 12:37

Title: EIP-ZZ-00212 BASES APPENDIX L  
 Plume & Unit: CALLAWAY UNIT 1  
 Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90	8 MPH E	237 M
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions  
 Containment Failure: Large, Dry, or Subatmospheric Containment  
 Core Condition: IN-VESSEL SEVERE CORE DAMAGE (>30 min)  
 Reactor Power: 3411 Mw(t)  
 Sprays: ON  
 Leak Rate: 0.1%/DAY (TYPICAL DESIGN)

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.8E-02	1.1E-02	6.6E-03	3.4E-03
Total EDE (EPA)	4.9E-02	2.9E-02	1.7E-02	7.7E-03
Thyroid (EPA)	4.5E-01	2.6E-01	1.5E-01	6.2E-02
Acute Lung	1.4E-02	8.1E-03	4.8E-03	1.9E-03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.4E-03	0.0E+00	0.0E+00	0.0E+00
Cloud Shine	1.6E-02	9.9E-03	6.1E-03	3.2E-03
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	8.3E-03	4.8E-03	2.8E-03	1.1E-03
CEDE Inhalation	2.5E-02	1.4E-02	8.4E-03	3.4E-03

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:37

9/14/94

Title: EIP-ZZ-00212 BASES APPENDIX M

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 100%/HOUR

Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.3E+02	7.5E+01	4.4E+01	2.0E+01
Total EDE (EPA)	1.6E+03	9.0E+02	5.3E+02	2.2E+02
Thyroid (EPA)	3.7E+04	2.1E+04	1.2E+04	5.0E+03
Acute Lung	3.8E+02	2.2E+02	1.3E+02	5.2E+01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	4.7E+01	2.7E+01	1.6E+01	6.4E+00
Cloud Shine	7.3E+01	4.4E+01	2.7E+01	1.4E+01
Initial Ground Shine	8.4E+00	4.2E+00	1.8E+00	0.0E+00
4-Day Ground Shine	1.8E+02	1.0E+02	6.0E+01	2.3E+01
CEDE Inhalation	1.3E+03	7.5E+02	4.4E+02	1.8E+02

NOTE: All values below 1.0E-03 have been set to zero.



Summary of ST-DOSE inputs

08/02/94 12:40

(42) 9/16/94

Title: EIP-ZZ-00212 BASES APPENDIX N

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure: Large, Dry, or Subatmospheric Containment

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Sprays: ON

Leak Rate: 100%/HOUR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	2.6E+01	1.5E+01	9.3E+00	4.7E+00
Total EDE (EPA)	9.0E+01	5.3E+01	3.1E+01	1.4E+01
Thyroid (EPA)	1.5E+03	8.4E+02	5.0E+02	2.0E+02
Acute Lung	1.5E+01	8.8E+00	5.2E+00	2.1E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	2.1E+00	1.2E+00	7.1E-01	2.9E-01
Cloud Shine	2.3E+01	1.4E+01	8.4E+00	4.5E+00
Initial Ground Shine	7.0E-01	3.5E-01	1.4E-01	0.0E+00
4-Day Ground Shine	1.3E+01	7.5E+00	4.3E+00	1.7E+00
CEDE Inhalation	5.4E+01	3.1E+01	1.9E+01	7.4E+00

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:41

(PS) 9/16/94

T: EIP-ZZ-00212 BASES APPENDIX O

Straight-Line Plume

P: &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M

Building Wake: Y

Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE	
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure: Large, Dry, or Subatmospheric Containment

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 100%/DAY

Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0
Acute Bone Total	5.1E+00	3.0E+00	1.8E+00	8.0E-01
Total EDE (EPA)	6.2E+01	3.6E+01	2.1E+01	8.6E+00
Thyroid (EPA)	1.5E+03	8.4E+02	5.0E+02	2.0E+02
Acute Lung	1.5E+01	8.7E+00	5.2E+00	2.1E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.9E+00	1.1E+00	6.4E-01	2.6E-01
Cloud Shine	2.9E+00	1.7E+00	1.1E+00	5.6E-01
Initial Ground Shine	3.4E-01	1.7E-01	7.0E-02	0.0E+00
4-Day Ground Shine	7.2E+00	4.1E+00	2.4E+00	9.4E-01
CEDE Inhalation	5.2E+01	3.0E+01	1.8E+01	7.1E+00

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:42

Title: EIP-ZZ-00212 BASES APPENDIX P

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Sprays: ON

Leak Rate: 100%/DAY

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.0E+00	6.1E-01	3.7E-01	1.9E-01
Total EDE (EPA)	3.6E+00	2.1E+00	1.3E+00	5.4E-01
Thyroid (EPA)	5.9E+01	3.4E+01	2.0E+01	8.0E+00
Acute Lung	6.1E-01	3.5E-01	2.1E-01	8.4E-02

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	8.4E-02	4.8E-02	2.9E-02	1.1E-02
Cloud Shine	9.2E-01	5.5E-01	3.4E-01	1.8E-01
Initial Ground Shine	2.8E-02	1.4E-02	5.8E-03	0.0E+00
4-Day Ground Shine	5.2E-01	3.0E-01	1.7E-01	6.7E-02
CEDE Inhalation	2.2E+00	1.3E+00	7.4E-01	3.0E-01

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:43

9/6/94

Title: EIP-ZZ-00212 BASES APPENDIX Q

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Sprays: OFF

Leak Rate: 0.1%/DAY (TYPICAL DESIGN)

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	5.1E-03	3.0E-03	1.8E-03	0.0E+00
Total EDE (EPA)	6.2E-02	3.6E-02	2.1E-02	8.6E-03
Thyroid (EPA)	1.5E+00	8.4E-01	5.0E-01	2.0E-01
Acute Lung	1.5E-02	8.7E-03	5.2E-03	2.1E-03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.9E-03	1.1E-03	0.0E+00	0.0E+00
Cloud Shine	2.9E-03	1.7E-03	1.1E-03	0.0E+00
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	7.2E-03	4.1E-03	2.4E-03	0.0E+00
CEDE Inhalation	5.2E-02	3.0E-02	1.8E-02	7.1E-03

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:44

9/14/94

Title: EIP-ZZ-00212 BASES APPENDIX R

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M

Building Wake: Y

Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94	00:00	90	8 MPH E	237 M NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Failure; Large, Dry, or Subatmospheric Containment

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Sprays: ON

Leak Rate: 0.1%/DAY (TYPICAL DESIGN)

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.0E-03	0.0E+00	0.0E+00	0.0E+00
Total EDE (EPA)	3.6E-03	2.1E-03	1.3E-03	0.0E+00
Thyroid (EPA)	5.9E-02	3.4E-02	2.0E-02	8.0E-03
Acute Lung	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cloud Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CEDE Inhalation	2.2E-03	1.3E-03	0.0E+00	0.0E+00

NOTE: All values below 1.0E-03 have been set to zero.

## Summary of ST-DOSE inputs

08/02/94 12:46

Title: EIP-ZZ-00212 BASES APPENDIX S

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90	8 MPH E	237 M
Rel End	08/02/94	01:00	2				NONE
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: SAFETY VALVE

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0
Acute Bone Total	1.5E+02	9.2E+01	5.6E+01	2.9E+01
Total EDE (EPA)	3.5E+02	2.1E+02	1.2E+02	5.6E+01
Thyroid (EPA)	2.6E+03	1.5E+03	8.9E+02	3.6E+02
Acute Lung	8.2E+01	4.8E+01	2.8E+01	1.1E+01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	8.7E+00	5.0E+00	3.0E+00	1.2E+00
Cloud Shine	1.4E+02	8.5E+01	5.2E+01	2.8E+01
Initial Ground Shine	3.0E+00	1.5E+00	6.3E-01	0.0E+00
4-Day Ground Shine	6.2E+01	3.5E+01	2.1E+01	8.0E+00
CEDE Inhalation	1.5E+02	8.6E+01	5.1E+01	2.0E+01

NOTE: All values below 1.0E-03 have been set to zero.



## Summary of ST-DOSE inputs

08/02/94 12:47

Time: EIP-ZZ-00212 BASES APPENDIX T

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E		237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: STEAM JET AIR EJECTOR

## Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0
Acute Bone Total	1.4E+02	8.6E+01	5.2E+01	2.7E+01
Total EDE (EPA)	2.0E+02	1.2E+02	7.3E+01	3.5E+01
Thyroid (EPA)	1.3E+02	7.7E+01	4.5E+01	1.8E+01
Acute Lung	4.8E+00	2.8E+00	1.6E+00	6.6E-01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	2.0E+00	1.1E+00	6.6E-01	2.7E-01
Cloud Shine	1.4E+02	8.3E+01	5.1E+01	2.7E+01
Initial Ground Shine	2.5E+00	1.3E+00	5.2E-01	0.0E+00
4-Day Ground Shine	4.1E+01	2.4E+01	1.4E+01	5.2E+00
CEDE Inhalation	2.3E+01	1.3E+01	7.8E+00	3.1E+00

NOTE: All values below 1.0E-03 have been set to zero.

## Summary of ST-DOSE inputs

08/02/94 12:49

(13) 9/6/94

Title: EIP-ZZ-00212 BASES APPENDIX U

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH	E	237 M NONE
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: GAP RELEASE (uncovered 15-30 min)

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: SAFETY VALVE

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	8.5E+00	5.1E+00	3.1E+00	1.6E+00
Total EDE (EPA)	2.4E+01	1.4E+01	8.5E+00	3.8E+00
Thyroid (EPA)	3.4E+02	2.0E+02	1.2E+02	4.7E+01
Acute Lung	3.6E+00	2.1E+00	1.2E+00	4.9E-01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	5.2E-01	3.0E-01	1.8E-01	7.1E-02
Cloud Shine	7.8E+00	4.7E+00	2.9E+00	1.5E+00
Initial Ground Shine	2.1E-01	1.0E-01	4.3E-02	0.0E+00
4-Day Ground Shine	3.7E+00	2.1E+00	1.2E+00	4.8E-01
CEDE Inhalation	1.3E+01	7.5E+00	4.4E+00	1.8E+00

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:53

(2.1) 7/14/94

Title: EIP-72-00212 BASES APPENDIX V

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: GAP RELEASE (uncovered 15-30 min)

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: STEAM JET AIR EJECTOR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	7.5E+00	4.5E+00	2.8E+00	1.4E+00
Total EDE (EPA)	1.1E+01	6.5E+00	3.9E+00	1.9E+00
Thyroid (EPA)	1.7E+01	9.9E+00	5.8E+00	2.3E+00
Acute Lung	2.2E-01	1.2E-01	7.3E-02	2.9E-02

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.1E-01	6.1E-02	3.6E-02	1.4E-02
Cloud Shine	7.3E+00	4.4E+00	2.7E+00	1.4E+00
Initial Ground Shine	1.3E-01	6.8E-02	2.8E-02	0.0E+00
4-Day Ground Shine	2.2E+00	1.3E+00	7.3E-01	2.8E-01
CEDE Inhalation	1.5E+00	8.4E-01	5.0E-01	2.0E-01

NOTE: All values below 1.0E-03 have been set to zero.

9/6/94

Summary of ST-DOSE inputs

08/02/94 12:54

TID: EIP-ZZ-00212 BASES APPENDIX W

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE	
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: COOLANT WITH 100x NORMAL NON-NOBLES

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: SAFETY VALVE

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	5.3E-03	3.1E-03	1.8E-03	0.0E+00
Total EDE (EPA)	6.6E-02	3.8E-02	2.2E-02	9.0E-03
Thyroid (EPA)	1.1E-01	6.3E-02	3.7E-02	1.5E-02
Acute Lung	4.5E-02	2.6E-02	1.5E-02	6.1E-03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	4.8E-03	2.8E-03	1.6E-03	0.0E+00
Cloud Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	1.3E-03	0.0E+00	0.0E+00	0.0E+00
CEDE Inhalation	6.4E-02	3.7E-02	2.2E-02	8.7E-03

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 12:54

9/16/94

TIDAL: EIP-ZZ-00212 BASES APPENDIX X

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: COOLANT WITH 100x NORMAL NON-NOBLES

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: STEAM JET AIR EJECTOR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	3.7E-03	2.1E-03	1.0E-03	0.0E+00
Total EDE (EPA)	7.0E-03	4.0E-03	2.1E-03	0.0E+00
Thyroid (EPA)	9.0E-03	5.2E-03	3.1E-03	1.2E-03
Acute Lung	5.5E-03	3.2E-03	1.9E-03	0.0E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	3.5E-03	2.0E-03	1.2E-03	0.0E+00
Cloud Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CEDE Inhalation	6.8E-03	3.9E-03	2.3E-03	0.0E+00

NOTE: All values below 1.0E-03 have been set to zero.

## Summary of ST-DOSE inputs

08/02/94 12:55

Title: EIP-ZZ-00212 BASES APPENDIX Y

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Steam Generator Tube Rupture

Core Condition: TYPICAL COOLANT

Steam Generator: PARTITIONED

Leak Rate: 1 TUBE AT FULL PRESSURE

Release Point: SAFETY VALVE

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total EDE (EPA)	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Thyroid (EPA)	1.1E-03	0.0E+00	0.0E+00	0.0E+00
Acute Lung	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cloud Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CEDE Inhalation	0.0E+00	0.0E+00	0.0E+00	0.0E+00

NOTE: All values below 1.0E-03 have been set to zero.



18 9/16/94

Summary of ST-DOSE inputs 08/02/94 12:56

Title: EIP-ZZ-00212 BASES APPENDIX Z Straight-Line Plume  
 Plant & Unit: CALLAWAY UNIT 1  
 Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data				
Shut Down	08/02/94	00:00					
Rel->Cont	08/02/94	00:00	date	time	winds	stb	mix precip
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2				
Expos End	08/02/94	01:00	3				
			4				

Source Term: Plant Conditions  
 Steam Generator Tube Rupture  
 Core Condition: TYPICAL COOLANT  
 Steam Generator: PARTITIONED  
 Leak Rate: 1 TUBE AT FULL PRESSURE  
 Release Point: STEAM JET AIR EJECTOR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total EDE (EPA)	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Thyroid (EPA)	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Acute Lung	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cloud Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Initial Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
4-Day Ground Shine	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CEDE Inhalation	0.0E+00	0.0E+00	0.0E+00	0.0E+00

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSH inputs

08/02/94 12:57

② 9/6/94

Title: EIP-ZZ-00212 BASES APPENDIX AA

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Bypass (Event V)

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Reactor Power: 3411 Mw(t)

Filters: UNFILTERED

Leak Rate: 100%/HOUR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	7.3E+02	4.3E+02	2.6E+02	1.2E+02
Total EDE (EPA)	5.1E+03	2.9E+03	1.7E+03	7.2E+02
Thyroid (EPA)	7.5E+04	4.3E+04	2.6E+04	1.0E+04
Acute Lung	2.3E+03	1.3E+03	8.0E+02	3.2E+02

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	2.1E+02	1.2E+02	7.1E+01	2.8E+01
Cloud Shine	5.0E+02	3.0E+02	1.8E+02	9.7E+01
Initial Ground Shine	2.3E+01	1.1E+01	4.7E+00	0.0E+00
4-Day Ground Shine	7.4E+02	4.2E+02	2.5E+02	9.7E+01
CEDE Inhalation	3.8E+03	2.2E+03	1.3E+03	5.3E+02

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs 08/02/94 12:59

Time: EIP-ZZ-00212 BASES APPENDIX BB Straight-Line Plume  
Plant & Unit: CALLAWAY UNIT 1  
Release Height: 0 M Building Make: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1 08/02/94	00:00	90 8 MPH E	237 M	NONE	
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions  
Containment Bypass (Event V)  
Core Condition: IN-VESSEL SEVERE CORE DAMAGE (>30 min)  
Reactor Power: 3411 Mw(t)  
Filters: UNFILTERED  
Leak Rate: 100%/DAY

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	2.9E+01	1.7E+01	1.0E+01	5.0E+00
Total EDE (EPA)	2.0E+02	1.2E+02	7.0E+01	2.9E+01
Thyroid (EPA)	3.0E+03	1.7E+03	1.0E+03	4.1E+02
Acute Lung	9.3E+01	5.4E+01	3.2E+01	1.3E+01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	8.3E+00	4.8E+00	2.8E+00	1.1E+00
Cloud Shine	2.0E+01	1.2E+01	7.3E+00	3.9E+00
Initial Ground Shine	9.1E-01	4.6E-01	1.9E-01	0.0E+00
4-Day Ground Shine	2.9E+01	1.7E+01	9.9E+00	3.9E+00
CEDE Inhalation	1.5E+02	8.9E+01	5.2E+01	2.1E+01

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs

08/02/94 13:00

9/16/94

Title: EIP-ZZ-00212 BASES APPENDIX CC

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Bypass (Event V)

Core Condition: IN-VESSEL SEVERE CORE DAMAGE (&gt;30 min)

Reactor Power: 3411 Mw(t)

Filters: FILTERED

Leak Rate: 100%/DAY

Plume Model

Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	1.6E+01	9.8E+00	6.0E+00	3.1E+00
Total EDE (EPA)	2.4E+01	1.4E+01	8.6E+00	4.2E+00
Thyroid (EPA)	3.0E+01	1.7E+01	1.0E+01	4.1E+00
Acute Lung	1.0E+00	5.9E-01	3.5E-01	1.4E-01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	2.6E-01	1.5E-01	9.0E-02	3.6E-02
Cloud Shine	1.6E+01	9.5E+00	5.9E+00	3.1E+00
Initial Ground Shine	2.9E-01	1.5E-01	6.0E-02	0.0E+00
4-Day Ground Shine	4.8E+00	2.8E+00	1.6E+00	6.1E-01
CEDE Inhalation	3.4E+00	1.9E+00	1.1E+00	4.6E-01

NOTE: All values below 1.0E-03 have been set to zero.

Summary of ST-DOSE inputs 08/02/94 13:01

Title: EIP-ZZ-00212 BASES APPENDIX DD

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Bypass (Event V)

Core Condition: GAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Filters: UNFILTERED

Leak Rate: 100%/HOUR

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	5.0E+01	2.9E+01	1.7E+01	8.3E+00
Total EDE (EPA)	4.4E+02	2.5E+02	1.5E+02	6.1E+01
Thyroid (EPA)	9.7E+03	5.6E+03	3.3E+03	1.3E+03
Acute Lung	1.0E+02	5.8E+01	3.4E+01	1.4E+01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	1.3E+01	7.3E+00	4.3E+00	1.7E+00
Cloud Shine	3.5E+01	2.1E+01	1.3E+01	6.7E+00
Initial Ground Shine	2.5E+00	1.3E+00	5.2E-01	0.0E+00
4-Day Ground Shine	5.2E+01	3.0E+01	1.8E+01	6.8E+00
CEDE Inhalation	3.5E+02	2.0E+02	1.2E+02	4.8E+01

NOTE: All values below 1.0E-03 have been set to zero.

(2X) 9/14/94

Summary of ST-DOSE inputs 08/02/94 13:02

Title: EIP-ZZ-00212 BASES APPENDIX EE

Straight-Line Plume

Plant &amp; Unit: CALLAWAY

UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Bypass (Event V)

Core Condition: CAP RELEASE (uncovered 15-30 min)

Reactor Power: 111 Mw(t)

Filters: UNFILTERED

Leak Rate: 100%/DAY

Plume Model Maximum doses at selected distances (rem)

Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0

Acute Bone Total	2.0E+00	1.2E+00	7.0E-01	3.3E-01
Total EDE (EPA)	1.7E+01	1.0E+01	6.0E+00	2.4E+00
Thyroid (EPA)	3.9E+02	2.2E+02	1.3E+02	5.3E+01
Acute Lung	4.0E+00	2.3E+00	1.4E+00	5.5E-01

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine

Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

Acute Bone Inhalation	5.0E-01	2.9E-01	1.7E-01	6.9E-02
Cloud Shine	1.4E+00	8.3E-01	5.1E-01	2.7E-01
Initial Ground Shine	1.0E-01	5.1E-02	2.1E-02	0.0E+00
4-Day Ground Shine	2.1E+00	1.2E+00	7.0E-01	2.7E-01
CEDE Inhalation	1.4E+01	8.1E+00	4.8E+00	1.9E+00

NOTE: All values below 1.0E-03 have been set to zero.



9/14/94

Summary of ST-DOSE inputs

08/02/94 13:03

Ti EIP-ZZ-00212 BASES APPENDIX FF

Straight-Line Plume

Plant &amp; Unit: CALLAWAY UNIT 1

Release Height: 0 M Building Wake: Y Calculation Radius: 25 mi (40 km)

event	date	time	Meteorological Data					
			date	time	winds	stb	mix	precip
Shut Down	08/02/94	00:00						
Rel->Cont	08/02/94	00:00						
Rel->Envi	08/02/94	00:00	1	08/02/94 00:00	90	8 MPH E	237 M	NONE
Rel End	08/02/94	01:00	2					
Expos End	08/02/94	01:00	3					
			4					

Source Term: Plant Conditions

Containment Bypass (Event V)

Core Condition: CAP RELEASE (uncovered 15-30 min)

Reactor Power: 3411 Mw(t)

Filters: FILTERED

Leak Rate: 100%/DAY

Plume Model

Maximum doses at selected distances (rem)

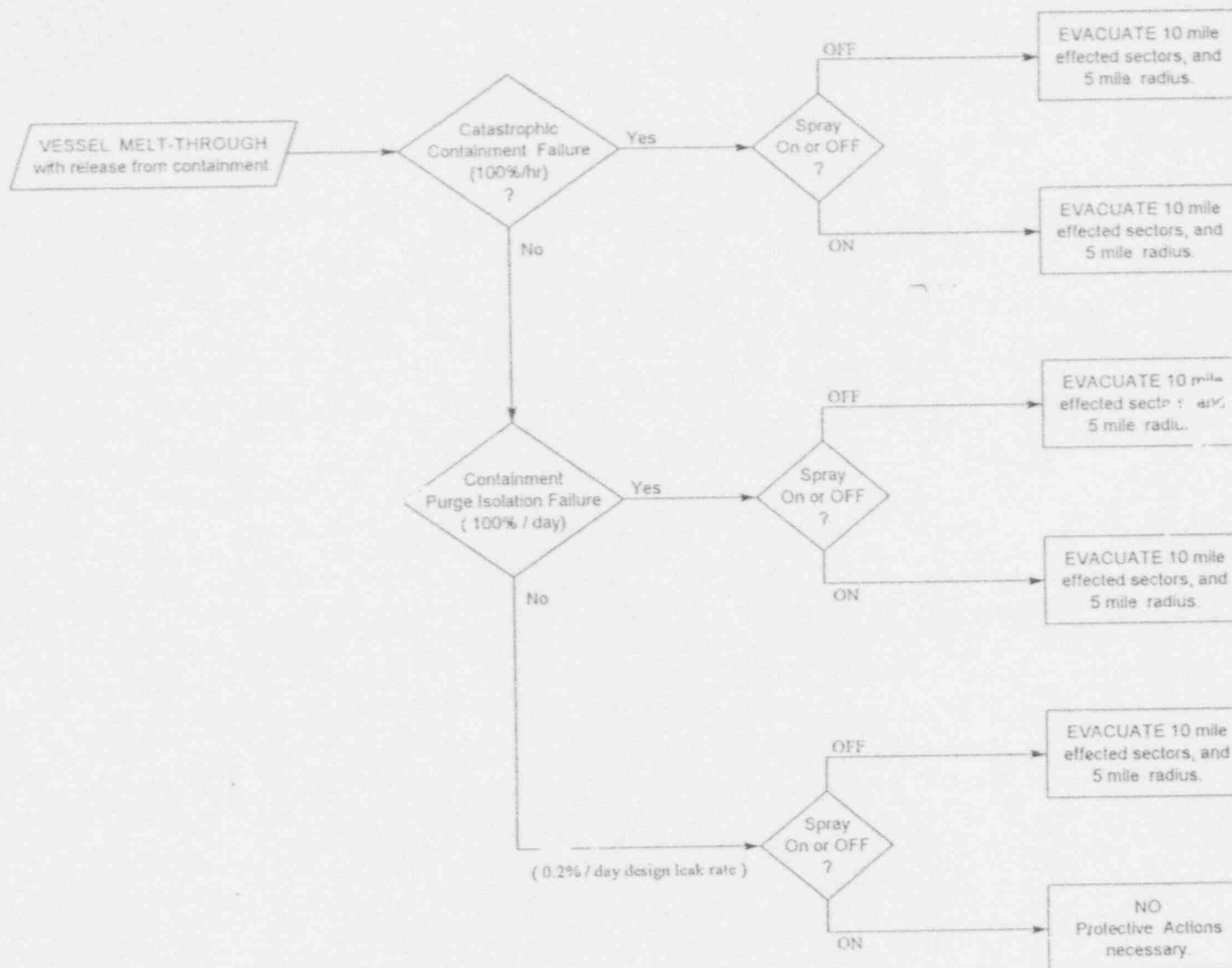
Distance (miles)	.5	1.0	2.0	5.0
(km)	.8	1.6	3.2	8.0
Acute Bone Total	8.7E-01	5.2E-01	3.2E-01	1.7E-01
Total EDE (EPA)	1.3E+00	7.9E-01	4.8E-01	2.3E-01
Thyroid (EPA)	3.9E+00	2.3E+00	1.3E+00	5.3E-01
Acute Lung	4.5E-02	2.6E-02	1.5E-02	6.1E-03

Acute Bone Total = Acute Bone Inh. + Cloud Shine + Init. Ground Shine  
 Total EDE = Cloud Shine + 4-Day Ground Shine + CEDE Inhalation

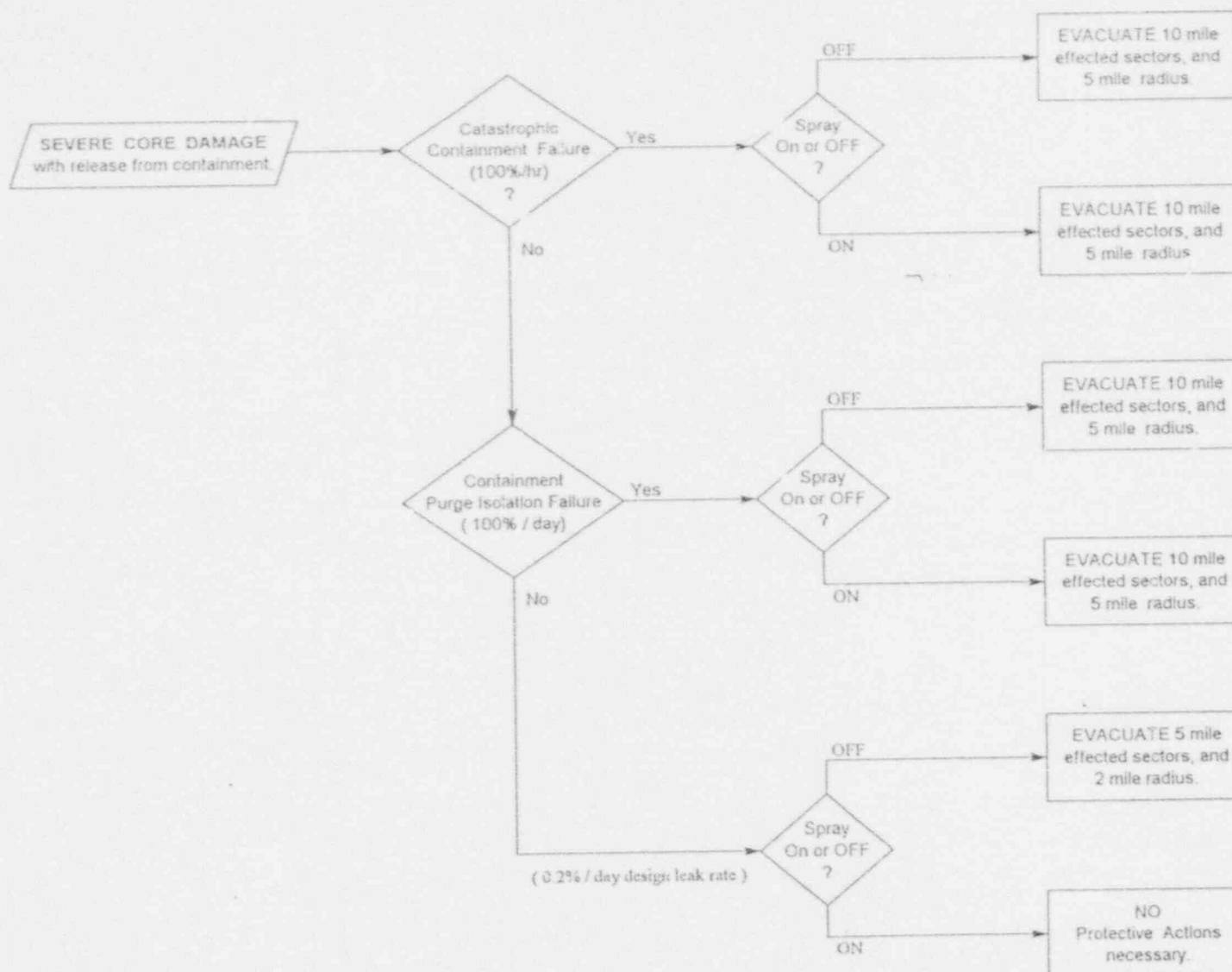
Acute Bone Inhalation	1.5E-02	8.4E-03	5.0E-03	2.0E-03
Cloud Shine	8.4E-01	5.0E-01	3.1E-01	1.6E-01
Initial Ground Shine	1.6E-02	8.0E-03	3.3E-03	0.0E+00
4-Day Ground Shine	2.6E-01	1.5E-01	8.6E-02	3.3E-02
CEDE Inhalation	2.4E-01	1.4E-01	8.1E-02	3.2E-02

NOTE: All values below 1.0E-03 have been set to zero.

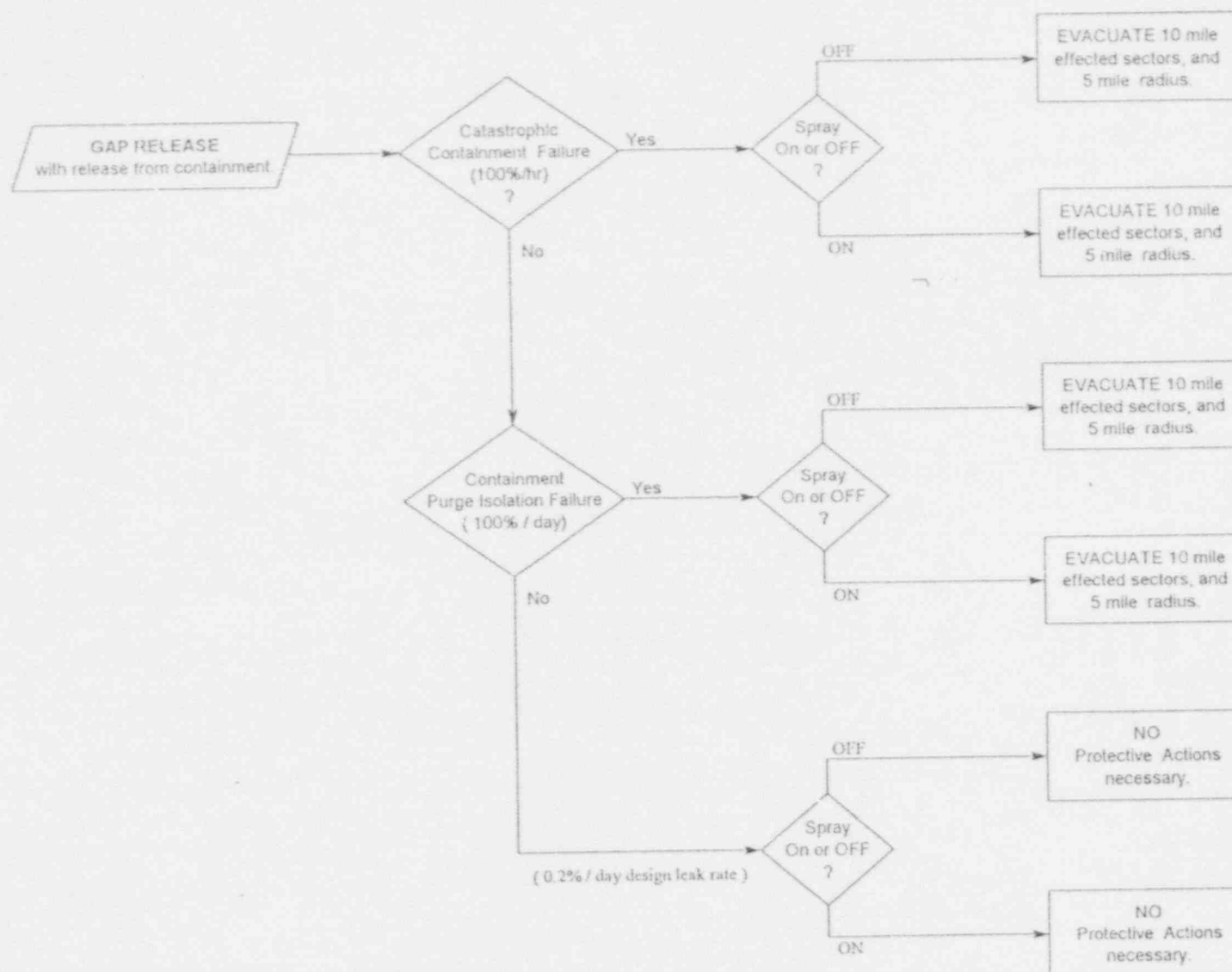
VESSEL MELT-THROUGH WITH CONTAINMENT RELEASE

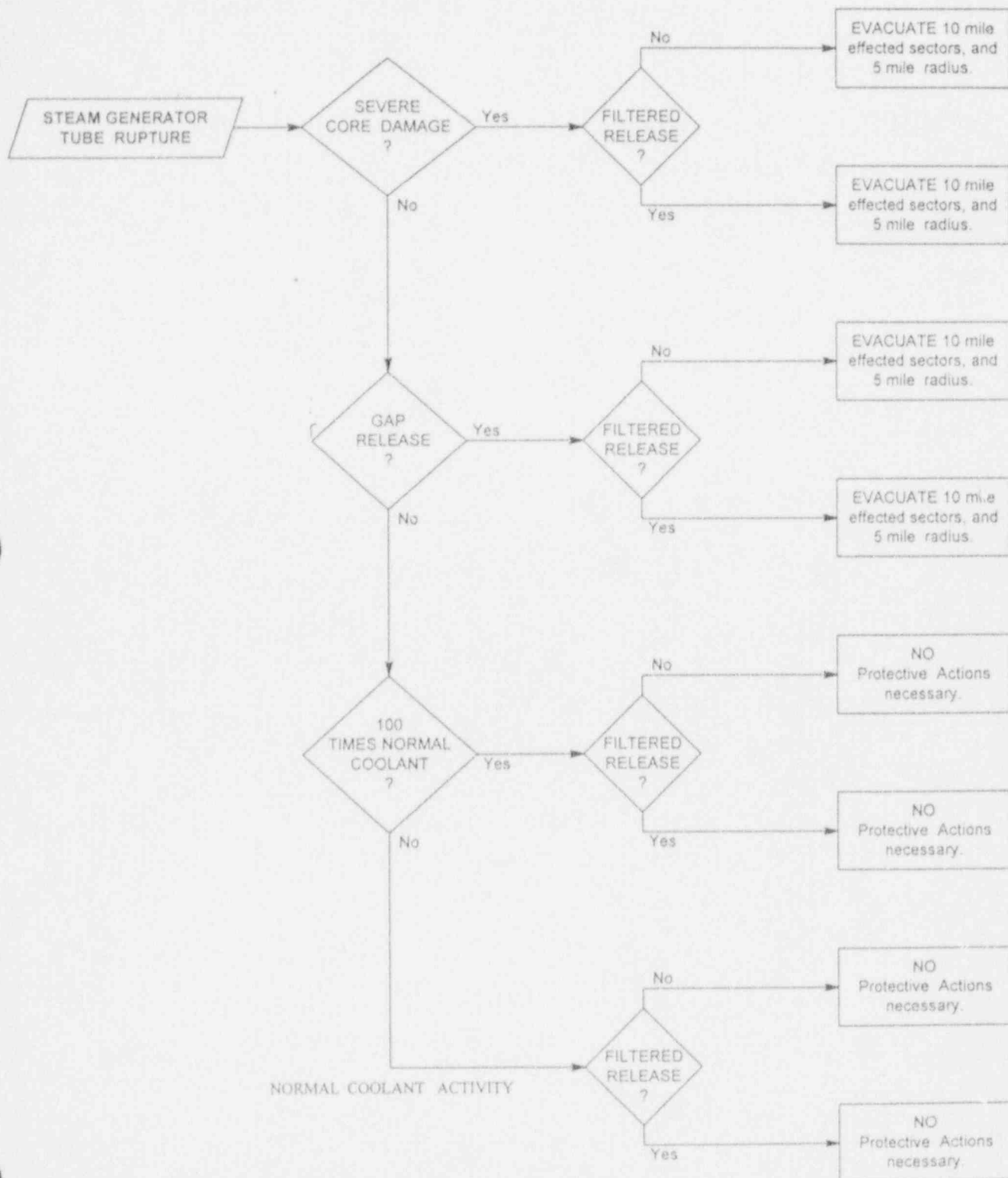


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9/16/94

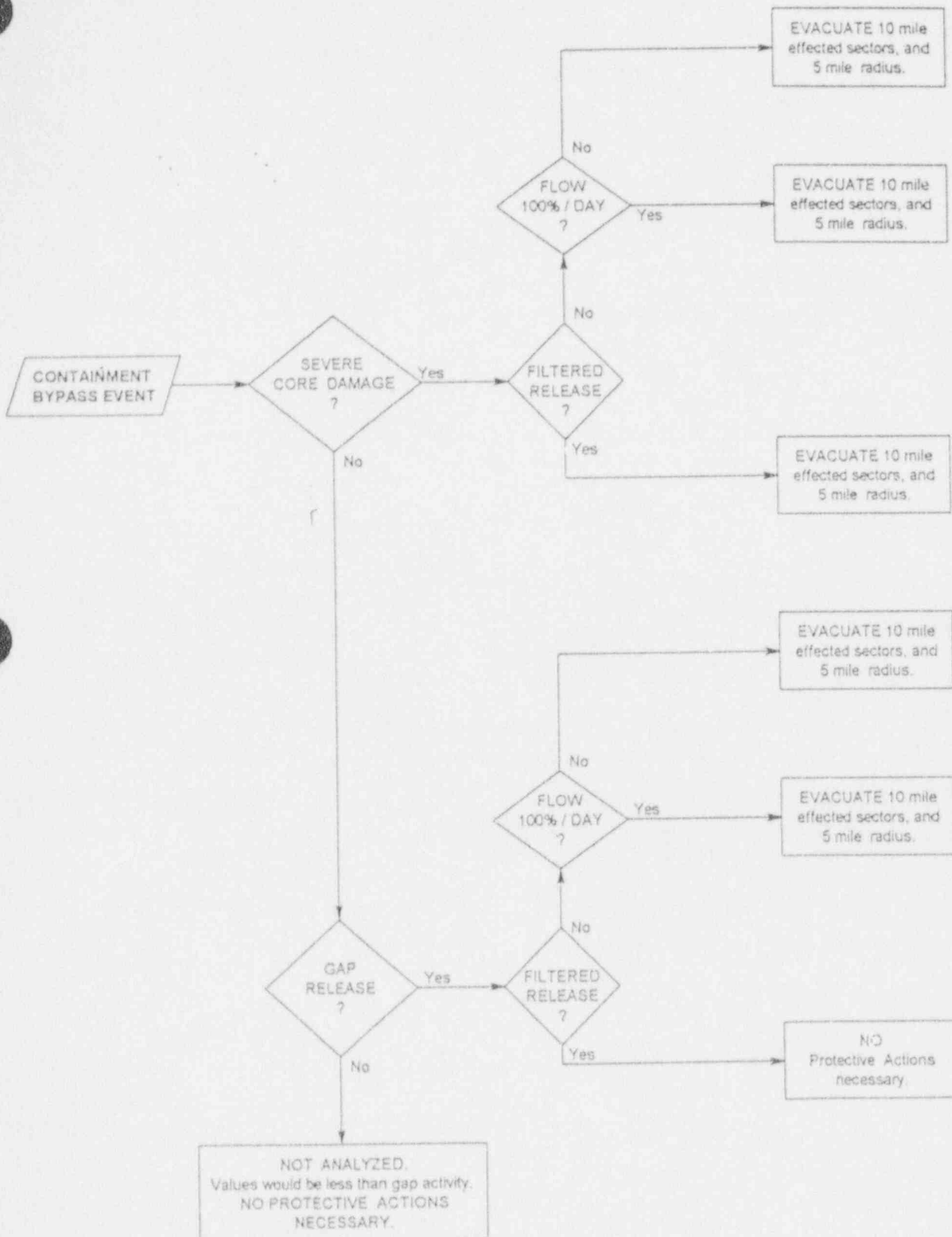
SEVERE CORE DAMAGE WITH CONTAINMENT RELEASE

11/14/94

GAP RELEASE WITH CONTAINMENT RELEASE18  
11/16/94

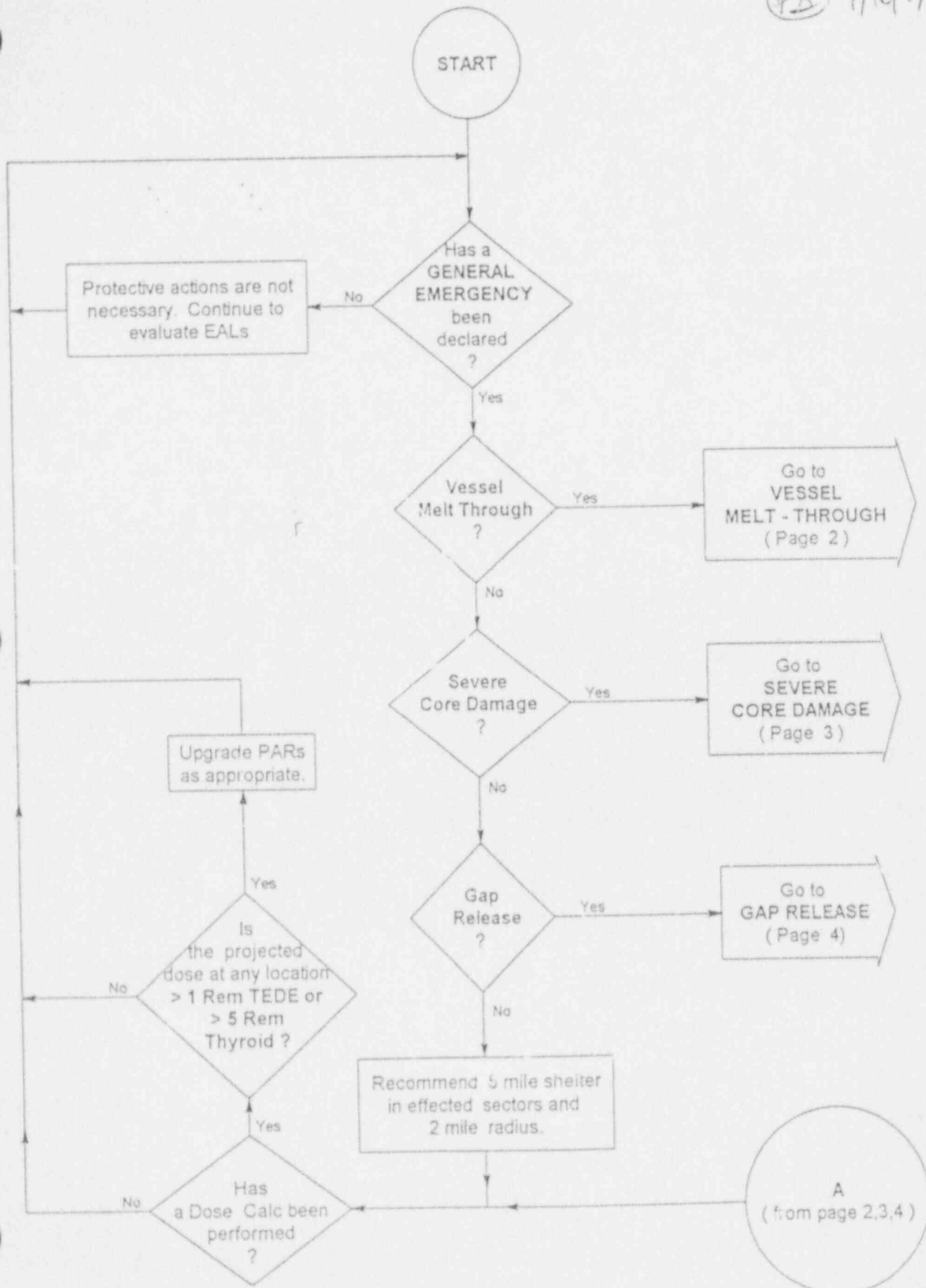
*8/16/94*STEAM GENERATOR TUBE RUPTURE

9/16/94

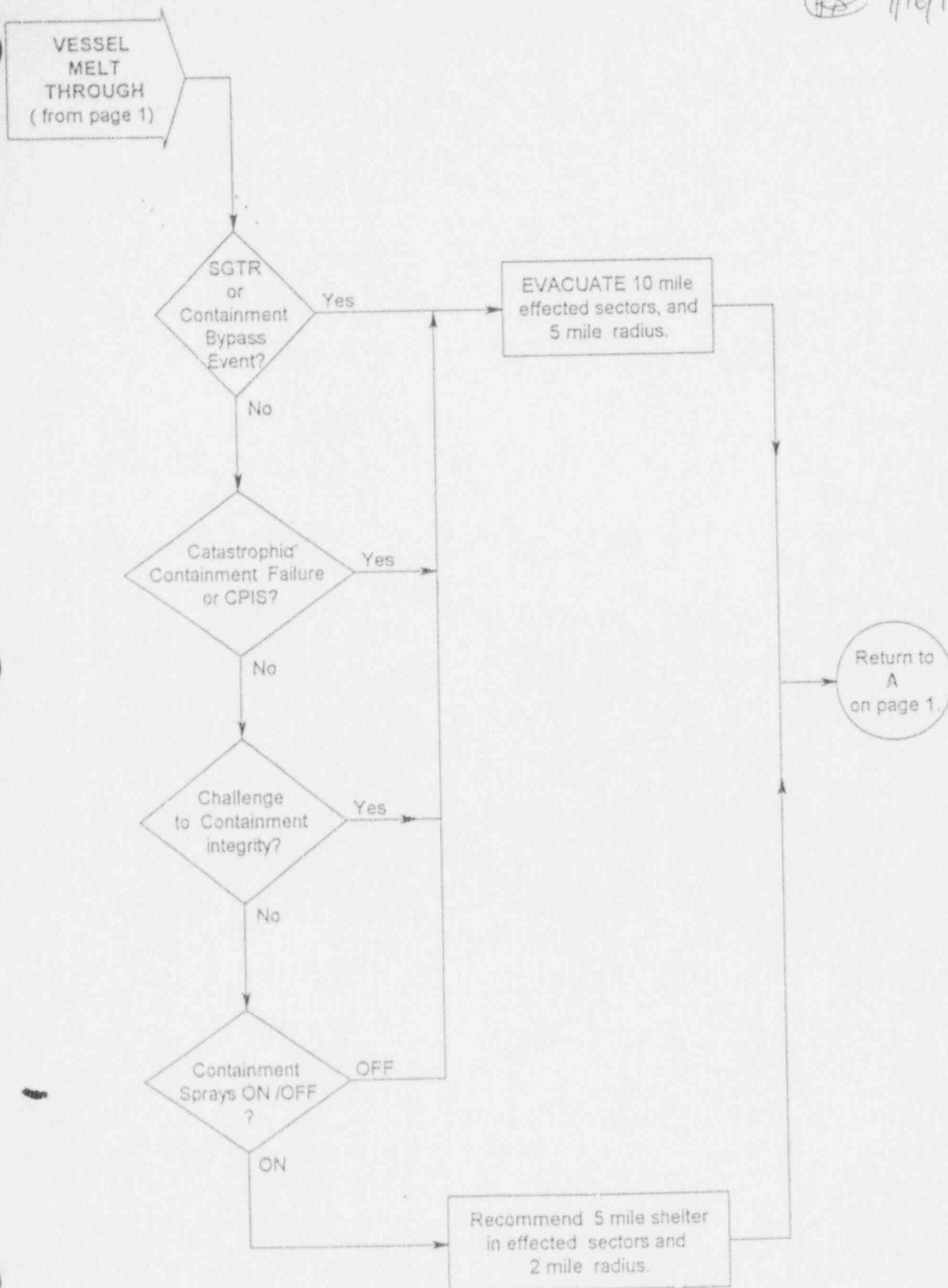
CONTAINMENT BYPASS EVENT



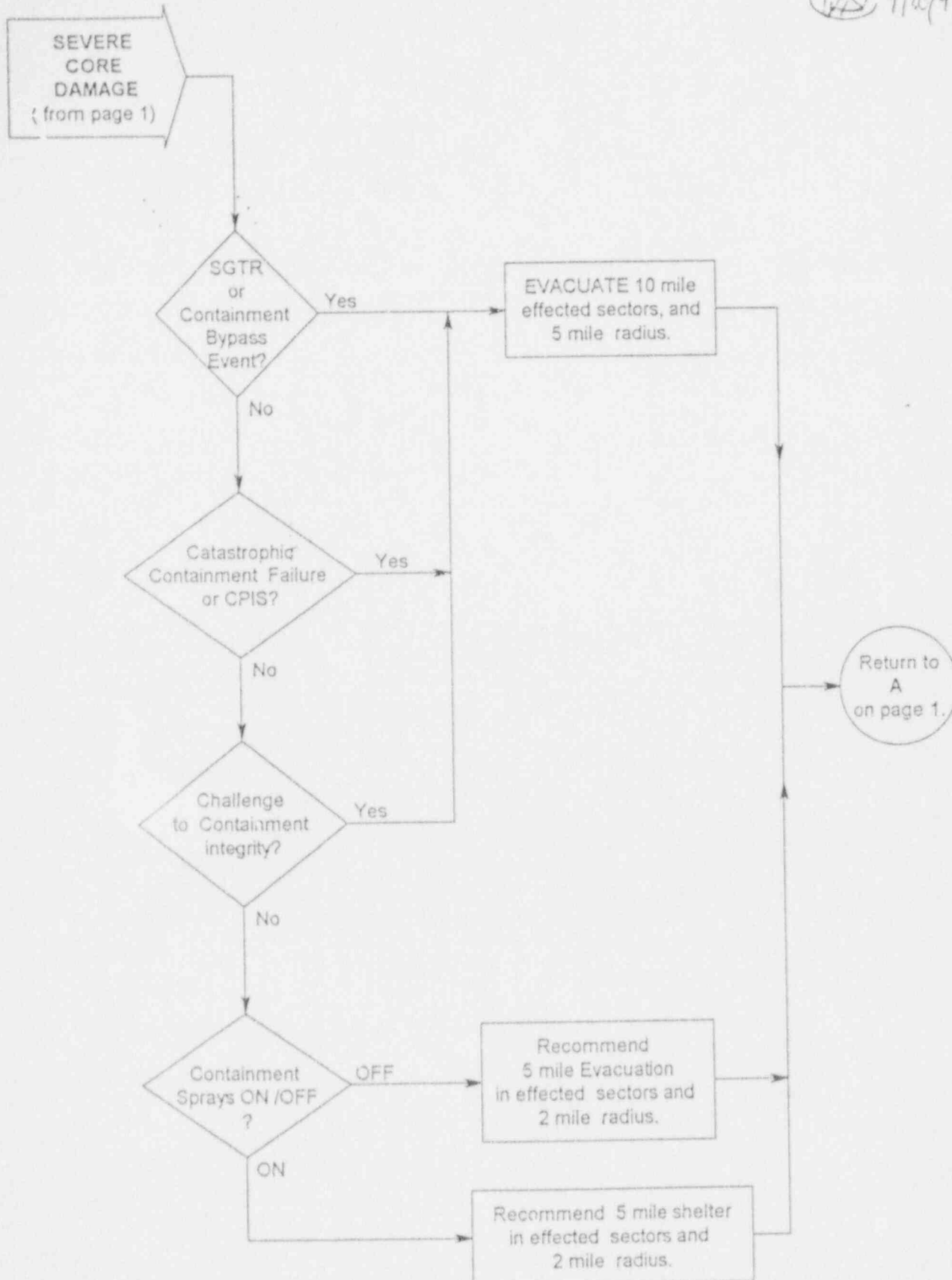
(PS) 9/16/94



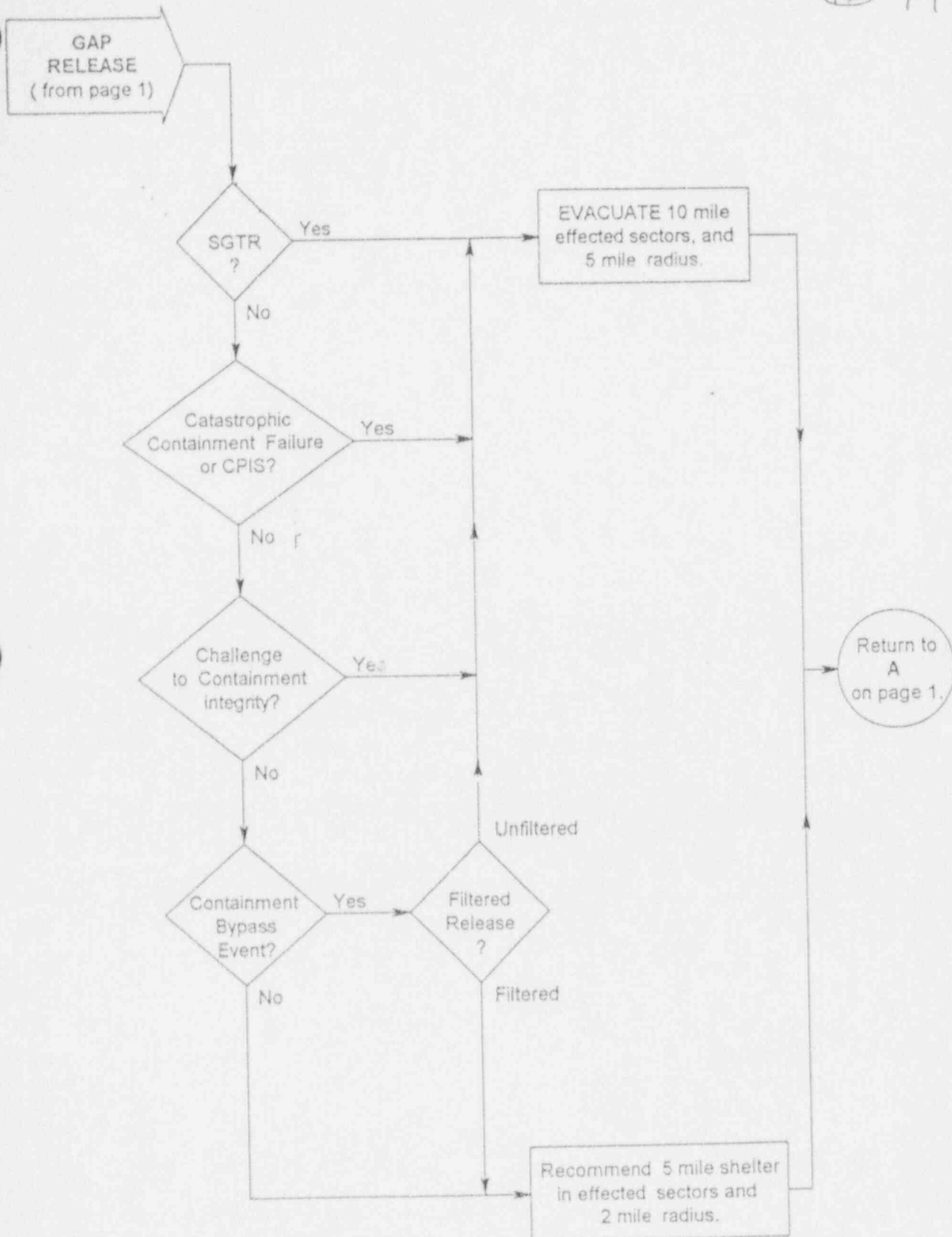
9/16/94



DS 9/16/99



(S) 9/16/94

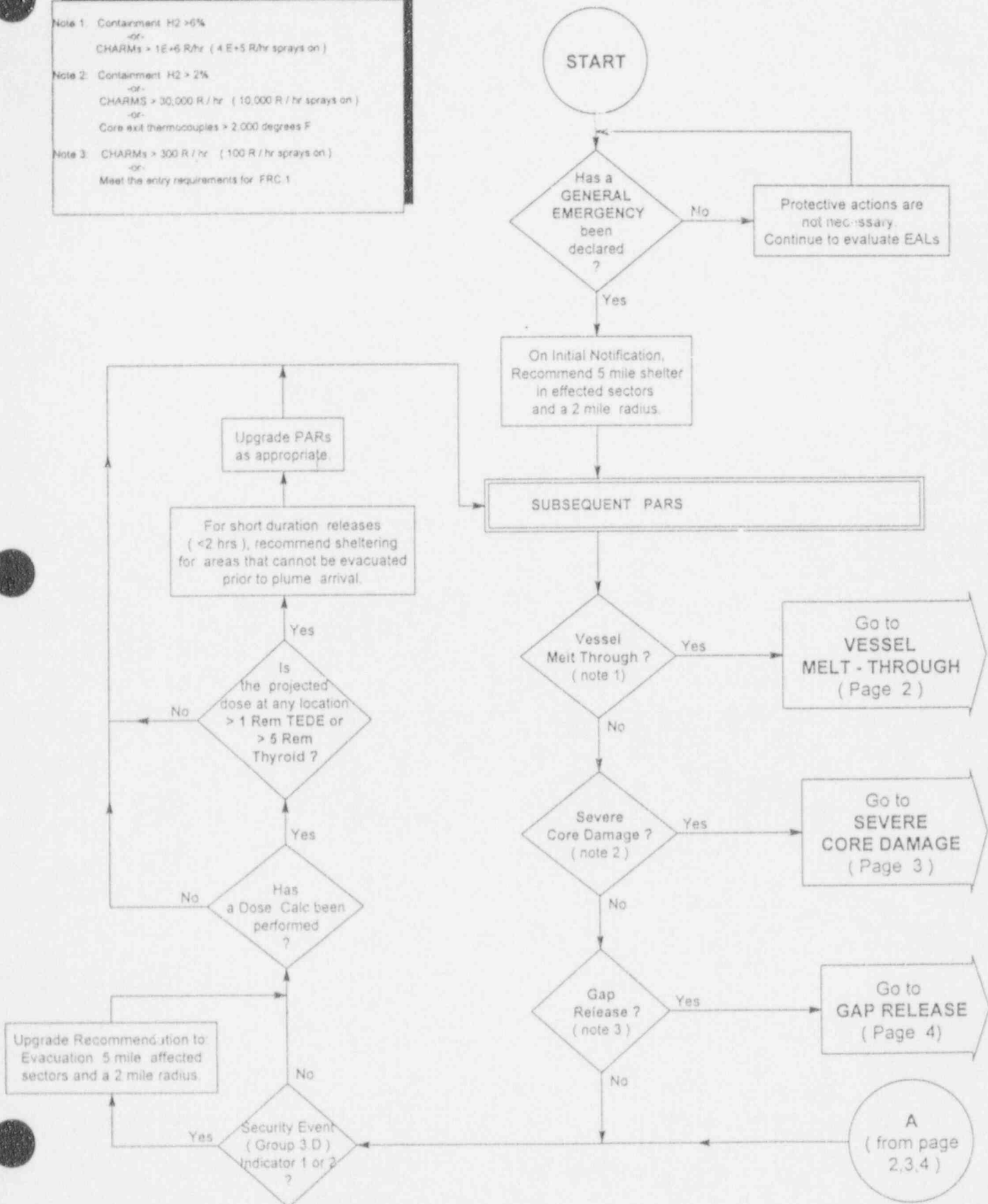


9/16/94

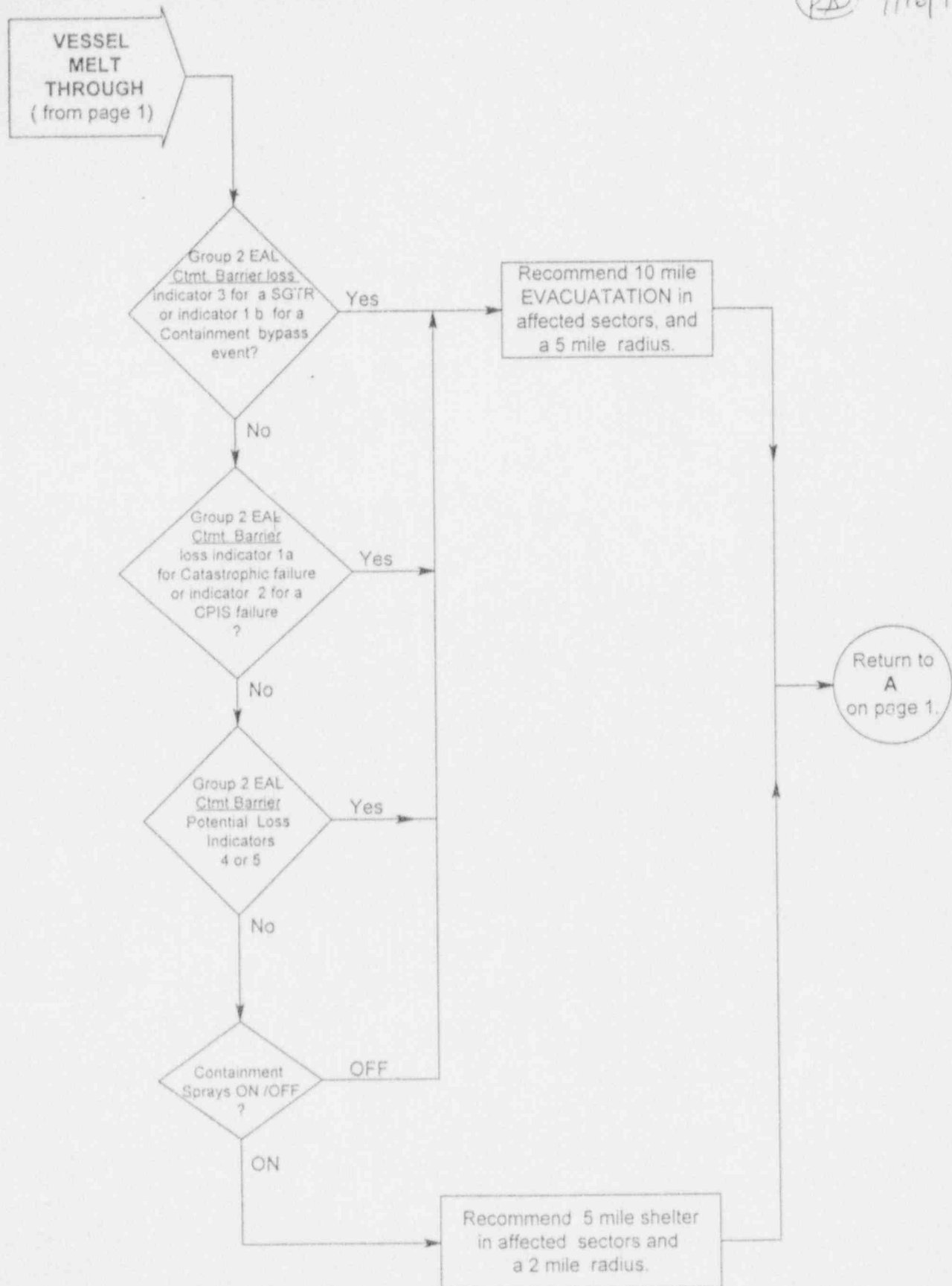
Note 1: Containment H<sub>2</sub> > 6%  
-or-  
CHARMs > 1E+6 R/hr ( 4 E+5 R/hr sprays on )

Note 2: Containment H<sub>2</sub> > 2%  
-or-  
CHARMs > 30,000 R/hr ( 10,000 R/hr sprays on )  
-or-  
Core exit thermocouples > 2,000 degrees F

Note 3: CHARMs > 300 R/hr ( 100 R/hr sprays on )  
-or-  
Meet the entry requirements for FRC 1

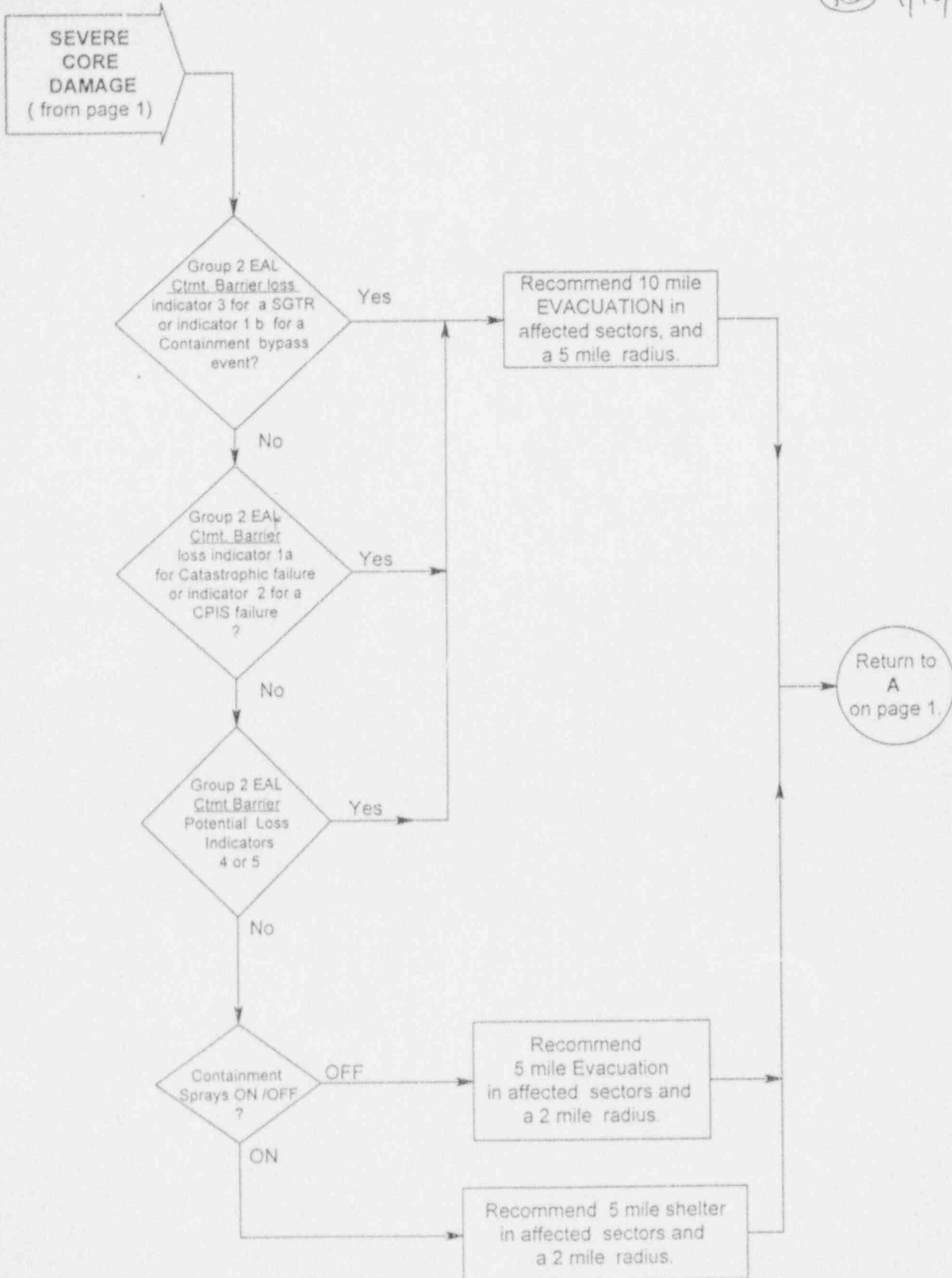


PS 9/16/94



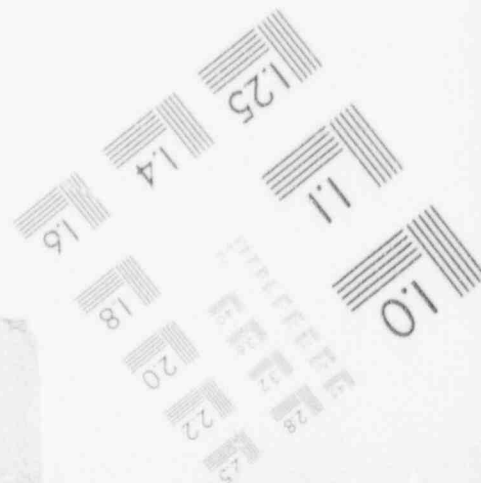
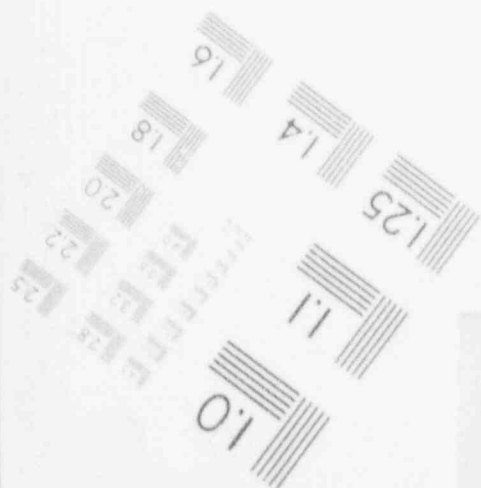
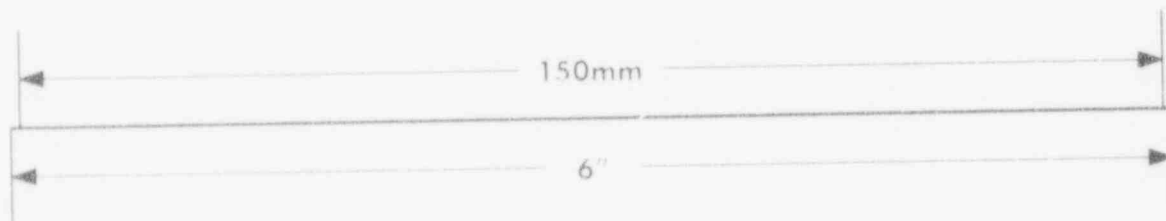
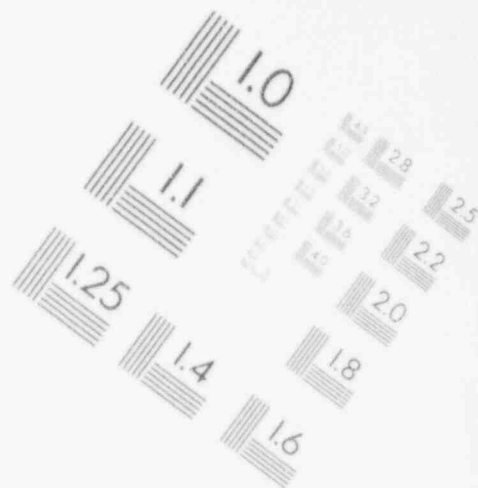
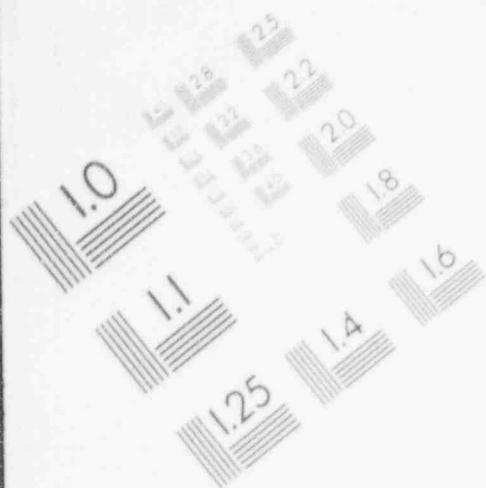


9/16/94



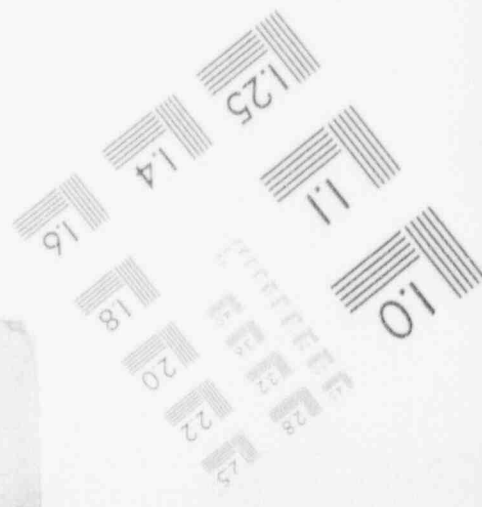
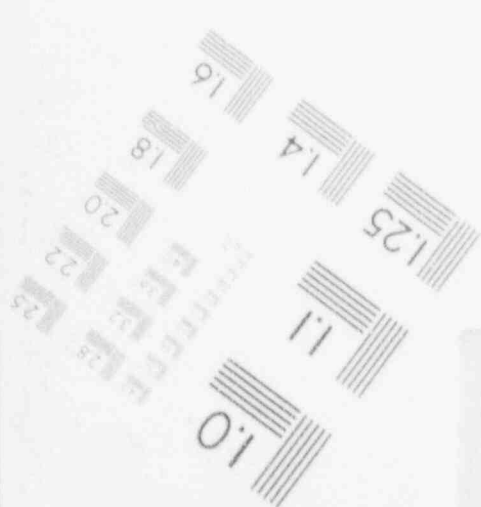
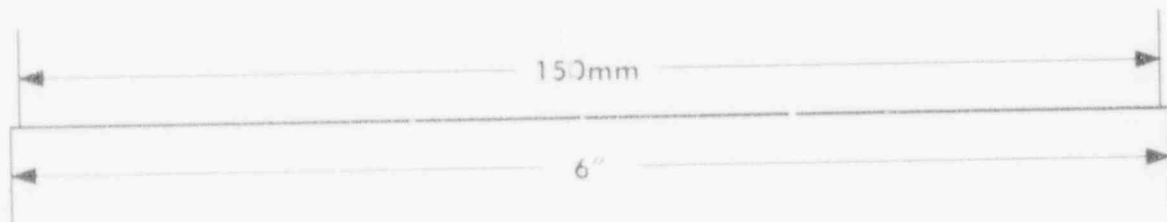
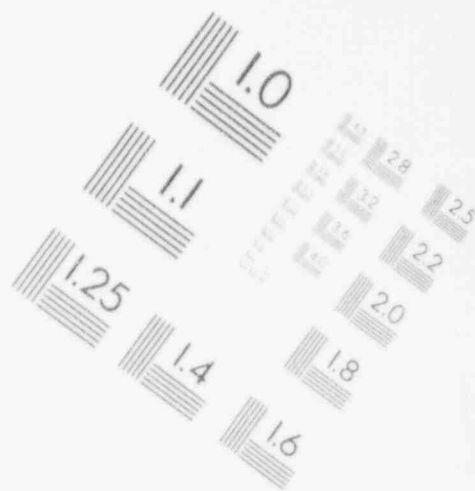
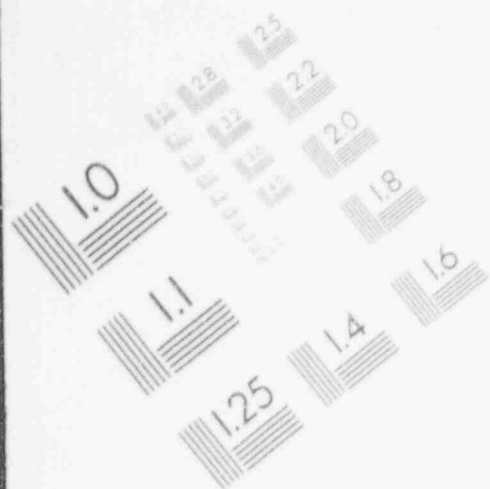
# 1

## IMAGE EVALUATION TEST TARGET (MT-3)



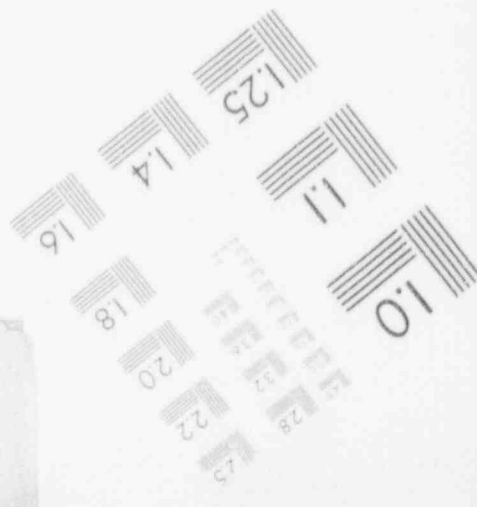
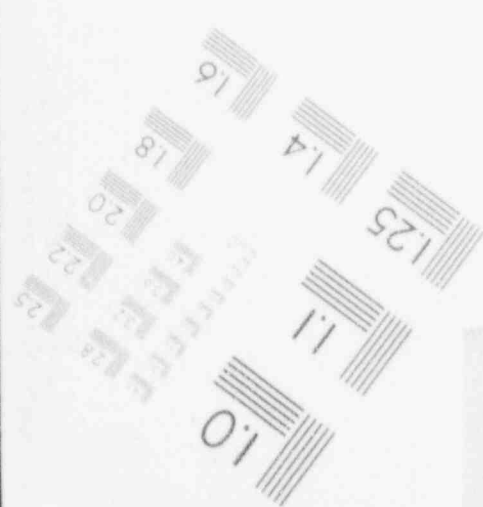
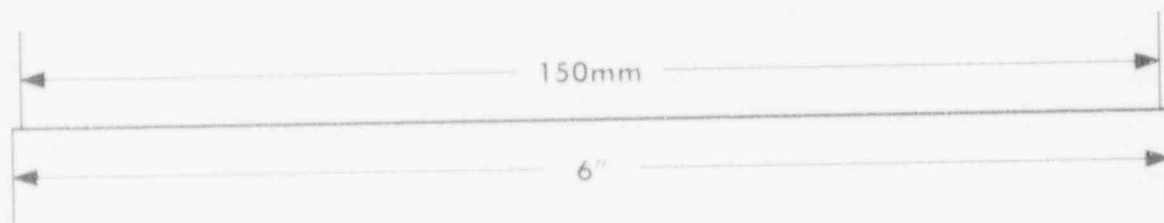
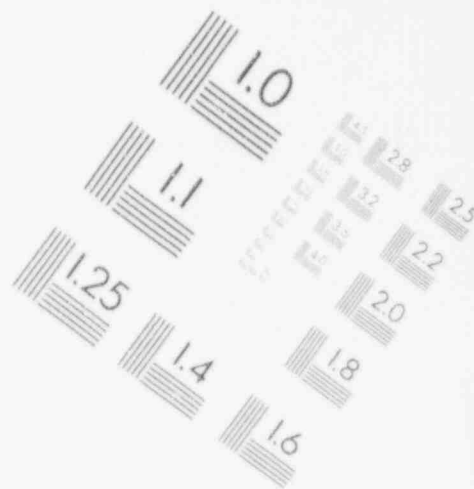
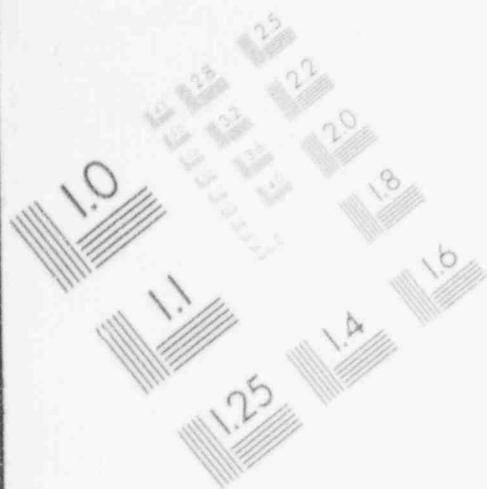
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IMAGE EVALUATION  
TEST TARGET (MT-3)



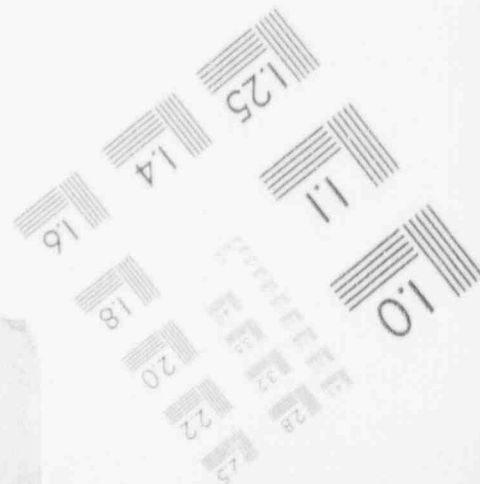
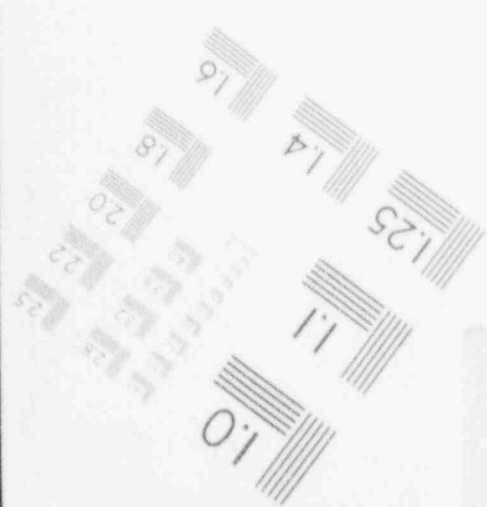
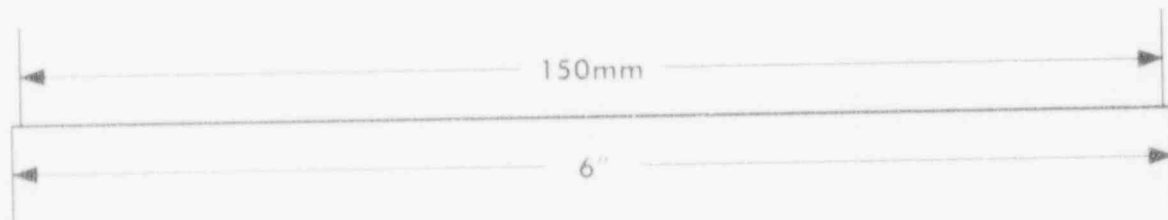
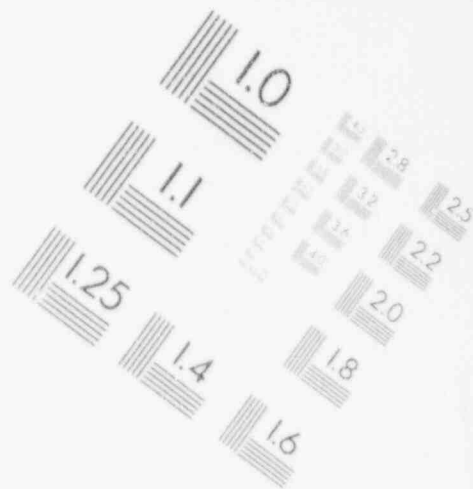
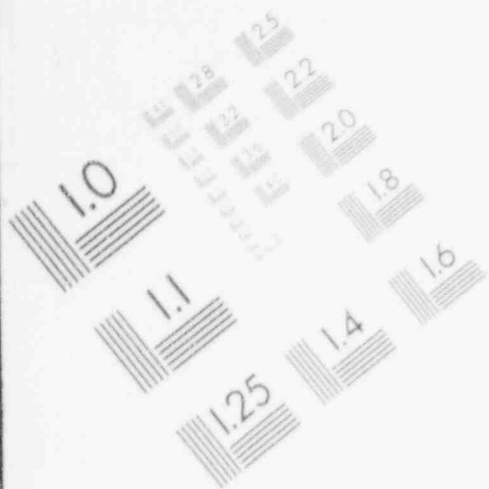
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IMAGE EVALUATION  
TEST TARGET (MT-3)



# 1

## IMAGE EVALUATION TEST TARGET (MT-3)



9/16/94

