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New Emergency
Dose Assessment
Manual submitted
in its entirety

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DUKE POWER COMPANY

EMERGENCY DOSE ASSESSMENT MANUAL

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CRISIS MANAGEMENT PLAN

IMPLEMENTING PROCEDURE

EDA-1

"Procedure for Estimating Food Chain Doses
Under Post-Accident Conditions"

R E Harris
Approved by:

9/6/88
Date

Rev. 2
Sept. 1, 1988

IMPLEMENTING PROCEDURE FOR ESTIMATING FOOD CHAIN DOSES
UNDER POST-ACCIDENT CONDITIONS
CRISIS MANAGEMENT CENTER

1.0 Purpose

The determination of potential areas of concern in the ingestion pathway under post-accident conditions will be made by the Radiological Assessment Manager, based initially upon station releases, prevailing meteorological and hydrological conditions, and confirmatory measurements of dose rates and air sample results by field monitoring teams (when available).

This procedure describes the method to be used in order to estimate offsite doses through significant food chain dose pathways under post-accident conditions. It is to be used only under the direction of the Radiological Assessment Manager.

2.0 Reference

2.1 U.S. NRC Reg. Guide 1.109.

3.0 Limits and Precautions

- 3.1 Reg. Guide 1.109 is intended to guide the calculation of doses under long term steady state conditions. The body of this procedure contains notes covering cases in which the calculation of doses under accident conditions differs from the calculation of doses under routine conditions.
- 3.2 This procedure covers only the calculation of the food chain pathway doses most likely to be limiting under post-accident conditions. Other food chain doses must be calculated using the methods of the Duke Power Company Offsite Dose Calculation Manual or Reg Guide 1.109. General Office Health Physics personnel shall be consulted when these other food chain doses are calculated.
- 3.3 The errors in the doses calculated through the use of this procedure are not necessarily conservative (on the high side).
- 3.4 The assumptions outlined in this procedure shall be carefully compared with existing post-accident conditions before this procedure is used.
- 3.5 This procedure calculates doses by relating concentration to the uptake by the individual and the associated dose factor (mRem/pCi).
- 3.6 It is expected that the samples will be collected by off-site monitoring teams under the direction of the Field Monitoring Coordinator.

4.0 Procedure

4.1 Vegetation → Cow or Goat Milk → Consumer Dose Pathway for Radioiodine.

4.1.1 Assumptions:

Child (Infant) milk consumption: 900 ml/day (2 pints approx.)

Adult milk consumption: 850 ml/day (2 pints approx.)

Decay time between iodine deposition on vegetation and milk consumption: 2 days.

All (100%) of the milk animals' feed is fresh pasture vegetation; if this is known not to be the case, calculate the concentration eaten by the animal by multiplying the concentration in the pasture vegetation by the fraction of feed which is fresh pasture vegetation.

The contribution to dose of I-132 and I-134 is negligible because of the short half-lives and small dose factors for these radionuclides.

- 4.1.2 Doses can be calculated on the basis of radioiodine concentrations measured in or on either grass (or other vegetation consumed by milk animals) or milk. Doses calculated on basis of milk radioiodine concentrations will be much more accurate than those calculated on the basis of vegetation radioiodine concentrations. However, the measurement of vegetation radioiodine concentrations permits the prediction of approximate doses due to milk consumption one or two days later.

Follow-up vegetation radioiodine analysis with milk radioiodine analysis for several days to ensure accurate dose assessments.

4.1.3 Calculation of doses through vegetation analysis:

- 4.1.3.1 Collect samples of vegetation eaten by milk animals and analyze on GeLi counter. Compute radioiodine concentrations in $\mu\text{Ci}/\text{gram}$ of undried vegetation.

NOTE: All calculations for vegetation samples are done for cows; however, if the dose from goat milk is desired, simply multiply the dose from cow milk ingestion by 1.2.

- 4.1.3.2 Calculate thyroid doses by use of the following equations:

$$D_{\text{TCV}} = 3200 C_{\text{I-131v}} + 180 C_{\text{I-133v}} + 1.1 C_{\text{I-135v}}$$

$$D_{\text{TAV}} = 420 C_{\text{I-131v}} + 20 C_{\text{I-133v}} + 0.1 C_{\text{I-135v}}$$

where:

D_{TCV} = Human child (infant) thyroid dose commitment in Rems per day milk animal consumes contaminated vegetation.

D_{TAV} = Same as above for human adult.

C_{I-131v} = Concentration of I-131 in vegetation ($\mu\text{Ci/g}$).

C_{I-133v} = Concentration of I-133 in vegetation ($\mu\text{Ci/g}$).

C_{I-135v} = Concentration of I-135 in vegetation ($\mu\text{Ci/g}$).

4.1.4 Calculation of doses through milk concentrations:

4.1.4.1 Collect samples of milk and analyze on GeLi counter. Compute radioiodine concentrations in $\mu\text{Ci/ml}$.

4.1.4.2 Calculate thyroid doses by use of the following equations.

$$D_{TCM} = 13000 C_{I-131m} + 3000 C_{I-133m} + 590 C_{I-135m}$$

$$D_{TAM} = 1700 C_{I-131m} + 300 C_{I-133m} + 65 C_{I-135m}$$

where:

D_{TCM} = Human child (infant) thyroid dose commitment in Rems per day of consumption of contaminated milk.

D_{TAM} = Same as above for human adult.

C_{I-131m} = Concentration of I-131 in milk ($\mu\text{Ci/ml}$)

C_{I-133m} = Concentration of I-133 in milk ($\mu\text{Ci/ml}$)

C_{I-135m} = Concentrations of I-135 in milk ($\mu\text{Ci/ml}$)

NOTE: Whole body doses due to radioiodine ingestion will always be much smaller than the thyroid dose.

4.2 Drinking Water \rightarrow Consumer Pathway for Radioiodine.

4.2.1 Assumptions:

Child (infant) water consumption: 900 ml/day (2 pints approx.)

Adult water consumption: 2000 ml/day (4 1/3 pints approx.)

Decay time in water distribution system: 1 day.

The contribution to dose of I-132 and I-134 is negligible because of the short half-lives and small dose factors of these radionuclides.

4.2.2 Calculation of doses through water concentrations:

4.2.2.1 Collect water samples and analyze on GeLi counter. Compute radioiodine concentrations in $\mu\text{Ci/ml}$.

4.2.2.2 Calculate thyroid doses by use of the following equations:

$$D_{\text{TCW}} = 12000 C_{\text{I-131w}} + 1400 C_{\text{I-133w}} + 50 C_{\text{I-135w}}$$

$$D_{\text{TAW}} = 3700 C_{\text{I-131w}} + 320 C_{\text{I-133w}} + 12 C_{\text{I-135w}}$$

where:

D_{TCW} = Human child (infant) thyroid dose commitment in Rems per day of consumption of contaminated water.

D_{TAW} = Same as above for human adult.

$C_{\text{I-131w}}$ = Concentration of I-131 in water ($\mu\text{Ci/ml}$)

$C_{\text{I-133w}}$ = Concentration of I-133 in water ($\mu\text{Ci/ml}$)

$C_{\text{I-135w}}$ = Concentrations of I-135 in water ($\mu\text{Ci/ml}$)

NOTE: Whole body doses due to radioiodine ingestion will always be much smaller than the thyroid dose.

4.3 Water → Fish Consumer Pathway for Radiocesium

4.3.1 Assumptions:

Child (teen) fish consumption: 44 g/day (1½ oz. approx.)

Adult fish consumption: 56 g/day (2 oz. approx.)

Bioaccumulation factor for cesium in fish: 2000.

The contribution to dose of Cs-138 is negligible because of its short half-life and small dose factor.

4.3.2 Doses can be calculated on the basis of radiocesium concentrations in either water or fish. Doses calculated on the basis of concentrations in fish will be more accurate than those calculated on the basis of concentrations in water. However, the measurement of water radiocesium concentrations permits the prediction of doses due to future consumption of fish.

4.3.3 Calculation of doses through water analysis:

4.3.3.1 Collect water samples and analyze on GeLi counter. Compute radiocesium concentrations in $\mu\text{Ci/ml}$.

4.3.3.2 Calculate whole body doses by use of the following equations:

$$D_{BCW} = 8000 C_{Cs-134w} + 2000 C_{Cs-136w} + 4600 C_{Cs-137w}$$

$$D_{BAW} = 14000 C_{Cs-134w} + 2200 C_{Cs-136w} + 8200 C_{Cs-137w}$$

where:

D_{BCW} = Human child (teen) whole body dose commitment in Rems per day fish are exposed to contaminated water.

D_{BAW} = Same as above for human adult.

$D_{Cs-134w}$ = Concentration of Cs-134 in water ($\mu\text{Ci/ml}$)

$C_{Cs-136w}$ = Concentration of Cs-136 in water ($\mu\text{Ci/ml}$)

$C_{Cs-137w}$ = Concentration of Cs-137 in water ($\mu\text{Ci/ml}$)

4.3.4 Calculations of doses through fish concentrations:

4.3.4.1 Collect fish samples and analyze on GeLi counter. Compute radiocesium concentrations in $\mu\text{Ci/gram}$ (wet weight).

4.3.4.2 Calculate whole body doses by use of the following equations:

$$D_{BCF} = 4.0 C_{Cs-134F} + 1.0 C_{Cs-136F} + 2.3 C_{Cs-137F}$$

$$D_{BAF} = 6.9 C_{Cs-134F} + 1.1 C_{Cs-136F} + 4.1 C_{Cs-137F}$$

where:

D_{BCF} = Human child (teen) whole body dose commitment in Rems per day of consumption (at 44 g/day) of contaminated fish.

D_{BAF} = Human adult infinity whole body dose commitment in Rems per day of consumption (at 57 g/day) of contaminated fish.

$C_{Cs-134F}$ = Concentrations of Cs-134 in fish ($\mu\text{Ci/g}$)

$C_{Cs-136F}$ = Concentration of Cs-136 in fish ($\mu\text{Ci/g}$)

$C_{Cs-137F}$ = Concentration of Cs-137 in fish ($\mu\text{Ci/g}$)

NOTE: In any one day, a person may easily consume 5 or even 10 times the assumed daily quantity of fish.

Liver doses due to radiocesium ingestion are about two times the whole body doses. The whole body dose limit is 5 Rems, and the dose limit for the liver is 15 Rems; therefore, the whole body doses are limiting.

5.0 Enclosures

5.1 Food Chain Dose Calculations Worksheet

Enclosure 5.1
FOOD CHAIN DOSE CALCULATIONS WORKSHEET

Date: _____ Performed By: _____

I. Dose to Thyroid from Radioiodine

A. Vegetation → Cow or Goat Milk → Consumer Dose Pathway

1. Vegetation Analysis: Date Sampled _____ Location _____

Age Group	Isotope (I-)	Concentration In Vegetation (μCi/g)		Multiplying Factor $\frac{\text{(rem/d)}}{\text{(μCi/g)}}$	=	Dose (rem/d)
Child (In-fant)	131	_____	*	3200**	=	_____
	133	_____	*	180**	=	_____
	135	_____	*	1.1**	=	_____
				Total Dose	=	_____
Adult	131	_____	*	420**	=	_____
	133	_____	*	20**	=	_____
	135	_____	*	0.1**	=	_____
				Total Dose	=	_____

NOTE: Dose is per day animals eat contaminated vegetation.

**All multiplying factors for vegetation are for cow milk, if the dose from goat milk is desired, multiply the dose from cow milk calculations by 1.2.

2. Milk Analysis: Date Sampled _____ Location _____

Age Group	Isotope (I-)	Concentration In Milk (μCi/ml)		Multiplying Factor $\frac{\text{(rem/d)}}{\text{(μCi/ml)}}$	=	Dose (rem/d)
Child (In-fant)	131	_____	*	13000	=	_____
	133	_____	*	3000	=	_____
	135	_____	*	590	=	_____
				Total Dose	=	_____
Adult	131	_____	*	1700	=	_____
	133	_____	*	300	=	_____
	135	_____	*	65	=	_____
				Total Dose	=	_____

Enclosure 5.1 (cont'd)

B. Drinking Water → Consumer Dose Pathway:

Date Sampled _____ Location _____

Age Group	Isotope (I-)	Concentration In Water (μCi/ml)		Multiplying Factor (rem/d) (μCi/ml)	=	Dose (rem/d)
Child	131	_____	*	12000	=	_____
(In-	133	_____	*	1400	=	_____
fant)	135	_____	*	50	=	_____
				Total Dose	=	_____
Adult	131	_____	*	3700	=	_____
	133	_____	*	320	=	_____
	135	_____	*	12	=	_____
				Total Dose	=	_____

II. Dose to Whole Body from Radiocesium:

A. Water → Fish → Consumer Dose Pathway

1. Water Analysis: Date Sampled _____ Location _____

Age Group	Isotope (I-)	Concentration In Water (μCi/ml)		Multiplying Factor (rem/d) (μCi/ml)	=	Dose (rem/d)
Child	134	_____	*	8000	=	_____
(teen)	136	_____	*	2000	=	_____
	137	_____	*	4600	=	_____
				Total Dose	=	_____
Adult	134	_____	*	14000	=	_____
	136	_____	*	2200	=	_____
	137	_____	*	8200	=	_____
				Total Dose	=	_____

NOTE: Dose is per day fish are exposed to contaminated water.

Enclosure 5.1 (cont'd)

1. Fish Analysis: Date Sampled _____ Location _____

Age Group	Isotope (I-)	Concentration In Vegetation ($\mu\text{Ci/g}$)	*	Multiplying Factor (rem/d) ($\mu\text{Ci/g}$)	=	Dose (rem/d)
Child (teen)	134	_____	*	4.0	=	_____
	136	_____	*	1.0	=	_____
	137	_____	*	2.3	=	_____
				Total Dose	=	_____
Adult	134	_____	*	6.9	=	_____
	136	_____	*	1.1	=	_____
	137	_____	*	4.1	=	_____
				Total Dose	=	_____

CRISIS MANAGEMENT PLAN

IMPLEMENTING PROCEDURE

EDA - 02

"Off-Site Dose Projections for
Catawba Nuclear Station"

R E Harris
Approved By

11/15/88
Date

DUKE POWER COMPANY
Offsite Dose Projections for
Catawba Nuclear Station

1.0 PURPOSE

To describe a method for projecting dose commitment from a noble gas and/or iodine release, through the containment, the unit vent and/or the steam relief valves, during an emergency.

2.0 REFERENCES

- 2.1 HP/O/B/1000/10, Determination of Radiation Monitor Setpoints
- 2.2 HP/O/B/1009/06, Alternative Method for Determining Dose Rate Within the Reactor Building
- 2.3 HP/O/B/1009/14, Health Physics Actions Following an Uncontrolled Release of Liquid Radioactive Material
- 2.4 HP/O/B/1009/17, Unit 1 Post-Accident Containment Air Sampling System
- 2.5 HP/O/B/1009/21, Abnormal Unit Vent Sampling
- 2.6 CNS Technical Specification 3.6.1.2
- 2.7 Offsite Dose Calculation Manual (ODCM)
- 2.8 Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors"
- 2.9 Regulatory Guide 1.109, "Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I"
- 2.10 NuReg-0396, EPA 520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants"
- 2.11 NuReg-0654, FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants"
- 2.12 Letter from F. G. Hudson, September 30, 1985, re: Release Rate Information for McGuire and Catawba Nuclear Station (File: CN-134.10)
- 2.13 Catawba Nuclear Station Class A Computer Model Validation (File: NUC-0306)
- 2.14 Letter from J. E. Thomas, May 19, 1987, File: CN-1346.05 and personal conversation with Frank Poley.

3.0 LIMITS AND PRECAUTIONS

- 3.1 This procedure is an alternative method of dose assessment to the Catawba Class A Atmospheric Dispersion Model computer code.
- 3.2 This procedure applies to releases made from Catawba Nuclear Station only. Many of the values contained in this procedure are site specific.
- 3.3 It is assumed that the whole body dose from an iodine release is very small compared to the thyroid dose; therefore, iodine whole body dose is not considered here.
- 3.4 This procedure considers all releases to be ground level releases and that meteorological data are 15 minute averages.
- 3.5 Once a zone has been added to the list of affected zones, it shall not be removed except under the direction of the Dose Assessment Coordinator.
- 3.6 Once the Crisis Management Center (CMC) has been activated, the doses calculated by the Technical Support Center (TSC) dose assessment group, should be compared with those calculated by the CMC before an evacuation recommendation is made.

4.0 PROCEDURE

4.1 Meteorology Assessment

- 4.1.1 Acquire the following information and record on the Dose Assessment and Meteorology Worksheets (Enclosures 5.1 and 5.2, respectively):
 - 4.1.1.1 Lower tower wind speed (WS) in miles per hour.
 - 4.1.1.1.1 Use upper tower wind speed if lower tower wind speed is not available.
 - 4.1.1.2 Upper tower wind direction in degrees from North (North = 0).
 - 4.1.1.2.1 Use lower tower wind direction if upper tower wind direction is not available.
 - 4.1.1.2.2 If the wind speed or wind direction cannot be obtained from plant systems, obtain them from the National Weather Service (phone 704-399-6000). If the NWS information is unavailable, then obtain data from McGuire Nuclear Station Control Room (73 or 78, then 875, then ext. 4262, or 4263, or 4264).

- 4.1.1.3 Temperature gradient (ΔT) in degrees centigrade.
- 4.1.1.4 Using Enclosure 5.2, record the stability class based on ΔT .
 - 4.1.1.4.1 If the temperature gradient is unknown, the following applies:
 - If between 1000 - 1600 hours, use stability class D;
 - If between 1600 - 1000 hours, use stability class G.
- 4.1.1.5 If necessary, use forecasted meteorological data for calculating doses due to changing meteorological conditions.
- 4.1.2 Determine the atmospheric dispersion parameter, $\overline{X/Q}$ (sec/m^3), for .5, 2, 5 and 10 miles (record on Enclosure 5.1):
 - 4.1.2.1 Use ΔT , determine the two hour relative concentration value (C_H) from Enclosure 5.2.
 - 4.1.2.2 Convert the C_H values to $\overline{X/Q}$:
$$\overline{X/Q} = \frac{C_H}{WS}$$
- 4.1.3 Using Enclosure 5.3, circle on Enclosure 5.1 the protective action zones (PAZ), based upon wind speed and wind direction.
- 4.1.4 Recheck meteorology conditions approximately every 15 minutes to ensure that other sectors have not been affected.

4.2 Source Term Assessment - Steam Relief Valve (Enclosure 5.4)

- 4.2.1 Determine the Sub-Noble Gas Release Rates, SQ_{NG} (Ci/sec), by the following method:
 - 4.2.1.1 For Unit 1-EMF26, EMF27, EMF28 and EMF29 or for Unit 2-EMF10, EMF11, EMF12, EMF13:

$$SQ_{NG} = R/\text{hr} \times \frac{1}{VOPEN} \times \text{LBM} \times \text{CF} \frac{\text{Ci}}{\text{lbm R/hr}}$$

where:

R/hr = EMF26, EMF27, EMF28, EMF29, EMF10, EMF11, EMF12, EMF13 reading
VOPEN = time the valve is open in seconds

IBM = lbm released for the time the
valve was open
CF = the correction factor per
Enclosure 5.5.

4.2.2 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec):

$$Q_{NG} = SQ_{NG}(EMF26) + SQ_{NG}(EMF27) + SQ_{NG}(EMF28) + SQ_{NG}(EMF29)$$

4.2.3 Determine the Iodine release rate, Q_I (Ci/sec):

$$Q_I = Q_{NG} \times Irat$$

where:

Irat = ratio of I131 eqv./Xe133 eqv. from Enclosure 5.6.

4.2.4 Record Q_{NG} and Q_I on Enclosure 5.1.

4.3 Source Term Assessment - Containment (Enclosure 5.7)

4.3.1 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec) based on one of the following methods;

4.3.1.1 Based on and EMF reading, where;

$$Q_{NG} = EMF \times CF \times LR$$

Where;

EMF = 39(L), if EMF39(L) < 1E7 cpm,
EMF = 39(H), if EMF39(L) is offscale and
EMF39(H) > 100 cpm,
EMF = 53A or 53B, if EMF39(H) is offscale,

CF = the correction factor per Enclosure 5.8.

LR = Leak Rate x BYPASS,
Leak Rate, (ml/hr), by one
of the following methods:

based on containment pressure:
LR = RLR (from Enclosure 5.9)

based on an opening in containment:
LR = OIC (from Enclosure 5.10)

based on design leak rate:
LR = 2.449E6 (Reference 2.13)

BYPASS = Bypass leakage, default is 7% or
0.07 (Reference 2.6)

4.3.1.2 Based on PACS sample, where;

$$Q_{NG} = PACS \times CF \times LR$$

where;

$$PACS = \mu\text{Ci/ml (Reference 2.4)}$$

$$CF = 2.78E-10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}}$$

LR = Leak rate, as determined in Step 4.3.1.1 above

4.3.2 Determine the Iodine Release Rate, Q_I (Ci/sec) based on one of the following methods:

4.3.2.1 Based on Q_{NG} ;

$$Q_I = Q_{NG} \times \text{Irat}$$

where:

Q_{NG} = Noble Gas Release Rate as determined in Step 4.3.1 above

Irat = ratio of I131 eqv./Xe 133 eqv. from Enclosure 5.6.

4.3.2.2 Based on EMF 40;

$$Q_I = \frac{\Delta\text{CPM}}{\Delta\text{min}} \times 9.82E-20 \frac{\text{Ci hr min}}{\text{sec ml cpm}} \times LR$$

where:

ΔCPM = reading from EMF40

Δmin = the time interval for EMF40 observation (normally 15 minutes)

$9.82E-20 = 4.0E-5 \mu\text{Ci/cpm} \times .25 \text{ min/ft}^3$
(inverse of EMF flow rate) \times
 $3.53E-5 \text{ ft}^3/\text{ml} \times 1\text{Ci}/1E6 \mu\text{Ci} \times$
 $1 \text{ hr}/3600 \text{ sec.}$

$4.0E-5$ = correlation factor for EMF40 from Reference 2.1.

LR = Leak rate, as determined in Step 4.3.1.1 above

4.3.2.3 Based on PACS sample;

$$Q_I = \text{PACS} \times \text{CF} \times \text{LR}$$

where;

$$\text{PACS} = (\mu\text{Ci/ml}) \text{ (Reference 2.4)}$$

$$\text{CF} = 2.78\text{E-}10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}}$$

LR = Leak rate as determined in Step
4.3.1.1 above

4.3.3 Record Q_{NG} and Q_I on Enclosure 5.1.

4.4 Source Term Assessment - Unit Vent (Enclosure 5.11)

4.4.1 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec) based on one of the following methods:

4.4.1.1 Based on as EMF reading, where;

$$Q_{\text{NG}} = \text{EMF} \times \text{CF} \times \text{CFM}$$

where:

EMF = 36(L) if EMF36(L) < 1E7 cpm,
EMF = 36(H) if EMF36(L) is offscale and
EMF36(H) > 100 cpm,
EMF = 54 if EMF36(H) is offscale,
CF = unit vent factor per Enclosure 5.12
CFM = unit vent flow rate (ft³/min)

4.4.1.2 Based on unit vent sample, where;

$$Q_{\text{NG}} = \text{Unit Vent Sample} \times \text{CF} \times \text{CFM}$$

where:

Unit Vent Sample = ($\mu\text{Ci/ml}$) per Reference 2.5

$$\text{CF} = 4.72\text{E-}4 \frac{\text{Ci min ml}}{\text{sec ft}^3 \mu\text{Ci}}$$

CFM = unit vent flow rate (ft³/min)

4.4.2 Determine the Iodine Release Rate, Q_I (Ci/sec), based on one of the following methods:

4.4.2.1 Based on Q_{NG} ;

$$Q_I = Q_{NG} \times \text{Irat}$$

where:

Q_{NG} = Noble Gas Release Rate as determined in Step 4.4.1 above

Irat = ratio of I131 eqv./Xe133 eqv. from Enclosure 5.6.

4.4.2.2 Based on EMF 37;

$$\frac{\Delta\text{CPM}}{\Delta\text{min}} \times 1.11\text{E-}13 \frac{\text{Ci min min}}{\text{sec ft}^3 \text{ cpm}} \times \text{CFM} = Q_I$$

where:

ΔCPM = reading from EMF37

Δmin = the time interval from EMF37 observation (normally 15 minutes)

$1.11\text{E-}13 = 4.0\text{E-}5 \mu\text{Ci}/\text{cpm} \times 0.1667 \text{ min}/\text{ft}^3$
(inverse of EMF flow rate) \times
 $1\text{Ci}/1\text{E}6 \mu\text{Ci} \times 1 \text{ min}/60 \text{ sec.}$

$4.0\text{E-}5$ = correlation factor for EMF37 from Reference 2.1.

CFM = unit vent flow rate (ft^3/min)

4.4.2.3 Based on unit vent sample:

$$Q_I = \text{Unit vent sample} \times 4.72\text{E-}4 \frac{\text{Ci min ml}}{\text{sec ft}^3 \mu\text{Ci}} \times \text{CFM}$$

where:

Unit vent sample = ($\mu\text{Ci}/\text{ml}$) (Reference 2.5)

CFM = unit vent flow rate (ft^3/min)

4.4.3 Record Q_{NG} and Q_I on Enclosure 5.1.

4.5 Dose Assessment (Enclosure 5.1)

4.5.1 Determine the total Noble Gas and Iodine Release Rates (TQ_{NG} and TQ_I) from all releases.

- 4.5.2 Determine the Projected Whole Body Dose Rate, DRwb (rem/hr), due to the noble gases for .5, 2, 5 and 10 miles:

$$DRwb = 33.6 \frac{\text{rem m}^3}{\text{hr Ci}} \times TQ_{NG} \times \overline{X/Q}$$

where:

33.6 is the adult whole body dose conversion factor from Reference 2.9 in $\frac{\text{rem m}^3}{\text{hr Ci}}$

- 4.5.3 Determine the Projected Whole Body Dose, Dwb(rem), due to noble gases for .5, 2, 5 and 10 miles:

$$Dwb = DRwb \times 2 \text{ hr}$$

where:

dose is integrated over 2 hour time period

- 4.5.4 Determine the Projected Thyroid Dose Rate, DRct (rem/hr), due to iodine for .5, 2, 5 and 10 miles:

$$DRct = \overline{X/Q} \times TQ_I \times 2.26E6 \frac{\text{rem m}^3}{\text{hr Ci}}$$

where:

2.26E6 is the child thyroid dose conversion factor from Reference 2.13 in $\frac{\text{rem m}^3}{\text{hr Ci}}$

- 4.5.5 Determine the Projected Thyroid Dose, Dct(rem), due to iodine for .5, 2, 5 and 10 miles:

$$Dct = DRct \times 2 \text{ hr}$$

where:

dose is integrated over 2 hour time period

- 4.6 Protective Action Recommendations (Enclosure 5.1):

- 4.6.1 If the dose rate at the site boundary is $\geq 5.0E-4$ rem/hr whole body then recommend an Alert.
- 4.6.2 If the dose rate at the site boundary is $\geq .05$ rem/hr whole body or $\geq .25$ rem/hr thyroid, then recommend a Site Area Emergency if readings last 30 minutes.
- 4.6.3 If the dose rate at the site boundary is $\geq .5$ rem/hr whole body or ≥ 2.5 rem/hr thyroid, then recommend a Site Area Emergency if readings last 2 minutes.
- 4.6.4 If the dose rate at the site boundary is ≥ 1 rem/hr whole body or ≥ 5 rem/hr thyroid, then recommend a General Emergency.

5.0 ENCLOSURES

- 5.1 Sample of Source Term and Dose Assessment Worksheet
- 5.2 Two-hour Relative Concentration Factors (C_H)
- 5.3 Protective Action Zones Determination
- 5.4 Sample of Source Term Assessment - Steam Relief Valves
- 5.5 EMF26, EMF27, EMF28, EMF29 or EMF10, EMF11, EMF12, EMF13 Noble Gas Correction Factor
- 5.6 I131 eqv./Xe 133 eqv. Ratio
- 5.7 Sample of Source Term Assessment - Containment
- 5.8 Containment Noble Gas Correction Factor
- 5.9 Containment Leakage Rate versus Pressure
- 5.10 Containment Leakage Rate versus Pressure and Size Opening
- 5.11 Sample of Source Term Assessment - Unit Vent
- 5.12 Unit Vent Noble Gas Correction Factor

ENCLOSURE 5.1
METEOROLOGY, SOURCE TERM AND DOSE ASSESSMENT

Catawba Nuclear Station

Emergency Drill

Meteorology, Source Term and Dose Assessment

Report # _____

Approved for release to state/counties by _____

Unit Date/Time of reactor trip _____

Prepared by _____

Projection based on data on _____

Time since trip _____ hrs.

PART 1

1. The emergency condition:
 - ____ (a) Does not involve the release of radioactive materials from the plant.
 - ____ (b) Involves the potential for a release, but no release is occurring.
 - ____ (c) Involves the release of radioactive materials.
2. Recommended Protective Actions (based on Dose Projections only)
 - (a) - In zones A0, B1, E1, A1, C1, D1, F1, B2, A2, C2, D2, E2, F2, F3, A3 no action is recommended.
 - (b) - In zones A0, B1, E1, A1, C1, D1, F1, B2, A2, C2, D2, E2, F2, F3, A3 remain indoors with the doors and windows closed, turn off air conditioners and other ventilation monitor EBS stations.
 - (c) - In zones A0, B1, E1, A1, C1, D1, F1, B2, A2, C2, D2, E2, F2, F3, A3 evacuate their homes and businesses and go to a designated shelter.
 - (d) - In zones A0, B1, E1, A1, C1, D1, F1, B2, A2, C2, D2, E2, F2, F3, A3 pregnant women and children evacuate and go to a designated shelter.

- NOTES: 1) For all evacuations, recommend that the remainder of the 10 mile emergency planning zone stay indoors.
2) Compare these recommendations with other groups' recommendations that the Emergency Coordinator/Recovery Manager reviews.

PART 2

3. Dose Projection Data

Windspeed _____ mph

Wind Direction _____ degrees from North

Release Type: Ground

Weighted Dose 33.6 (R/hr/Ci/m³) whole body

Conversion Factor 2.26E6 (R/hr/Ci/m³) thyroid

Stability Class _____

Radiological Release: Noble Gas Equivalent - _____ Ci/sec

Iodine Equivalent - _____ Ci/sec

4. The type of actual or projected release is:

____ (a) Airborne ____ (b) Waterborne ____ (c) Surface Spill ____ (d) Other _____

____ (e) No release is in progress or expected at this time.

5. Release (a) ____ will begin/ (b) ____ began at: _____.

6. The estimated duration of the release is _____ hours.

7. The source and description of the release is: _____

8. Dose Projections

Distance	Dose Commitment		Projected Integrated Dose	
	Whole Body	Child Thyroid	Whole Body	Child Thyroid
Site Boundary	rem/hr	rem/hr	rem	rem
2 miles	_____	_____	_____	_____
5 miles	_____	_____	_____	_____
10 miles	_____	_____	_____	_____

ENCLOSURE 5.1
 METEOROLOGY, SOURCE TERM AND DOSE ASSESSMENT

9. Field measurement of dose rate (mr/hr) or contamination (dpm/100 cm²)

Time Zone	Distance	Direction	Whole Body	Child Thyroid			
_____	_____	_____	_____	_____			
_____	_____	_____	_____	_____			
Miles	.5	1	2	4	5	7	8
PAZ	AO	B1 E1	A1 C1 D1 F1	B2	A2 C2 D2 E2 F2	F3	A3

Total Source Term Assessment Current Hypothetical
 Steam Relief Containment Unit Vent
 Encl. 5.5 Encl. 5.8 Encl. 5.12
 _____ Ci/sec + _____ Ci/sec _____ Ci/Sec
 _____ Ci/sec + _____ Ci/sec _____ Ci/Sec

Source Term Based on

- | | |
|---------------------------|---------------------------------------|
| 1. LOCA | 5. Tube Rupture |
| 2. LOCA (charcoal) | 6. New Fuel Accident (< 100 days old) |
| 3. Melted Core | 7. Old Fuel Accident (> 100 days old) |
| 4. Melted Core (charcoal) | 8. Waste Gas Decay Tank |

Dose Assessment

$$\frac{C_H}{WS} = \bar{X}/Q$$

<-----< <u>Adult whole body</u> <-----<		>-----> <u>Child thyroid</u> >----->	
2 hr		2 hr	
Dose = 2 x DRwb = 33.6 x TQ _{NG}	$\bar{X}/Q \times$	TQ _I x 2.26E6	= DRct x 2 = Dose
(rem) (rem/hr)	(Ci/sec) (sec/m ³)	(Ci/sec)	(rem/hr) (rem)
		Distance	
		miles	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	.5 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	2 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	5 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	10 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	1 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	4 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	7 _____ TQ _I x 2.26E6 = _____ x 2= _____	
_____ =2 x _____ = 33.6 x TQ _{NG}	_____	8 _____ TQ _I x 2.26E6 = _____ x 2= _____	

Review with Emergency Coordinator the recommended Emergency Classification.

- Recommend Alert
- Recommend Site Area Emergency if readings last 30 minutes
- Recommend Site Area Emergency if readings last 2 minutes
- Recommend General Emergency

DUKE POWER COMPANY
ENCLOSURE 5.2
TWO-HOUR RELATIVE CONCENTRATION FACTORS(C_H)

Temperature Gradient (C)	Stability Class	Distance (miles)										
		.5	1	2	3	4	5	6	7	8	9	10
1) $\Delta T < -0.6$	A	1.4E-5	1.2E-6	5.9E-7	4.1E-7	3.2E-7	2.5E-7	2.0E-7	1.9E-7	1.8E-7	1.6E-7	1.5E-7
2) $-0.6 \leq \Delta T < -0.5$	C	1.5E-4	4.5E-5	1.3E-5	6.3E-6	3.9E-6	2.7E-6	1.9E-6	1.4E-6	1.1E-6	8.3E-7	7.8E-7
3) $-0.5 \leq \Delta T < -0.2$	D	3.8E-4	1.4E-4	4.9E-5	2.7E-5	1.7E-5	1.2E-5	9.2E-6	7.3E-6	6.0E-6	5.0E-6	4.3E-6
4) $-0.2 \leq \Delta T < +0.4$	E	6.9E-4	2.5E-4	9.6E-5	5.5E-5	3.5E-5	2.5E-5	2.0E-5	1.6E-5	1.3E-5	1.1E-5	9.7E-6
5) $+0.4 \leq \Delta T < +1.2$	F	1.1E-3	5.1E-4	2.0E-4	1.2E-4	8.2E-5	6.3E-5	5.1E-5	4.3E-5	3.8E-5	3.3E-5	3.0E-5
6) $+1.2 \leq \Delta T$	G	1.8E-3	1.1E-3	4.3E-4	2.7E-4	2.0E-4	1.7E-4	1.3E-4	1.2E-4	8.6E-5	7.8E-5	7.3E-5

NOTE: If ΔT is unavailable use: 1000-1600 hours Use Stability Class D
1600-1000 hours Use Stability Class G

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02
 ENCLOSURE 5.3
 PROTECTIVE ACTION ZONES DETERMINATION

Determine the affected zones (based on wind direction) from the table below and record on Enclosure 5.1.

NOTE: If wind speed is less than or equal to 5 mph, the affected zones for 0-5 miles shall be A0, A1, B1, C1, D1, E1, F1.

Wind Direction (degrees from North)	PAZ's	
	0-5 miles	5-10 miles
0.0 - 22	A0, C1, D1	C2, D2
22.1 - 73	A0, C1, D1, E1	C2, D2, E2, F2
73.1 - 108	A0, C1, D1, E1, F1	D2, E2, F2, F3
108.1 - 120	A0, D1, E1, F1	D2, E2, F2, F3
120.1 - 159	A0, E1, F1	D2, E2, F2, F3, A2
159.1 - 207	A0, E1, F1, A1	E2, F2, F3, A2, B2
207.1 - 247	A0, F1, A1, B1	F2, F3, A2, B2
247.1 - 265	A0, A1, B1	F3, A2, B2, A3, C2
265.1 - 298	A0, A1, B1, C1	A2, B2, A3, C2
298.1 - 338	A0, B1, C1	B2, A3, C2, D2
338.1 - 359.9	A0, B1, C1, D1	B2, C2, D2

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02
 ENCLOSURE 5.4
 SOURCE TERM ASSESSMENT - STEAM RELIEF VALVES

Reactor Trip _____ / _____ Report # _____
 (Date/Time) Projection based on data on _____
 (Date/Time)

Calculations based on _____ Melted Core _____ LOCA

NOBLE GAS

based on EMF26 or EMF10

SG_{NG}

$$\text{_____ R/hr} \times \left[\frac{\text{_____}}{\text{_____ sec}} \right] \times \text{_____ lbm} \times \frac{\text{_____ Ci}}{\text{_____ lbm R/hr}} = \frac{\text{_____ Ci}}{\text{_____ sec}}$$

(Encl. 5.5)

based on EMF27 or EMF11

$$\text{_____ R/hr} \times \left[\frac{\text{_____}}{\text{_____ sec}} \right] \times \text{_____ lbm} \times \frac{\text{_____ Ci}}{\text{_____ lbm R/hr}} = \frac{\text{_____ Ci}}{\text{_____ sec}}$$

(Encl. 5.5)

based on EMF28 or EMF12

$$\text{_____ R/hr} \times \left[\frac{\text{_____}}{\text{_____ sec}} \right] \times \text{_____ lbm} \times \frac{\text{_____ Ci}}{\text{_____ lbm R/hr}} = \frac{\text{_____ Ci}}{\text{_____ sec}}$$

(Encl. 5.5)

based on EMF29 or EMF13

$$\text{_____ R/hr} \times \left[\frac{\text{_____}}{\text{_____ sec}} \right] \times \text{_____ lbm} \times \frac{\text{_____ Ci}}{\text{_____ lbm R/hr}} = \frac{\text{_____ Ci}}{\text{_____ sec}}$$

(Encl. 5.5)

Total from all Steam Relief Valves, $Q_{NG} = \text{_____ Ci/sec}$

IODINE

From all Steam Relief valves

$$Q_{NG} \times \text{_____ I131 eqv./Xe 133 eqv. ratio} = \frac{Q_I}{\text{_____}} \text{ Ci/sec}$$

(Encl. 5.6)

Emergency

Drill

Prepared by: _____

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02
 ENCLOSURE 5.5
 EMF26, EMF27, EMF28, EMF29 or
 EMF10,- EMF11, EMF12, EMF13 NOBLE GAS CORRECTION FACTOR

Time Since Trip (hrs)	Correction Factor based on Melted Core or LOCA
>0	3.622
<u>>2</u>	3.971
>4	4.041
<u>>8</u>	4.029
>24	3.332
<u>>48</u>	2.647
>100	2.438
<u>>250</u>	2.438
>500	2.438
<u>>720</u>	2.438

* units in $\frac{\text{Ci}}{\text{lbm R/hr}}$

* Enclosure 5.5 is the correlation factor per Reference 2.13 x
 $2.83\text{E}4 \frac{\text{ml}}{\text{ft}^3} \times .41 \frac{\text{ft}^3}{\text{lbm}} \times \frac{\text{m}^3}{1\text{E}6 \text{ ml}}$

.41 = specific gravity of steam per Reference 2.13.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02
 ENCLOSURE 5.6
 I131 eqv./Xe133 eqv. RATIO

Time Since Trip (hrs)	Ratio based on LOCA (Column 1)	Ratio based on Melted Core (Column 2)
>0	2.74E-3	2.24E-3
>2	3.42E-3	9.66E-3
>4	3.82E-3	1.59E-2
>8	4.34E-3	2.85E-2
>24	4.79E-3	7.52E-2
>48	4.84E-3	1.11E-1
>100	5.06E-3	1.33E-1
>250	6.55E-3	1.80E-1
>500	1.02E-2	2.90E-1
>720	1.44E-2	4.33E-1

* Enclosure 5.6 is from Reference 2.13.

NOTE: For unit vent releases in which Irat is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below:

1. LOCA, use column 1 (based on LOCA).
2. LOCA through charcoal filters, divide column 1 value by 100.
3. Core damage, use column 2 (based on Core Melt).
4. Core damage through charcoal filters, divide column 2 value by 100.
5. Tube rupture, use 1.44E-5
6. New fuel accident, use 2.217E-4
7. Old fuel accident, use 7.227E-4
8. Gas decay tank, assume no radioiodine released, only noble gases are considered to be released from gas tank, use 0.

NOTE: For steam releases in which Irat is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below:

1. LOCA divide column 1 value by 100.
2. Core damage, divide column 2 value by 100.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02
 ENCLOSURE 5.7
 SOURCE TERM ASSESSMENT - CONTAINMENT

Reactor Trip _____ / _____ (Date/Time) Report # _____
 Projection based on data on _____ / _____ (Date/Time)

Calculations based on _____ Melted Core _____ LOCA

Containment pressure _____ psig

LR = _____ ml/hr x BYPASS _____ (default = .07)

LR based on _____ Realistic Leak Rate

(check one)

_____ 1" 2" 4" 6" 8" 12" 18" 34" diameter opening
 (circle one) Personnel Hatch opening
 Equipment Hatch opening

_____ Design Leak Rate (2.449E6)

NOBLE GAS

based on (check one)

- EMF39(L) if < 1E7 cpm EMF39(H) if > 100 cpm EMF53 if 39(H) is off scale

$$\begin{array}{ccccccc} \text{EMF} & & \text{CF} & & \text{LR} & & Q_{\text{NG}} \\ \text{_____} & \text{cpm} & & & & & \\ \text{_____} & \text{or} & & & & & \\ \text{_____} & \text{R/hr} & \times & \text{_____} & \times & \text{_____} & = & \text{_____} & \frac{\text{Ci}}{\text{sec}} \\ & & & \text{(Encl. 5.8)} & & \text{ml/hr} & & & \end{array}$$

(Note on Encl. 5.9)

based on
 PACS sample

$$\text{_____ } \frac{\mu\text{Ci}}{\text{ml}} \times 2.78\text{E-}10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}} \times \text{_____} \text{ ml/hr} = \text{_____} \frac{\text{Ci}}{\text{sec}}$$

IODINE

based on

$$\begin{array}{ccccccc} Q_{\text{NG}} & & & & & & Q_{\text{I}} \\ \text{_____} & \frac{\text{Ci}}{\text{sec}} \times & \text{_____} & \text{I131 eqv./Xe133 eqv.} & = & \text{_____} & \frac{\text{Ci}}{\text{sec}} \\ & & & \text{ratio (Encl. 5.6)} & & & \end{array}$$

based on EMF40

LR

$$\frac{\text{_____ } \Delta\text{cpm}}{\text{_____ } \Delta\text{min}} \times 9.82\text{E-}20 \frac{\text{Ci hr min}}{\text{sec ml cpm}} \times \text{_____} \text{ ml/hr} = \text{_____} \frac{\text{Ci}}{\text{sec}}$$

based on PACS sample

$$\text{_____} \frac{\mu\text{Ci}}{\text{ml}} \times 2.78\text{E-}10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}} \times \text{_____} \text{ ml/hr} = \text{_____} \frac{\text{Ci}}{\text{sec}}$$

Emergency

Drill

Prepared by: _____

DUKE POWER COMPANY
ENCLOSURE 5.8
CATAWBA CONTAINMENT NOBLE GAS CORRECTION FACTOR

Time Since Trip (hours)	EMF 39(L) based on		EMF 39(H) based on		EMF 53 based on	
	LOCA	Melted Core	LOCA	Melted Core	LOCA	Melted Core
≥ 0	6.389E-18	6.672E-17	5.56E-14	1.429E-13	3.781E-10	1.190E-9
≥ 2	6.389E-18	4.448E-17	5.56E-14	1.003E-13	3.114E-10	5.894E-10
≥ 4	6.389E-18	3.058E-17	5.56E-14	1.232E-13	2.780E-10	4.726E-10
≥ 8	6.389E-18	2.113E-17	5.56E-14	1.195E-13	2.446E-10	3.392E-10
≥ 24	6.389E-18	1.112E-17	5.56E-14	7.339E-14	2.335E-10	1.890E-10
≥ 48	6.389E-18	1.056E-17	5.56E-14	6.060E-14	2.335E-10	1.668E-10
≥ 100	6.389E-18	1.390E-17	5.56E-14	5.699E-14	2.335E-10	1.612E-10
≥ 250	6.389E-18	1.446E-17	5.56E-14	5.588E-14	2.335E-10	1.557E-10
≥ 500	6.389E-18	9.730E-18	5.56E-14	5.560E-14	2.335E-10	1.251E-10
≥ 720	6.389E-18	6.394E-18	5.56E-14	5.560E-14	2.335E-10	1.056E-10
	Units in $\frac{\text{Ci hr}}{\text{sec ml cpm}}$		units in $\frac{\text{Ci hr}}{\text{sec ml cpm}}$		units in $\frac{\text{Ci hr}}{\text{sec ml R/hr}}$	

Enclosure 5.8 is the correlation factor per Reference 2.13 $\times \frac{\text{hr}}{3600 \text{ sec}} \times \frac{\text{Ci}}{1E6 \mu\text{Ci}}$

NOTE: Reference 2.14 - After 2 days since reactor trip;

If 53A or 53B reading is 0 add 150 R/hr

If 53A or 53B reading is 150, add 150 R/hr

From 0-2 days since reactor trip;

Use 53A and 53B reading as is.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02
 ENCLOSURE 5.9
 CONTAINMENT LEAKAGE RATE VERSUS PRESSURE

<u>PSIG</u>	<u>ml/hr</u>
<u>>0</u>	*2.081E5
<u>>2</u>	4.536E5
<u>>4</u>	8.316E5
<u>>8</u>	1.397E6
<u>>10</u>	1.591E6
<u>>11</u>	1.663E6
<u>>12</u>	1.713E6
<u>>13</u>	1.764E6
<u>>14</u>	1.800E6
<u>>15</u>	1.836E6

Enclosure 5.9 is the realistic leakage rate (m³/sec) per Reference 2.12 x 1E6 ml/m³ x 3600 sec/hr.

* 2.081E5 ml/hr is derived as follows:

$$2.081E5 \frac{\text{ml}}{\text{hr}} = 0.017 \text{ \%/day} \times 3.4E-3 \frac{\text{m}^3 \text{ -day}}{\text{\%-sec}} \times 1E6 \frac{\text{ml}}{\text{m}^3} \times 3600 \frac{\text{sec}}{\text{hr}}$$

where:

0.017 is determined from containment leakage rate vs pressure curve from Reference 2.13 for an assumed 1 psig. 3.4E-3 is from Reference 2.12.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-02

ENCLOSURE 5.10

CONTAINMENT LEAKAGE RATE VERSUS PRESSURE AND SIZE OPENING

For 1" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.209E8	>5.0	3.908E8	>12.5	5.862E8
>2.50	2.889E8	>7.5	4.588E8	>15.0	6.287E8
>3.75	3.483E8	>10.0	5.268E8		

For 2" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	8.496E8	>5.0	1.512E9	>12.5	2.243E9
>2.50	1.121E9	>7.5	1.784E9	>15.0	2.464E9
>3.75	1.342E9	>10.0	2.022E9		

For 4" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	3.144E9	>5.0	5.692E9	>12.5	8.496E9
>2.50	4.248E9	>7.5	6.797E9	>15.0	9.176E9
>3.75	5.098E9	>10.0	7.731E9		

For 6" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	7.137E9	>5.0	1.291E10	>12.5	1.937E10
>2.50	9.516E9	>7.5	1.529E10	>15.0	2.124E10
>3.75	1.138E10	>10.0	1.716E10		

For 8" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.257E10	>5.0	2.243E10	>12.5	3.381E10
>2.50	1.648E10	>7.5	2.634E10	>15.0	3.568E10
>3.75	1.971E10	>10.0	3.042E10		

For 12" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.719E10	>5.0	5.012E10	>12.5	7.476E10
>2.50	3.738E10	>7.5	5.947E10	>15.0	8.156E10
>3.75	4.452E10	>10.0	6.712E10		

For 18" opening

PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	5.522E10	>5.0	1.003E11	>12.5	1.529E11
>2.50	7.476E10	>7.5	1.189E11	>15.0	1.665E11
>3.75	8.836E10	>10.0	1.351E11		

For 34" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.869E11	>5.0	3.398E11	>12.5	5.132E11
>2.50	2.583E11	>7.5	4.078E11	>15.0	5.607E11
>3.75	3.093E11	>10.0	4.588E11		

For Personnel Hatch opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.379E12	>5.0	4.690E12	>12.5	6.967E12
>2.50	3.398E12	>7.5	5.573E12	>15.0	7.646E12
>3.75	4.111E12	>10.0	6.372E12		

For Equipment Hatch opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.121E13	>5.0	2.022E13	>12.5	3.059E13
>2.50	1.478E13	>7.5	2.379E13	>15.0	3.398E13
>3.75	1.767E13	>10.0	2.719E13		

* Enclosure 5.10 is the containment leakage for an opening size in standard cubic feet per min (scfm) x 2.83E4 ml/ft³ x 60 min/hr.

DUKE POWER COMPANY
 ENCLOSURE 5.12
 CATAWBA UNIT VENT NOBLE GAS CORRECTION FACTOR

Time Since Trip (hours)	EMF36(L) based on Melted Core	EMF36(H) based on Melted Core	EMF54 based on Melted Core
>0	1.133E-10	2.426E-7	1.887E-3
>2	7.552E-11	1.704E-7	1.179E-3
>4	5.192E-11	2.091E-7	9.905E-4
>8	3.587E-11	2.030E-7	6.367E-4
>24	1.888E-11	1.246E-7	2.931E-4
>48	1.794E-11	1.029E-7	2.405E-4
>100	2.360E-11	9.676E-8	2.358E-4
>250	2.454E-11	9.487E-8	2.358E-4
>500	1.652E-11	9.440E-8	2.358E-4
>720	1.086E-11	9.440E-8	2.358E-4

If accident is:

1. Melted core use table.
2. Melted core through charcoal use table.
3. New Fuel Accident (less than 100 days old) use 2.358E-11 for EMF36(L), use 9.67E-8 for EMF36(H), use 2.358E-4 for EMF54.
4. All other accidents use 1.086E-11 for EMF36(L), use 9.44E-8 for EMF36(H), use 2.358E-4 for EMF54.

Units in $\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}$

units in $\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}$

units in $\frac{\text{Ci min}}{\text{sec ft}^3 \text{ R/hr}}$

Enclosure 5.12 is the correlation factor per Reference $2.13 \times 2.83E4 \frac{\text{ml}}{\text{ft}^3} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{\text{Ci}}{1E6 \mu\text{Ci}}$

CRISIS MANAGEMENT PLAN

IMPLEMENTING PROCEDURE

EDA-03

"Off-Site Dose Projections for
McGuire Nuclear Station"

R E Harris

Approved By

11/9/88

Date

Rev. 3
November 8, 1988

OFF-SITE DOSE PROJECTIONS
FOR MCGUIRE NUCLEAR STATION1.0 Purpose

1.1 To describe a method for projecting dose commitment from a noble gas and/or iodine release, through the containment, the unit vent and/or the steam relief valves, during an emergency.

2.0 References

- 2.1 HP/0/B/1003/08, Determination of Radiation Monitor Setpoints (EMF's).
- 2.2 HP/0/B/1009/02, Alternative Method for Determining Dose Rate Within the Reactor Building.
- 2.3 HP/0/B/1009/10, Releases of Liquid Radioactive Material Exceeding Technical Specifications.
- 2.4 HP/1/B/1009/15 and HP/2/B/1009/15, Post-Accident Containment Air Sampling System Operating Procedures.
- 2.5 HP/0/B/1009/06, Procedure for Quantifying High Level Radioactivity Releases During Accident Conditions.
- 2.6 McGuire Nuclear Station Technical Specifications 3.6.1.2.
- 2.7 Offsite Dose Calculation Manual (ODCM).
- 2.8 Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors".
- 2.9 Regulatory Guide 1.109, "Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I".
- 2.10 NuReg-0396, EPA 520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants".
- 2.11 NuReg-0654, FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants".
- 2.12 Letter from F.G. Hudson; September 30, 1985, re: Release Rate Information from McGuire and Catawba Nuclear Station.
- 2.13 McGuire Nuclear Station Class A Computer Model Validation.

3.0 Limits and Precautions

- 3.1 This procedure is an alternative method of dose assessment to the Class A Atmospheric Dispersion Model computer code.
- 3.2 This procedure applies to releases made from McGuire Nuclear Station only. Many of the values contained in this procedure are site specific.
- 3.3 It is assumed that the whole body dose from an iodine release is very small compared to the thyroid dose; therefore, iodine whole body dose is not considered here.
- 3.4 This procedure considers all releases to be ground level releases and that all meteorological data are 15 minute averages.
- 3.5 Once a zone has been added to the list of affected zones, it shall not be removed except under the direction of the Dose Assessment Coordinator.
- 3.6 Once the Crisis Management Center (CMC) has been activated, the doses calculated by the Technical Support Center (TSC) dose assessment group, shall be compared with those calculated by the CMC before an evacuation recommendation is made.
- 3.7 EMF's 38, 39, and 40 will isolate on a phase A containment isolation (1 psig in containment). Therefore, EMF's 38L, 38H, 39L, 39H, and 40 should not be considered valid when containment pressure is \geq 1 psig.
- 3.8 The sample pump to EMF's 35, 36, and 37 will trip when there is a Trip 1 on EMF 36 HH. Therefore, EMF's 35L, 35H, 36L, 36H, and 37 should not be considered valid when EMF 36 HH is \geq Trip 1 (usually set at 5-7 R/Hr).

4.0 Procedure

NOTE: Much of the information for the meteorology assessment can be obtained on the OAC, (Tech. Spec. 04 program). See Enclosure 5.14 for instructions.

4.1 Meteorology Assessment

- 4.1.1 Acquire the following information and record on the Dose Assessment Report and Meteorology Worksheet (Enclosures 5.1 and 5.2 respectively).

- 4.1.1.1 Lower tower wind speed (WS) in miles per hour.
 - 4.1.1.1.1 Use upper tower wind speed if lower tower wind speed is not available.
- 4.1.1.2 Upper tower wind direction in degrees from North (North = 0).
 - 4.1.1.2.1 Use lower tower wind direction if upper tower wind direction is not available.
 - 4.1.1.2.2 If the wind speed or wind direction can not be obtained from plant systems, obtain them from the National Weather Service (phone 399-6000). If the NWS information is unavailable, then obtain data from the CNS Control Room (8-831-2338).
- 4.1.1.3 Temperature gradient (ΔT) in degrees centigrade.
- 4.1.1.4 Using Enclosure 5.3, determine the stability class based on ΔT . If ΔT is unknown, then the following applies:
 - 4.1.1.4.1 If between 1000 - 1600 hours, use stability class D;
 - 4.1.1.4.2 If between 1600 - 1000 hours, use stability class G.
- 4.1.1.5 If necessary, use forecasted meteorological data for calculating doses due to changing meteorological conditions.
- 4.1.2 Determine the atmospheric dispersion parameters, $\overline{X/Q}$ (sec/m^3), for .5, 2, 5 and 10 miles (record on Enclosure 5.1).
 - 4.1.2.1 Using ΔT , determine the two hour relative concentration value (C_H) from Enclosure 5.3.
 - 4.1.2.2 Convert the C_H values to X/Q :

$$\overline{X/Q} = \frac{C_H}{WS}$$

- 4.1.3 Using Enclosure 5.4, circle on Enclosure 5.1 the protective action zones (PAZ), based upon wind speed and wind direction.
- 4.1.4 Recheck meteorological conditions approximately every 15 minutes to ensure that other zones have not been affected.
- 4.2 Source Term Assessment - Steam Relief Valves (Enclosure 5.5)

NOTE: Much of the information for Steam Relief Valve source term assessment can be obtained from the OAC (General 19 program). See Enclosure 5.14 for instructions.

- 4.2.1 Determine the Sub-Noble Gas Release Rates, SQ_{NG} (Ci/sec), by the following method:
 - 4.2.1.1 For Unit 1 - EMF24, EMF25, EMF26 and EMF27 or for Unit 2 - EMF10, EMF11, EMF12 and EMF13:

$$SQ_{NG} = R/hr \times \frac{1}{VOPEN} \times LBM \times CF$$

where:

- R/hr = EMF reading
 - Unit 1 = EMF's 24,25,26,27
 - Unit 2 = EMF's 10,11,12,13
- VOPEN = time the valve is open in seconds
- LBM = lbm released for the time the valve was open
- CF = the correction factor per Enclosure 5.6

$$Units = \frac{Ci}{lbm R/hr}$$

- 4.2.2 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec):

$$Q_{NG} = SQ_{NG} (1EMF24 \text{ or } 2EMF10) +$$

$$SQ_{NG} (1EMF25 \text{ or } 2EMF11) +$$

$$SQ_{NG} (1EMF26 \text{ or } 2EMF12) +$$

$$SQ_{NG} (1EMF27 \text{ or } 2EMF13)$$

4.2.3 Determine the Iodine release rate, Q_I (Ci/sec):

$$Q_I = Q_{NG} \times \text{I/Xe ratio}$$

where:

I/Xe ratio = ratio of I-131 eqv./Xe-133 eqv. from Enclosure 5.7

4.2.4 Record Q_{NG} and Q_I from the steam relief valves on Enclosure 5.1.

4.3 Source Term Assessment - Containment (Enclosure 5.8)

NOTE: Some of the information for Containment source term assessment can be obtained from the OAC (Tech Spec 04 program). See Enclosure 5.14 for instructions.

4.3.1 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec) based on one of the following methods:

NOTE: See Limit and Precaution 3.7.

4.3.1.1 Based on an EMF reading, where;

$$Q_{NG} = \text{EMF} \times \text{CF} \times \text{LR}$$

where:

EMF = 39(L), if EMF39(L) < 1E7 cpm,

EMF = 39(H), if EMF39(L) is offscale and EMF39(H) > 100 cpm,

EMF = 51A or 51B; if EMF39(H) is offscale

CF = the correction factor per Enclosure 5.9

LR = Leak Rate, (ml/hr) by one of the following methods:

based on containment pressure:

LR = RLR (from Enclosure 5.10)

based on an opening in containment:

$$LR = 0.10 \text{ (from Enclosure 5.11)}$$

based on design leak rate:

$$LR = 1.714E5 \text{ (reference 2.13)}$$

4.3.1.2 Based on PAGES sample or sample collected in accordance with reference 2.5, where;

$$Q_{NG} = \text{Conc.} \times CF \times LR$$

where:

Conc = the Xe-133 equivalent concentration ($\mu\text{Ci/ml}$) from Reference 2.4 or 2.5

$$CF = 2.78E-10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}}$$

LR = leak rate, as determined in step 4.3.1.1 above

4.3.2 Determine the Iodine Release Rate Q_I (Ci/sec), based on one of the following methods:

4.3.2.1 Based on Q_{NG} ;

$$Q_I = Q_{NG} \times \text{I/Xe ratio}$$

where:

Q_{NG} = noble gas release rate as determined in Step 4.3.1 above

I/Xe ratio = ratio of I-131 eqv./Xe-133 eqv. from Enclosure 5.7

4.3.2.2 Based on EMF40:

$$Q_I = \frac{\Delta\text{CPM}}{\Delta\text{min}} \times 6.54E-20 \frac{\text{Ci hr min}}{\text{sec ml cpm}} \times LR$$

where:

ΔCPM = reading from EMF40

Δmin = the time interval for EMF40
observation (normally 15 minutes)

LR = leak rate as determined in step
4.3.1.1 above

$6.54\text{E}-20$ = $(4.0\text{E}-5 \mu\text{Ci}/\text{cpm} \times .1667 \text{ min}/\text{ft}^3 \times$
 $3.53\text{E}-5 \text{ ft}^3/\text{ml} \times 1\text{Ci}/1\text{E}6 \mu\text{Ci} \times$
 $1 \text{ hr}/3600 \text{ sec})$

$4.0\text{E}-5$ = correlation factor for EMF40 from
Reference 2.1

$.1667 \text{ min}/\text{ft}^3$ = inverse of EMF flow rate

4.3.2.3 Based on PAGES sample or sample collected in
accordance with reference 2.5.

$$Q_I = \text{Conc} \times 2.78\text{E}-10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}} \times \text{LR}$$

where:

Conc = I-131 equivalent concentration ($\mu\text{Ci}/\text{ml}$)
from Reference 2.4 or reference 2.5

LR = leak rate as determined in step 4.3.1.1
above

4.3.3. Record Q_{NG} and Q_I from containment on Enclosure 5.1.

4.4 Source Term Assessment - Unit Vent (Enclosure 5.12)

NOTE: Some of the information for Unit Vent source term
assessment can be obtained from the OAC (Tech Spec 04
program). See Enclosure 5.14 for instructions.

4.4.1 Determine the Noble Gas Release Rate, Q_{NG} (Ci/sec), based
on one of the following methods:

4.4.1.1 Based on an EMF reading, where

NOTE: See Limit and Precaution 3.3.

$$Q_{NG} = EMF \times CF \times CFM$$

where:

EMF = 36(L) if EMF36(L) < 1E7 cpm

EMF = 36(H) if EMF36(L) is offscale and
EMF36(H) is > 100 cpm

EMF = 36(HH) if EMF36(H) is offscale

CF = the correction factor per Enclosure 5.13

CFM = unit vent flow rate (ft³/min)

4.4.1.2 Based on unit vent sample, where;

$$Q_{NG} = \text{Conc.} \times CF \times CFM$$

where:

Conc = the Xe-133 equivalent concentration
($\mu\text{Ci/ml}$) from Reference 2.5

$$CF = 4.72E-4 \frac{\text{Ci min ml}}{\text{sec ft}^3 \mu\text{Ci}}$$

CFM = Unit vent flow (ft³/min)

4.4.2 Determine the Iodine Release Rate Q_I (Ci/sec) based on one of the following methods:

4.4.2.1 Based on Q_{NG} ;

$$Q_I = Q_{NG} \times \text{I/Xe ratio}$$

where:

Q_{NG} = noble gas release rate as
determined in step 4.4.1 above

I/Xe ratio = ratio of I-131 eqv./Xe-133 eqv.
from Enclosure 5.7

4.4.2.2 Based on EMF37:

$$Q_I = \frac{\Delta CPM}{\Delta min} \times 1.11E-13 \frac{Ci \cdot min \cdot min}{sec \cdot ft^3 \cdot cpm} \times CFM$$

where:

ΔCPM = reading from EMF37

Δmin = the time interval for EMF37 observation
(normally 15 minutes)

CFM = unit vent flow (ft³/min)

1.11E-13 = (4.0E-5 $\mu Ci/cpm$ x .1667 min/ft³
x 1 Ci/1E6 μCi x 1 min/60 sec)

4.0E-5 = correlation factor for EMF 37 from
Reference 2.1

.1667 ft³/min = inverse of EMF flow rate

4.4.2.3 Based on unit vent sample:

$$Q_I = Conc \times 4.72E-4 \frac{Ci \cdot min \cdot ml}{sec \cdot ft^3 \cdot \mu Ci} \times CFM$$

where:

Conc = I-131 equivalent concentration ($\mu Ci/ml$)
from Reference 2.5

CFM = unit vent flow rate (ft³/min)

4.4.3 Record Q_{NG} and Q_I from the unit vent on Enclosure 5.1.

4.5 Dose Assessment (Enclosure 5.1)

4.5.1 Determine the total Noble Gas and Iodine Release Rates
(TQ_{NG} and TQ_I) by summing Q_{NG} and Q_I from all releases.

4.5.2 Determine the Projected Whole Body Dose Rate, DRwb
(Rem/hr), due to noble gases for .5, 2, 5 and 10 miles:

$$DRwb = \overline{X/Q} \times TQ_{NG} \times 33.6 \frac{Rem \cdot m^3}{hr \cdot Ci}$$

where:

33.6 is the adult whole body dose conversion factor from
Reference 2.9 in $\frac{Rem \cdot m^3}{hr \cdot Ci}$

4.5.3 Determine the Projected Whole Body Dose, Dwb (rem), due to noble gases for .5, 2, 5 and 10 miles:

$$Dwb = DRwb \times 2 \text{ hr}$$

where:

dose is integrated over 2 hour time period

4.5.4 Determine the Projected Child Thyroid Dose Rate, DRct (Rem/hr), due to iodine for .5, 2, 5 and 10 miles:

$$DRct = \overline{K/Q} \times TQ_I \times 2.26E6 \frac{\text{Rem m}^3}{\text{hr Ci}}$$

where:

2.26E6 is the child thyroid dose conversion factor from Reference 2.13 in $\frac{\text{Rem m}^3}{\text{hr Ci}}$

4.5.5 Determine the Projected Child Thyroid Dose, Dct(Rem), due to iodine for .5, 2, 5 and 10 miles:

$$Dct = DRct \times 2 \text{ hr}$$

where:

dose is integrated over 2 hour time period

4.6 Protective Action Recommendations (Enclosure 5.1, page 2 of 2):

4.6.1 Record the next sequential report number.

4.6.2 Circle the PAZs and the actions for the current and previous protective action recommendations.

4.6.3 If the projected dose in a PAZ is < 1 Rem whole body and < 5 Rem thyroid, then recommend no protective action (action A).

4.6.4 If the projected dose in a PAZ is 1 - 5 Rem whole body or 5 - 25 Rem thyroid, then recommend evacuation of children and pregnant women and shelter others (action B and E).

- 4.6.5 If the projected dose in a PAZ is > 5 Rem whole body or 25 Rem thyroid, then recommend evacuation of everyone (action C).
- 4.6.6 If the dose rate at the site boundary is $\geq 5.0E-4$ Rem/hr whole body, then recommend an Alert.
- 4.6.7 If the dose rate at the site boundary is $\geq .05$ Rem/hr whole body or $\geq .25$ Rem/hr thyroid, then recommend a Site Area Emergency if readings last 30 minutes.
- 4.6.8 If the dose rate at the site boundary is $\geq .5$ Rem/hr whole body or ≥ 2.5 Rem/hr thyroid, then recommend a Site Area Emergency if readings last 2 minutes.
- 4.6.9 If the dose rate at the site boundary is ≥ 1 Rem/hr whole body or ≥ 5 Rem/hr thyroid, then recommend a General Emergency.

5.0 Enclosures

- 5.1 Dose Assessment Report
- 5.2 Meteorology Worksheet
- 5.3 Two-hour Relative Concentration Factors (C_H)
- 5.4 Protective Action Zones Determination
- 5.5 Source Term Assessment - Steam Relief Valves
- 5.6 EMF24, EMF25, EMF26, EMF27 or EMF10, EMF11, EMF12, EMF13 Noble Gas Correction Factors (Steam Line Monitors)
- 5.7 I-131 eqv./Xe-133 eqv. Ratio
- 5.8 Source Term Assessment - Containment
- 5.9 Containment Monitors - Correction Factors
- 5.10 Containment Leakage Rate versus Pressure
- 5.11 Containment Leakage Rate versus Pressure and Size Opening
- 5.12 Source Term Assessment - Unit Vent
- 5.13 Unit Vent Monitors - Correction Factors
- 5.14 OAC Instructions

McGUIRE NUCLEAR STATION
DOSE ASSESSMENT REPORT

Reactor Trip _____
(date/time)

Report # _____
Projection based on data on _____
(date/time)

Prepared by: _____

Meteorology Assessment
 Wind Speed _____ mph
 Temperature Gradient (ΔT) _____ C
 Miles 0 - 2 2 - 5 5 - 10
 PAZ L B M C N A D O R E F G H I J K P Q S

[] Current [] Hypothetical
 Wind Direction _____ degrees from North.
 Stability Class A B C D E F G

Total Source Term Assessment [] Current [] Hypothetical

Steam Relief Enclosure 5.5	+	Containment Enclosure 5.8	+	Unit Vent Enclosure 5.12	=	Total (Ci/sec)	=	TQ _{NG}
_____ Ci/sec		_____ Ci/sec		_____ Ci/sec		_____		
_____ Ci/sec		_____ Ci/sec		_____ Ci/sec		_____		TQ _I

Dose Assessment

$$\frac{C_H}{WS} = \overline{X/Q}$$

<---< Adult whole body <---<				>---> Child thyroid >--->			
2 hr			$\overline{X/Q}$ (sec/m ³) Distance miles .5 _____ 2 _____ 5 _____ 10 _____ 1 _____ 4 _____ 7 _____ 8 _____			2 hr	
Dose = 2 x DRwb	= 33.6 x TQ _{NG}	x $\overline{X/Q}$			$\overline{X/Q}$ x TQ _I	x 2.26E6 = DRct	x 2 = Dose
(rem)	(rem/hr)	(Ci/sec)			(Ci/sec)	(rem/hr)	(rem)
_____	= 2 x _____	= 33.6 x _____			TQ _I	x 2.26E6 = _____	x 2 = _____
_____	= 2 x _____	= 33.6 x _____			_____	x 2.26E6 = _____	x 2 = _____
_____	= 2 x _____	= 33.6 x _____			_____	x 2.26E6 = _____	x 2 = _____
_____	= 2 x _____	= 33.6 x _____			_____	x 2.26E6 = _____	x 2 = _____
_____	= 2 x _____	= 33.6 x _____			_____	x 2.26E6 = _____	x 2 = _____
_____	= 2 x _____	= 33.6 x _____			_____	x 2.26E6 = _____	x 2 = _____
_____	= 2 x _____	= 33.6 x _____			_____	x 2.26E6 = _____	x 2 = _____

Field Data

Location	Dose Rate Rem/hr	2hr Dose Rem
_____	_____	_____
_____	_____	_____
_____	_____	_____

Location	Dose Rate Rem/hr	2hr Dose Rem
_____	_____	_____
_____	_____	_____
_____	_____	_____

[] Emergency [] Drill

McGUIRE NUCLEAR STATION
DOSE ASSESSMENT REPORT

EDA-03
Enclosure 5.1
Page 2 of 2

o: Emergency Coordinator _____

Report # _____

The emergency condition:

- _____ (a) Does not involve the release of radioactive material from the plant
 _____ (b) Involves the potential for a release, but no release has occurred.
 _____ (c) Involves the release of radioactive material.

The following protective actions are recommended:

Miles	PAZ	Current Actions	Previous Actions
0 - 2	L,B,M,C	A B C E	A B C E
2 - 5	N,A,D,O,R	A B C E	A B C E
5 - 10	E,F,G,H,I,J,K,P,Q,S	A B C E	A B C E

- A - Monitor environmental radiation levels. No specific actions.
(Less than 1 Rem Whole Body and less than 5 Rem Thyroid)
- B - Remain indoors with windows closed, turn off air conditioners and other ventilation, monitor EBS stations. Control access. (Action E also)
(1-5 Rem Whole Body or 5-25 Rem Thyroid)
- C - Evacuate; seek shelter if immediate evacuation is not possible. Monitor environmental radiation levels. Control access.
(Greater than 5 Rem Whole Body or greater than 25 Rem Thyroid)
- E - Pregnant women and children evacuate and go to designated shelter.
(1-5 Rem Whole Body or 5-25 Rem Thyroid)
- * - based on field data

Emergency Classification based on Radiological Data

- Recommend Alert
(Dose rate at 0.5 miles is > .5 mR/hr Whole Body)
- Potential Site Area Emergency if readings last 30 minutes
- Recommend Site Area Emergency Now, readings have lasted 30 minutes
(Dose rate at 0.5 miles is > .05 Rem/hr Whole Body or > .025 Rem/hr Thyroid)
- Recommend Site Area Emergency if readings last 2 minutes
(Dose rate at 0.5 miles is > .5 Rem/hr Whole Body or > 2.5 Rem/hr Thyroid)
- Recommend General Emergency
(Dose rate at 0.5 miles is > 1 Rem/hr Whole Body or > 25 Rem/hr Thyroid)

Comments:

concur with CMC? (Yes/No/NA)

- Emergency
 Drill

Dose Assessment Coordinator

Date/Time

McGUIRE NUCLEAR STATION
METEOROLOGY

Unit: _____

Report #: _____

Reactor Trip: _____ / _____

Prepared by: _____

Wind speed (WS) _____ mph

Wind direction _____ °N

ΔT _____ °C

Default Data

Wind speed (WS) _____ mph

1000 to 1600 hrs.

Wind direction _____ °N

Stability Class D °C

Wind speed (WS) _____ mph

1600 to 1000 hrs.

Wind direction _____ °N

Stability Class G °C

NOTE: If the wind speed or wind direction cannot be obtained from plant systems, obtain them from the National Weather Service, 399-6000. If NWS information is unavailable, then obtain data from the Catawba Nuclear Station Control Room, 8-831-2338.

McGUIRE NUCLEAR STATION
TWO-HOUR RELATIVE CONCENTRATION FACTORS (C_H)

Temperature Gradient	Stability Class	Distance (Miles)										
		.5	1	2	3	4	5	6	7	8	9	10
1) $\Delta T < -1.6$	A	1.4E-5	1.2E-6	5.9E-7	4.1E-7	3.2E-7	2.5E-7	2.0E-7	1.9E-7	1.8E-7	1.6E-7	1.5E-7
2) $-1.6 \leq \Delta T < -1.5$	C	1.5E-4	4.5E-5	1.3E-5	6.3E-6	3.9E-6	2.7E-6	1.9E-6	1.4E-6	1.1E-6	8.3E-7	7.8E-7
3) $-1.5 \leq \Delta T < -1.2$	D	3.8E-4	1.4E-4	4.9E-5	2.7E-5	1.7E-5	1.2E-5	9.2E-6	7.3E-6	6.0E-6	5.0E-6	4.3E-6
4) $-1.2 \leq \Delta T < +1.4$	E	6.9E-4	2.5E-4	9.6E-5	5.5E-5	3.5E-5	2.5E-5	2.0E-5	1.6E-5	1.3E-5	1.1E-5	9.7E-6
5) $+1.4 \leq \Delta T < +1.2$	F	1.1E-3	5.1E-4	2.0E-4	1.2E-4	8.2E-5	6.3E-5	5.1E-5	4.3E-5	3.8E-5	3.3E-5	3.0E-5
6) $+1.2 \leq \Delta T$	G	1.8E-3	1.1E-3	4.3E-4	2.7E-4	2.0E-4	1.7E-4	1.3E-4	1.2E-4	8.6E-5	7.8E-5	7.3E-5

NOTE: If ΔT is unavailable use: 1000-1600 hours Use Stability Class D
1600-1000 hours Use Stability Class G

There is no B Stability Class for McGuire.

McGUIRE NUCLEAR STATION
PROTECTIVE ACTION ZONES DETERMINATION

Determine the affected zones (based on wind direction) from the table below and record on Enclosure 5.1.

NOTE: If wind speed is less than or equal to 5 mph - the affected zones for 0 - 5 miles shall be L,B,M,C,N,A,D,O,R

Wind Direction (Degrees from North)	0 - 5 Miles	5 - 10 Miles
0 - 22.5	L,B,M,C,D,O,R	E,S,F
22.6 - 45.0	L,B,M,C,D,O,R	E,Q,S
45.1 - 67.5	L,B,M,C,D,O,R	E,Q,S
67.6 - 90.0	L,B,M,C,D,O,R,N	P,Q,S
90.1 - 112.5	L,B,M,C,O,R,N	K,P,Q,S
112.6 - 135.0	L,B,M,C,O,N,R,A	I,K,P,Q,S
135.1 - 157.5	L,B,M,C,O,A,N	I,K,P,Q
157.6 - 180.0	L,B,M,C,A,N	I,J,K,P
180.1 - 202.5	L,B,M,C,A,N	G,H,I,J,K,P
202.6 - 225.0	L,B,M,C,A,N,D	G,H,I,J,K,P
225.1 - 247.5	L,B,M,C,A,D	F,G,H,I,J
247.6 - 270.0	L,B,M,C,A,D	F,G,H,I,J
270.1 - 292.5	L,B,M,C,A,D	E,F,G,H,J
292.6 - 315.0	L,B,M,C,A,D	E,F,G
315.1 - 337.5	L,B,M,C,D,R	E,F,G
337.6 - 359.9	L,B,M,C,D,R	E,F,S

McGUIRE NUCLEAR STATION
 STEAM LINE MONITOR
 NOBLE GAS CORRECTION FACTOR
 EMF24, EMF25, EMF26, EMF27 or
 EMF10, EMF11, EMF12, EMF13

Time Since Trip (hrs)	Correction Factor
> 0	6.382
≥ 2	11.255
> 4	12.763
≥ 8	14.736
> 24	16.476
≥ 48	16.476
> 100	16.476
≥ 250	16.476
> 500	16.476
≥ 720	16.476

* units in $\frac{Ci}{lbm R/hr}$

* Enclosure 5.6 is the correlation factor per Reference 2.13 x $2.83E4 \frac{ml}{ft^3}$ x $.41 \frac{ft^3}{lbm}$ x $\frac{C}{1E6}$

.41 = specific gravity of steam per Reference 2.13.

McGUIRE NUCLEAR STATION
I-131 eqv./Xe-133 eqv. Ratio

Time Since Trip (hrs)	Column 1 Ratio based on LOCA	Column 2 Ratio based on Melted Core
≥ 0	2.91E-3	2.24E-3
≥ 2	3.61E-3	9.66E-3
≥ 4	4.05E-3	1.59E-2
≥ 8	4.64E-3	2.85E-2
≥ 24	5.08E-3	7.52E-2
≥ 48	5.11E-3	1.11E-1
≥ 100	5.42E-3	1.33E-1
≥ 250	7.00E-3	1.80E-1
≥ 500	1.09E-2	2.90E-1
≥ 720	1.53E-2	4.33E-1

* Enclosure 5.7 is from Reference 2.13.

NOTE: For vent or containment releases in which I/Xe ratio is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below:

1. LOCA, use column 1 (based on LOCA).
2. LOCA through charcoal filters, divide column 1 value by 100.
3. Core damage, use column 2 (based on Core Melt).
4. Core damage through charcoal filters, divide column 2 values by 100.
5. Tube rupture, divide column 1 value by 1,000.
6. New fuel accident, divide column 2 value by 600.
7. Old fuel accident, divide column 2 value by 600.
8. Gas decay tank, assume no radioiodine released, only noble gases are considered to be released from gas tank.

NOTE: For steam releases in which I/Xe ratio is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below:

1. Design basis primary coolant, divide column 1 value by 100.
2. Iodine spiked primary coolant, use column 1.
3. Core damage, divide column 2 value by 100.

McGUIRE NUCLEAR STATION
SOURCE TERM ASSESSMENT - CONTAINMENT

Report # _____

Reactor Trip _____ / _____
(date/time)

Projection based on data on _____ / _____
(date/time)

Calculations based on _____ Melted Core _____ LOCA

Containment pressure _____ psig

LR = _____ ml/hr

LR based on: Realistic Leak Rate
(circle one)

Opening in Containment
Opening size: _____

Design Leak Rate
(1.714E5)

NOBLE GAS

based on (check one)

EMF39(L)

[] if < 1E7 cpm

EMF39(H)

[] if > 100 cpm

EMF51

[] if 39(H) is offscale

$$\frac{\text{EMF}}{\text{cpm or R/hr}} \times \text{CF (Encl. 5.9)} \times \text{LR (ml/hr)} = \frac{Q_{NG}}{\text{Ci/sec}}$$

based on
PAGS sample

$$\text{PAGS sample } (\mu\text{Ci/ml}) \times 2.78E-10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}} \times \text{LR (ml/hr)} = \frac{\text{Ci}}{\text{sec}}$$

IODINE

based on

Q_{NG}

$$\frac{Q_{NG}}{\text{Ci/sec}} \times \text{I-131 eqv./Xe-133 eqv. ratio (Encl. 5.7)} = \frac{Q_I}{\text{Ci/sec}}$$

based on
EMF40

$$\frac{\Delta\text{cpm}}{\Delta\text{min}} \times 6.54E-20 \frac{\text{Ci hr min}}{\text{sec ml cpm}} \times \text{LR (ml/hr)} = \frac{\text{Ci}}{\text{sec}}$$

based on
PAGS sample

$$\text{PAGS sample } (\mu\text{Ci/ml}) \times 2.78E-10 \frac{\text{Ci hr}}{\text{sec } \mu\text{Ci}} \times \text{LR (ml/hr)} = \frac{\text{Ci}}{\text{sec}}$$

[] Emergency

[] Drill

Prepared by: _____

McGUIRE NUCLEAR STATION
CONTAINMENT MONITORS NOBLE GAS CORRECTION FACTORS

EMF39L

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
> 0	6.394E-18	6.672E-17
> 2	6.394E-18	4.448E-17
> 4	6.394E-18	3.058E-17
> 8	6.394E-18	2.113E-17
> 24	6.394E-18	1.112E-17
> 48	6.394E-18	1.056E-17
> 100	6.394E-18	1.390E-17
> 250	6.394E-18	1.446E-17
> 500	6.394E-18	9.730E-18
> 720	6.394E-18	6.394E-18

EMF39H

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
> 0	5.56E-14	1.429E-13
> 2	5.56E-14	1.003E-13
> 4	5.56E-14	1.232E-13
> 8	5.56E-14	1.195E-13
> 24	5.56E-14	7.339E-14
> 48	5.56E-14	6.060E-14
> 100	5.56E-14	5.699E-14
> 250	5.56E-14	5.588E-14
> 500	5.56E-14	5.560E-14
> 720	5.56E-14	5.560E-14

EMF51 A or B

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
> 0	3.781E-10	1.190E-9
> 2	3.114E-10	5.894E-10
> 4	2.780E-10	4.726E-10
> 8	2.446E-10	3.392E-10
> 24	2.335E-10	1.890E-10
> 48	2.335E-10	1.668E-10
> 100	2.335E-10	1.612E-10
> 250	2.335E-10	1.557E-10
> 500	2.335E-10	1.251E-10
> 720	2.335E-10	1.056E-10

Units in $\frac{\text{Ci hr}}{\text{sec ml cpm}}$

Units in $\frac{\text{Ci hr}}{\text{sec ml cpm}}$

Units in $\frac{\text{Ci hr}}{\text{sec ml R/hr}}$

* Enclosure 5.9 is the correlation factor per Reference 2.13 $\times \frac{\text{hr}}{3600 \text{ sec}} \times \frac{\text{Ci}}{1E6 \mu\text{Ci}}$

McGUIRE NUCLEAR STATION
CONTAINMENT LEAKAGE RATE VERSUS PRESSURE

PSIG	ml/hr
> 0	1.460E4
≥ 2	3.175E4
> 4	5.821E4
≥ 8	9.779E4
> 10	1.114E5
≥ 11	1.164E5
> 12	1.199E5
≥ 13	1.235E5
> 14	1.260E5
= 15	1.285E5
> 15	Use design leak rate (1.714E5 ml/hr)

* Enclosure 5.10 is the realistic leakage rate (m^3/sec) per Reference 2.12 x $1\text{E}6 \text{ ml}/\text{m}^3$ x 3600 sec/hr x 0.07 (0.07 per Reference 2.6).

McGUIRE NUCLEAR STATION
 CONTAINMENT LEAKAGE RATE VERSUS PRESSURE AND SIZE OPENING

For 1" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.209E8	>5.0	3.908E8	>12.5	5.862E8
>2.50	2.889E8	>7.5	4.588E8	>15.0	6.287E8
>3.75	3.483E8	>10.0	5.268E8		
For 2" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	8.496E8	>5.0	1.512E9	>12.5	2.243E9
>2.50	1.121E9	>7.5	1.784E9	>15.0	2.464E9
>3.75	1.342E9	>10.0	2.022E9		
For 4" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	3.144E9	>5.0	5.692E9	>12.5	8.496E9
>2.50	4.248E9	>7.5	6.797E9	>15.0	9.176E9
>3.75	5.098E9	>10.0	7.731E9		
For 6" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	7.137E9	>5.0	1.291E10	>12.5	1.937E10
>2.50	9.516E9	>7.5	1.529E10	>15.0	2.124E10
>3.75	1.138E10	>10.0	1.716E10		
For 8" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.257E10	>5.0	2.243E10	>12.5	3.381E10
>2.50	1.648E10	>7.5	2.634E10	>15.0	3.568E10
>3.75	1.971E10	>10.0	3.042E10		
For 12" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.719E10	>5.0	5.012E10	>12.5	7.476E10
>2.50	3.738E10	>7.5	5.947E10	>15.0	8.156E10
>3.75	4.452E10	>10.0	6.712E10		
For 18" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	5.522E10	>5.0	1.003E11	>12.5	1.529E11
>2.50	7.476E10	>7.5	1.189E11	>15.0	1.665E11
>3.75	6.836E10	>10.0	1.351E11		
For 34" opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.869E11	>5.0	3.398E11	>12.5	5.132E11
>2.50	2.583E11	>7.5	4.078E11	>15.0	5.607E11
>3.75	3.093E11	>10.0	4.588E11		
For Personnel Hatch Opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	2.379E12	>5.0	4.690E12	>12.5	6.967E12
>2.50	3.398E12	>7.5	5.573E12	>15.0	7.646E12
>3.75	4.111E12	>10.0	6.372E12		
For Equipment Hatch Opening					
PSIG	ml/hr	PSIG	ml/hr	PSIG	ml/hr
>1.25	1.121E13	>5.0	2.022E13	>12.5	3.059E13
>2.50	1.478E13	>7.5	2.379E13	>15.0	3.398E13
>3.75	1.767E13	>10.0	2.719E13		

* Enclosure 5.11 is the containment leakage for an opening size in standard cubic feet per min (scfm) x 2.83E4 ml/ft³ x 60 min/hr.

McGUIRE NUCLEAR STATION
 SOURCE TERM ASSESSMENT - UNIT VENT

Report # _____

Reactor Trip /
 (date/time)

Projection based on data on /
 (date/time)

Calculations based on _____ Melted Core _____ LOCA

CFM = _____ ft³/min

NOBLE GAS

based on (check one)

EMF36(L)

EMF36(H)

EMF36(HH)

if < 1E7 cpm

if > 100 cpm

if 36(H) is offscale

EMF	CF	CFM	Q _{NG}
cpm or R/hr		ft ³ min	Ci sec
x	(Encl. 5.13)	x	=

based on
 Unit Vent Sample

_____ μCi/ml	x	4.72E-4	Ci min ml	x	ft ³	=	Ci
			sec ft ³ μCi		min		sec

IODINE

based on

Q _{NG}	Ci	x	I-131 eqv./Xe-133 eqv.	=	Ci
	sec		ratio (Encl. 5.7)		sec

based on
 EMF37

_____ Δcpm	x	1.11E-13	Ci min min	x	ft ³	=	Ci
_____ Δmin			sec ml cpm		min		sec

based on
 Unit Vent Sample

_____ μCi/ml	x	4.72E-4	Ci min ml	x	ft ³	=	Ci
			sec ft ³ μCi		min		sec

Emergency

Drill

Prepared by: _____

McGUIRE NUCLEAR STATION
 UNIT VENT MONITORS NOBLE GAS CORRECTION FACTORS

EMF36L

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
> 0	1.086E-11	1.133E-10
> 2	1.086E-11	7.552E-11
> 4	1.086E-11	5.192E-11
> 8	1.086E-11	3.587E-11
> 24	1.086E-11	1.888E-11
> 48	1.086E-11	1.794E-11
> 100	1.086E-11	2.360E-11
> 250	1.086E-11	2.454E-11
> 500	1.086E-11	1.652E-11
> 720	1.086E-11	1.086E-11

EMF36H

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
> 0	9.44E-8	2.426E-7
> 2	9.44E-8	1.704E-7
> 4	9.44E-8	2.091E-7
> 8	9.44E-8	2.030E-7
> 24	9.44E-8	1.246E-7
> 48	9.44E-8	1.029E-7
> 100	9.44E-8	9.676E-8
> 250	9.44E-8	9.481E-8
> 500	9.44E-8	9.440E-8
> 720	9.44E-8	9.440E-8

EMF36HH

Time Since Trip (hrs)	Correction Factor based on LOCA	Correction Factor based on Melted Core
> 0	2.358E-4	1.887E-3
> 2	2.358E-4	1.179E-3
> 4	2.358E-4	9.905E-4
> 8	2.358E-4	6.367E-4
> 24	2.358E-4	2.931E-4
> 48	2.358E-4	2.405E-4
> 100	2.358E-4	2.358E-4
> 250	2.358E-4	2.358E-4
> 500	2.358E-4	2.358E-4
> 720	2.358E-4	2.358E-4

Units in $\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}$

Units in $\frac{\text{Ci min}}{\text{sec ft}^3 \text{ cpm}}$

Units in $\frac{\text{Ci min}}{\text{sec ft}^3 \text{ R/hr}}$

* Enclosure 5.13 is the correlation factor per Reference 2.13 x $\frac{2.83E4 \text{ ml}}{\text{ft}^3} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{\text{Ci}}{1E6 \text{ } \mu\text{Ci}}$

INSTRUCTIONS ON HOW TO OBTAIN DATA
FROM THE OPERATOR AID COMPUTER OAC

- 1) Tech Spec 04 Program (Plant Data and Status Summary)
 - a) At the OAC in the TSC or Computer Room, press [Tech Spec] 04
 - b) Then press [Print] and [Enter]
 - c) The report will print out

- 2) General 19 Program (Main Steam Release Program)
 - a) At the OAC in the TSC or Computer Room, press [General] 19
 - b) Then press [Print] and [Enter]
 - c) Using the arrow pointer keys, highlight "Main Steam Release" and press enter
 - d) The report will print out

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 4

"Off-Site Dose Projections for
Oconee Nuclear Station"

R. E. Harris

Approved By

6/15/88

Date

DUKE POWER COMPANY
OCONEE NUCLEAR STATION
OFFSITE DOSE PROJECTIONS

1.0 Purpose

This procedure describes a method for projecting dose commitment from a noble gas and/or iodine release through the containment, the unit vent, and/or the steam relief valves during an emergency.

2.0 References

- 2.1 PT/0/A/230/01, Radiation Monitor Check
- 2.2 HP/1,2,3/A/1009/17, Operating Procedure for Post-Accident Containment Air Sampling System
- 2.3 HP/0/B/1009/15, Procedure for Sampling and Quantifying High Level Gaseous, Radioiodine, and Particulate Radioactivity
- 2.4 ONS Technical Specification, Appendix A, Section 3.1.4 Reactor Coolant System Activity
- 2.5 Offsite Dose Calculation Manual (ODCM)
- 2.6 Regulatory Guide 1.4, Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors
- 2.7 Regulatory Guide 1.109, Calculations of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I
- 2.8 NuReg-0396, EPA 520/1-78-016, Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans In Support of Light Water Nuclear Power Plants
- 2.9 NuReg-0654, FEMA-REP-1, Rev. 1, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants
- 2.10 Oconee Nuclear Station Class A Computer Model Validation (File: NUC-0306)
- 2.11 Letter from R. P. Todd, 1-3-86, re: R. B. Containment Leak Flow Rate File: ON-750.25

3.0 Limits and Precautions

- 3.1 This procedure is an alternative method of dose assessment to the Class A Atmospheric Dispersion Model Computer Code.
- 3.2 This procedure applies to releases made from Oconee Nuclear Station only. Many of the values contained in this procedure are site specific.
- 3.3 It is assumed that the whole body dose from an iodine release is very small compared to the thyroid dose, therefore this procedure does not consider iodine whole body dose.
- 3.4 This procedure considers all releases to be ground level releases and that meteorological data are fifteen minute averages.
- 3.5 Once a sector has been added to the list of affected sectors, it shall not be removed except under the direction of the Dose Assessment Coordinator.
- 3.6 Once the Crisis Management Center (CMC) has been activated, the doses calculated by the Technical Support Center (TSC) dose assessment group, should be compared with those calculated by the CMC before a protective action recommendation is made.
- 3.7 Vent releases can occur through more than one unit at a time. Check unit vent monitors on all 3 units during a vent release.

4.0 Procedure

4.1 Meteorology Assessment

- 4.1.1 Record the following information on Enclosure 5.1.

Note: The sources of data are listed in order of preference in the flowchart on Enclosure 5.1.

- 4.1.1.1 Unit(s) affected.
- 4.1.1.2 Date and time of reactor trip.
- 4.1.1.3 Report number.
- 4.1.1.4 Name of person preparing report.
- 4.1.1.5 Time Meteorological data taken.
- 4.1.1.6 Wind speed in miles per hour.
- 4.1.1.7 Direction from which the wind is blowing in degrees from North (North = 0).
- 4.1.1.8 Temperature gradient in degrees centigrade ($\Delta T^{\circ}\text{C}$).

4.1.1.9 Stability class, based on ΔT .

Note: Refer to flowchart on Enclosure 5.1 to determine stability class when ΔT is unavailable.

4.1.2 Determine the atmospheric dispersion parameters, $X/Q \frac{\text{sec}}{\text{m}^3}$ corresponding to the ΔT determined in Step 4.1.1.8, for each point of interest downwind.

Note: If specific points have not been requested, use the 1, 2, 5, and 10 mile values.

4.1.2.1 Record the appropriate two hour relative concentration value, CH, from Enclosure 5.2 onto Enclosure 5.3.

4.1.2.2 Convert the CH values to X/Q by,

$$X/Q \left(\frac{\text{sec}}{\text{m}^3} \right) = \frac{\text{CH (MPH - Sec/m}^3\text{)}}{\text{Wind Speed MPH}}$$

4.1.2.3 Record results from Step 4.1.2.2 on Enclosure 5.3.

4.1.3 Protective Action Zone Determination (Enclosure 5.4)

4.1.3.1 Determine the protective action zones (PAZ) according to the guidance provided in Enclosure 5.4.

4.1.3.2 Circle the PAZ on Enclosure 5.3.

4.1.4 Recheck meteorological conditions every 15 minutes to ensure that additional PAZ are identified as necessary.

4.2 Source Term Assessment

4.2.1 Steam Relief Valve Assessment (Enclosure 5.5)

4.2.1.1 Determine the noble gas release rate, Q_{NG} Ci/sec, by the following method;

For RIA's 16 and 17;

$$Q_{\text{NG}} = \left(\text{RIA} \frac{\text{mR}}{\text{hr}} \right) \left(2.24 \frac{\text{Ci/sec}}{\text{mR/hr}} \right)$$

where: $\text{RIA} = \text{RIA 16} + \text{RIA 17 readings in } \frac{\text{mR}}{\text{hr}}$

$$2.24 = (28,320 \frac{\text{ml}}{\text{ft}^3}) (\frac{1 \text{ Ci}}{1E6 \mu\text{Ci}}) (0.3 \frac{\mu\text{Ci/ml}}{\text{mR/hr}}) (\frac{63,330 \text{ ft}^3/2}{120 \text{ sec}})$$

where: 28,320 = a conversion factor which converts cubic feet to milliliters

$\frac{1 \text{ Ci}}{1E6\mu\text{Ci}}$ = an activity conversion factor

$0.3 \frac{\mu\text{Ci/ml}}{\text{mR/hr}}$ = a correlation value relating activity concentration to RIA's 16 and 17 response

$63,330 \text{ ft}^3$ = Steam volume released in a 2 minute (120 seconds) period. This is based on releasing 1.5E5 lbs of steam at 1050 psia with a 2 minute average steam release rate of 0.4222 $\text{ft}^3/\text{lb-m}$.

2 = The point at which the sum of RIA's 16 and 17 readings are averaged.

4.2.1.2 Record Q_{NG} on Enclosure 5.3.

4.2.1.3 Determine the iodine release rate, Q_i (Ci/sec), by the following method:

$$Q_i = Q_{\text{NG}} \times I_{\text{rat}}$$

Where:

Q_{NG} = Noble Gas Release Rate (Ci/sec) determined in Section 4.2.1.1.

I_{rat} = ratio of I-131 equiv./Xe-133 equiv. from Enclosure 5.6.

4.2.1.4 Record Q_i on Enclosure 5.3.

4.2.2 Containment Assessment (Enclosure 5.7)

4.2.2.1 Determine the noble gas release rate, $Q_{\text{NG}} \frac{\text{Ci}}{\text{sec}}$, by one of the following methods;

4.2.2.1.1 Based on RIA 57/58 readings, as follows:

$$Q_{\text{NG}} = R/\text{hr} \times \text{CF} \frac{\text{Ci-hr}}{\text{sec-ml-R/hr}} \times \text{LR} \frac{\text{ml}}{\text{hr}}$$

Where:

R/hr = RIA 57 or 58 reading in R/hr.

CF = Correction factor per Enclosure 5.8.

LR = Leak rate in ml/hr by one of the following methods:

based upon containment pressure,
LR = Realistic Leak Rate, RLR,
Enclosure 5.9 (per Reference 2.10).

based upon an opening in (failure of)
containment wall or penetration,
LR = Opening In Containment, OIC,
Enclosure 5.9 (per Reference 2.11).

based upon design leakage rate,
LR = 5.6E6 (per Reference 2.10).

4.2.2.1.2 Based on survey instrument, as follows:

$$Q_{NG} = R/hr \times CF \frac{Ci-hr}{sec-ml-R/hr} \times LR \frac{ml}{hr}$$

Where:

R/hr = survey instrument (PIC-6A) reading
in R/hr.

CF = correlation factor per Enclosure 5.8.

LR = Leak Rate in ml/hr as determined in
Step 4.2.2.1.1 above.

4.2.2.1.3 Based on PAG sample as follows:

$$Q_{NG} = Conc. \times 2.78E-10 \frac{Ci-hr}{sec-\mu Ci} \times LR \frac{ml}{hr}$$

Where:

Conc. = the Xe-133 equiv. sample data
($\mu Ci/ml$) from PAG sample.

2.78E-10 = units correction factor
($1E - 6 Ci/\mu Ci$)(1 hr/3600 sec)

LR = Leak Rate in ml/hr as determined in
Step 4.2.2.1.1 above.

4.2.2.2 Record Q_{NG} on Enclosure 5.3.

4.2.2.3 Determine the iodine release rate,
 $Q_I \frac{Ci}{sec}$, by one of the following methods:

4.2.2.3.1 Based on Q_{NG} as follows:

$$Q_I = Q_{NG} \times I_{rat}$$

Where:

Q_{NG} = noble gas release rate
determined in Section 4.2.2.1.

I_{rat} = ratio of I-131 equiv./Xe-133
equiv. from Enclosure 5.6

4.2.2.3.2 Based on PAG sample as follows:

$$Q_I = \text{Conc.} \times 2.78 \text{ E-10} \frac{Ci-hr}{sec-\mu Ci} \times LR$$

Where:

Conc. = I-131 equivalent sample data
($\mu Ci/ml$) from PAG sample.

$2.78E-10$ = units correction factor.

LR = Leak Rate in ml/hr as determined in
Step 4.2.2.1.1

4.2.2.4 Record Q_I on Enclosure 5.3.

4.2.3 Unit Vent Assessment (Enclosure 5.10)

4.2.3.1 Determine the noble gas release rate,

$Q_{NG} \frac{Ci}{sec}$, by one of the following methods

for each affected unit:

4.2.3.1.1 Based on RIA 45, 46 or 56 on-scale
reading as follows:

$$Q_{NG} = U-1 (RIA \times CF \times CFM) + \\ U-2 (RIA \times CF \times CFM) + \\ U-3 (RIA \times CF \times CFM)$$

Where:

RIA = RIA reading in cpm or R/hr.

CF = correction factor per Enclosure 5.11.

CFM = unit vent flow rate in ft³/minute.

4.2.3.1.2 Based on unit vent sample as follows:

$$Q_{NG} = U-1 (\text{Conc} \times 4.72E-4 \times \text{CFM}) + \\ U-2 (\text{Conc} \times 4.72E-4 \times \text{CFM}) + \\ U-3 (\text{Con} \times 4.72E-4 \times \text{CFM})$$

Where:

Conc. = the Xe-133 equiv. sample data
in $\mu\text{Ci/ml}$.

$$4.72E-4 \frac{\text{Ci-min-ml}}{\text{sec-ft}^3-\mu\text{Ci}} = \text{units correction factor}$$

$$\frac{1\text{Ci}}{1E6\mu\text{Ci}} \times \frac{1 \text{ minute}}{60 \text{ seconds}} \times \frac{1 \text{ ml}}{3.5314E-5 \text{ ft}^3}$$

CFM = unit vent flow rate ft³/minute

4.2.3.2 Record the noble gas release rate, Q_{NG} ,
on Enclosure 5.3.

4.2.3.3 Determine the iodine release rate,

$Q_I \frac{\text{Ci}}{\text{sec}}$, by one of the following methods for
each affected unit.

4.2.3.3.1 Based on Q_{NG} as follows:

$$Q_I = Q_{NG} \times I_{\text{rat}}$$

Where:

Q_{NG} = noble gas release rate determined
in Section 4.2.3.1.

I_{rat} = ratio of I-131 equiv./Xe-133 equiv.
from Enclosure 5.6.

4.2.3.3.2 Based on unit vent sample as follows:

$$Q_I = U-1(\text{Conc.} \times 4.72E-4 \times \text{CFM}) + \\ U-2 (\text{Conc.} \times 4.72E-4 \times \text{CFM}) + \\ U-3 (\text{Conc.} \times 4.72E-4 \times \text{CFM})$$

Where:

Conc. = I-131 equiv. sample data in $\mu\text{Ci/ml}$.

$4.72\text{E-}4$ = units conversion factor

CFM = unit vent flow rate in $\text{ft}^3/\text{minute}$

4.2.3.4 Record iodine release rate, Q_I , on Enclosure 5.3.

4.3 Dose Assessment (Enclosure 5.3)

4.3.1 Determine whole body dose due to noble gas as follows:

4.3.1.1 Determine the total noble gas release rate, TQ_{NG} , by adding Q_{NG} values from all source terms.

4.3.1.1.1 Record TQ_{NG} on Enclosure 5.3.

4.3.1.2 Determine the projected whole body dose in rem, D_{WB} , for appropriate distances (1, 2, 5 and 10 miles unless specified otherwise) by:

NOTE: $D_{\text{RWB}} \frac{\text{REM}}{\text{hr}}$ on Enclosure 5.3 is the whole body dose rate due to noble gas and is calculated for information or for use in other calculations.

$$D_{\text{WB}} = TQ_{\text{NG}} \times X/Q \times 33.6 \times 2$$

Where:

TQ_{NG} = total noble gas release rate, determined in Step 4.3.1.1.

X/Q = two-hour relative concentration value divided by wind speed, determined in Step 4.1.2.2.

33.6 = the adult whole body dose conversion factor in $\frac{\text{rem-m}^3}{\text{hr-Ci}}$.

2 = time period in hours over which dose is integrated.

4.3.1.2.1 Record D_{WB} on Enclosure 5.3.

4.3.2 Determine thyroid dose due to radioiodine as follows:

4.3.2.1 Determine the total iodine release rate, TQ_I , by adding Q_I values from all source terms.

4.3.2.1.1 Record TQ_I on Enclosure 5.3.

4.3.2.2 Determine the projected thyroid dose, D_T , for appropriate distances (1, 2, 5 and 10 miles unless specified otherwise) by:

NOTE: D_{RTHY} $\frac{REM}{hr}$ on Enclosure 5.3 is the thyroid dose rate due to iodine and is calculated for information or for use in other calculations.

$$D_T = TQ_I \times X/Q \times 2.26E6 \times 2$$

Where:

TQ_I = total iodine release rate, determined in Step 4.3.2.1.

X/Q = same as above, under 4.3.1.2.

2.26E6 = child thyroid dose conversion factor in $\frac{rem-m^3}{hr-Ci}$ (per Reference 2.10).

2 = same as above, under 4.3.1.2.

4.3.2.2.1 Record D_T on Enclosure 5.3.

4.3.3 Recommend protective action as follows:

4.3.3.1 Compare doses calculated in Steps 4.3.1.2 and 4.3.2.2 to guidelines provided on Enclosure 5.4.

4.3.3.2 Record the results of comparison in 4.3.3.1 on Enclosure 5.3.

4.3.3.3 Make the following recommendations to the Dose Assessment Coordinator if the dose rates described are achieved in the field and have not been previously calculated:

4.3.3.3.1 Recommend an Alert if the dose rate at the site boundary $\geq 5.0E-4 \frac{REM}{hr}$ whole body.

4.3.3.3.2 Recommend a Site Area Emergency if the dose rate at the site boundary $> 0.05 \frac{\text{REM}}{\text{hr}}$ whole body or $> 0.25 \frac{\text{REM}}{\text{hr}}$ thyroid and these dose rates persist for 30 minutes.

4.3.3.3.3 Recommend a Site Area Emergency if the dose rate at the site boundary $\geq 0.5 \frac{\text{REM}}{\text{hr}}$ whole body or $\geq 2.5 \frac{\text{REM}}{\text{hr}}$ thyroid, and these dose rates persist for 2 minutes.

4.3.3.3.4 Recommend a General Emergency if the dose rate at the site boundary $\geq 1 \frac{\text{REM}}{\text{hr}}$ whole body or $\geq 5 \frac{\text{REM}}{\text{hr}}$ thyroid.

5.0 Enclosures

- 5.1 Oconee Meteorology, 1 Page, 5/88
- 5.2 Oconee Two-Hour Relative Concentration Factors (CH), 1 Page, 5/88
- 5.3 Oconee Warning Message: Nuclear Facility to State/Local Government, 2 Pages, 5/88
- 5.4 Oconee Protective Action Zones Determinations, 2 Pages, 9/87
- 5.5 Oconee Source Term Assessment-Steam Relief Valves, 1 Page, 9/87
- 5.6 Oconee I-131 Equivalent/Xe-133 Equivalent Ratio, 1 Page, 5/88
- 5.7 Oconee Source Term Assessment-Containment, 1 Page, 9/87
- 5.8 Oconee Containment Noble Gas Correction Factor, 1 Page, 5/88
- 5.9 Oconee Containment Leakage Rate, 1 Page, 5/88
- 5.10 Oconee Source Term Assessment-Unit Vent, 1 Page, 9/87
- 5.11 Oconee Unit Vent Noble Gas Correction Factor, 1 Page, 5/88

OCONEE METEOROLOGY

EDA-4

Unit _____

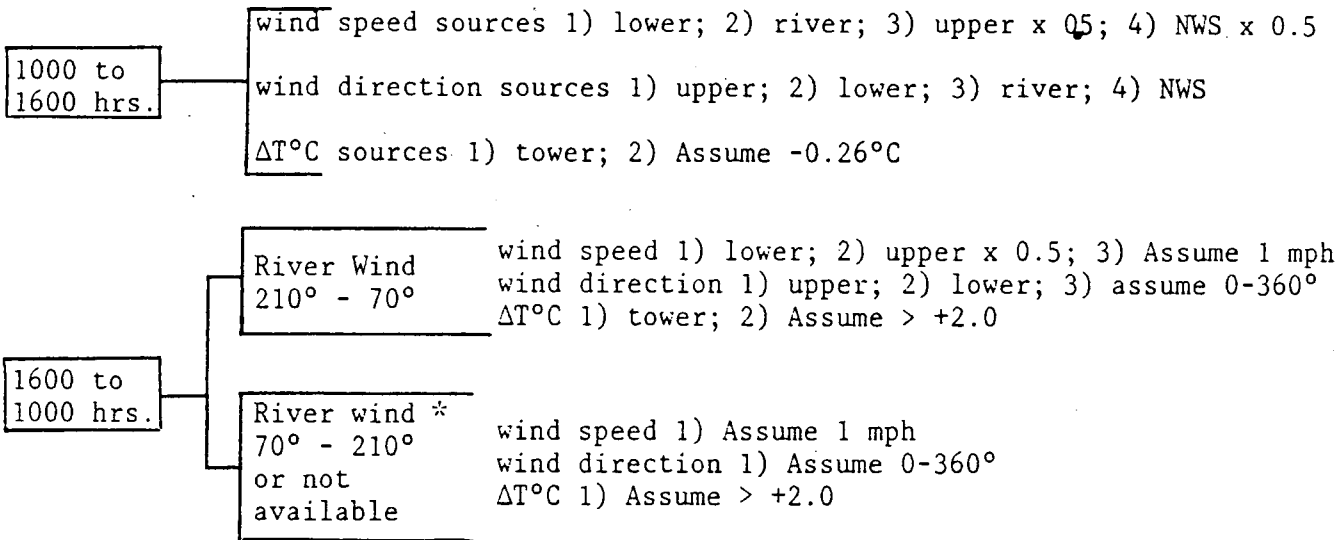
Report # _____

Date/Time of Rx trip ____/____

Prepared By: _____

METEOROLOGICAL DATA

(All data is 15 min average except NWS.)
 National Weather Service (NWS) phone number is (803) 877-6998.



* Based on experiment

-Time	ΔT°C	Stability Class
_____	<-0.95	A
- wind speed	-0.95 to -0.86	B
_____ mph	-0.85 to -0.76	C
- wind direction	-0.75 to -0.26	D
_____ °	-0.25 to +0.74	E
- ΔT°C	+0.75 to +2.0	F
_____ °C	> +2.0	G
- Stability Class		

*Conversion formulas for the meteorological data obtained from the NWS are:

$$(1.15) \times (\text{knots}) = \text{mph}$$

$$(1.8 \times \text{°C}) + 32 = \text{°F}$$

OCONEE TWO-HOUR RELATIVE CONCENTRATION FACTORS (CH)

EDA-4

Temperature Difference $\Delta T^{\circ}\text{C}$	Stability Class	Distance (Miles)									
		1	2	3	4	5	6	7	8	9	10
< -0.95	A	1.8E-6	6.2E-7	4.3E-7	3.4E-7	2.8E-7	2.4E-7	2.1E-7	1.8E-7	1.7E-7	1.5E-7
-0.95 to -0.86	B	1.7E-5	4.2E-6	1.9E-6	1.1E-6	6.7E-7	4.7E-7	3.5E-7	2.7E-7	2.1E-7	1.7E-7
-0.85 to -0.76	C	4.6E-5	1.4E-5	6.4E-6	3.8E-6	2.6E-6	1.8E-6	1.4E-6	1.1E-6	8.8E-7	7.4E-7
-0.75 to -0.26	D	1.2E-4	5.2E-5	2.9E-5	1.8E-5	1.4E-5	1.0E-5	8.0E-6	6.7E-6	5.7E-6	4.9E-6
-0.25 to +0.74	E	2.7E-4	1.0E-4	5.9E-5	4.0E-5	3.0E-5	2.3E-5	1.8E-5	1.6E-5	1.4E-5	1.1E-5
+0.75 to +2.0	F	5.3E-4	2.3E-4	1.4E-4	9.6E-5	7.3E-5	5.8E-5	4.7E-5	4.0E-5	3.4E-5	3.0E-5
> +2.0	G	8.8E-4	4.5E-4	2.9E-4	2.0E-4	1.5E-4	1.2E-4	1.0E-4	8.8E-5	7.5E-5	6.6E-5

DUKE POWER COMPANY
 OCONEE WARNING MESSAGE: NUCLEAR FACILITY TO STATE/LOCAL GOVERNMENT
 EDA-4

Report # _____ Reviewed by: _____ Date: _____
 Dose Report By: _____ Real Emergency
 based on data from: _____ (date/time) _____ Exercise Message

- Plant Status: OCONEE NUCLEAR STATION; Unit _____; Emergency Class _____
 Reactor(a) _____ is tripped/(b) _____ was tripped at (Time): _____
 Plant is at: (a) _____ % power (c) _____ hot shutdown (or hot standby)
 (b) _____ cold shutdown (d) _____ cooling down
 Prognosis is: (a) _____ stable (c) _____ degrading
 (b) _____ improving (d) _____ unknown
- Emergency actions underway at the facility include: _____
- Onsite support needed from offsite organizations: _____

 4. Dose Projection Data

Wind Speed: _____ mph Wind Direction _____ ° (from) ΔT _____ °C
 Stability Class: A, B, C, D, E, F, G Release Type: Ground
 Weighted Dose Conversion Factor: (a) 33.6 R/hr/Ci/m³ (whole body)
 (b) 2.2E6 R/hr/Ci/m³ (child thyroid)

Release Rate:

Stm Relief Contain. Vent Total Ci/sec
 $Q_{NG} + Q_{NG} + Q_{NG} = TQ_{NG}$ (N.G. Eq. Ci/sec)
 $Q_I + Q_I + Q_I = TQ_I$ (I. Eq. Ci/sec)

- The type of actual or projected release is:
 _____ (a) airborne _____ (d) other _____
 _____ (b) waterborne _____ (e) No release is in progress or expected
 _____ (c) surface spill _____ at this time
- Release (a) _____ will begin at _____ / (b) _____ began at _____
- The estimated duration of the release is _____ hours.
- The source and description of the release _____

9. Dose Projections: *Whole Body*

Mile	TQ_{NG}	$\times \frac{CH}{\text{Wind Speed}}$	$\times 33.6 =$	$D_{RWB} \frac{REM}{hr}$	$\times 2 =$	$D_{WB} REM$
			33.6 =			
			33.6 =			
			33.6 =			
			33.6 =			

Child Thyroid

Mile	TQ_I	$\times \frac{CH}{\text{Wind Speed}}$	$\times 2.26E6 =$	$D_{RTHY} \frac{REM}{hr}$	$\times 2 =$	$D_{THY} REM$
			2.26E6 =			
			2.26E6 =			
			2.26E6 =			
			2.26E6 =			

DUKE POWER COMPANY
 OCONEE WARNING MESSAGE: NUCLEAR FACILITY TO STATE/LOCAL GOVERNMENT
 EDA-4

10. Field Data

Time	Location	Distance from Plant	Direction from Plant	Whole Body*	Thyroid*

*Indicate units data is given in.

Protective Action Recommendations:

- ___ (a) No protective action is recommended at this time
- ___ (b) People living in zones _____ remain indoors with the doors and windows closed, turn off air conditioners and other ventilation, monitor EBS stations.
- ___ (c) People living in zones _____ evacuate their homes and businesses and go to a designated shelter.
- ___ (d) Pregnant women and children in zones _____ evacuate and go to a designated shelter.
- ___ (e) Other recommendations: _____

Miles	1	2	5	10
PAZ	A0	A0	A1,B1,C1,D1,E1,F1	A2,B2,C2,D2,E2,F2

Previous protective actions recommended:

- ___ (a) None
- ___ (b) & (d) Evacuate pregnant women and children; shelter remaining people.
 Zones _____
- ___ (c) Evacuate all people. Zones _____

OCONEE PROTECTIVE ACTION ZONES DETERMINATION

EDA-4

1. Determine PAZ by completing one of the options under A or B, using meteorological data from Enclosure 5.1. Record the PAZ on Enclosure 5.3.

A. Daytime (1000-1600 hrs.)

- 1) Wind speed \geq 5 mph for tower or river wind direction; use the table below.
- 2) Wind speed $<$ 5 mph for tower or river wind direction. Assume Sectors A1, B1, C1, D1, E1, and F1 are affected. Then use the table below to determine additional PAZ.
- 3) For NWS wind direction. Assume all sectors are affected (A1 through F1, A2 through F2).

B. Nighttime (1600-1000 hrs.)

(If river wind direction is unavailable, assume 70°-210°.)

- 1) If river wind direction is between 210°-70°, use Option A (Daytime).
- 2) If river wind direction is between 70°-210°, assume all sectors are affected (A1 through F1, A2 through F2).

Wind Direction

Protective Action Zones

14°-27°	C1, C2, D1, D2, E1, E2
27°-42°	C1, D1, D2, E1, E2
42°-66°	D1, D2, E1, E2
66°-85°	D1, D2, E1, E2, F2
85°-104°	D1, D2, E1, E2, F1, F2
104°-129°	E1, E2, F1, F2
129°-156°	A1, A2, E1, E2, F1, F2
156°-175°	A1, A2, E1, F1, F2
175°-181°	A1, A2, F1, F2
181°-219°	A1, A2, B1, B2, F1, F2
219°-255°	A1, A2, B1, B2
255°-271°	A1, A2, B1, B2, C1, C2
271°-297°	B1, B2, C1, C2
297°-312°	B1, B2, C1, C2, D2
312°-345°	B1, B2, C1, C2, D1, D2
345°-14°	C1, C2, D1, D2

OCONEE PROTECTIVE ACTION ZONES DETERMINATION

EDA-4

2. Submit protective action guides to the Offsite Radiological Coordinator based on the calculated dose from Enclosure 5.3 and the following information.
 - A) Recommend Evacuation of Population in affected area. For doses:
 - > 5 Rem Whole Body or,
 - > 25 Rem Thyroid
 - B) Recommend evacuation of children and pregnant women, and sheltering of remainder of personnel in the affected area. For doses:
 - 1-5 Rem Whole Body or,
 - 5-25 Rem Thyroid
 - C) Recommend no action. For doses:
 - < 1 Rem Whole Body or,
 - < 5 Rem Thyroid

OCONEE SOURCE TERM ASSESSMENT-STEAM RELIEF VALVES
 EDA-4

Unit(s) 1 2 3
 (circle one)

Report # _____

Reactor Trip _____ / _____
 date time

Projections based on data on _____
 date/time

Calculations based on: Core Melt/LOCA
 (circle one)

Noble Gas based on RIA-16 and 17

$(RIA-16 \frac{mR}{hr} + RIA-17 \frac{mR}{hr}) \times 2.24 = Q_{NG} \frac{Ci}{sec}$
$(\frac{mR}{hr} + \frac{mR}{hr}) \times 2.24 =$

Iodine based on I-131 equiv./Xe-133 equiv. ratio, Encl.5.6

$Q_{NG} \frac{Ci}{sec} \times I_{rat} \text{ (Encl 5.6)} = Q_I \frac{Ci}{sec}$
$\frac{Ci}{sec} \times =$

Prepared by: _____

OCONEE I-131 EQUIVALENT/Xe-133 EQUIVALENT RATIO

EDA-4

<u>Time Since Trip (hrs)</u>	<u>Ratio Based On LOCA (Column 1)</u>	<u>Ratio Based On Core Melt (Column 2)</u>
0	4.83E-3	2.24E-3
2	6.16E-3	1.06E-2
4	7.09E-3	1.56E-2
8	8.31E-3	2.79E-2
24	9.76E-3	7.40E-2
48	1.02E-2	1.10E-1
100	1.09E-2	1.34E-1
250	1.43E-2	1.79E-1
500	2.26E-2	2.90E-1
720	3.32E-2	4.31E-1

- NOTE: A) For VENT releases in which I_{rat} is utilized to determine I-131 equiv. concentration, apply the appropriate correction from the table below. Ratios are per Reference 2.10.
1. LOCA , use column 1 (based on LOCA).
 2. LOCA through charcoal filters, divide column 1 value by 100.
 3. Core damage, use column 2 (based on Core Melt).
 4. Core damage through charcoal filters, divide column 2 value by 100.
 5. Tube rupture, use 3.32E-5.
 6. New fuel accident, use 2.23E-4.
 7. Old fuel accident, use 7.18E-4.
 8. Gas decay tank, assume no radioiodine released, only noble gases are considered to be released from gas tank.
- B) For Steam Release Valve releases in which I_{rat} is utilized to determine I-131 eq concentration, apply the appropriate correction from the table below. Ratios are per Reference 2.10.
1. LOCA, divide Column 1 values by 100.
 2. Core Melt, divide Column 2 values by 100.

OCONEE SOURCE TERM ASSESSMENT-CONTAINMENT

EDA-4

Unit(s) 1 2 3
 (circle one)

Report # _____

Reactor Trip _____/_____
 date time

Projection based on data on _____/_____
 date time

Calculations based on: Core Melt/LOCA
 (circle one)

Containment pressure _____ psig

LR = _____ ml/hr

LR based on (check one):

_____ Realistic Leak Rate (Encl. 5.9)

_____ Opening in Containment (Encl. 5.9) (circle one) 1" 2" 4" 6" 8" 12" 18" 48"
 Diameter opening

_____ Design Leak Rate (5.6E6)

Noble Gas

Based on RIA-57 and 58

RIA (or PIC-6A) Reading	$\frac{R}{hr}$	X	CF	$\frac{Ci-hr}{sec-ml-R/hr}$ (Encl. 5.8)	X	LR	$\frac{ml}{hr}$	=	Q_{NG}	$\frac{Ci}{sec}$
_____		X	_____	X	_____			=	_____	

Based on PAG sample

Conc.	$\frac{\mu Ci}{ml}$	x	2.78E-10	$\frac{Ci-hr}{sec-\mu Ci}$	x	LR	$\frac{ml}{hr}$	=	Q_{NG}	$\frac{Ci}{sec}$
_____		x	2.78E-10	x	_____			=	_____	

Iodine

Based on Irat

Q_{NG}	$\frac{Ci}{sec}$	x	I_{rat} (Encl. 5.6)	=	Q_I	$\frac{Ci}{sec}$
_____		x	_____	=	_____	

Based on PAG sample

Conc.	$\frac{\mu Ci}{ml}$	x	2.78E-10	$\frac{Ci-hr}{sec-\mu Ci}$	x	LR	$\frac{ml}{hr}$	=	Q_I	$\frac{Ci}{sec}$
_____		x	2.78E-10	x	_____			=	_____	

Prepared By: _____

OCONEE CONTAINMENT NOBLE GAS CORRECTION FACTOR

EDA-4

Time Since Trip (hrs)	Based on RIA-57 and 58 Correlation Factor*		Time Since Trip (hrs)	Based on Survey Instrument Correlation Factor**	
	LOCA	Core Melt		LOCA	Core Melt
0	5.17E-11	1.57E-10	0.1 to 0.5	1.71E-5	5.32E-5
2	4.31E-11	1.07E-10	>0.5 to 1.0	1.95E-5	6.05E-5
4	3.86E-11	1.04E-10	>1.0 to 1.5	2.18E-5	6.78E-5
8	3.36E-11	9.11E-11	>1.5 to 2.0	1.93E-5	3.28E-5
24	2.81E-11	6.64E-11	>2.0 to 2.5	2.09E-5	3.56E-5
48	2.63E-11	5.42E-11	>2.5 to 3.0	2.25E-5	3.83E-5
100	2.55E-11	4.47E-11	>3.0 to 4.0	2.21E-5	3.69E-5
250	2.58E-11	4.50E-11	>4.0 to 5.0	2.50E-5	4.18E-5
500	2.74E-11	5.22E-11	>5.0 to 6.0	2.65E-5	4.43E-5
720	2.94E-11	5.92E-11	>6.0 to 7.0	2.94E-5	4.92E-5
			>7.0 to 8.0	2.86E-5	3.94E-5
			>8.0 to 9.0	3.12E-5	4.30E-5
			>9.0 to 10	3.38E-5	4.65E-5
			> 10 to 15	4.68E-5	6.44E-5
			> 15 to 20	6.76E-5	9.31E-5
			> 20 to 25	8.32E-5	7.34E-5
			> 25 to 30	1.11E-4	9.79E-5
			> 30 to 35	1.50E-4	1.33E-4
			> 35 to 40	1.96E-4	1.73E-4
			> 40 to 45	2.54E-4	2.24E-4
			> 45 to 50	3.18E-4	2.44E-4
			> 50 to 60	5.45E-4	4.18E-4
			> 60 to 70	7.26E-4	5.57E-4
			> 70 to 80	1.18E-3	9.05E-4
			> 80 to 90	1.70E-3	1.31E-3
			> 90 to 100	3.30E-3	2.04E-3

* Units in $\frac{\text{Ci-hr}}{\text{sec-ml-R/hr}}$; correlation factors

per Reference 2.10 x hr/3600 sec x Ci/1E6 μ Ci

**Units in $\frac{\text{Ci-hr}}{\text{sec-ml-R/hr}}$

OCONEE CONTAINMENT LEAKAGE RATE

EDA-4

Leak Rate versus Pressure (RLR)*

<u>Pressure (psig)</u>	<u>Leakage Rate (ml/hr)</u>
1	1.00E5
5	4.734E5
10	9.693E5
15	1.443E6
20	1.916E6
25	2.389E6
30	2.885E6
35	3.314E6
37	3.471E6
40	3.652E6
42	3.764E6
45	3.922E6
47	4.012E6
50	4.103E6
52	4.148E6
55	4.193E6
57	4.215E6
59	4.238E6

*NOTE: (Per Reference 2.10)

Leak Rate versus Size Opening (OIC)**

<u>Opening Diameter (inches)</u>	<u>Actual ft³/hr</u>	<u>Actual ml/hr</u>
1	15,100	4.276E8
2	60,400	1.710E9
4	241,600	6.842E9
6	543,500	1.540E10
8	966,200	2.737E10
12	2,174,000	6.158E10
18	4,892,000	1.386E11
48	34,785,000	9.853E11

**Note: (Per Reference 2.11)

- 1) For all pressure greater than 30 psia and temperature greater than 280°F (conservative for lower temperatures or pressures).
- 2) Leak rates for 12 inches and larger are more than one reactor building volume per hour. In an accident, these leak rates could not exist for more than a few minutes.

OCONEE SOURCE TERM ASSESSMENT-UNIT VENT
 EDA-4

Unit(s) 1 2 3

Report # _____

Reactor Trip _____ / _____
 date / time

Projections based on: _____ / _____
 date / time

Calculations on: Core Melt/LOCA
 (circle one)

Noble Gas: Based on 45 46 56

RIA 45, 46 or 56 cpm or R/hr value	X	Appropriate Correction Factor (Enclosure 5.11)	X	Vent Flow CFM	=	Q_{NG}	$\frac{Ci}{sec}$	Q_{NG} Total (add U-1,2,3)
U-1) _____	X	_____		_____	=	_____	_____	_____
U-2) _____	X	_____		_____	=	_____	_____	_____
U-3) _____	X	_____		_____	=	_____	_____	_____

Vent Sample Activity $\frac{\mu Ci}{ml}$	X	4.72E-4	$\frac{Ci-min-ml}{sec-ft^3-\mu Ci}$	X	Vent Flow CFM	=	Q_{NG}	$\frac{Ci}{sec}$
_____	X	4.72E-4		X	_____	=	_____	_____

Iodine

Based on I/Xe ratio

Q_{NG} Total	$\frac{Ci}{sec}$	X	I_{rat} (Encl. 5.6)	=	Q_I	$\frac{Ci}{sec}$
_____	X	_____		=	_____	_____

Based on Unit Vent Sample

Vent Sample Activity $\frac{\mu Ci}{ml}$	X	4.72E-4	$\frac{Ci-min-ml}{sec-ft^3-\mu Ci}$	X	Vent Flow CFM	=	Q_I	$\frac{Ci}{sec}$
_____	X	4.72E-4		X	_____	=	_____	_____

Prepared By: _____

OCONEE UNIT VENT NOBLE GAS CORRECTION FACTOR*

EDA-4

Time Since Trip (hrs.)	RIA-45	RIA-46	RIA-56	Other Accidents	RIA-45	RIA-46	RIA-56
	Core Melt	Core Melt	Core Melt		RIA-45	RIA-46	RIA-56
0	4.717E-11	2.170E-07	1.472E-03	LOCA	7.075E-12	1.179E-07	1.340E-04
2	4.528E-11	1.698E-07	6.651E-04	LOCA thru Filter	7.075E-12	1.179E-07	1.340E-04
4	3.868E-11	2.311E-07	5.990E-04	Tube Rupture	7.075E-12	1.179E-07	1.340E-04
8	2.736E-11	2.406E-07	4.358E-04	Old Fuel	7.075E-12	1.179E-07	1.340E-04
24	1.509E-11	1.509E-07	2.476E-04	New Fuel	1.085E-11	1.226E-07	2.071E-04
48	1.179E-11	1.274E-07	2.113E-04	Gas Tank	7.075E-12	1.179E-07	1.340E-04
100	1.085E-11	1.226E-07	2.071E-04				
250	1.132E-11	1.179E-07	1.943E-04				
500	9.905E-12	1.179E-07	1.613E-04				
720	7.075E-12	1.179E-07	1.340E-04				

Units in Ci-min/sec-ft -cpm
 or Ci-min/sec-ft -R/hr

Correlation factors per Reference 2.10 x 2.832E4 ml/ft x min/60 sec x m /1E6 ml

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 5

"Class A Model for Catawba Nuclear Station"

R E Harris

Approved By

8/11/87

Date

Rev. 1
August 26, 1985

OVERVIEW OF CLASS A MODEL

The Class A Model is a computer program developed to calculate release rates (optional), atmospheric dispersion, and off-site doses from accidental airborne releases.

Data is input to the program either manually or from the OAC. In both cases, a 15-minute average for the data is assumed.

Accidental airborne releases may originate from three locations: containment, steam lines, and unit vent. The Class A Model allows manual entry of release rate information or may calculate the release rate based on monitor readings and correlation curves developed from time-dependent, accident-specific radionuclide mixes. In all cases, the noble gas release rate is a Xe133 equivalent release rate (Ci/sec); the radioiodine release rate is an I131 equivalent release rate (Ci/sec). No particulate releases are considered in the program.

The atmospheric dispersion is calculated by using a puff advection model which assumes a gaussian concentration distribution for each puff generated. A sufficient number of puffs are generated to approximate a continuous release for each data set input in the program. The dispersion is based on the stability class (A, B-C, D, E, F, or G), wind speed, and wind direction (terrain effects are considered). For conservatism, all releases are considered to be ground releases. The dispersion parameters may be varied in the program.

The whole-body dose (and dose rate) at the centerline of the plume and at predetermined receptors (36 receptors are evenly distributed around each of 11 rings resulting in a total of 396 receptor locations) is calculated based on the Xe133 equivalent concentration at the plume centerline at each ring and using a finite plume correction which is based on the dispersion coefficients at that ring. The child thyroid dose (and dose rate) at the centerline of the plume and at the predetermined receptors is calculated based on the I131 equivalent concentration at the the plume centerline and at the receptors.

I. LOGON PROCEDURE

The user must logon to a LA120 hard-copy terminal, or any comparable hard-copy terminal with a print line of 132 characters long. Ensure that the configuration code selections are as follows:

c14 -- full duplex reverse channel ON for ready
c25 -- 1200 baud
c32 -- transmit even parity, receive parity checkoff
c83 -- transmit DC3 or BREAK on printer busy, DC1 on ready

- A. Call the appropriate number on the phone to connect your terminal to the VAX computer. The station VAX is to be used during emergencies and drills; the General Office VAX is used as a backup if the station VAX is inaccessible.

VAX Location	Phone Numbers
Catawba (831)	2801 through 2804
McGuire (875)	4050 through 4054 and 4056 through 4061
Oconee (882)	1608 through 1613
G.O. (373)	5243 through 5248

- B. When the computer answers with a high-pitch tone, press the "ORG" button on the low speed modem (or release the DA button on the RIXON modem RA212A) and hang up the phone. Release the "ORG" button.
- C. Quickly press "RETURN" twice.
- D. Terminal response: USERNAME (If the terminal does not respond, return to step A above.)
- E. User response: METTSC or METCMC
- F. Terminal response: PASSWORD
- G. User response: PASS
- H. Terminal response: the terminal will respond with a few system messages followed by: ENTER COMMAND:
- I. The system is now in "command level." The commands available are listed below:

RUN -- the program will be used to calculate release data and offsite doses
SHOW NET -- shows the VAX/VMS network status for local node
MAIL -- allows the user to send and receive messages through the VAX system for users of the Class A Model (NOTE: MAIL>DIR will list the messages received)

UTILITY -- allows the user to send system messages (all users of VAX will receive the messages).
OAG -- used to list, add, change, or delete Ocone OAC point ID data
USERS -- lists the VAX/VMS interactive users
LO -- logs the user off of the VAX system
HELP -- explains the use of the different commands

II. Running the program

- A. With the system in "command level," enter RUN.
- B. Terminal response: Is This A Drill? (Y/N):
(NOTE: If the user is signed onto the G.O. VAX, the first terminal response will be:

ENTER STATION - (MCG, OCO, CAT):

The user should respond with the correct station, and the terminal will then ask: Is This A Drill? (Y/N):)

- C. User response: Y or N
- D. Terminal response: the terminal will list the station name and units followed by:

ENTER NUMBER FOR STATION/UNIT:

- E. User response: enter appropriate number for the unit you need.
- F. Terminal response: AVAILABLE DATA TYPES:

1. MANUAL
2. CURRENT

ENTER NUMBER FOR DATA TYPE:

- G. User response: enter the appropriate number for the data type desired.

MANUAL: the user will be prompted for a value for each parameter needed to create the input file for the model.

CURRENT: the user will be asked to select record(s) from the OAC files to be used in creating the input file for the model.

- H. Terminal response: DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):
- I. User response: Y or N
If the user responds with Y, a list of default values (see APPENDIX) will be displayed. The terminal will

change a default parameter it will be changed for the duration of the current run only. If changes are made to the default values, the new values will be displayed for verification.

- J. At this point, the information that the user will be responding to will be specific depending on the DATA TYPE selected in step G above. These prompts will be addressed in sections III. and IV. After the information has been input for the initial record(s), the terminal will respond with:

AVAILABLE TYPES OF PROJECTED DATA:

1. FORECASTED
2. PERSISTANT

ENTER THE OPTION NUMBER YOU WANT THE TWO HOURS OF PROJECTED DATA TO BE:

- K. User response: enter the number desired. If PERSISTANT data is picked, the program writes the last record (data set) eight (8) times for use in the projected section of the program. If FORECASTED data is picked the following responses are necessary.

- L. Terminal response: ENTER WIND SPEED (MPH):

- M. User response: the user should enter the forecasted wind speed.

- N. Terminal response: ENTER WIND DIRECTION (DEG) -FROM:

- O. User response: the user should enter the forecasted wind direction.

- P. Terminal response: THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER DELTA TEMPERATURE (DEG C):

- Q. User response: the user should enter the forecasted temperature gradient.

- R. Terminal response: ENTER AMBIENT TEMPERATURE (DEG C):

- S. User response: the user should enter the forecasted ambient temperature.

- T. Terminal response: ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :

- U. User response: the user should enter the forecasted Xel33 eq. release rate. If the release is not expected to continue more than 15 minutes, or if it is desired

to get a prompt estimate of the dose from a short-term release, this value may be set to zero (0).

- V. Terminal response: ENTER I131eq/XE133eq RATIO:
- W. User response: the user should enter the forecasted ratio of I131 eq. release rate to the Xe133 eq. release rate. If the Xe133 eq. release rate has been set to zero (0), this ratio should be set to the same value as the initial ratio so that the I131 eq. concentration and the child thyroid dose rate from the initial release will be calculated.
- X. Terminal response: ENTER TIME SINCE SHUTDOWN (HOURS):
- Y. User response: the user should enter the time since shutdown.
- Z. Terminal response: ENTER PRECIPITATION (INCHES):
- AA. User response: the user should enter the forecasted precipitation (in inches) for a 15 minute time period.
- AB. Terminal response: ENTER THE NUMBER OF TIME PERIODS:
- AC. User response: the user may input 1 through 8 for the number of 15 minute time periods the forecasted data will be used. If the user inputs less than 8, the prompts will be repeated until 8 forecasted periods have been input.
- AD. Terminal response: THE INPUT FILE FOR THE CLASS A DISPLAY MODEL HAS BEEN CREATED.

The terminal will then display an initial report for each record:

CLASS A MODEL - INITIAL REPORT

MCG NUCLEAR STATION UNIT # DATE mm/dd/yy TIME hh.mm

TIME SINCE TRIP/SHUTDOWN #.# HRS.

METEOROLOGY

WIND SPEED #.# MPH WIND DIRECTION (FROM) ###

AMBIENT TEMP ###.# C DELTA TEMP #.# C STABILITY CLASS _

SOURCE TERM

XE-133eq RELEASE RATE: ###.#E+### Ci/s I-131eq RELEASE RATE ###.#E+### Ci/s

The terminal will then display the following message:

THE MODEL IS RUNNING.....

After the model has run, the map generating program is run and the following messages are displayed:

Now running 6D ...
BMDP STOP
All done.

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
REVIEW - TO SEE THE INPUT DATA
RELEASE - TO SEND THE REPORT
RETRIEVE - TO SEE OAC DATA
END - TO RETURN TO COMMAND LEVEL
ENTER OPTION:

- AE. User response: the user should input the desired option. The report is explained in the APPENDIX. Releasing the report will send it to all other users of the program (including NRC and state agencies). After the CMC has signed onto the station VAX, the TSC does not have the capability of sending any reports; only the CMC will be allowed to send reports.

III. Processing MANUAL DATA

The user will need to enter all the data values requested by the terminal prompt.

- A. Terminal response: ENTER DATE (YYMMDD):
- B. User response: enter date in the correct format.
- C. Terminal response: ENTER TIME (HH.MM) ex:(02.33):
- D. User response: enter time of run in the correct format.
- E. Terminal response: ENTER WIND SPEED (MPH):
- F. User response: the user should enter the initial wind speed.
- G. Terminal response: ENTER WIND DIRECTION (DEG) -FROM:
- H. User response: the user should enter the initial wind direction.
- I. Terminal response: THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER DELTA TEMPERATURE (DEG C):

- J. User response: the user should enter the initial temperature gradient.
- K. Terminal response: ENTER AMBIENT TEMPERATURE (DEG C):
- L. User response: the user should enter the initial ambient temperature.
- M. Terminal response: ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :
- N. User response: the user should enter the initial Xel33 eq. release rate.
- O. Terminal response: ENTER I131eq/XE133eq RATIO:
- P. User response: the user should enter the initial ratio of I131 eq. release rate to the Xel33 eq. release rate.
- Q. Terminal response: ENTER TIME SINCE SHUTDOWN (HOURS):
- R. User response: the user should enter the time since shutdown.
- S. Terminal response: ENTER PRECIPITATION (INCHES):
- T. User response: the user should enter the initial precipitation (in inches) for a 15 minute time period.
- U. Terminal response: ENTER THE NUMBER OF TIME PERIODS:
- V. User response: the user may input any number for the number of 15 minute time periods the initial data will be used.
- W. Terminal response:
DO YOU WANT TO CREATE ANY MORE RECORDS? (Y/N):
- X. User response: Y or N
If Y, the same prompts (E - W) will be displayed; otherwise, the terminal will then display the prompt in step II.J. above.

IV. Processing CURRENT DATA

The user will have to input certain items depending on the availability of parameters from the OAC files. For example: if upper wind speed is available from the OAC data, it is used; if there is no upper wind speed, lower wind speed is checked for a value. If there is no lower wind speed, the terminal will prompt the user to manually input the data value for wind speed.

- A. An index of all current OAC records will be displayed at the terminal. This index lists the date and time of each OAC record. The terminal then prompts:

ENTER RECORD NUMBER OR END:

- B. User response: enter, one at a time, the record number of each OAC record you want as input to the model. Each choice will be processed separately and represent one 15-minute record in the file. When you have entered all the records you want for the current run, enter END.

- C. Terminal response: DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):

- D. User response: Y or N
If the user responds with Y, a list of default values (see APPENDIX) will be displayed. The terminal will ask if any changes are desired. If the user chooses to change a default parameter it will be changed for the duration of the current run only. If changes are made to the default values, the new values will be displayed for verification.

- E. Terminal response: DO YOU WANT TO REVIEW THE CURRENT DATA FOR RECORD "n"? (Y/N):

- F. User response: Y or N
A Y response will cause a list of the 44 OAC parameters (see APPENDIX) to be displayed along with their current values. The user will be presented with the option of changing values as desired. If values are changed in a record, the 44 OAC parameters along with their new values will be redisplayed for verification when END is entered. If the current or new value is outside of the acceptable range of the parameter, *'s will be printed to show that the value is not acceptable. The program requires that the value be corrected prior to running the model.

- G. Terminal response: ENTER TIME SINCE SHUTDOWN IN HOURS. (ex:2.5):

- H. User response: enter a numerical value.

- I. Terminal response: CONTAINMENT? (Y/N):

- J. User response: Y or N
If a containment release is occurring, or may occur, answer Y, and additional information will be required. If N, the terminal response will be as in step W. below.

- K. Terminal response:

CONTAINMENT RELEASE

1. LOCA
2. COREMELT

ENTER NUMBER OF ACCIDENT FOR CONTAINMENT RELEASE:

L. User response: enter the number of the appropriate accident (see APPENDIX).

M. Terminal response:

ENTER CONTAINMENT VOLUME LEAK RATE, (ml/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

N. User response: enter containment volume leak rate, if available.

O. Terminal response: if the user has not entered a leak rate,

DO YOU WANT TO USE DESIGN VOLUME LEAK RATE?
RATE=6.80E+02 (Y/N):

P. User response: Y or N
If Y, the design volume leak rate which is the leak rate corresponding to a design pressure of 15 psig will be used (this may be used if the pressure instrumentation is not functioning and the pressure is considered to be no greater than 15 psig); otherwise, the highest containment pressure reading will be used to calculate the leak rate from containment. When the pressure is too large, the following message will be displayed:

PRESSURE ABOVE DESIGN PRESSURE.

The user will have one last chance to input the leak rate manually, if this option is not taken, the containment volume leak rate will be set to zero (0) and the terminal session will continue.

Q. Terminal response:

ENTER THE FRACTION OF CONTAINMENT LEAKAGE THAT WILL
BYPASS THE ANNULUS OR AUXILIARY BUILDING GOING DIRECTLY
TO THE ENVIRONMENT
(EX: DESIGN VALUE IS 0.07):

R. User response: enter the bypass leakage fraction.
NOTE: if the input fraction is less than 1, then the VENT RELEASE option must also be used in order to account for the remaining containment leakage fraction.

S. Terminal response:

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR
CONTAINMENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

T. User response: if a gas sample has been taken, enter
the Xe133 equivalent concentration; otherwise, the
containment monitors will be used to calculate the
concentration.

U. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR
CONTAINMENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

V. User response: if a gas sample has been taken, enter
the I131 equivalent concentration; otherwise, the Xe133
equivalent concentration and the assumed I/Xe ratio
(based on time since shutdown and accident type) will
be used to calculate the concentration.

W. Terminal response: STEAM? (Y/N):

X. User response: Y or N
If a steam release is occurring, or may occur, answer Y,
and additional information will be required. If N, the
terminal response will be as in step AG. below.

Y. Terminal response: (this will be repeated for all four
steam lines)

ENTER STEAM LINE MASS RELEASE RATE #, (lb/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

Z. User response: enter mass release rate, if known.

AA. Terminal response: if none of the four mass release
rates are known,

ASSUMPTIONS FOR DESIGN VALUE ARE: DOUBLE ENDED TUBE
RUPTURE, NO CONDENSORS, NO PORVS.

DO YOU WANT TO USE THE DESIGN VALUE FOR STEAM LINE
RELEASE RATE? RATE = 60.0 lb/sec (Y/N):

AB. User response: Y or N
If N, the OAC steamline mass releases will be checked.
If the four steamline mass releases are available, the
four steam mass release rates will be calculated.
Otherwise, the user will be prompted to input the four
steamline mass releases manually.

If no data is available from OAC and no data is provided through manual input, steam release rate is set to zero (0).

AC. Terminal response:

1. NORMAL PRIMARY COOLANT
2. IODINE SPIKED PRIMARY COOLANT
3. CORE DAMAGE

ENTER NUMBER OF ACCIDENT FOR STEAM RELEASE:

AD. User response: enter the accident type (see APPENDIX).

AE. Terminal response:

IF KNOWN, INPUT I-131EQ/XE-133EQ RATIO,
IF NOT AVAILABLE, HIT RETURN:

AF. User response: enter ratio if known; otherwise, a ratio will be assumed based on accident type and time after shutdown.

AG. Terminal response: VENT? (Y/N):

AH. User response: Y or N

If a vent release is occurring, or may occur, answer Y, and additional information will be required. If N, the terminal response will be as in step AQ. below.

AI. Terminal response:

VENT RELEASE

1. LOCA
2. LOCA THROUGH CHARCOAL FILTER
3. CORE DAMAGE
4. CORE DAMAGE THROUGH CHARCOAL FILTER
5. TUBE RUPTURE
6. NEW FUEL ACCIDENT
7. OLD FUEL ACCIDENT
8. GAS DECAY TANK

ENTER NUMBER OF ACCIDENT FOR VENT RELEASE:

AJ. User response: enter the number for the accident type (see APPENDIX).

AK. Terminal response:

ENTER UNIT VENT FLOW RATE, (CFM) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

- AL. User response: If the user does not enter a value, the OAC parameter will be checked for a value. If a value is not found, the vent release will be set to zero (0).
- AM. Terminal response:

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR UNIT VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:
- AN. User response: if a gas sample has been taken, enter the Xe133 equivalent concentration; otherwise, the unit vent monitors will be used to calculate the concentration.
- AO. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR UNIT VENT RELEASE,(uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:
- AP. User response: if a gas sample has been taken, enter the I131 equivalent concentration; otherwise, the Xe133 equivalent concentration and the assumed I/Xe ratio (based on time since shutdown and accident type) will be used to calculate the concentration.
- AQ. Terminal response: RECORD "n" WRITTEN TO MODEL INPUT FILE.
- AR. At this point, the program will repeat the above prompts for all current data sets chosen and then continues at step II.J. above.

APPENDIX
FOR THE CLASS A MODEL
USER'S MANUAL

CATAWBA NUCLEAR STATION

DEFAULT VALUES

	(meters)
1. Stack Diameter	2.10
2. Stack Height	38.00
3. Source X-Coordinate	0.000000E+00
4. Source Y-Coordinate	0.000000E+00
5. Source Z-Coordinate	1.810000E+02
6. Mixing Height	1000.00
7. Maximum Adjacent Building Height	41.00
8. Maximum Adjacent Building Width	40.00
9. Ring Radius(1)	8.046500E+02
10. Ring Radius(2)	1.609300E+03
11. Ring Radius(3)	3.218600E+03
12. Ring Radius(4)	4.827900E+03
13. Ring Radius(5)	6.437200E+03
14. Ring Radius(6)	8.046500E+03
15. Ring Radius(7)	9.655800E+03
16. Ring Radius(8)	1.126510E+04
17. Ring Radius(9)	1.287460E+04
18. Ring Radius(10)	1.448370E+04
19. Ring Radius(11)	1.609300E+04

STABILITY CLASS vs. DELTA TEMPERATURE

STABILITY CLASS	DELTA TEMPERATURE (°C/100 ft)
A	< -0.6
B-C	>= -0.6 to <= -0.5
D	>= -0.4 to <= -0.2
E	>= -0.1 to <= +0.4
F	>= +0.5 to <= +1.2
G	> +1.2

CATAWBA NUCLEAR STATION

OAC DATA AVAILIABLE TO THE MET SYSTEM

POINT ID	DESCRIPTION	RANGE	UNITS	
1	A0483	UPPER WIND SPEED	0 - 60	MPH
2	A0485	LOWER WIND SPEED	0 - 60	MPH
3	A0484	UPPER WIND DIRECTION-FROM	0 - 540	DEG
4	A0489	LOWER WIND DIRECTION-FROM	0 - 540	DEG
5	A0490	DELTA TEMPERTURE	-4 - +8	DEG C
6	A1110	SIGMA THETA	0 - 90	DEG
7	A0495	AMBIENT TEMPERATURE	-20 - +40	DEG C
8	A0496	DEW POINT	-30 - +30	DEG C
9	P0595	PRECIP. DURING LAST 15 MIN	0 - 6	INCH
10	A1499	CONT. PRESS. TRAIN A	-5 - +60	PSIG
11	A1515	CONT. PRESS. TRAIN B	-5 - +60	PSIG
12	A1308	EMF53A IN CONT. HI RANGE	1.0E0 - 1.0E8	R/HR
13	A1314	EMF53B IN CONT. HI RANGE	1.0E0 - 1.0E8	R/HR
14	A1315	EMF54 UNIT VENT GAS EXTENDED	1.0E0 - 1.0E8	R/HR
15	A0019	EMF36H UNIT VENT GAS HI	1.0E1 - 1.0E6	CPM
16	A0013	EMF36L UNIT VENT GAS LO	1.0E1 - 1.0E7	CPM
17	A0048	EMF37 UNIT VENT IODINE	1.0E1 - 1.0E7	CPM
18	A0018	EMF35H UNIT VENT PART. HI	1.0E1 - 1.0E6	CPM
19	A1104	UNIT VENT STACK FLOW	0 - 1.95E5	CFM
20	A0012	EMF35L UNIT VENT PART. LO	1.0E1 - 1.0E7	CPM
21	A0024	EMF38L CONT. PART. LO	1.0E1 - 1.0E7	CPM
22	A0030	EFM38H CONT. PART. HI	1.0E1 - 1.0E6	CPM
23	A1008	1EMF26 (2-10) STEAMLINE A RAD.	1.0E-2 - 1.0E+3	R/HR
24	A1014	1EMF27 (2-11) STEAMLINE B RAD.	1.0E-2 - 1.0E+3	R/HR
25	A1020	1EMF28 (2-12) STEAMLINE C RAD.	1.0E-2 - 1.0E+3	R/HR
26	A1026	1EMF29 (2-13) STEAMLINE D RAD.	1.0E-2 - 1.0E+3	R/HR
27	P0612	MAIN STEAM RELEASE - START TIME		HH.00
28	P0613	MAIN STEAM RELEASE - STOP TIME		HH.00
29	A0723	STEAM GEN A STEAM PRESS. I	0 - 1300	PSIG
30	A1274	STEAM GEN A STEAM PRESS. II	0 - 1300	PSIG
31	A1280	STEAM GEN A STEAM PRESS. IV	0 - 1300	PSIG
32	A0729	STEAM GEN B STEAM PRESS. I	0 - 1300	PSIG
33	A1286	STEAM GEN B STEAM PRESS. II	0 - 1300	PSIG
34	A1292	STEAM GEN B STEAM PRESS. III	0 - 1300	PSIG
35	A0735	STEAM GEN C STEAM PRESS. I	0 - 1300	PSIG
36	A1298	STEAM GEN C STEAM PRESS. II	0 - 1300	PSIG
37	A1304	STEAM GEN C STEAM PRESS. III	0 - 1300	PSIG
38	A0741	STEAM GEN D STEAM PRESS. I	0 - 1300	PSIG
39	A1310	STEAM GEN D STEAM PRESS. II	0 - 1300	PSIG
40	A1316	STEAM GEN D STEAM PRESS. IV	0 - 1300	PSIG
41	P0596	S/G A MAIN STEAM RELEASED DURING LAST 15 MIN		LBM
42	P0597	S/G B MAIN STEAM RELEASED DURING LAST 15 MIN		LBM
43	P0598	S/G C MAIN STEAM RELEASED DURING LAST 15 MIN		LBM
44	P0599	S/G D MAIN STEAM RELEASED DURING LAST 15 MIN		LBM

ACCIDENT TYPES

CONTAINMENT RELEASE

1. LOCA -- Release of reactor coolant activity to the containment. No core damage expected.
2. COREMELT -- Significant damage to the fuel caused by insufficient heat removal from the core.

STEAM RELEASE

1. NORMAL PRIMARY COOLANT --
The water leaking from the primary system to the secondary system contains only normal reactor coolant activity.
2. IODINE SPIKED PRIMARY COOLANT --
The water leaking from the primary to the secondary system contains activity characteristic of an iodine spike in addition to normal coolant activity.
3. CORE DAMAGE --
The water leaking from the primary to the secondary system contains activity characteristic of core damage in the primary system.

VENT RELEASE

1. LOCA -- The discharge air from the unit vent has isotopic content characteristic of containment leakage into the annulus or auxiliary building following a loss of reactor coolant with no fuel damage.
2. LOCA THROUGH CHARCOAL FILTER --
Same as 1 above except iodine is expected to be filtered with a 99% removal efficiency before release through the unit vent (VA and VE charcoal filters are working properly).
3. CORE DAMAGE --
Same as 1 above except fuel damage is expected inside the containment building (no iodine filtering).
4. CORE DAMAGE THROUGH CHARCOAL FILTER --
Same as 3 above except with the VA and VE charcoal filters operating properly.

5. TUBE RUPTURE --

The discharge air from the unit vent has isotopic content characteristic of a tube rupture accident (air ejector discharge to unit vent).

6. NEW FUEL ACCIDENT --

The discharge air from the unit vent has isotopic content characteristic of a spent fuel handling accident with the fuel damaged having decayed less than 100 days.

7. OLD FUEL ACCIDENT --

Same as 6 above except fuel damaged having decayed more than 100 days.

8. GAS DECAY TANK --

The discharge air from the unit vent has isotopic content characteristic of a gas decay tank rupture.

EXPLANATION OF CLASS A MODEL PRINT-OUT

The first part of the print-out of the Class A Model consists of a map of the 10-mile EPZ. The rings affected by the plume (in the form of whole-body dose) is shown on the map. A "+" is used for those rings affected only during the current time steps. A "*" is used for those rings affected during the input time steps and the 2-hour projection. A "O" is used for those rings affected during the 2-hour projection only.

The input parameters are summarized after the map has been printed. The output values consist of a CENTERLINE CONDITIONS table and a RECEPTOR CONDITIONS table for each of the input time steps and for the end of the 2-hour projection. These tables are more fully explained below.

CENTERLINE CONDITIONS Table:

The CENTERLINE CONDITIONS table(s) consists of twelve (12) columns and eleven (11) rows (one for each ring distance). The twelve columns are explained below:

1. RING DISTANCE (miles) -- self-explanatory.
2. X (miles) -- the actual x-coordinate of the centerline of the plume for that ring distance (miles).
3. Y (miles) -- the actual y-coordinate of the centerline of the plume for that ring distance (miles).
4. Z (m) -- the vertical distance from the plume centerline to the ground (for ground releases, $z = 0.0$) (meters).
5. SGM Y (m) -- the standard deviation of the plume concentration in the horizontal direction at the plume centerline (meters).
6. SGM Z (m) -- the standard deviation of the plume concentration in the vertical direction at the plume centerline (meters).
7. Xe133 eq CONC-ELEV (Ci/m) -- the Xe133 equivalent concentration at the plume centerline (curies/meter).
8. WHOLE BODY DOSE RATE-GR (Rem/hr) -- the whole body dose rate directly below the plume centerline (or at the plume centerline for ground releases) at the ring (rem/hr).

$$\text{For } z = 0: \text{ WBDR} = 33.6 * \text{Xe133 eq Conc} * [1 - \exp(-.01 * R)]$$

$$\text{For } z > 0: \text{ WBDR} = 33.6 * \text{Xe133 eq Conc} * [1 - \exp(-.01 * R)] * [1 - \exp(-\text{sgm } z / z)]$$

NOTE: $R = \text{sqrt}(\text{sgm } y * \text{sgm } z)$.

9. I131 eq CONC-ELEV (Ci/m) -- the I131 equivalent concentration at the plume centerline (curies/meter).
10. THYROID DOSE RATE-ELEV (Rem/hr) -- the child thyroid dose rate at the plume centerline (rem/hr).

$$\text{TDR-ELEV} = 2.26\text{E}+06 * \text{I131 eq Conc-elev}$$

11. I131 eq CONC-GR (Ci/m) -- the I131 equivalent concentration directly below the plume centerline at the ring (curies/meter).
12. THYROID DOSE RATE-GR (Rem/hr) -- the child thyroid dose rate directly below the plume centerline at the ring (rem/hr).

$$\text{TDR-GR} = 2.25\text{E}+06 * \text{I131 eq Conc-gr}$$

The CENTERLINE CONDITIONS table will be printed for every input data record of the run and for the last 15-minute record of the 2-hour projection.

RECEPTOR CONDITIONS Table:

The RECEPTOR CONDITIONS table(s) consists of five (5) columns and a minimum of eleven (11) rows (one for each ring distance). The five columns are explained below:

1. RING DISTANCE (miles) -- self-explanatory.
2. X (miles) -- the actual x-coordinate of the receptor affected by the plume for that ring distance (miles).
3. Y (miles) -- the actual y-coordinate of the receptor affected by the plume for that ring distance (miles).
4. PRESENT (or PROJECTED) WHOLE BODY TOTAL DOSE-GR (Rem) -- the whole body total dose at the receptor for either the input data records (one for all records together) or for the end of the 2-hour projection (NOTE: the 2-hour projection DOES NOT INCLUDE THE INPUT DATA RECORD(S)).
5. PRESENT (or PROJECTED) THYROID TOTAL DOSE-GR (Rem) -- the child thyroid dose at the receptor for either the input data record(s) (one for all records together) or for the end of the 2-hour projection (NOTE: the 2-hour projection DOES NOT INCLUDE THE INPUT DATA RECORD(S)).

A row will be printed for each ring distance and each receptor on that ring that is affected by the plume. All receptors that have a whole body dose rate greater than or equal to 1% of the centerline-ground whole body dose rate will be shown in the receptor table (the receptor whole body dose may be due to "shine"). All receptors that have a thyroid dose will also be shown in the table.

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 6

"Class A Model for McGuire Nuclear Station"

R E Harris

Approved By

8/11/87

Date

Rev. 1
August 26, 1985

OVERVIEW OF CLASS A MODEL

The Class A Model is a computer program developed to calculate release rates (optional), atmospheric dispersion, and off-site doses from accidental airborne releases.

Data is input to the program either manually or from the OAC. In both cases, a 15-minute average for the data is assumed.

Accidental airborne releases may originate from three locations: containment, steam lines, and unit vent. The Class A Model allows manual entry of release rate information or may calculate the release rate based on monitor readings and correlation curves developed from time-dependent, accident-specific radionuclide mixes. In all cases, the noble gas release rate is a Xe133 equivalent release rate (Ci/sec); the radioiodine release rate is an I131 equivalent release rate (Ci/sec). No particulate releases are considered in the program.

The atmospheric dispersion is calculated by using a puff advection model which assumes a gaussian concentration distribution for each puff generated. A sufficient number of puffs are generated to approximate a continuous release for each data set input in the program. The dispersion is based on the stability class (A, B-C, D, E, F, or G), wind speed, and wind direction (terrain effects are considered). For conservatism, all releases are considered to be ground releases. The dispersion parameters may be varied in the program.

The whole-body dose (and dose rate) at the centerline of the plume and at predetermined receptors (36 receptors are evenly distributed around each of 11 rings resulting in a total of 396 receptor locations) is calculated based on the Xe133 equivalent concentration at the plume centerline at each ring and using a finite plume correction which is based on the dispersion coefficients at that ring. The child thyroid dose (and dose rate) at the centerline of the plume and at the predetermined receptors is calculated based on the I131 equivalent concentration at the the plume centerline and at the receptors.

I. LOGON PROCEDURE

The user must logon to a LA120 hard-copy terminal, or any comparable hard-copy terminal with a print line of 132 characters long. Ensure that the configuration code selections are as follows:

c14 -- full duplex reverse channel ON for ready
c25 -- 1200 baud
c32 -- transmit even parity, receive parity checkoff
c83 -- transmit DC3 or BREAK on printer busy, DC1 on ready

- A. Call the appropriate number on the phone to connect your terminal to the VAX computer. The station VAX is to be used during emergencies and drills; the General Office VAX is used as a backup if the station VAX is inaccessible.

VAX Location	Phone Numbers
Catawba (831)	2801 through 2804
McGuire (875)	4050 through 4054 and 4056 through 4061
Oconee (882)	1608 through 1613
G.O. (373)	5243 through 5248

- B. When the computer answers with a high-pitch tone, press the "ORG" button on the low speed modem (or release the DA button on the RIXON modem RA212A) and hang up the phone. Release the "ORG" button.
- C. Quickly press "RETURN" twice.
- D. Terminal response: USERNAME (If the terminal does not respond, return to step A above.)
- E. User response: METTSC or METCMC
- F. Terminal response: PASSWORD
- G. User response: PASS
- H. Terminal response: the terminal will respond with a few system messages followed by: ENTER COMMAND:
- I. The system is now in "command level." The commands available are listed below:
- RUN -- the program will be used to calculate release data and offsite doses
- SHOW NET -- shows the VAX/VMS network status for local node
- MAIL -- allows the user to send and receive messages through the VAX system for users of the Class A Model (NOTE: MAIL>DIR will list the messages received)

UTILITY -- allows the user to send system messages (all users of VAX will receive the messages).
OAC -- used to list, add, change, or delete Oconee OAC point ID data
USERS -- lists the VAX/VMS interactive users
LO -- logs the user off of the VAX system
HELP -- explains the use of the different commands

II. Running the program

- A. With the system in "command level," enter RUN.
- B. Terminal response: Is This A Drill? (Y/N):
(NOTE: If the user is signed onto the G.O. VAX, the first terminal response will be:

ENTER STATION - (MCG, OCO, CAT):

The user should respond with the correct station, and the terminal will then ask: Is This A Drill? (Y/N):)

- C. User response: Y or N
- D. Terminal response: the terminal will list the station name and units followed by:

ENTER NUMBER FOR STATION/UNIT:

- E. User response: enter appropriate number for the unit you need.

- F. Terminal response: AVAILABLE DATA TYPES:

1. MANUAL
2. CURRENT

ENTER NUMBER FOR DATA TYPE:

- G. User response: enter the appropriate number for the data type desired.

MANUAL: the user will be prompted for a value for each parameter needed to create the input file for the model.

CURRENT: the user will be asked to select record(s) from the OAC files to be used in creating the input file for the model.

- H. Terminal response: DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):

- I. User response: Y or N
If the user responds with Y, a list of default values (see APPENDIX) will be displayed. The terminal will

ask if any changes are desired. If the user chooses to change a default parameter it will be changed for the duration of the current run only. If changes are made to the default values, the new values will be displayed for verification.

- J. At this point, the information that the user will be responding to will be specific depending on the DATA TYPE selected in step G above. These prompts will be addressed in sections III. and IV. After the information has been input for the initial record(s), the terminal will respond with:

AVAILABLE TYPES OF PROJECTED DATA:

1. FORECASTED
2. PERSISTANT

ENTER THE OPTION NUMBER YOU WANT THE TWO HOURS OF PROJECTED DATA TO BE:

- K. User response: enter the number desired. If PERSISTANT data is picked, the program writes the last record (data set) eight (8) times for use in the projected section of the program. If FORECASTED data is picked the following responses are necessary.
- L. Terminal response: ENTER WIND SPEED (MPH):
- M. User response: the user should enter the forecasted wind speed.
- N. Terminal response: ENTER WIND DIRECTION (DEG) -FROM:
- O. User response: the user should enter the forecasted wind direction.
- P. Terminal response: THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.
- ENTER DELTA TEMPERATURE (DEG C):
- Q. User response: the user should enter the forecasted temperature gradient.
- R. Terminal response: ENTER AMBIENT TEMPERATURE (DEG C):
- S. User response: the user should enter the forecasted ambient temperature.
- T. Terminal response: ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :
- U. User response: the user should enter the forecasted Xel33 eq. release rate. If the release is not expected to continue more than 15 minutes, or if it is desired

to get a prompt estimate of the dose from a short-term release, this value may be set to zero (0).

- V. Terminal response: ENTER I131eq/XE133eq RATIO:
- W. User response: the user should enter the forecasted ratio of I131 eq. release rate to the Xe133 eq. release rate. If the Xe133 eq. release rate has been set to zero (0), this ratio should be set to the same value as the initial ratio so that the I131 eq. concentration and the child thyroid dose rate from the initial release will be calculated.
- X. Terminal response: ENTER TIME SINCE SHUTDOWN (HOURS):
- Y. User response: the user should enter the time since shutdown.
- Z. Terminal response: ENTER PRECIPITATION (INCHES):
- AA. User response: the user should enter the forecasted precipitation (in inches) for a 15 minute time period.
- AB. Terminal response: ENTER THE NUMBER OF TIME PERIODS:
- AC. User response: the user may input 1 through 8 for the number of 15 minute time periods the forecasted data will be used. If the user inputs less than 8, the prompts will be repeated until 8 forecasted periods have been input.
- AD. Terminal response: THE INPUT FILE FOR THE CLASS A DISPLAY MODEL HAS BEEN CREATED.

The terminal will then display an initial report for each record:

CLASS A MODEL - INITIAL REPORT

MCG NUCLEAR STATION UNIT # DATE mm/dd/yy TIME hh.mm

TIME SINCE TRIP/SHUTDOWN #.# HRS.

METEOROLOGY

WIND SPEED #.# MPH WIND DIRECTION (FROM) ###

AMBIENT TEMP ###.# C DELTA TEMP #.# C STABILITY CLASS _

SOURCE TERM

XE-133eq RELEASE RATE: #.##E+## Ci/s I-131eq RELEASE RATE #.##E+## Ci/s

The terminal will then display the following message:

THE MODEL IS RUNNING.....

After the model has run, the map generating program is run and the following messages are displayed:

Now running 6D ...
BMDP STOP
All done.

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
REVIEW - TO SEE THE INPUT DATA
RELEASE - TO SEND THE REPORT
RETRIEVE - TO SEE OAC DATA
END - TO RETURN TO COMMAND LEVEL
ENTER OPTION:

- AE. User response: the user should input the desired option. The report is explained in the APPENDIX. Releasing the report will send it to all other users of the program (including NRC and state agencies). After the CMC has signed onto the station VAX, the TSC does not have the capability of sending any reports; only the CMC will be allowed to send reports.

III. Processing MANUAL DATA

The user will need to enter all the data values requested by the terminal prompt.

- A. Terminal response: ENTER DATE (YYMMDD):
- B. User response: enter date in the correct format.
- C. Terminal response: ENTER TIME (HH.MM) ex:(02.33):
- D. User response: enter time of run in the correct format.
- E. Terminal response: ENTER WIND SPEED (MPH):
- F. User response: the user should enter the initial wind speed.
- G. Terminal response: ENTER WIND DIRECTION (DEG) -FROM:
- H. User response: the user should enter the initial wind direction.
- I. Terminal response: THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER DELTA TEMPERATURE (DEG C):

- J. User response: the user should enter the initial temperature gradient.
- K. Terminal response: ENTER AMBIENT TEMPERATURE (DEG C):
- L. User response: the user should enter the initial ambient temperature.
- M. Terminal response: ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :
- N. User response: the user should enter the initial Xel33 eq. release rate.
- O. Terminal response: ENTER I131eq/XE133eq RATIO:
- P. User response: the user should enter the initial ratio of I131 eq. release rate to the Xel33 eq. release rate.
- Q. Terminal response: ENTER TIME SINCE SHUTDOWN (HOURS):
- R. User response: the user should enter the time since shutdown.
- S. Terminal response: ENTER PRECIPITATION (INCHES):
- T. User response: the user should enter the initial precipitation (in inches) for a 15 minute time period.
- U. Terminal response: ENTER THE NUMBER OF TIME PERIODS:
- V. User response: the user may input any number for the number of 15 minute time periods the initial data will be used.
- W. Terminal response:
DO YOU WANT TO CREATE ANY MORE RECORDS? (Y/N):
- X. User response: Y or N
If Y, the same prompts (E - W) will be displayed; otherwise, the terminal will then display the prompt in step II.J. above.

IV. Processing CURRENT DATA

The user will have to input certain items depending on the availability of parameters from the OAC files. For example: if upper wind speed is available from the OAC data, it is used; if there is no upper wind speed, lower wind speed is checked for a value. If there is no lower wind speed, the terminal will prompt the user to manually input the data value for wind speed.

- A. An index of all current OAC records will be displayed at the terminal. This index lists the date and time of each OAC record. The terminal then prompts:
- ENTER RECORD NUMBER OR END:
- B. User response: enter, one at a time, the record number of each OAC record you want as input the the model. Each choice will be processed separately and represent one 15-minute record in the file. When you have entered all the records you want for the current run, enter END.
- C. Terminal response: DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):
- D. User response: Y or N
If the user responds with Y, a list of default values (see APPENDIX) will be displayed. The terminal will ask if any changes are desired. If the user chooses to change a default parameter it will be changed for the duration of the current run only. If changes are made to the default values, the new values will be displayed for verification.
- E. Terminal response: DO YOU WANT TO REVIEW THE CURRENT DATA FOR RECORD "n"? (Y/N):
- F. User response: Y or N
A Y response will cause a list of the 44 OAC parameters (see APPENDIX) to be displayed along with their current values. The user will be presented with the option of changing values as desired. If values are changed in a record, the 44 OAC parameters along with their new values will be redisplayed for verification when END is entered. If the current or new value is outside of the acceptable range of the parameter, '*'s will be printed to show that the value is not acceptable. The program requires that the value be corrected prior to running the model.
- G. Terminal response: ENTER TIME SINCE SHUTDOWN IN HOURS. (ex:2.5):
- H. User response: enter a numerical value.
- I. Terminal response: CONTAINMENT? (Y/N):
- J. User response: Y or N
If a containment release is occurring, or may occur, answer Y, and additional information will be required. If N, the terminal response will be as in step W. below.
- K. Terminal response:

CONTAINMENT RELEASE

1. LOCA
2. COREMELT

ENTER NUMBER OF ACCIDENT FOR CONTAINMENT RELEASE:

L. User response: enter the number of the appropriate accident (see APPENDIX).

M. Terminal response:

ENTER CONTAINMENT VOLUME LEAK RATE,(ml/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

N. User response: enter containment volume leak rate, if available.

O. Terminal response: if the user has not entered a leak rate,

DO YOU WANT TO USE DESIGN VOLUME LEAK RATE?
RATE=6.80E+02 (Y/N):

P. User response: Y or N

If Y, the design volume leak rate which is the leak rate corresponding to a design pressure of 15 psig will be used (this may be used if the pressure instrumentation is not functioning and the pressure is considered to be no greater than 15 psig); otherwise, the highest containment pressure reading will be used to calculate the leak rate from containment. When the pressure is too large, the following message will be displayed:

PRESSURE ABOVE DESIGN PRESSURE.

The user will have one last chance to input the leak rate manually, if this option is not taken, the containment volume leak rate will be set to zero (0) and the terminal session will continue.

Q. Terminal response:

ENTER THE FRACTION OF CONTAINMENT LEAKAGE THAT WILL
BYPASS THE ANNULUS OR AUXILIARY BUILDING GOING DIRECTLY
TO THE ENVIRONMENT
(EX: DESIGN VALUE IS 0.07):

R. User response: enter the bypass leakage fraction.
NOTE: if the input fraction is less than 1, then the VENT RELEASE option must also be used in order to account for the remaining containment leakage fraction.

S. Terminal response:

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR
CONTAINMENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

T. User response: if a gas sample has been taken, enter
the Xe133 equivalent concentration; otherwise, the
containment monitors will be used to calculate the
concentration.

U. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR
CONTAINMENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

V. User response: if a gas sample has been taken, enter
the I131 equivalent concentration; otherwise, the Xe133
equivalent concentration and the assumed I/Xe ratio
(based on time since shutdown and accident type) will
be used to calculate the concentration.

W. Terminal response: STEAM? (Y/N):

X. User response: Y or N
If a steam release is occurring, or may occur, answer Y,
and additional information will be required. If N, the
terminal response will be as in step AG. below.

Y. Terminal response: (this will be repeated for all four
steam lines)

ENTER STEAM LINE MASS RELEASE RATE #, (lb/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

Z. User response: enter mass release rate, if known.

AA. Terminal response: if none of the four mass release
rates are known,

ASSUMPTIONS FOR DESIGN VALUE ARE: DOUBLE ENDED TUBE
RUPTURE, NO CONDENSORS, NO PORVS.

DO YOU WANT TO USE THE DESIGN VALUE FOR STEAM LINE
RELEASE RATE? RATE = 60.0 lb/sec (Y/N):

AB. User response: Y or N
If N, the OAC steamline mass releases will be checked.
If the four steamline mass releases are available, the
four steam mass release rates will be calculated.
Otherwise, the user will be prompted to input the four
steamline mass releases manually.

If no data is available from OAC and no data is provided through manual input, steam release rate is set to zero (0).

AC. Terminal response:

1. NORMAL PRIMARY COOLANT
2. IODINE SPIKED PRIMARY COOLANT
3. CORE DAMAGE.

ENTER NUMBER OF ACCIDENT FOR STEAM RELEASE:

AD. User response: enter the accident type (see APPENDIX).

AE. Terminal response:

IF KNOWN, INPUT I-131EQ/XE-133EQ RATIO,
IF NOT AVAILABLE, HIT RETURN:

AF. User response: enter ratio if known; otherwise, a ratio will be assumed based on accident type and time after shutdown.

AG. Terminal response: VENT? (Y/N):

AH. User response: Y or N
If a vent release is occurring, or may occur, answer Y, and additional information will be required. If N, the terminal response will be as in step AQ. below.

AI. Terminal response:

VENT RELEASE

1. LOCA
2. LOCA THROUGH CHARCOAL FILTER
3. CORE DAMAGE
4. CORE DAMAGE THROUGH CHARCOAL FILTER
5. TUBE RUPTURE
6. NEW FUEL ACCIDENT
7. OLD FUEL ACCIDENT
8. GAS DECAY TANK

ENTER NUMBER OF ACCIDENT FOR VENT RELEASE:

AJ. User response: enter the number for the accident type (see APPENDIX).

AK. Terminal response:

ENTER UNIT VENT FLOW RATE, (CFM) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

- AL. User response: If the user does not enter a value, the OAC parameter will be checked for a value. If a value is not found, the vent release will be set to zero (0).
- AM. Terminal response:
ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR
UNIT VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:
- AN. User response: if a gas sample has been taken, enter the Xe133 equivalent concentration; otherwise, the unit vent monitors will be used to calculate the concentration.
- AO. Terminal response:
ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR
UNIT VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:
- AP. User response: if a gas sample has been taken, enter the I131 equivalent concentration; otherwise, the Xe133 equivalent concentration and the assumed I/Xe ratio (based on time since shutdown and accident type) will be used to calculate the concentration.
- AQ. Terminal response: RECORD "n" WRITTEN TO MODEL INPUT FILE.
- AR. At this point, the program will repeat the above prompts for all current data sets chosen and then continues at step II.J. above.

APPENDIX
FOR THE CLASS A MODEL
USER'S MANUAL

McGUIRE NUCLEAR STATION

DEFAULT VALUES

	(meters)
1. Stack Diameter	2.13
2. Stack Height	40.00
3. Source X-Coordinate	0.000000E+00
4. Source Y-Coordinate	0.000000E+00
5. Source Z-Coordinate	2.360000E+02
6. Mixing Height	1000.00
7. Maximum Adjacent Building Height	43.00
8. Maximum Adjacent Building Width	40.00
9. Ring Radius(1)	8.046500E+02
10. Ring Radius(2)	1.609300E+03
11. Ring Radius(3)	3.218600E+03
12. Ring Radius(4)	4.827900E+03
13. Ring Radius(5)	6.437200E+03
14. Ring Radius(6)	8.046500E+03
15. Ring Radius(7)	9.655800E+03
16. Ring Radius(8)	1.126510E+04
17. Ring Radius(9)	1.287460E+04
18. Ring Radius(10)	1.448370E+04
19. Ring Radius(11)	1.609300E+04

STABILITY CLASS vs. DELTA TEMPERATURE

STABILITY CLASS	DELTA TEMPERATURE (C/100 ft)
A	< -0.6
B-C	>= -0.6 to <= -0.5
D	>= -0.4 to <= -0.2
E	>= -0.1 to <= +0.4
F	>= +0.5 to <= +1.2
G	> +1.2

McGUIRE NUCLEAR STATION

OAC DATA AVAILIABLE TO THE MET SYSTEM

POINT ID	DESCRIPTION	RANGE	UNITS
1	A1069	UPPER WIND SPEED	0 - 60 MPH
2	A1183	LOWER WIND SPEED	0 - 60 MPH
3	A1075	UPPER WIND DIRECTION-FROM	0 - 540 DEG
4	A1189	LOWER WIND DIRECTION-FROM	0 - 540 DEG
5	A1200	DELTA TEMPERTURE	-4 - +8 DEG C
6	A0638	SIGMA THETA	0 - 100 DEG
7	A1218	AMBIENT TEMPERATURE	-20 - +40 DEG C
8	A0757	DEW POINT	-30 - +30 DEG C
9	P0595	PRECIP. DURING LAST 15 MIN	0 - 1 INCH
10	A0147	CONT. PRESS. TRAIN A	-5 - +60 PSIG
11	A0665	CONT. PRESS. TRAIN B	-5 - +60 PSIG
12	A0829	EMF51A IN CONT. HI RANGE	1.0E0 - 1.0E8 R/HR
13	A0835	EMF51B IN CONT. HI RANGE	1.0E0 - 1.0E8 R/HR
14	A1009	EMF36HH UNIT VENT GAS HI HI	1.0E0 - 1.0E8 R/HR
15	A0018	EMF36H UNIT VENT GAS HI	1.0E1 - 1.0E6 CPM
16	A0012	EMF36L UNIT VENT GAS LO	1.0E1 - 1.0E7 CPM
17	A0049	EMF37 UNIT VENT IODINE	1.0E1 - 1.0E7 CPM
18	A0019	EMF35H UNIT VENT PART. HI	1.0E1 - 1.0E6 CPM
19	A0863	UNIT VENT STACK FLOW	0 - 1.62E5 CFM
20	A0013	EMF35L UNIT VENT PART. LO	1.0E1 - 1.0E7 CPM
21	A0055	EMF38L CONT. PART. LO	1.0E1 - 1.0E7 CPM
22	A0061	EFM38H CONT. PART. HI	1.0E1 - 1.0E6 CPM
23	A1368	EMF24 STEAMLINE A RAD. MON.	1.0E-2 - 1.0E+3 R/HR
24	A1374	EMF25 STEAMLINE B RAD. MON.	1.0E-2 - 1.0E+3 R/HR
25	A1380	EMF26 STEAMLINE C RAD. MON.	1.0E-2 - 1.0E+3 R/HR
26	A1386	EMF27 STEAMLINE D RAD. MON.	1.0E-2 - 1.0E+3 R/HR
27	P0612	MAIN STEAM RELEASE - START TIME	HH.00
28	P0613	MAIN STEAM RELEASE - STOP TIME	HH.00
29	A1107	STEAM GEN A STEAM PRESS. I	0 - 1300 PSIG
30	A1022	STEAM GEN A STEAM PRESS. II	0 - 1300 PSIG
31	A1028	STEAM GEN A STEAM PRESS. IV	0 - 1300 PSIG
32	A1113	STEAM GEN B STEAM PRESS. I	0 - 1300 PSIG
33	A1023	STEAM GEN B STEAM PRESS. II	0 - 1300 PSIG
34	A1029	STEAM GEN B STEAM PRESS. III	0 - 1300 PSIG
35	A1119	STEAM GEN C STEAM PRESS. I	0 - 1300 PSIG
36	A1024	STEAM GEN C STEAM PRESS. II	0 - 1300 PSIG
37	A1030	STEAM GEN C STEAM PRESS. III	0 - 1300 PSIG
38	A1125	STEAM GEN D STEAM PRESS. I	0 - 1300 PSIG
39	A1025	STEAM GEN D STEAM PRESS. II	0 - 1300 PSIG
40	A1031	STEAM GEN D STEAM PRESS. IV	0 - 1300 PSIG
41	P0596	S/G A MAIN STEAM RELEASED DURING LAST 15 MIN	LBM
42	P0597	S/G B MAIN STEAM RELEASED DURING LAST 15 MIN	LBM
43	P0598	S/G C MAIN STEAM RELEASED DURING LAST 15 MIN	LBM
44	P0599	S/G D MAIN STEAM RELEASED DURING LAST 15 MIN	LBM

ACCIDENT TYPES

CONTAINMENT RELEASE

1. LOCA -- Release of reactor coolant activity to the containment. No core damage expected.
2. COREMELT -- Significant damage to the fuel caused by insufficient heat removal from the core.

STEAM RELEASE

1. NORMAL PRIMARY COOLANT --
The water leaking from the primary system to the secondary system contains only normal reactor coolant activity.
2. IODINE SPIKED PRIMARY COOLANT --
The water leaking from the primary to the secondary system contains activity characteristic of an iodine spike in addition to normal coolant activity.
3. CORE DAMAGE --
The water leaking from the primary to the secondary system contains activity characteristic of core damage in the primary system.

VENT RELEASE

1. LOCA -- The discharge air from the unit vent has isotopic content characteristic of containment leakage into the annulus or auxiliary building following a loss of reactor coolant with no fuel damage.
2. LOCA THROUGH CHARCOAL FILTER --
Same as 1 above except iodine is expected to be filtered with a 99% removal efficiency before release through the unit vent (VA and VE charcoal filters are working properly).
3. CORE DAMAGE --
Same as 1 above except fuel damage is expected inside the containment building (no iodine filtering).
4. CORE DAMAGE THROUGH CHARCOAL FILTER --
Same as 3 above except with the VA and VE charcoal filters operating properly.

5. TUBE RUPTURE --

The discharge air from the unit vent has isotopic content characteristic of a tube rupture accident (air ejector discharge to unit vent).

6. NEW FUEL ACCIDENT --

The discharge air from the unit vent has isotopic content characteristic of a spent fuel handling accident with the fuel damaged having decayed less than 100 days.

7. OLD FUEL ACCIDENT --

Same as 6 above except fuel damaged having decayed more than 100 days.

8. GAS DECAY TANK --

The discharge air from the unit vent has isotopic content characteristic of a gas decay tank rupture.

EXPLANATION OF CLASS A MODEL PRINT-OUT

The first part of the print-out of the Class A Model consists of a map of the 10-mile EPZ. The rings affected by the plume (in the form of whole-body dose) is shown on the map. A "+" is used for those rings affected only during the current time steps. A "*" is used for those rings affected during the input time steps and the 2-hour projection. A "0" is used for those rings affected during the 2-hour projection only.

The input parameters are summarized after the map has been printed. The output values consist of a CENTERLINE CONDITIONS table and a RECEPTOR CONDITIONS table for each of the input time steps and for the end of the 2-hour projection. These tables are more fully explained below.

CENTERLINE CONDITIONS Table:

The CENTERLINE CONDITIONS table(s) consists of twelve (12) columns and eleven (11) rows (one for each ring distance). The twelve columns are explained below:

1. RING DISTANCE (miles) -- self-explanatory.
2. X (miles) -- the actual x-coordinate of the centerline of the plume for that ring distance (miles).
3. Y (miles) -- the actual y-coordinate of the centerline of the plume for that ring distance (miles).
4. Z (m) -- the vertical distance from the plume centerline to the ground (for ground releases, $z = 0.0$) (meters).
5. SGM Y (m) -- the standard deviation of the plume concentration in the horizontal direction at the plume centerline (meters).
6. SGM Z (m) -- the standard deviation of the plume concentration in the vertical direction at the plume centerline (meters).
7. Xel33 eq CONC-ELEV (C_i/m) -- the Xel33 equivalent concentration at the plume centerline (curies/meter).
8. WHOLE BODY DOSE RATE-GR (Rem/hr) -- the whole body dose rate directly below the plume centerline (or at the plume centerline for ground releases) at the ring (rem/hr).

$$\text{For } z = 0: \text{ WBDR} = 33.6 * \text{Xel33 eq Conc} * [1 - \exp(-.01 * R)]$$

$$\text{For } z > 0: \text{ WBDR} = 33.6 * \text{Xel33 eq Conc} * [1 - \exp(-.01 * R)] * [1 - \exp(-\text{sgm } z / z)]$$

NOTE: $R = \text{sqrt}(\text{sgm } y * \text{sgm } z)$.

9. I131 eq CONC-ELEV (Ci/m) -- the I131 equivalent concentration at the plume centerline (curies/meter).

10. THYROID DOSE RATE-ELEV (Rem/hr) -- the child thyroid dose rate at the plume centerline (rem/hr).

$$\text{TDR-ELEV} = 2.26\text{E}+06 * \text{I131 eq Conc-elev}$$

11. I131 eq CONC-GR (Ci/m) -- the I131 equivalent concentration directly below the plume centerline at the ring (curies/meter).

12. THYROID DOSE RATE-GR (Rem/hr) -- the child thyroid dose rate directly below the plume centerline at the ring (rem/hr).

$$\text{TDR-GR} = 2.25\text{E}+06 * \text{I131 eq Conc-gr}$$

The CENTERLINE CONDITIONS table will be printed for every input data record of the run and for the last 15-minute record of the 2-hour projection.

RECEPTOR CONDITIONS Table:

The RECEPTOR CONDITIONS table(s) consists of five (5) columns and a minimum of eleven (11) rows (one for each ring distance). The five columns are explained below:

1. RING DISTANCE (miles) -- self-explanatory.
2. X (miles) -- the actual x-coordinate of the receptor affected by the plume for that ring distance (miles).
3. Y (miles) -- the actual y-coordinate of the receptor affected by the plume for that ring distance (miles).
4. PRESENT (or PROJECTED) WHOLE BODY TOTAL DOSE-GR (Rem) -- the whole body total dose at the receptor for either the input data records (one for all records together) or for the end of the 2-hour projection (NOTE: the 2-hour projection DOES NOT INCLUDE THE INPUT DATA RECORD(S)).
5. PRESENT (or PROJECTED) THYROID TOTAL DOSE-GR (Rem) -- the child thyroid dose at the receptor for either the input data record(s) (one for all records together) or for the end of the 2-hour projection (NOTE: the 2-hour projection DOES NOT INCLUDE THE INPUT DATA RECORD(S)).

A row will be printed for each ring distance and each receptor on that ring that is affected by the plume. All receptors that have a whole body dose rate greater than or equal to 1% of the centerline-ground whole body dose rate will be shown in the receptor table (the receptor whole body dose may be due to "shine"). All receptors that have a thyroid dose will also be shown in the table.

EXAMPLE @ MMS VAX

System Rev-1.0 VAX/VMS Rev 4.1

Username: METTSC
Password:

You have 5 new Mail messages.

%AISLOGIN-I-LASTACC METTSC, METO, last accessed in Interactive mode
at 23-AUG-1985 15:30:12.94

Welcome to VAX/VMS - Duke Power Company - Node _MCG::

PRODUCTION Login Procedure.
PRODUCTION Login Procedure Completed.

ENTER COMMAND: RUN

Is This A Drill (Y/N): Y

1. MCGUIRE - UNIT 1
2. MCGUIRE - UNIT 2

ENTER NUMBER FOR STATION/UNIT:1

AVAILABLE DATA TYPES:

1. MANUAL
2. CURRENT

ENTER NUMBER FOR DATA TYPE:1

DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):Y

DEFAULT VALUES:

(METER)

- | | |
|-------------------------------------|--------------|
| 1. STACK DIAMETER | 2.13 |
| 2. STACK HEIGHT | 40.00 |
| 3. SOURCE X-COORDINATE | 0.000000E+00 |
| 4. SOURCE Y-COORDINATE | 0.000000E+00 |
| 5. SOURCE Z-COORDINATE | 2.360000E+02 |
| 6. MIXING HEIGHT | 1000.00 |
| 7. MAXIMUM ADJACENT BUILDING HEIGHT | 43.00 |
| 8. MAXIMUM ADJACENT BUILDING WIDTH | 40.00 |
| 9. RING RADIUS(1) | 8.046500E+02 |
| 10. RING RADIUS(2) | 1.609300E+03 |

11. RING RADIUS(3)	3.218600E+03
12. RING RADIUS(4)	4.827900E+03
13. RING RADIUS(5)	6.437200E+03
14. RING RADIUS(6)	8.046500E+03
15. RING RADIUS(7)	9.655800E+03
16. RING RADIUS(8)	1.126510E+04
17. RING RADIUS(9)	1.287460E+04
18. RING RADIUS(10)	1.448370E+04
19. RING RADIUS(11)	1.609300E+04

DO YOU WISH TO CHANGE ANY DEFAULT PARAMETERS? Y/N:Y

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:2

ENTER THE NEW VALUE FOR STACK HEIGHT :60

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:7

ENTER THE NEW VALUE FOR MAXIMUM ADJACENT BUILDING HEIGHT:60

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:8

ENTER THE NEW VALUE FOR MAXIMUM ADJACENT BUILDING WIDTH :189

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:END

DEFAULT VALUES:

(METER)

1. STACK DIAMETER	2.13
2. STACK HEIGHT	60.00
3. SOURCE X-COORDINATE	0.000000E+00
4. SOURCE Y-COORDINATE	0.000000E+00
5. SOURCE Z-COORDINATE	2.360000E+02
6. MIXING HEIGHT	1000.00
7. MAXIMUM ADJACENT BUILDING HEIGHT	60.00
8. MAXIMUM ADJACENT BUILDING WIDTH	189.00
9. RING RADIUS(1)	8.046500E+02
10. RING RADIUS(2)	1.609300E+03
11. RING RADIUS(3)	3.218600E+03
12. RING RADIUS(4)	4.827900E+03
13. RING RADIUS(5)	6.437200E+03
14. RING RADIUS(6)	8.046500E+03
15. RING RADIUS(7)	9.655800E+03
16. RING RADIUS(8)	1.126510E+04
17. RING RADIUS(9)	1.287460E+04
18. RING RADIUS(10)	1.448370E+04
19. RING RADIUS(11)	1.609300E+04

DO YOU WISH TO CHANGE ANY DEFAULT PARAMETERS? Y/N:N

ENTER DATE (YYMMDD):850826

ENTER TIME (HH.MM) ex:(02.33):11.15

ENTER WIND SPEED (MPH):2

ENTER WIND DIRECTION (DEG) -FROM:90

RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER DELTA TEMPERATURE (DEG C):1.5

ENTER AMBIENT TEMPERATURE (DEG C):15

ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :2.62

ENTER I131eq/XE133eq RATIO:0.00532

ENTER TIME SINCE SHUTDOWN (HOURS):2

ENTER PRECIPITATION (INCHES):0

ENTER THE NUMBER OF TIME PERIODS:1

DO YOU WANT TO CREATE ANY MORE RECORDS? (Y/N):N

AVAILABLE TYPES OF PROJECTED DATA:

1. FORECASTED
2. PERSISTANT

ENTER THE OPTION NUMBER YOU WANT THE TWO
HOURS OF PROJECTED DATA TO BE:1

ENTER WIND SPEED (MPH):2

ENTER WIND DIRECTION (DEG) -FROM:90

RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER DELTA TEMPERATURE (DEG C):1.5

ENTER AMBIENT TEMPERATURE (DEG C):15

ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :0

ENTER I131eq/XE133eq RATIO:0.00532

ENTER TIME SINCE SHUTDOWN (HOURS):2.25

ENTER PRECIPITATION (INCHES):0

ENTER THE NUMBER OF TIME PERIODS:8

THE INPUT FILE FOR THE CLASS A DISPLAY MODEL HAS BEEN CREATED.

CLASS A MODEL - INITIAL REPORT

MCG NUCLEAR STATION UNIT 1 DATE 08/26/85 TIME 11.15

TIME SINCE TRIP/SHUTDOWN 2.0 HRS.

METEOROLOGY

WIND SPEED 2.0 MPH

WIND DIRECTION (FROM) 90

AMBIENT TEMP 15.0 C

DELTA TEMP 1.5 C STABILITY CLASS G

SOURCE TERM

XE-133 $\epsilon\gamma$ RELEASE RATE: 2.62000E+00 Ci/s I-131 $\epsilon\gamma$ RELEASE RATE 1.39384E-02 Ci/s

THE MODEL IS RUNNING.....

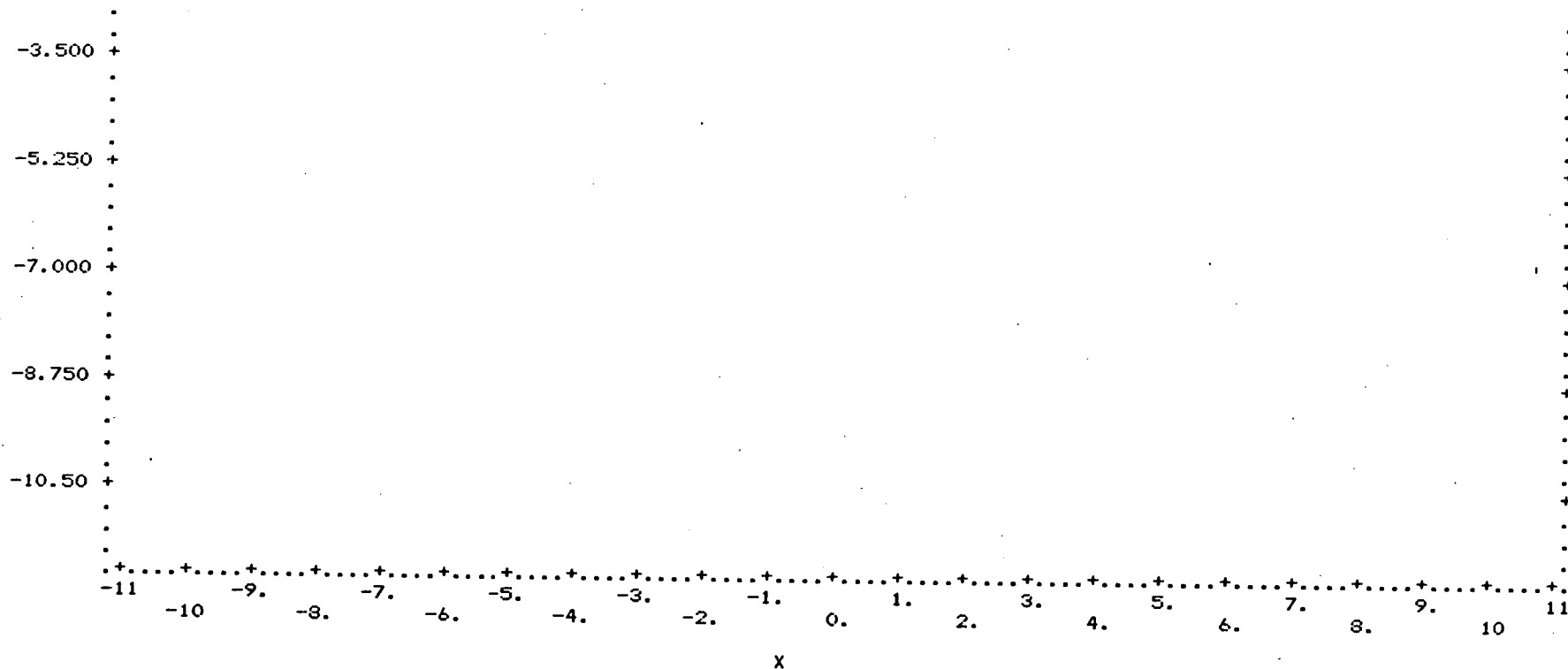
Now running 6D ...

BMDP STOP

All done.

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
REVIEW - TO SEE THE INPUT DATA
RELEASE - TO SEND THE REPORT
RETRIEVE - TO SEE OAC DATA



VARIABLE 1 X VERSUS VARIABLE 2 Y SYMBOL=+
 VARIABLE 1 X VERSUS VARIABLE 3 Y_PROJ SYMBOL=0

CLASS A MODEL OUTPUT

MCG NUCLEAR STATION UNIT 1 DATE 08/26/85 TIME 11.15

INPUT PARAMETERS:

TIME SINCE TRIP/SHUTDOWN 2.0 hrs WIND DIRECTION FROM 90 WIND SPEED 2.0 mph

DELTA TEMP: 1.5 C AMB TEMP: 15.0 C VENT FLOW: 0.00000E+00 cfm

RELEASE RATE Xe133 eq 2.62000E+00 Ci/s I131 eq 1.39384E-02 Ci/s

THIS DATA COMES FROM THE TSC/CMC. THIS IS THE LAST 15 MINUTE AVERAGE FORECAST DATA.

OUTPUT VALUES:

CENTERLINE CONDITIONS TIME: 11.15

RING DISTANCE (miles)	X (miles)	Y (miles)	Z (m)	SGM Y (m)	SGM Z (m)	Xe133 eq CONC-ELEV 3 (Ci/m)	WHOLE BODY DOSE RATE-GR (Rem/hr)	I131 eq CONC-ELEV 3 (Ci/m)	THYROID DOSE RATE-ELEV (Rem/hr)	I131 eq CONC-GR 3 (Ci/m)	THYROID DOSE RATE-GR (Rem/hr)
0.5	- 0.50	0.00	0.0	32.0	13.8	4.03E-04	2.574E-03	2.142E-06	4.842E+00	2.12E-06	4.780308E+00
1.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
2.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
3.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
4.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
5.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
6.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
7.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
8.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
9.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
10.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00

RECEPTOR CONDITIONS

RING DISTANCE	X (miles)	Y (miles)	PRESENT WHOLE BODY TOTAL DOSE-GR (Rem)	PRESENT THYROID TOTAL DOSE-GR (Rem)
0.5	- 0.38	- 0.32	9.97E-06	0.00E+00
	- 0.43	- 0.25	2.75E-05	0.00E+00
	- 0.46	- 0.17	7.76E-05	0.00E+00
	- 0.49	- 0.09	2.23E-04	6.74E-05

	- 0.50	0.00	6.44E-04	1.20E+00
	- 0.49	0.08	2.23E-04	6.74E-05
	- 0.46	0.17	7.76E-05	0.00E+00
	- 0.43	0.25	2.75E-05	0.00E+00
	- 0.38	0.32	9.97E-06	0.00E+00
1.0				
2.0				
3.0				
4.0				
5.0				
6.0				
7.0				
8.0				
9.0				
10.0				

CENTERLINE CONDITIONS -PROJECTED TWO HOURS

RING DISTANCE (miles)	X (miles)	Y (miles)	Z (m)	SGM Y (m)	SGM Z (m)	Xe133 eq CONC-ELEV ₃ (Ci/m)	WHOLE BODY DOSE RATE-GR (Rem/hr)	I131 eq CONC-ELEV ₃ (Ci/m)	THYROID DOSE RATE-ELEV (Rem/hr)	I131 eq CONC-GR ₃ (Ci/m)	THYROID DOSE RATE-GR (Rem/hr)
0.5	0.00	0.00	0.0	32.0	13.8	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
1.0	0.00	0.00	0.0	60.3	21.7	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
2.0	0.00	0.00	0.0	99.7	30.3	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
3.0	0.00	0.00	0.0	120.5	32.8	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
4.0	4.00	0.00	0.0	143.2	35.0	1.53E-04	2.614E-03	8.149E-07	1.842E+00	8.15E-07	1.841572E+00
5.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
6.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
7.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00

8.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
9.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
10.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00

RECEPTOR CONDITIONS

RING DISTANCE	X (miles)	Y (miles)	PROJECTED WHOLE BODY TOTAL DOSE-GR (Rem)	PROJECTED THYROID TOTAL DOSE-GR (Rem)
0.5	- 0.38	- 0.32	4.20E-05	0.00E+00
	- 0.43	- 0.25	1.16E-04	0.00E+00
	- 0.46	- 0.17	3.27E-04	0.00E+00
	- 0.49	- 0.08	9.37E-04	3.90E-04
	- 0.50	0.00	2.71E-03	5.04E+00
	- 0.49	0.08	9.37E-04	3.90E-04
	- 0.46	0.17	3.27E-04	0.00E+00
	- 0.43	0.25	1.16E-04	0.00E+00
	- 0.38	0.32	4.20E-05	0.00E+00
	1.0	- 0.93	- 0.34	5.49E-05
- 0.98		- 0.17	3.12E-04	4.50E-05
- 1.00		0.00	1.79E-03	2.11E+00
- 0.98		0.17	3.12E-04	4.50E-05
- 0.93		0.34	5.49E-05	0.00E+00
2.0	- 1.96	- 0.34	6.64E-05	0.00E+00
	- 2.00	0.00	1.10E-03	9.32E-01
	- 1.96	0.34	6.64E-05	0.00E+00
3.0	- 2.95	- 0.52	2.03E-05	0.00E+00
	- 2.99	0.00	9.19E-04	7.05E-01
	- 2.95	0.52	2.03E-05	0.00E+00
4.0	- 4.00	0.00	7.84E-04	5.52E-01
5.0				
6.0				

7.0

8.0

9.0

10.0

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
REVIEW - TO SEE THE INPUT DATA
RELEASE - TO SEND THE REPORT
RETRIEVE - TO SEE OAC DATA
END - TO RETURN TO COMMAND LEVEL

ENTER OPTION: END

ENTER COMMAND: LO

METTSC logged out at 26-AUG-1985 11:24:13.04

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 7

"Class A Model for Oconee Nuclear Station"

R E Harris

Approved By

8/11/87

Date

Rev. 1
February 17, 1986

OVERVIEW OF CLASS A MODEL

The Class A Model is a series of computer programs developed to calculate release rates (optional), atmospheric dispersion, and off-site doses from accidental airborne releases.

Data is input to the program either manually or from the OAC. In both cases, a 15-minute average for the data is assumed.

Accidental airborne releases may originate from three locations: containment, steam lines, and unit vent. The Class A Model allows manual entry of release rate information or may calculate the release rate based on monitor readings and correlation curves developed from time-dependent, accident-specific radionuclide mixes. In all cases, the noble gas release rate is a Xe133 equivalent release rate (Ci/sec); the radioiodine release rate is an I131 equivalent release rate (Ci/sec). No particulate releases are considered in the program.

The atmospheric dispersion is calculated by using a puff advection model which assumes a gaussian concentration distribution for each puff generated. A sufficient number of puffs are generated to approximate a continuous release for each data set input in the program. The dispersion is based on the stability class (A, B-C, D, E, F, or G), wind speed, and wind direction (terrain effects are considered). For conservatism, all releases are considered to be ground releases. The dispersion parameters may be varied in the program. Ocone is situated in a river valley, and, therefore, special consideration must be given to the terrain effects on atmospheric dispersion. A description is given in the APPENDIX for the special considerations.

The whole-body dose (and dose rate) at the centerline of the plume and at predetermined receptors (36 receptors are evenly distributed around each of 11 rings resulting in a total of 396 receptor locations) is calculated based on the Xe133 equivalent concentration at the plume centerline at each ring and using a finite plume correction which is based on the dispersion coefficients at that ring. The child thyroid dose (and dose rate) at the centerline of the plume and at the predetermined receptors is calculated based on the I131 equivalent concentration at the the plume centerline and at the receptors.

I. LOGON PROCEDURE

The user must logon to a LA120 hard-copy terminal, or any comparable hard-copy terminal with a print line 132 characters long. Ensure that the configuration code selections are as follows:

c14 -- full duplex reverse channel ON for ready
c25 -- 1200 baud
c32 -- transmit even parity, receive parity checkoff
c83 -- transmit DC3 or BREAK on printer busy, DC1 on ready

- A. Call the appropriate number on the phone to connect your terminal to the VAX computer. The station VAX is to be used during emergencies and drills; the General Office VAX is used as a backup if the station VAX is inaccessible.

VAX Location	Phone Numbers
Catawba (831)	2801 through 2804
McGuire (875)	4050 through 4054 and 4056 through 4061
Oconee (882)	1608 through 1613
G.O. (373)	5243 through 5248

- B. When the computer answers with a high-pitch tone, press the "ORG" button on the low speed modem (or release the DA button on the RIXON modem RA212A) and hang up the phone. Release the "ORG" button.
- C. Quickly press "RETURN" twice.
- D. Terminal response: USERNAME (If the terminal does not respond, return to step A above.)
- E. User response: METTSC or METCMC
- F. Terminal response: PASSWORD
- G. User response: PASS
- H. Terminal response: the terminal will respond with a few system messages followed by: ENTER COMMAND:
- I. The system is now in "command level." The commands available are listed below:

RUN -- the program will be used to calculate release data and offsite doses
SHOW NET -- shows the VAX/VMS network status for local node
MAIL -- allows the user to send and receive messages through the VAX system for users of the Class A Model (NOTE: MAIL'DIR will list the messages received)

UTILITY -- allows the user to send system messages (all users of VAX will receive the messages).
OAC -- used to list, add, change, or delete Ocone OAC point ID data
USERS -- lists the VAX/VMS interactive users
LO -- logs the user off of the VAX system
HELP -- explains the use of the different commands

II. Running the program

A. With the system in "command level," enter RUN.

B. Terminal response:

This version is current as of 02/21/86

Is This A Drill? (Y/N):

(NOTE: If the user is signed onto the G.O. VAX, the first terminal response will be:

ENTER STATION - (MCG, OCO, CAT):

The user should respond with OCO, and the terminal will then ask: Is This A Drill? (Y/N):)

C. User response: Y or N

D. Terminal response:

1. OCONEE - UNIT 1
2. OCONEE - UNIT 2
3. OCONEE - UNIT 3

ENTER NUMBER FOR STATION/UNIT:

E. User response: enter appropriate number for the unit you need.

F. Terminal response:

AVAILABLE DATA TYPES:

1. MANUAL
2. CURRENT

ENTER NUMBER FOR DATA TYPE:

G. User response: enter the appropriate number for the data type desired.

MANUAL: the user will be prompted for a value for each parameter needed to create the input file for the model.

CURRENT: the user will be asked to select record(s) from the OAC files to be used in creating the input file for the model.

H. Terminal response:

DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):

I. User response: Y or N

If the user responds with Y, a list of default values (see APPENDIX) will be displayed. The terminal will ask if any changes are desired. If the user chooses to change a default parameter it will be changed for the duration of the current run only. If changes are made to the default values, the new values will be displayed for verification.

J. At this point, the information that the user will be responding to will be specific depending on the DATA TYPE selected in step G above. These prompts will be addressed in sections III. and IV. After the information has been input for the initial record(s), the terminal will respond with:

AVAILABLE TYPES OF PROJECTED DATA:

1. FORECASTED
2. PERSISTANT

ENTER THE OPTION NUMBER YOU WANT THE TWO HOURS OF PROJECTED DATA TO BE:

K. User response: enter the number desired. If PERSISTANT data is chosen, the program writes the last record (data set) eight (8) times for use in the projected section of the program, and the terminal response is as in step AF. below. If FORECASTED data is chosen, the program continues at step L.

L. Terminal response:

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER TOWER WIND SPEED (MPH):

M. User response: the user should enter the forecasted tower wind speed.

NOTE: The model automatically corrects the wind speed by a factor of 0.8. This corrected wind speed is used in the calculations and will be shown in the reports.

N. Terminal response:

ENTER TOWER WIND DIRECTION (DEG) -FROM:

O. User response: the user should enter the forecasted tower wind direction.

P. Terminal response:

ENTER RIVER WIND DIRECTION (DEG) -FROM:

Q. User response: the user should enter the forecasted river wind direction. For conservatism, daytime runs (1000 - 1600 Eastern Standard Time) should use a river wind direction that is the same as the tower wind direction; nighttime runs (1601 - 0959 Eastern Standard Time) should use a river wind direction between 70 and 210 (inclusive) so that drainage conditions are assumed.

NOTE: If, based on time-of-day and river wind direction, drainage flow conditions exist (see APPENDIX), the terminal will respond as in step T below.

R. Terminal response:

ENTER DELTA TEMPERATURE (DEG C):

S. User response: the user should enter the forecasted temperature gradient.

T. Terminal response:

ENTER AMBIENT TEMPERATURE (DEG C):

U. User response: the user should enter the forecasted ambient temperature.

V. Terminal response:

ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :

W. User response: the user should enter the forecasted Xel33 eq. release rate. If the release is not expected to continue more than 15 minutes, or if it is desired to get a prompt estimate of the dose from a short-term release, this value may be set to zero (0).

X. Terminal response:

ENTER I131eq/XE133eq RATIO:

Y. User response: the user should enter the forecasted ratio of I131 eq. release rate to the Xel33 eq. release

rate. If the Xe133 eq. release rate has been set to zero (0), this ratio should be set to the same value as the initial ratio so that the I131 eq. concentration and the child thyroid dose rate from the initial release will be calculated.

Z. Terminal response:

ENTER TIME SINCE SHUTDOWN (HOURS):

AA. User response: the user should enter the time since shutdown.

AB. Terminal response:

ENTER PRECIPITATION (INCHES):

AC. User response: the user should enter the forecasted precipitation (in inches) for a 15 minute time period.

AD. Terminal response:

ENTER THE NUMBER OF TIME PERIODS:

AE. User response: the user may input 1 through 8 for the number of 15 minute time periods the forecasted data will be used. If the user inputs less than 8, the prompts (L - AD) will be repeated until 8 forecasted periods have been input.

AF. Terminal response:

THE INPUT FILE FOR THE CLASS A DISPLAY MODEL HAS BEEN CREATED.

The terminal will then display an initial report for each record:

CLASS A MODEL - INITIAL REPORT

OCO NUCLEAR STATION UNIT # DATE mm/dd/yy TIME hh.mm

TIME SINCE TRIP/SHUTDOWN #.# HRS.

METEOROLOGY

WIND SPEED #.# MPH WIND DIRECTION (FROM) ###

AMBIENT TEMP ##.# C DELTA TEMP #.# C STABILITY CLASS _____

SOURCE TERM

XE-133eq RELEASE RATE: #.##E+## Ci/s I-131eq RELEASE RATE #.##E+## Ci/s

The terminal will then display the following message:

THE MODEL IS RUNNING.....

After the model has run, the map generating program is run and the following messages are displayed:

Now running 6D ...

All done.

ZNONAME-W-NOMSG, Message number 00000000

ZNONAME-W-NOMSG, Message number 00000000

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
REVIEW - TO SEE THE INPUT DATA
RELEASE - TO SEND THE REPORT
RETRIEVE - TO SEE OAC DATA
END - TO RETURN TO COMMAND LEVEL
ENTER OPTION:

- AG. User response: the user should input the desired option. The report is explained in the APPENDIX. Releasing the report will send it to all other users of the program (including NRC and state agencies). After the CMC has signed onto the station VAX, the TSC does not have the capability of sending any reports; only the CMC will be allowed to send reports.

III. Processing MANUAL DATA

The user will need to enter all the data values requested by the terminal prompt.

- A. Terminal response:

ENTER DATE (YYMMDD):

- B. User response: enter date in the correct format.

- C. Terminal response:

ENTER TIME (HH.MM) ex:(02.33):

- D. User response: enter time of run in the correct format.

- E. Terminal response:

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER TOWER WIND SPEED (MPH):

F. User response: the user should enter the initial tower wind speed. If tower information is unavailable, use river information.

G. Terminal response:

ENTER TOWER WIND DIRECTION (DEG) -FROM:

H. User response: the user should enter the initial tower wind direction. If tower information is unavailable, use river information.

I. Terminal response:

ENTER RIVER WIND DIRECTION (DEG) -FROM:

J. User response: the user should enter the initial river wind direction. If the river wind direction is unknown, daytime runs (1000 - 1600 Eastern Standard Time) may use a river wind direction the same as the tower wind direction; nighttime runs (1601 - 0959 Eastern Standard Time) should use a river wind direction between 70 and 210 (inclusive) so that drainage conditions are assumed.

NOTE: If, based on time-of-day and river wind direction, drainage flow conditions exist (see APPENDIX), the terminal will respond as in step M below.

K. Terminal response:

ENTER DELTA TEMPERATURE (DEG C):

L. User response: the user should enter the initial temperature gradient.

M. Terminal response:

ENTER AMBIENT TEMPERATURE (DEG C):

N. User response: the user should enter the initial ambient temperature.

O. Terminal response:

ENTER XE133 eq. RELEASE RATE (CI/SEC) (ex:1E+06) :

P. User response: the user should enter the initial Xel33 eq. release rate.

Q. Terminal response:

ENTER I131eq/XE133eq RATIO:

- R. User response: the user should enter the initial ratio of 1131 eq. release rate to the Xel33 eq. release rate.
- S. Terminal response:
ENTER TIME SINCE SHUTDOWN (HOURS):
- T. User response: the user should enter the time since shutdown.
- U. Terminal response:
ENTER PRECIPITATION (INCHES):
- V. User response: the user should enter the initial precipitation (in inches) for a 15 minute time period.
- W. Terminal response:
ENTER THE NUMBER OF TIME PERIODS:
- X. User response: the user may input any number for the number of 15 minute time periods the initial data will be used.
- Y. Terminal response:
DO YOU WANT TO CREATE ANY MORE RECORDS? (Y/N):
- Z. User response: Y or N
If Y, the same prompts (E - Y) will be displayed; otherwise, the terminal will then display the prompt in step II.J above.

IV. Processing CURRENT DATA

The user will have to input certain items depending on the availability of parameters from the OAC files. For example: if tower wind speed is available from the OAC data, it is used; if there is no tower wind speed, river wind speed is checked for a value. If there is no river wind speed, the terminal will prompt the user to manually input the data value for tower wind speed.

- A. An index of all current OAC records will be displayed at the terminal. This index lists the date and time of each OAC record. The terminal then prompts:

ENTER RECORD NUMBER OR END:

- B. User response: enter, one at a time, the record number of each OAC record you want as input the the model. Each choice will be processed separately and represent one 15-minute record in the file. When you have

entered all the records you want for the current run, enter END.

- C. Terminal response: DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):
- D. User response: Y or N
If the user responds with Y, a list of default values (see APPENDIX) will be displayed. The terminal will ask if any changes are desired. If the user chooses to change a default parameter it will be changed for the duration of the current run only. If changes are made to the default values, the new values will be displayed for verification.
- E. Terminal response:
A list of the 36 OAC parameters (see APPENDIX) will be displayed along with their current values. (NOTE: Numbers 13 - 16 are not listed since they correspond to the other two units containment high range area monitors.)
DO YOU WANT ENTER/CHANGE ANY VALUE? (Y/N):
- F. User response: Y or N
If "Y", the line number and new value are requested. If values are changed in a record, the OAC parameters along with their new values will be redisplayed for verification when END is entered. If the current or new value is outside of the acceptable range of the parameter, '*'s will be printed in the value column to show that the value is not acceptable. Monitor data that are not yet available on the plant computer are indicated by a '*' appearing as part of the description (see APPENDIX). The program requires that as much of this data be furnished/corrected by the user as possible prior to running the model.
- G. Terminal response:
ENTER TIME SINCE SHUTDOWN IN HOURS. (ex:2.5):
- H. User response: enter the time since shutdown.
- I. Terminal response:
CONTAINMENT? (Y/N):
- J. User response: Y or N
If a containment release is occurring, or may occur, answer Y, and additional information will be required. If N, the terminal response will be as in step W below.

K. Terminal response:

CONTAINMENT RELEASE

1. LOCA
2. COREMELT

ENTER NUMBER OF ACCIDENT FOR CONTAINMENT RELEASE:

L. User response: enter the number of the appropriate accident type (see APPENDIX).

M. Terminal response:

ENTER CONTAINMENT VOLUME LEAK RATE, (ml/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

N. User response: enter containment volume leak rate, if available, and continue at step Q.

O. Terminal response: if the user has not entered a leak rate,

DO YOU WANT TO USE DESIGN VOLUME LEAK RATE?
RATE=1.57E+03 (Y/N):

P. User response: Y or N

If Y, the design volume leak rate which is the leak rate corresponding to a design pressure of 60 psig will be used (this may be used if the pressure instrumentation is not functioning and the pressure is considered to be no greater than 60 psig); otherwise, the highest containment pressure reading will be used to calculate the leak rate from containment. When the pressure is too large, the following message will be displayed:

PRESSURE ABOVE DESIGN PRESSURE.

The user will have one last chance to input the leak rate manually, if this option is not taken, the containment volume leak rate will be set to zero (0) and the terminal session will continue at step W.

Q. Terminal response:

ENTER THE FRACTION OF CONTAINMENT LEAKAGE THAT WILL BYPASS THE PEN. RM. OR AUXILIARY BUILDING GOING DIRECTLY TO THE ENVIRONMENT (EX: DESIGN VALUE IS 0.5):

R. User response: enter the bypass leakage fraction.
NOTE: if the input fraction is less than 1, then the VENT RELEASE option must also be used in order to account for the remaining containment leakage fraction.

S. Terminal response:

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR
CONTAINMENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

T. User response: if a gas sample has been taken, enter
the Xel33 equivalent concentration; otherwise, the
monitors and appropriate correlations will be used.

NOTE: If no release rates or concentrations are input,
the following message is printed and the model continues
at step W:

NO INPUT DATA WAS PROVIDED FOR CONTAINMENT RELEASE CALCULATIONS.
PROGRAM ASSUMES CONTAINMENT RELEASE RATE = 0.

U. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR
CONTAINMENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

V. User response: if a gas sample has been taken, enter
the I131 equivalent concentration; otherwise, the Xel33
equivalent concentration and the assumed I/Xe ratio
(based on time since shutdown and accident type) will
be used to calculate the concentration.

W. Terminal response:

STEAM? (Y/N):

X. User response: Y or N

If a steam release is occurring, or may occur, answer Y,
and additional information will be required. If N, the
terminal response will be as in step AK below.

Y. Terminal response:

STEAM RELEASE

IN COMPUTING THE STEAM RELEASE RATE
TWO OPTIONS ARE AVAILABLE.

1. CURRENT RELEASE VALUES
2. THE MASS RELEASE RATE TABLE WHICH READS:

NOTICE

FOR OPTIONAL INFORMATION IN DETERMINING THE MASS RELEASE

A. FOR A DOUBLE ENDED STEAM GENERATOR TUBE
RUPTURE WITH THE TURBINE BYPASS VALVES OPEN,
THE DESIGN MASS RELEASE RATE WOULD BE:

TIME FOLLOWING REACTOR
AND TURBINE TRIP
FROM 100% POWER

MASS RELEASE RATE
PER MAIN STEAM LINE
(LBM/SEC)

0 - 15 MIN
> 15 MIN

30 (LBM/SEC)
10 (LBM/SEC)

B. FOR A DOUBLE ENDED STEAM GENERATOR TUBE RUPTURE
WITH THE TURBINE BYPASS VALVES CLOSED,

THE DESIGN MASS RELEASE RATE WOULD BE:

TIME FOLLOWING REACTOR
AND TURBINE TRIP
FROM 100% POWER

MASS RELEASE RATE
PER MAIN STEAM LINE
(LBM/SEC)

0 - 15 MIN
> 15 MIN

60 (LBM/SEC)
30 (LBM/SEC)

VALID OPTION CHOICES ARE 1 OR 2
ENTER YOUR CHOICE----->

Z. User response: enter either a "1" (which uses the OAC
data for mass released and continues at step AE) or a
"2" (continues at step AA)

AA. Terminal response:

ENTER STEAMLINE MASS RELEASE RATE 1, (lbm/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

AB. User response: using the above tables, enter the steam-
line mass release rate; otherwise, hit return.

AC. Terminal response:

ENTER STEAMLINE MASS RELEASE RATE 2, (lbm/sec) ex:(1E+01),
IF NOT AVAILABLE, HIT RETURN:

AD. User response: using the above tables, enter the steam-
line mass release rate; otherwise, hit return.

NOTE: If no mass release rates are input, the following
message is printed and the model continues at step AS:

NO INPUT DATA WAS PROVIDED FOR STEAM RELEASE CALCULATIONS.
PROGRAM ASSUMES STEAM RELEASE RATE = 0.

AE. Terminal response:

1. NORMAL PRIMARY COOLANT
2. IODINE SPIKED PRIMARY COOLANT
3. CORE DAMAGE

ENTER NUMBER OF ACCIDENT FOR STEAM RELEASE:

AF. User response: enter either a "1", "2", or a "3" (see APPENDIX)

AG. Terminal response:

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR STEAMLINE 1, (uCi/cc) ex:(1E-01), IF NOT AVAILABLE, HIT RETURN:

AH. User response: if a sample has been taken, enter the Xel33 equivalent concentration; otherwise, hit return.

AI. Terminal response:

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR STEAMLINE 2, (uCi/cc) ex:(1E-01), IF NOT AVAILABLE, HIT RETURN:

AJ. User response: if a sample has been taken, enter the Xel33 equivalent concentration and continue at step AM; otherwise, hit return.

AK. Terminal response:

IN COMPUTING THE XE133 EQ CONCENTRATIONS TWO OPTIONS ARE AVAILABLE.

1. CURRENT RIA 16 AND 17 VALUES
2. THE XE133 EQ CONCENTRATIONS TABLE WHICH READS: THE FOLLOWING INFORMATION IS PROVIDED TO AID THE USER IN DETERMINING THE RADIOACTIVE CONCENTRATIONS IN THE STEAM RELEASE:

FOR NORMAL ACTIVITY IN REACTOR COOLANT SYSTEM

<u>TIME OF RELEASE</u>	<u>XE133 EQ CONCENTRATION IN STEAM LINE (uCi/ml) NORMALIZED TO 1 GPM TUBE LEAK RATE</u>	<u>XE133 EQ (uCi/ml) DOUBLE ENDED TUBE RUPTURE (400 GPM)</u>
0 - 60 SEC	6.50E-04	0.26
60 - 120 SEC	2.89E-03	1.16
2 - 15 MIN	8.67E-03	3.47
15 - 30 MIN	7.08E-03	2.83
30 - 60 MIN	6.20E-03	2.48
1 - 2 HR	5.31E-03	2.12
> 2 HR	4.43E-03	1.77

FOR 1% FAILED FUEL ACTIVITIES IN REACTOR COOLANT

<u>TIME OF RELEASE</u>	<u>XE133 EQ CONCENTRATION IN STEAM LINE (uCi/ml) NORMALIZED TO 1 GPM TUBE LEAK RATE</u>	<u>XE133 EQ (uCi/ml) DOUBLE ENDED TUBE RUPTURE (400 GPM)</u>
------------------------	---	--

0 -	60 SEC	6.29E-03	2.25
60 -	120 SEC	2.80E-02	11.2
2 -	15 MIN	8.39E-02	33.6
15 -	30 MIN	7.97E-02	31.88
30 -	60 MIN	7.65E-02	30.6
1 -	2 HR	7.22E-02	28.9
>	2 HR	6.62E-02	26.5

FOR CORE DAMAGE IN REACTOR COOLANT

<u>TIME OF RELEASE</u>	<u>XE133 EQ CONCENTRATION IN STEAM LINE (uCi/ml) NORMALIZED TO 1 GPM TUBE LEAK RATE</u>	<u>XE133 EQ (uCi/ml) DOUBLE ENDED TUBE RUPTURE (400 GPM)</u>
0 -	60 SEC	4.0E+02
60 -	120 SEC	1.8E+03
2 -	15 MIN	5.3E+03
15 -	30 MIN	3.7E+03
30 -	60 MIN	2.8E+03
1 -	2 HR	1.9E+03
>	2 HR	1.5E+03

VALID OPTION CHOICES ARE 1 OR 2
ENTER YOUR CHOICE----->

AL. User response: enter either "1" (which uses the monitor readings and correlation curves and continues at step AQ) or "2" (continues at step AM)

AM. Terminal response:

ENTER XE133 EQ CONCENTRATION IN STEAMLINE 1,(uCi/cc)
ex:(1E-01)
IF NOT AVAILABLE HIT RETURN:

AN. User response: using the above tables for the appropriate accident type, enter the Xel33 equivalent concentration.

AO. Terminal response:

ENTER XE133 EQ CONCENTRATION IN STEAMLINE 2,(uCi/cc)
ex:(1E-01)
IF NOT AVAILABLE HIT RETURN:

AP. User response: using the above tables for the appropriate accident type, enter the Xel33 equivalent concentration.

NOTE: If no concentrations are input, the following message is printed and the model continues at step AS:

NO INPUT DATA WAS PROVIDED FOR STEAM RELEASE CALCULATIONS.
PROGRAM ASSUMES STEAM RELEASE RATE = 0.

AQ. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR STEAM
RELEASE, (uCi/cc) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

AR. User response: if a sample has been taken, enter the
I131 equivalent concentration; otherwise, the Xe133
equivalent concentration and the assumed I/Xe ratio
(based on time since shutdown and accident type) will be
used to calculate the concentration.

AS. Terminal response:

VENT? (Y/N):

AT. User response: Y or N

If a vent release is occurring, or may occur, answer Y,
and additional information will be required. If N, the
terminal response will be as in step BI below.

NOTE: If there is no vent flow information and
neither containment nor steam releases are being
used the following message is printed:

THE MODEL REQUIRES A RELEASE RATE GREATER THAN ZERO ON
THE FIRST INPUT RECORD

DO YOU WANT TO INPUT THE RELEASE RATE MANUALLY? (Y/N):

If the user responds with "Y", the following message is
printed and the program continues at BI; otherwise, the
user is returned to command level.

ENTER XE133eq RELEASE RATE (CI/SEC) (ex:1E+01) :

AU. Terminal response:

VENT RELEASE

1. LOCA
2. LOCA THROUGH CHARCOAL FILTER
3. CORE DAMAGE
4. CORE DAMAGE THROUGH CHARCOAL FILTER
5. TUBE RUPTURE
6. NEW FUEL ACCIDENT
7. OLD FUEL ACCIDENT
8. GAS DECAY TANK

ENTER NUMBER OF ACCIDENT FOR VENT RELEASE:

AV. User response: enter the number for the accident type
(see APPENDIX).

AW. Terminal response:

UNIT VENT 1

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR
UNIT 1 VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

AX. User response: if a gas sample has been taken, enter
the Xel33 equivalent concentration; otherwise, the
unit vent monitors will be used to calculate the
concentration.

AY. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR UNIT 1
VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

AZ. User response: if a gas sample has been taken, enter
the I131 equivalent concentration; otherwise, the Xel33
equivalent concentration and the assumed I/Xe ratio
(based on time since shutdown and accident type) will
be used to calculate the concentration.

BA. Terminal response: (if unit vent flow rate information
is supplied for Unit 2)

UNIT VENT 2

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR UNIT 2
VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

Otherwise:

UNIT VENT 2

NO UNIT VENT FLOW SUPPLIED FOR UNIT 2

Continues at step BE

BB. User response: if a gas sample has been taken, enter
the Xel33 equivalent concentration; otherwise, the
unit vent monitors will be used to calculate the
concentration.

BC. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR UNIT 2
VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

BD. User response: if a gas sample has been taken, enter

the I131 equivalent concentration; otherwise, the Xe133 equivalent concentration and the assumed I/Xe ratio (based on time since shutdown and accident type) will be used to calculate the concentration.

- BE. Terminal response: (if unit vent flow rate information is supplied for Unit 3)

UNIT VENT 3

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR UNIT 3 VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

Otherwise:

UNIT VENT 3

NO UNIT VENT FLOW SUPPLIED FOR UNIT 3

Continues at step BI

- BF. User response: if a gas sample has been taken, enter the Xe133 equivalent concentration; otherwise, the unit vent monitors will be used to calculate the concentration.

- BG. Terminal response:

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR UNIT 3 VENT RELEASE, (uCi/ml) ex:(1E-01),
IF NOT AVAILABLE, HIT RETURN:

- BH. User response: if a gas sample has been taken, enter the I131 equivalent concentration; otherwise, the Xe133 equivalent concentration and the assumed I/Xe ratio (based on time since shutdown and accident type) will be used to calculate the concentration.

- BI. Terminal response:

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

RECORD "n" WRITTEN TO MODEL INPUT FILE.

- BJ. At this point, the program will repeat the above prompts for all current data sets chosen and then continues at step II.J above.

APPENDIX
FOR THE CLASS A MODEL
USER'S MANUAL

DEFAULT VALUES

	(meters)
1. Stack Diameter	1.50
2. Stack Height	60.70
3. Source X-Coordinate	0.000000E+00
4. Source Y-Coordinate	0.000000E+00
5. Source Z-Coordinate	2.426000E+02
6. Mixing Height	1000.00
7. Maximum Adjacent Building Height	58.20
8. Maximum Adjacent Building Width	36.60
9. Ring Radius(1)	8.046500E+02
10. Ring Radius(2)	1.609300E+03
11. Ring Radius(3)	3.218600E+03
12. Ring Radius(4)	4.827900E+03
13. Ring Radius(5)	6.437200E+03
14. Ring Radius(6)	8.046500E+03
15. Ring Radius(7)	9.655800E+03
16. Ring Radius(8)	1.126510E+04
17. Ring Radius(9)	1.287460E+04
18. Ring Radius(10)	1.448370E+04
19. Ring Radius(11)	1.609300E+04

STABILITY CLASS vs. DELTA TEMPERATURE

STABILITY CLASS	DELTA TEMPERATURE (C/120 ft)
A	<= -0.7
B-C	> -0.7 to <= -0.6
D	> -0.6 to <= -0.2
E	> -0.2 to <= +0.5
F	> +0.5 to <= +1.44
G	> +1.44

OCONEE NUCLEAR STATION

UNIT 1

OAC DATA AVAILIABLE TO THE MET SYSTEM

POINT ID	DESCRIPTION	RANGE	UNITS
1	A1018	MC WIND SPEED MW TW	0 - 60 MPH
2	A1019	MC WIND SPEED RV SITE	0 - 60 MPH
3	A1016	MC WIND DIRECTION MW TW-FROM	0 - 540 DEG
4	A1017	MC WIND DIRECTION RV SITE-FROM	0 - 540 DEG
5	A1020	MC DELTA TEMP	-4 - +8 DEG C
6	A1023	MC AMBIENT AIR TEMP	-20 - +40 DEG C
7	A1021	MC DEW POINT TEMP	-30 - +30 DEG C
8	A1022	MC PRECIP DURING LAST 15 MIN	0 - 1 INCH
9	A1011	REACTOR BLDG PRESS CH A	PSIG
10	A1315	REACTOR BLDG PRESS CH B	PSIG
11	00000	* 1RM HR CONT AREA MON TR A	1.0E-1 - 1.0E7 R/HR
12	00000	* 1RM HR CONT AREA MON TR B	1.0E-1 - 1.0E7 R/HR
17	A1678	1RM HI HI RANGE	1.0E-1 - 1.0E7 R/HR
18	A1680	1RM 46 UNIT 1 VENT GAS HR	1.0E1 - 1.0E6 CPM
19	A1679	1RM 45 UNIT 1 VENT GAS LR	1.0E1 - 1.0E6 CPM
20	A0946	UNIT 1 VENT STACK FLOW	CFM
21	00000	* 2RM HI HI RANGE	1.0E-1 - 1.0E7 R/HR
22	00000	* 2RM 46 UNIT 2 VENT GAS HR	1.0E1 - 1.0E6 CPM
23	00000	* 2RM 45 UNIT 2 VENT GAS LR	1.0E1 - 1.0E6 CPM
24	00000	* UNIT 2 VENT STACK FLOW	CFM
25	00000	* 3RM HI HI RANGE	1.0E-1 - 1.0E7 R/HR
26	00000	* 3RM 46 UNIT 3 VENT GAS HR	1.0E1 - 1.0E6 CPM
27	00000	* 3RM 45 UNIT 3 VENT GAS LR	1.0E1 - 1.0E6 CPM
28	00000	* UNIT 3 VENT STACK FLOW	CFM
29	00000	* STEAMLINE A RAD MONITOR	1.0E-1 - 1.0E3 mR/HR
30	00000	* STEAMLINE B RAD MONITOR	1.0E-1 - 1.0E3 mR/HR
31	A1470	MS STEAM GEN A PRESS 1	PSIG
32	A1471	MS STEAM GEN A PRESS 2	PSIG
33	A1466	MS STEAM GEN B PRESS 1	PSIG
34	A1467	MS STEAM GEN B PRESS 2	PSIG
35	00000	* S/G A MAIN STEAM RELEASED DURING LAST 15 MIN	LBM
36	00000	* S/G B MAIN STEAM RELEASED DURING LAST 15 MIN	LBM

ASTERISK (*) INDICATES THAT THE PLANT COMPUTER DOES NOT AUTOMATICALLY SUPPLY NEEDED MONITOR READINGS.

NOTE: The listing of the record in the Class A Model does not include the PID's (point identifications); however, the program does check the OAC data for valid PID's (non-zero) and will print an asterisk as noted above for all data not available from the OAC. The items asterisked above are presently not available.

OCONEE NUCLEAR STATION

UNIT 2

OAC DATA AVAILIABLE TO THE MET SYSTEM

POINT ID	DESCRIPTION	RANGE	UNITS
1	A1842 MC WIND SPEED MW TW	0 - 60	MPH
2	A1843 MC WIND SPEED RV SITE	0 - 60	MPH
3	A1840 MC WIND DIRECTION MW TW-FROM	0 - 540	DEG
4	A1841 MC WIND DIRECTION RV SITE-FROM	0 - 540	DEG
5	A1844 MC DELTA TEMP	-4 - +8	DEG C
6	A1847 MC AMBIENT AIR TEMP	-20 - +40	DEG C
7	A1845 MC DEW POINT TEMP	-30 - +30	DEG C
8	00000 * MC PRECIP DURING LAST 15 MIN	0 - 1	INCH
9	A1011 REACTOR BLDG PRESS CH A		PSIG
10	A1315 REACTOR BLDG PRESS CH B		PSIG
11	00000 * 2RM HR CONT AREA MON TR A	1.0E-1 - 1.0E7	R/HR
12	00000 * 2RM HR CONT AREA MON TR B	1.0E-1 - 1.0E7	R/HR
17	A1678 2RM HI HI RANGE	1.0E-1 - 1.0E7	R/HR
18	A1680 2RM 46 UNIT 2 VENT GAS HR	1.0E1 - 1.0E6	CPM
19	A1679 2RM 45 UNIT 2 VENT GAS LR	1.0E1 - 1.0E6	CPM
20	A0946 UNIT 2 VENT STACK FLOW		CFM
21	00000 * 1RM HI HI RANGE	1.0E-1 - 1.0E7	R/HR
22	00000 * 1RM 46 UNIT 1 VENT GAS HR	1.0E1 - 1.0E6	CPM
23	00000 * 1RM 45 UNIT 1 VENT GAS LR	1.0E1 - 1.0E6	CPM
24	00000 * UNIT 1 VENT STACK FLOW		CFM
25	00000 * 3RM HI HI RANGE	1.0E-1 - 1.0E7	R/HR
26	00000 * 3RM 46 UNIT 3 VENT GAS HR	1.0E1 - 1.0E6	CPM
27	00000 * 3RM 45 UNIT 3 VENT GAS LR	1.0E1 - 1.0E6	CPM
28	00000 * UNIT 3 VENT STACK FLOW		CFM
29	00000 * STEAMLINE A RAD MONITOR	1.0E-1 - 1.0E3	mR/HR
30	00000 * STEAMLINE B RAD MONITOR	1.0E-1 - 1.0E3	mR/HR
31	A1470 MS STEAM GEN A PRESS 1		PSIG
32	A1471 MS STEAM GEN A PRESS 2		PSIG
33	A1466 MS STEAM GEN B PRESS 1		PSIG
34	A1467 MS STEAM GEN B PRESS 2		PSIG
35	00000 * S/G A MAIN STEAM RELEASED DURING LAST 15 MIN		LBM
36	00000 * S/G B MAIN STEAM RELEASED DURING LAST 15 MIN		LBM

ASTERISK (*) INDICATES THAT THE PLANT COMPUTER DOES NOT AUTOMATICALLY SUPPLY NEEDED MONITOR READINGS.

NOTE: The listing of the record in the Class A Model does not include the PID's (point identifications); however, the program does check the OAC data for valid PID's (non-zero) and will print an asterisk as noted above for all data not available from the OAC. The items asterisked above are presently not available.

OCONEE NUCLEAR STATION

UNIT 3

OAC DATA AVAILIABLE TO THE MET SYSTEM

POINT ID	DESCRIPTION	RANGE	UNITS
1	A0953 MC WIND SPEED MW TW	0 - 60	MPH
2	A1758 MC WIND SPEED RV SITE	0 - 60	MPH
3	A1836 MC WIND DIRECTION MW TW-FROM	0 - 540	DEG
4	A0952 MC WIND DIRECTION RV SITE-FROM	0 - 540	DEG
5	A0794 MC DELTA TEMP	-4 - +8	DEG C
6	A0903 MC AMBIENT AIR TEMP	-20 - +40	DEG C
7	A0795 MC DEW POINT TEMP	-30 - +3	DEG C
8	00000 * MC PRECIP DURING LAST 15 MIN	0 - 1	INCH
9	A1011 REACTOR BLDG PRESS CH A		PSIG
10	A1315 REACTOR BLDG PRESS CH B		PSIG
11	00000 * 3RM HR CONT AREA MON TR A	1.0E-1 - 1.0E7	R/HR
12	00000 * 3RM HR CONT AREA MON TR B	1.0E-1 - 1.0E7	R/HR
17	00000 * 3RM HI HI RANGE	1.0E-1 - 1.0E7	R/HR
18	A1680 3RM 46 UNIT 3 VENT GAS HR	1.0E1 - 1.0E6	CPM
19	A1679 3RM 45 UNIT 3 VENT GAS LR	1.0E1 - 1.0E6	CPM
20	A0946 UNIT 3 VENT STACK FLOW		CFM
21	00000 * 1RM HI HI RANGE	1.0E-1 - 1.0E7	R/HR
22	00000 * 1RM 46 UNIT 1 VENT GAS HR	1.0E1 - 1.0E6	CPM
23	00000 * 1RM 45 UNIT 1 VENT GAS LR	1.0E1 - 1.0E6	CPM
24	00000 * UNIT 1 VENT STACK FLOW		CFM
25	00000 * 2RM HI HI RANGE	1.0E-1 - 1.0E7	R/HR
26	00000 * 2RM 46 UNIT 2 VENT GAS HR	1.0E1 - 1.0E6	CPM
27	00000 * 2RM 45 UNIT 2 VENT GAS LR	1.0E1 - 1.0E6	CPM
28	00000 * UNIT 2 VENT STACK FLOW		CFM
29	00000 * STEAMLINE A RAD MONITOR	1.0E-1 - 1.0E3	mR/HR
30	00000 * STEAMLINE B RAD MONITOR	1.0E-1 - 1.0E3	mR/HR
31	A1470 MS STEAM GEN A PRESS 1		PSIG
32	A1471 MS STEAM GEN A PRESS 2		PSIG
33	A1466 MS STEAM GEN B PRESS 1		PSIG
34	A1467 MS STEAM GEN B PRESS 2		PSIG
35	00000 * S/G A MAIN STEAM RELEASED DURING LAST 15 MIN		LBM
36	00000 * S/G B MAIN STEAM RELEASED DURING LAST 15 MIN		LBM

ASTERISK (*) INDICATES THAT THE PLANT COMPUTER DOES NOT AUTOMATICALLY SUPPLY NEEDED MONITOR READINGS.

NOTE: The listing of the record in the Class A Model does not include the PID's (point identifications); however, the program does check the OAC data for valid PID's (non-zero) and will print an asterisk as noted above for all data not available from the OAC. The items asterisked above are presently not available.

ACCIDENT TYPES

CONTAINMENT RELEASE

1. LOCA -- Release of reactor coolant activity to the containment. No core damage expected.
2. COREMELT -- Significant damage to the fuel caused by insufficient heat removal from the core.

STEAM RELEASE

1. NORMAL PRIMARY COOLANT --
The water leaking from the primary system to the secondary system contains only normal reactor coolant activity.
2. IODINE SPIKED PRIMARY COOLANT --
The water leaking from the primary to the secondary system contains activity characteristic of an iodine spike in addition to normal coolant activity.
3. CORE DAMAGE --
The water leaking from the primary to the secondary system contains activity characteristic of core damage in the primary system.

VENT RELEASE

1. LOCA -- The discharge air from the unit vent has isotopic content characteristic of containment leakage into the annulus or auxiliary building following a loss of reactor coolant with no fuel damage.
2. LOCA THROUGH CHARCOAL FILTER --
Same as 1 above except iodine is expected to be filtered with a 99% removal efficiency before release through the unit vent (VA and VE charcoal filters are working properly).
3. CORE DAMAGE --
Same as 1 above except fuel damage is expected inside the containment building (no iodine filtering).
4. CORE DAMAGE THROUGH CHARCOAL FILTER --
Same as 3 above except with the VA and VE charcoal filters operating properly.

5. TUBE RUPTURE --

The discharge air from the unit vent has isotopic content characteristic of a tube rupture accident (air ejector discharge to unit vent).

6. NEW FUEL ACCIDENT --

The discharge air from the unit vent has isotopic content characteristic of a spent fuel handling accident with the fuel damaged having decayed less than 100 days.

7. OLD FUEL ACCIDENT --

Same as 6 above except fuel damaged having decayed more than 100 days.

8. GAS DECAY TANK --

The discharge air from the unit vent has isotopic content characteristic of a gas decay tank rupture.

EXPLANATION OF CLASS A MODEL PRINT-OUT

The first part of the print-out of the Class A Model consists of a map of the 10-mile EPZ. The rings affected by the plume (in the form of whole-body dose) is shown on the map. A "+" is used for those rings affected only during the current time steps. A "*" is used for those rings affected during the input time steps and the 2-hour projection. A "0" is used for those rings affected during the 2-hour projection only.

NOTE: If the input does not affect any rings due to low wind speeds or release rates, the map and the tables will not be printed, but the following message will be printed:

DATA INPUT DID NOT GENERATE A PLOT.

The input parameters are summarized after the map has been printed. The output values consist of a CENTERLINE CONDITIONS table and a RECEPTOR CONDITIONS table for each of the input time steps and for the end of the 2-hour projection. These tables are more fully explained below.

CENTERLINE CONDITIONS Table:

The CENTERLINE CONDITIONS table(s) consists of twelve (12) columns and eleven (11) rows (one for each ring distance). The twelve columns are explained below:

1. RING DISTANCE (miles) -- self-explanatory.
2. X (miles) -- the actual x-coordinate of the centerline of the plume for that ring distance (miles).
3. Y (miles) -- the actual y-coordinate of the centerline of the plume for that ring distance (miles).
4. Z (m) -- the vertical distance from the plume centerline to the ground (for ground releases, $z = 0.0$) (meters).
5. SGM Y (m) -- the standard deviation of the plume concentration in the horizontal direction at the plume centerline (meters).
6. SGM Z (m) -- the standard deviation of the plume concentration in the vertical direction at the plume centerline (meters).

7. Xel33 eq CONC-ELEV (Ci/m**3) -- the Xel33 equivalent concentration at the plume centerline (curies/meter cubed).

8. WHOLE BODY DOSE RATE-GR (Rem/hr) -- the whole body dose rate at the plume centerline at the ring (rem/hr).

For $z = 0$: $WBDR = 33.6 * Xel33 \text{ eq Conc} * [1 - \exp(-.01 * R)]$

NOTE: $R = \text{sqrt}(\text{sgm } y * \text{sgm } z)$.

9. I131 eq CONC-ELEV (Ci/m**3) -- the I131 equivalent concentration at the plume centerline (curies/meter cubed).

10. THYROID DOSE RATE-ELEV (Rem/hr) -- the child thyroid dose rate at the plume centerline (rem/hr).

$TDR-ELEV = 2.26E+06 * I131 \text{ eq Conc-elev}$

11. I131 eq CONC-GR (Ci/m**3) -- the I131 equivalent concentration at the plume centerline at the ring (curies/meter cubed).

12. THYROID DOSE RATE-GR (Rem/hr) -- the child thyroid dose rate at the plume centerline at the ring (rem/hr).

$TDR-GR = 2.25E+06 * I131 \text{ eq Conc-gr}$

The CENTERLINE CONDITIONS table will be printed for every input data record of the run and for the last 15-minute record of the 2-hour projection.

RECEPTOR CONDITIONS Table:

The RECEPTOR CONDITIONS table(s) consists of five (5) columns and a minimum of eleven (11) rows (one for each ring distance). The five columns are explained below:

1. RING DISTANCE (miles) -- self-explanatory.
2. X (miles) -- the actual x-coordinate of the receptor affected by the plume for that ring distance (miles).
3. Y (miles) -- the actual y-coordinate of the receptor affected by the plume for that ring distance (miles).
4. PRESENT (or PROJECTED) WHOLE BODY TOTAL DOSE-GR (Rem) -- the whole body total dose at the receptor for either the input data records (one for all records together) or for the end of the 2-hour projection (NOTE: the 2-hour projection DOES NOT INCLUDE THE INPUT DATA RECORD(S)).

5. PRESENT (or PROJECTED) THYROID TOTAL DOSE-GR (Rem) -- the child thyroid dose at the receptor for either the input data record(s) (one for all records together) or for the end of the 2-hour projection (NOTE: the 2-hour projection DOES NOT INCLUDE THE INPUT DATA RECORD(S)).

A row will be printed for each ring distance and each receptor on that ring that is affected by the plume. All receptors that have a whole body dose rate greater than or equal to 1% of the center-line-ground whole body dose rate will be shown in the receptor table (the receptor whole body dose may be due to "shine"). All receptors that have a thyroid dose will also be shown in the table.

ATMOSPHERIC DISPERSION AT OCONEE NUCLEAR STATION

Oconee is situated in a river valley, and, therefore, special consideration must be given to the terrain effects on atmospheric dispersion. During daytime hours (1000 - 1600 Eastern Standard Time), atmospheric dispersion is considered to follow normal dispersion calculations based on the actual stability class, wind speed, and wind direction (NOTE: Tower wind speed and wind direction are used, if available; river wind speed and wind direction are used if tower information is unavailable. The wind speed is modified in all cases by a factor of 0.8 prior to dispersion calculations.)

During nighttime hours (1601 - 0959 Eastern Standard Time), the atmospheric dispersion may be either "drainage" flow or "synoptic" flow. If the river wind direction is between 70 and 210 deg. (inclusive), the dispersion is considered to be drainage flow. The stability class is assumed to be "G" and the wind speed is assumed to be 1.0 mph (including the 0.8 correction). NOTE: The wind speed may be printed as 0.9 mph in the reports of the Class A Model due to truncation of the conversion from m/sec to mph. Because the actual wind direction is highly variable during drainage conditions, the centerline concentrations and doses are considered to be present at all locations. The following note will appear after the map has been printed for drainage conditions:

*** THE ABOVE GRAPH & FOLLOWING TABLES ARE VALID FOR ***
*** THE PRESENT WIND DIRECTION & ALL DIRECTIONS ***

If the river wind direction is between 210 and 70 deg., (exclusive) the dispersion is considered to be synoptic flow and is treated as a daytime release.

EXAMPLE RUNS FOR
OCONEE CLASS A MODEL

OCONEE CLASS A MODEL TEST CASES: INPUT DATA

TEST CASE NUMBER 2

Maximum adjacent building height: 60 meters
 Maximum adjacent building width: 189 meters

Data type: MANUAL

Parameter:	Input:
Date	<u>851010</u>
Time	<u>1200</u>
Wind Speed	<u>2.5</u>
Wind Direction	<u>85 95</u>
Delta Temperature	<u>+1.5</u>
Ambient Temperature	<u>15.0</u>
Xe133eq Release Rate	<u>2.62</u>
I131eq/Xe133eq Ratio	<u>0.00532</u>
Time Since Shutdown	<u>2</u>
Precipitation	<u>0</u>
Number of Time Periods	<u>1</u>

Projected data type: FORECASTED

(for forecasted data:)

Parameter:	Input:
Wind Speed	<u>2.5</u>
Wind Direction	<u>85 95</u>
Delta Temperature	<u>+1.5</u>
Ambient Temperature	<u>15.0</u>
Xe133eq Release Rate	<u>0</u>
I131eq/Xe133eq Ratio	<u>0.00532</u>
Time Since Shutdown	<u>2.25</u>
Precipitation	<u>0</u>
Number of Time Periods	<u>8</u>

ESS OCC MODEL

System Rev-1.0 VAX/VMS Rev 4.1

Username: METTSC

Password:

XAISLOGIN=I-LASTACC METTSC, METO, last accessed in Interactive mode
at 7-FEB-1986 11:21:36.21

Welcome to VAX/VMS - Duke Power Company - Node ESS:

PRODUCTION Login Procedure.

NOTICE....

OC0

IF YOU HAVE A PROBLEM DIALING INTO OR WHILE LOGGED ON TO THE
VAX COMPUTER USING THE DATAPLEXER, PLEASE INFORM THE OPERATOR
AT EXT. 8982.

ESS VAX WILL BE DOWN FRIDAY 02/07/86 FROM 5:00PM TILL 10:00PM FOR
DISK BACKUPS.

THERE WILL BE FORTRAN V4.3 TESTING ON THE ESS VAX SAT. 2/8/86 FROM
9:00AM TIL 12:00 NOON.

PRODUCTION Login Procedure Completed.

ENTER COMMAND: RUN

ENTER STATION = (MCG,OC0,CAT): OC0

This version is current as of 02/05/86

Is this a Drill (Y/N): N

1. OCONEE - UNIT 1
2. OCONEE - UNIT 2
3. OCONEE - UNIT 3

ENTER NUMBER FOR STATION/UNIT:1

AVAILABLE DATA TYPES:

1. MANUAL
2. CURRENT

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DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N):Y

DEFAULT VALUES: (METER)

1. STACK DIAMETER	1.50
2. STACK HEIGHT	60.70
3. SOURCE X-COORDINATE	0.000000E+00
4. SOURCE Y-COORDINATE	0.000000E+00
5. SOURCE Z-COORDINATE	2.426000E+02
6. MIXING HEIGHT	1000.00
7. MAXIMUM ADJACENT BUILDING HEIGHT	58.20
8. MAXIMUM ADJACENT BUILDING WIDTH	38.80
9. RING RADIUS(1)	8.046500E+02
10. RING RADIUS(2)	1.609500E+03
11. RING RADIUS(3)	3.218600E+03
12. RING RADIUS(4)	4.827200E+03
13. RING RADIUS(5)	6.437200E+03
14. RING RADIUS(6)	8.046500E+03
15. RING RADIUS(7)	9.655800E+03
16. RING RADIUS(8)	1.126510E+04
17. RING RADIUS(9)	1.287460E+04
18. RING RADIUS(10)	1.448370E+04
19. RING RADIUS(11)	1.609500E+04

DO YOU WISH TO CHANGE ANY DEFAULT PARAMETERS? Y/N:Y

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:7

ENTER THE NEW VALUE FOR MAXIMUM ADJACENT BUILDING HEIGHT:60

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:8

ENTER THE NEW VALUE FOR MAXIMUM ADJACENT BUILDING WIDTH :189

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:END

DEFAULT VALUES: (METER)

1. STACK DIAMETER	1.50
2. STACK HEIGHT	60.70
3. SOURCE X-COORDINATE	0.000000E+00
4. SOURCE Y-COORDINATE	0.000000E+00
5. SOURCE Z-COORDINATE	2.426000E+02
6. MIXING HEIGHT	1000.00
7. MAXIMUM ADJACENT BUILDING HEIGHT	60.00
8. MAXIMUM ADJACENT BUILDING WIDTH	189.00
9. RING RADIUS(1)	8.046500E+02
10. RING RADIUS(2)	1.609500E+03
11. RING RADIUS(3)	3.218600E+03

13. RING RADIUS(5) 8.497200E+03
14. RING RADIUS(6) 8.046500E+03
15. RING RADIUS(7) 9.655800E+03
16. RING RADIUS(8) 1.126510E+04
17. RING RADIUS(9) 1.287480E+04
18. RING RADIUS(10) 1.448970E+04
19. RING RADIUS(11) 1.609300E+04

DO YOU WISH TO CHANGE ANY DEFAULT PARAMETERS? (Y/N):N

ENTER DATE (YYMMDD):851010

ENTER TIME (HH.MM) EX:(02.33):12.00 /

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER TOWER WIND SPEED (MPH): 2.5 ✓

ENTER TOWER WIND DIRECTION (DEG) - FROM: 95 ✓

ENTER RIVER WIND DIRECTION (DEG) - FROM: 95 ✓

ENTER DELTA TEMPERATURE (DEG C):1.5 ✓

ENTER AMBIENT TEMPERATURE (DEG C):15 ✓

ENTER XE133ea RELEASE RATE (G/SEC) (ex:1E+06) :2.62 ✓

ENTER I131ea/XE133ea RATIO: .00532 ✓

ENTER TIME SINCE SHUTDOWN (HOURS):2 ✓

ENTER PRECIPITATION (INCHES):0 ✓

ENTER THE NUMBER OF TIME PERIODS:1 ✓

DO YOU WANT TO CREATE ANY MORE RECORDS? (Y/N):N ✓

AVAILABLE TYPES OF PROJECTED DATA:

1. FORECASTED
2. PERSISTANT

ENTER THE OPTION NUMBER YOU WANT THE TWO HOURS OF PROJECTED DATA TO BE:1 ✓

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER TOWER WIND SPEED (MPH): 2.5 ✓

ENTER TOWER WIND DIRECTION (DEG) - FROM: 95

ENTER RIVER WIND DIRECTION (DEG) - FROM: 95

ENTER DELTA TEMPERATURE (DEG C):1.5

ENTER AMBIENT TEMPERATURE (DEG C):15

ENTER XE133ea RELEASE RATE (C1/SEC) (ext1E+06) :0

ENTER I131ea/XE133ea RATIO: .00532

ENTER TIME SINCE SHUTDOWN (HOURS):2.25

ENTER PRECIPITATION (INCHES):0

ENTER THE NUMBER OF TIME PERIODS:8

THE INPUT FILE FOR THE CLASS A DISPLAY MODEL HAS BEEN CREATED.

CLASS A MODEL - INITIAL REPORT

000 NUCLEAR STATION UNIT 1 DATE 10/10/85 TIME 12.00

TIME SINCE TRIP/SHUTDOWN 2.0 HRS.

METEOROLOGY

WIND SPEED 2.0 MPH WIND DIRECTION (FROM) 95

AMBIENT TEMP 15.0 C DELTA TEMP 1.5 C STABILITY CLASS 0

SOURCE TERM

XE-133ea RELEASE RATE: 2.62000E+00 C176 I-131ea RELEASE RATE 1.32384E-02 C176

THE MODEL IS RUNNING.....

Now running 6D...

All done.

%NONAME-W-NOMSG, Message number 00000000

%NONAME-W-NOMSG, Message number 00000000

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT

REVIEW - TO SEE THE INPUT DATA

RELEASE - TO SEND THE REPORT

RETRIEVE - TO SEE OAC DATA

END - TO RETURN TO COMMAND LEVEL

ENTER OPTION: PRINT

CLASS-A MODEL DISPLAY

OCO NUCLEAR STATION

UNIT 1

DATE: 10/10/85

TIME: 12.00

10

+

+

8

+

+

6

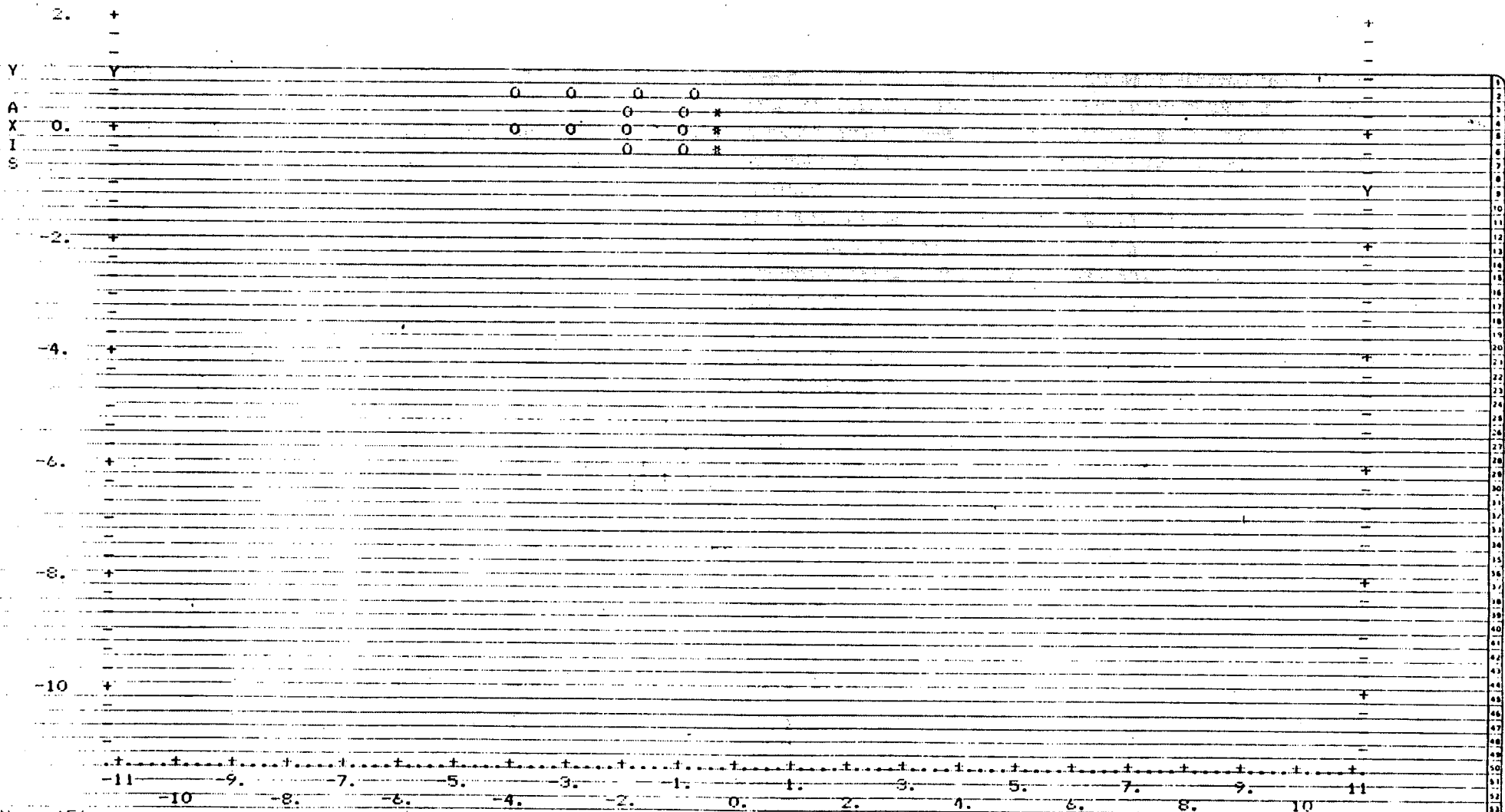
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4

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N = 156
 R = -.237
 P = .003

	MEAN	S.D.
REGRESSION LINE		
Y = .01012 - .07804 * X		
RMS		
X	-1.0549	.83890
Y	.09241	.27657

CLASS A MODEL OUTPUT

000 NUCLEAR STATION UNIT 1 DATE 10/10/85 TIME 12.00

INPUT PARAMETERS:

TIME SINCE TRIP/SHUTDOWN 2.0 hrs WIND DIRECTION FROM 95 WIND SPEED 2.0 mph

DELTA TEMP: 1.5 C AMB TEMP: 15.0 C VENT FLOW: 0.00000E+00 cfm

RELEASE RATE Xe133 eq 2.62000E+00 CI/s I131 eq 1.39384E-02 CI/s

THIS DATA COMES FROM THE TSC/CMC. THIS IS THE LAST 15 MINUTE AVERAGE MANUAL DATA.

OUTPUT VALUES:

CENTERLINE CONDITIONS TIME: 12.00

RING	X	Y	Z	SGM Y	SGM Z	Xe133 eq	WHOLE BODY	I131 eq	THYROID DOSE	I131 eq	THYROID DOSE
DISTANCE						CONC-ELEV	DOSE RATE-GR	CONC-ELEV	RATE-ELEV	CONC-GR	RATE-GR
(miles)	(miles)	(miles)	(m)	(m)	(m)	(Ci/m)	(Rem/hr)	(Ci/m)	(Rem/hr)	(Ci/m)	(Rem/hr)
0.5	0.49	0.04	0.0	32.0	13.8	4.03E-04	2.574E-03	2.142E-06	4.842E+00	2.14E-06	4.841882E+00
1.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
2.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
3.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
4.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
5.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
6.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
7.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
8.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
9.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00

10.0 ! 0.00 ! 0.00! 0.0! 0.0! 0.0! 0.00E+00 ! 0.000E+00 ! 0.000E+00! 0.000E+00 ! 0.00E+00! 0.000000E+00

RECEPTOR CONDITIONS

RING	X	Y	PRESENT WHOLE BODY TOTAL DOSE GR (Rem)	PRESENT THYROID TOTAL DOSE GR (Rem)
DISTANCE	(miles)	(miles)		
0.3	- 0.43	- 0.25	1.65E-05	0.00E+00
	- 0.46	- 0.17	4.61E-05	0.00E+00
	- 0.49	- 0.08	1.31E-04	0.00E+00
	- 0.50	0.00	3.78E-04	1.04E-01
	- 0.49	0.08	3.78E-04	1.04E-01
	- 0.46	0.17	1.31E-04	0.00E+00
	- 0.43	0.25	4.61E-05	0.00E+00
	0.36	0.32	1.65E-05	0.00E+00
1.0				
2.0				
3.0				
4.0				
5.0				
6.0				
7.0				
8.0				
9.0				
10.0				

CENTERLINE CONDITIONS - PROJECTED TWO HOURS

RING	X	Y	Z	SGM Y	SGM Z	Xe133 eq CONC-ELEV	WHOLE BODY DOSE RATE GR	I131 eq CONC-ELEV	THYROID DOSE RATE-ELEV	I131 eq CONC GR	THYROID DOSE RATE GR
DISTANCE	(miles)	(miles)	(miles)	(m)	(m)	(Ci/m)	(Rem/hr)	(Ci/m)	(Rem/hr)	(Ci/m)	(Rem/hr)
						3		3		3	

0.5	0.00	0.00	0.0	32.0	13.8	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
1.0	0.00	0.00	0.0	60.3	21.7	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
2.0	0.00	0.00	0.0	99.7	30.3	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
3.0	0.00	0.00	0.0	120.5	32.8	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
4.0	3.98	0.34	0.0	143.2	35.0	1.53E-04	2.614E-03	8.149E-07	1.842E+00	8.15E-07	1.841569E+00
5.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
6.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
7.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
8.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
9.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
10.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00

RECEPTOR CONDITIONS

RING DISTANCE	X		Y		PROJECTED WHOLE BODY TOTAL DOSE-GR (Rem)		PROJECTED THYROID TOTAL DOSE-GR (Rem)	
	(miles)	(miles)	(miles)	(miles)				
0.5	0.43	0.25			2.95E-05		0.00E+00	
	0.46	0.17			1.94E-04		0.00E+00	
	0.49	0.08			5.53E-04		0.00E+00	
	0.50	0.00			1.59E-03		4.72E-01	
	0.49	0.08			1.59E-03		4.72E-01	
	0.46	0.17			5.53E-04		0.00E+00	
	0.43	0.25			1.94E-04		0.00E+00	
	0.38	0.32			6.95E-05		0.00E+00	
1.0	0.93	0.34			2.93E-05		0.00E+00	
	0.93	0.17			1.31E-04		0.00E+00	
	1.00	0.00			7.47E-04		1.41E-01	
	0.98	0.17			7.47E-04		1.41E-01	
	0.93	0.34			1.31E-04		0.00E+00	
	0.86	0.50			2.33E-05		0.00E+00	

2.0	- 1.96	- 0.34	1.64E-05	0.00E+00
	- 2.00	0.00	2.70E-04	1.78E-02
	- 1.95	0.34	2.70E-04	1.78E-02
	- 1.87	0.68	1.64E-05	0.00E+00
3.0	- 2.99	0.00	1.36E-04	1.58E-03
	- 2.95	0.52	1.36E-04	1.58E-03
4.0	- 4.06	0.00	7.79E-05	2.55E-04
	- 3.93	0.69	7.79E-05	2.55E-04
5.0				
6.0				
7.0				
8.0				
9.0				
10.0				

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
 REVIEW - TO SEE THE INPUT DATA
 RELEASE - TO SEND THE REPORT
 RETRIEVE - TO SEE OAC DATA
 END - TO RETURN TO COMMAND LEVEL

ENTER OPTION: RINT

Invalid Option

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
 REVIEW - TO SEE THE INPUT DATA
 RELEASE - TO SEND THE REPORT
 RETRIEVE - TO SEE OAC DATA
 END - TO RETURN TO COMMAND LEVEL

ENTER OPTION: REVIEW

TOWER WIND SPEED		2.500	MPH
TOWER WIND DIRECTION - FROM		95.000	DEG
RIVER WIND DIRECTION - FROM		95.000	DEG
STABILITY CLASS	G		
RELEASE MODE	G		
DELTA TEMP		1.500	C
AMBIENT TEMP		15.000	C
RELEASE RATE		2.6200E+00	C/SEC
1131EQ/XE133EQ RATIO		0.005	
TIME SINCE SHUTDOWN		2.000	HRS

PROJECTED TWO HOUR DATA

MANUAL INELT

TOWER WIND SPEED		2.500	MPH
TOWER WIND DIRECTION - FROM		95.000	DEG
RIVER WIND DIRECTION - FROM		95.000	DEG
STABILITY CLASS	G		
RELEASE MODE	G		
DELTA TEMP		1.500	C
AMBIENT TEMP		15.000	C
1131EQ/XE133EQ RATIO		0.005	
TIME SINCE SHUTDOWN		2.250	HRS

AVAILABLE OPTIONS

PRINT - TO SEE THE REPORT
 REVIEW - TO SEE THE INPUT DATA
 RELEASE - TO SEND THE REPORT
 RETRIEVE - TO SEE OAC DATA
 END - TO RETURN TO COMMAND LEVEL

ENTER OPTION: RETRIEVE

~~ZDCL-I-SUPERSEDE, previous value of SYSIN has been superseded~~
~~ZDCL-I-SUPERSEDE, previous value of SYSIN has been superseded~~

INDEX OF OAC RECORDS

DATE	TIME
09/25/84	09.00
02/18/85	14.00
06/18/85	15.15
06/19/85	14.10

OCONEE NUCLEAR STATION: CLASS A MODEL TEST CASES

Test Case # 17

Current Data Input:

Record Number	<u>1</u>
Date	<u>1/30/86</u>
Time	<u>09.58</u>
MC Wind Speed MW TW	<u>2.5</u>
MC Wind Direction MW TW	<u>90</u>
MC Wind Direction RV Site	<u>90</u>
MC Delta Temperature	<u>1.5</u>
MC Ambient Air Temp	<u>15</u>
MC Dew Point Temp	<u>10</u>
MC Precip During Last 15 Min	<u>0</u>
Time Since Shutdown	<u>2</u>
Containment?	<u>Y</u>
Number of Accident ...	<u>1</u>
Containment Volume Leak Rate	<u>1</u>
Fraction of ... (Bypass)	<u>1</u>
Sampled Xe133eq Concentration	<u>2.62E+6</u>
Sampled I131eq Concentration	<u>1.394E+4</u>
Steam?	<u>N</u>
Vent?	<u>N</u>

Drainage or Synoptic Flow ? Drainage

Projected Data Type: Forecasted

Tower Wind Speed	<u>2.5</u>
Tower Wind Direction	<u>90</u>
River Wind Direction	<u>90</u>
Delta Temperature	<u>-</u>
Ambient Temperature	<u>1.5</u>
Xe133eq Release Rate	<u>0</u>
I131eq/Xe133eq Ratio	<u>.00532</u>
Time Since Shutdown	<u>2.25</u>
Precipitation	<u>0</u>
Number of Time Periods	<u>8</u>

Test Case 17

DRAINAGE CASE

Feb 5, 1986

3:55 PM

Test of Current Data Transfer

This version is current as of 02/05/86

Is this a DRAIN (Y/N): N

1. GCONEE - UNIT 1
2. GCONEE - UNIT 2
3. GCONEE - UNIT 3

ENTER NUMBER FOR STATION/UNIT: 1

AVAILABLE DATA TYPES:

1. MANUAL
2. CURRENT

ENTER NUMBER FOR DATA TYPE: 2

INDEX FOR NO. 1

7

1 01/30/83 09.50

ENTER RECORD NUMBER OR END:1

ENTER RECORD NUMBER OR END:END

DO YOU WISH TO REVIEW DEFAULT VALUES? (Y/N/D/E):

DEFAULT VALUES:

(METERS)

- 1. STACK DIAMETER 1.50
- 2. STACK HEIGHT 50.70
- 3. SOURCE X-COORDINATE 0.000000E+00
- 4. SOURCE Y-COORDINATE 0.000000E+00
- 5. SOURCE Z-COORDINATE 2.426010E+02
- 6. HEATING HEIGHT 1000.00
- 7. MAXIMUM ADJACENT BUILDING HEIGHT 55.20
- 8. MAXIMUM ADJACENT BUILDING WIDTH 55.20
- 9. RING RADIUS(1) 0.043000E+02
- 10. RING RADIUS(2) 1.209300E+02
- 11. RING RADIUS(3) 2.218400E+02
- 12. RING RADIUS(4) 4.827300E+02
- 13. RING RADIUS(5) 6.437100E+02
- 14. RING RADIUS(6) 8.046900E+02
- 15. RING RADIUS(7) 9.656700E+02
- 16. RING RADIUS(8) 1.126650E+03
- 17. RING RADIUS(9) 1.287630E+03
- 18. RING RADIUS(10) 1.448610E+03
- 19. RING RADIUS(11) 1.609590E+03

DO YOU WISH TO CHANGE ANY DEFAULT PARAMETERS? (Y/N):

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:7

ENTER THE NEW VALUE FOR MAXIMUM ADJACENT BUILDING HEIGHT:50

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:8

ENTER THE NEW VALUE FOR MAXIMUM ADJACENT BUILDING WIDTH:100

ENTER THE NUMBER OF THE PARAMETER YOU WISH TO CHANGE OR END:END

DEFAULT VALUES:

(METERS)

- 1. STACK DIAMETER 1.50
- 2. STACK HEIGHT 50.70
- 3. SOURCE X-COORDINATE 0.000000E+00
- 4. SOURCE Y-COORDINATE 0.000000E+00

UNITED STATES

6. MAXIMUM ADJACENT BUILDING HEIGHT 20.00
 7. MAXIMUM ADJACENT BUILDING HEIGHT 20.00
 8. MAXIMUM ADJACENT BUILDING WIDTH 189.00
 9. RING RADIUS(1) 8.046500E+02
 10. RING RADIUS(2) 1.809300E+03
 11. RING RADIUS(3) 3.218600E+03
 12. RING RADIUS(4) 4.827900E+03
 13. RING RADIUS(5) 6.437200E+03
 14. RING RADIUS(6) 8.046500E+03
 15. RING RADIUS(7) 9.655800E+03
 16. RING RADIUS(8) 1.126510E+04
 17. RING RADIUS(9) 1.287440E+04
 18. RING RADIUS(10) 1.448370E+04
 19. RING RADIUS(11) 1.609300E+04

DO YOU WISH TO CHANGE ANY DEFAULT PARAMETERS? Y/N

OCOWEE NUCLEAR STATION UNIT

DATE: 01/30/88

TIME 09:58

1.	NO WIND SPEED MW TW				DFH
2.	NO WIND SPEED RV SITE	0.300			BPH
3.	NO WIND DIRECTION MW TW - FROM	8.013			DEG
4.	NO WIND DIRECTION RV SITE - FROM				DEG
4.	NO WIND DIRECTION RV SITE - FROM	-188.317			DEG
5.	NO DELTA TEMP	-8.816			DEG C
6.	NO AMBIENT AIR TEMP	19.055			DEG C
7.	NO DEW POINT TEMP	29.100			DEG C
8.	NO PRECIP DURING LAST 15 MIN				INCH
9.	NO PRECIP DURING LAST 15 MIN	0.740			INCH
9.	REACTOR BLDG PRESS CH A	1.000			PSIG
10.	REACTOR BLDG PRESS CH B	0.400			PSIG
11.	* 1RM HR CONT AREA MON TR A				R/HR
12.	* 1RM HR CONT AREA MON TR B				R/HR
17.	1RM HI HI RANGE	74.780			R/HR
18.	1RM 45 UNIT 1 VENT GAS HR				CFM
18.	1RM 45 UNIT 1 VENT GAS HR	3.000			CFM
19.	1RM 45 UNIT 1 VENT GAS LR	182.760			CFM
20.	UNIT 1 VENT STACK FLOW	18707.500			CFM
21.	* 2RM HI HI RANGE				R/HR
22.	* 2RM 45 UNIT 2 VENT GAS HR				CFM
23.	* 2RM 45 UNIT 2 VENT GAS LR				CFM
24.	* UNIT 2 VENT STACK FLOW				CFM
25.	* 3RM HI HI RANGE				R/HR
26.	* 3RM 45 UNIT 3 VENT GAS HR				CFM
27.	* 3RM 45 UNIT 3 VENT GAS LR				CFM
28.	* UNIT 3 VENT STACK FLOW				CFM

31.	NO STEAM GEN A PRESS 1	007.500	PSIG
32.	NO STEAM GEN A PRESS 2	008.500	PSIG
33.	NO STEAM GEN B PRESS 1	079.000	PSIG
34.	NO STEAM GEN B PRESS 2	016.500	PSIG
35.	* S70 A MAIN STEAM RELEASED DURING LAST 15 MI		LEM
36.	* S70 B MAIN STEAM RELEASED DURING LAST 15 MI		LEM

ASTERISK (*) INDICATES THAT THE PLANT COMPUTER DOES NOT AUTOMATICALLY SUPPLY NEEDLE MONITOR READINGS.

VALUE NUMBER 4 IS OUT-OF-RANGE, PLEASE CHECK THE VALUE.
 VALUE NUMBER 8 IS OUT-OF-RANGE, PLEASE CHECK THE VALUE.
 VALUE NUMBER 18 IS OUT-OF-RANGE, PLEASE CHECK THE VALUE.

DO YOU WANT TO ENTER/CHANGE ANY VALUES? (Y/N):

ENTER LINE NUMBER (1 - 36) OR END:1

ENTER NEW VALUE FOR 1:2.5

ENTER LINE NUMBER (1 - 36) OR END:3

ENTER NEW VALUE FOR 3:90

ENTER LINE NUMBER (1 - 36) OR END:1

ENTER NEW VALUE FOR 4:90

ENTER LINE NUMBER (1 - 36) OR END:3

ENTER NEW VALUE FOR 5:1.5

ENTER LINE NUMBER (1 - 36) OR END:3

ENTER NEW VALUE FOR 6:15

ENTER LINE NUMBER (1 - 36) OR END:7

ENTER NEW VALUE FOR 7:10

ENTER LINE NUMBER (1 - 36) OR END:11

ENTER NEW VALUE FOR 8:0

ENTER LINE NUMBER (1 - 36) OR END:END

1.	MC WIND SPEED MW TR	2.500	MPH	✓
2.	MC WIND SPEED RV SITE	0.600	MPH	
3.	MC WIND DIRECTION MW TR - FROM	90.000	DEG	
4.	MC WIND DIRECTION RV SITE - FROM	90.000	DEG	✓
5.	MC DELTA TEMP	1.500	DEG C	
6.	MC AMBIENT AIR TEMP	15.000	DEG C	
7.	MC DEN POINT TEMP	101.000	DEG C	
8.	MC PRECIP DURING LAST 15 MIN	0.000	INCH	
9.	REACTOR BLDG PRESS CH A	1.000	PSIG	
10.	REACTOR BLDG PRESS CH B	0.727	PSIG	
11.	* 15M HR CONT AREA MON TR A		CPM	
12.	* 15M HR CONT AREA MON TR B		CPM	
13.	15M HI HI RANGE	741700	CPM	
14.	15M 45 UNIT 1 VENT GAS HR		CFM	
15.	15M 45 UNIT 1 VENT GAS LR	0.000	CFM	
16.	15M 45 UNIT 1 VENT GAS LR	1001700	CFM	
17.	UNIT 1 VENT STACK FLOW	49307.000	CFM	
18.	* 15M HI HI RANGE		CPM	
19.	* 15M 46 UNIT 2 VENT GAS HR		CFM	
20.	* 15M 46 UNIT 2 VENT GAS LR		CFM	
21.	* UNIT 2 VENT STACK FLOW		CFM	
22.	* 15M HI HI RANGE		CPM	
23.	* 15M 45 UNIT 3 VENT GAS HR		CFM	
24.	* 15M 45 UNIT 3 VENT GAS LR		CFM	
25.	* UNIT 3 VENT STACK FLOW		CFM	
26.	STEAMLINE A RAD MONITOR		MR/hr	
27.	STEAMLINE B RAD MONITOR		MR/hr	
28.	MS STEAM GEN A PRESS 1	000.000	PSIG	
29.	MS STEAM GEN A PRESS 2	000.000	PSIG	
30.	MS STEAM GEN B PRESS 1	000.000	PSIG	
31.	MS STEAM GEN B PRESS 2	010.000	PSIG	
32.	* S/S A MAIN STEAM RELEASED DURING LAST 15 MI		INH	
33.	* S/S B MAIN STEAM RELEASED DURING LAST 15 MI		INH	

ASTERISK (*) INDICATES THAT THE PLANT COMPUTER DOES NOT AUTOMATICALLY SUPPLY NEEDED MONITOR READINGS.

VALUE NUMBER 18 IS OUT-OF-RANGE, PLEASE CHANGE THE VALUE.

DO YOU WANT TO ENTER/CHANGE ANY VALUE? (Y/N):N

ENTER TIME SINCE SHUTDOWN IN HOURS. (0=2.5)=2.0

CONTAINMENT? (Y/N):Y

CONTAINMENT RELEASE

ENTER NUMBER OF INCIDENT FOR CONTAINMENT RELEASES

ENTER CONTAINMENT VOLUME LEAK RATE (m³/sec) (OPTIONAL)
IF NOT AVAILABLE, HIT RETURN

ENTER THE FRACTION OF CONTAINMENT LEAKAGE THAT WILL BYPASS THE PEN. RM.
OR AUXILIARY BUILDING GOING DIRECTLY TO THE ENVIRONMENT
(YEAR DESIGN VALUE IS 0.5).1

ENTER SAMPLED XE133 EQUIVALENT CONCENTRATION FOR CONTAINMENT RELEASE (OPTIONAL) (1E-01)
IF NOT AVAILABLE, HIT RETURN:1.02E-01

ENTER SAMPLED I131 EQUIVALENT CONCENTRATION FOR CONTAINMENT RELEASE (OPTIONAL) (1E-01)
IF NOT AVAILABLE, HIT RETURN:1.09E-01

STAND (Y/N):N

VENT (Y/N):N

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

RECORD 1 WRITTEN TO MODEL INPUT FILE.

AVAILABLE TYPES OF PROJECTED DATA:

1. FORECASTED
2. PERSISTENT

ENTER THE OPTION NUMBER YOU WANT THE TWO
MODES OF PROJECTED DATA TO BE:

THE RELEASE MODE IS CONSERVATIVELY ASSUMED TO BE A GROUND RELEASE.

ENTER TOWER WIND SPEED (MPS): 2.5

ENTER TOWER WIND DIRECTION (DEG) - FROM: 90

ENTER RIVER WIND DIRECTION (DEG) - FROM: 90

ENTER AMBIENT TEMPERATURE (DEG C): 15

ENTER XE133eq RELEASE RATE (G/SEC) (0E+00) TO

ENTER I131eq/XE133eq RATIO: 0.0532

ENTER TIME SINCE SHUTDOWN (HOURS): 2.25

PRECIPITATION (INCHES): 0

7

CLASS A MODEL - INITIAL REPORT

THE REPORT FILE FOR THE CLASS A DISPLAY MODEL HAS BEEN CREATED.

CLASS A MODEL - INITIAL REPORT

000 TRUCKLEAR STATION UNIT 1 DATE 01/30/80 TIME 04:00

TIME SINCE TRIP/SHUTDOWN 2.0 HRS.

METEOROLOGY

WIND SPEED 1.0 MPH ✓

WIND DIRECTION (FROM) 90 ✓

AMBIENT TEMP 18.0 C

DELTA TEMP 1.3 C

STABILITY CLASS B ✓

SOURCE TERM

AE-153 (M) RELEASE RATE: 2.82000E+00 C1/s ✓

I-131 (M) RELEASE RATE: 1.89100E+02 C1/s ✓

MESSAGE W-10000, Message number 00000000
MESSAGE W-10000, Message number 00000000

THE MODEL IS RUNNING.....

now running at ...

at ...

MESSAGE W-10000, Message number 00000000
MESSAGE W-10000, Message number 00000000

AVAILABLE ON ...

REPORT

REMOVE TO GET NEW DATA
END TO RETURN TO COMMAND LEVEL
ENTER NUMBER PRINT

CLASS 6 PRINT DISPLAY

DATE: 01/30/83 TIME: 09:58

000 NUCLEAR STATION UNIT 1

10

9

8

7

6

5

4

0 0 0
0 0 0

V.S.P. 01/30/83

7

WIND DIRECTION: 113.0 WIND SPEED: 1.0 mph
 LEVEL: 0.00 AMB TEMP: 10.0 C VENT FLOW: 0.0000E+00 CFM
 RELEASE RATE: 2.0000E+00 C178 1131.04 1.39100E-02 C178

THIS DATA COMES FROM THE TEC/CNC. THIS IS THE LAST 15 MINUTE AVERAGE ACTUAL DATA.
 OUTPUT VALUES:

CENTERLINE CONDITIONS TIME: 09.58

RING DISTANCE (miles)	X (miles)	Y (miles)	Z (m)	SGH Y (m)	SGH Z (m)	X1131.04 CONC-ELEV (Ci/m ³)	WHOLE BODY DOSE RATE-GR (Rem/hr)	1131.04 CONC-ELEV (Ci/m ³)	THYROID DOSE RATE-ELEV (rem/hr)	1131.04 CONC-GR (Ci/m ³)	THYROID DOSE RATE-GR (Rem/hr)
0.5	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
1.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
2.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
3.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
4.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
5.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
6.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
7.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
8.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00
9.0	0.00	0.00	0.0	0.0	0.0	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.00E+00	0.000000E+00

7

RING DISTANCE	X (miles)	Y (miles)	Z (miles)	U (miles)	V (miles)	W (miles)	PROJECTED UNCLE BOBY TOTAL DOSE-GR (Rem)	PROJECTED WINDRID TOTAL DOSE-GR (Rem)	PROJECTED WINDRID TOTAL DOSE-GR (Rem)	PROJECTED WINDRID TOTAL DOSE-GR (Rem)	PROJECTED WINDRID TOTAL DOSE-GR (Rem)
0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
5.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
6.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
7.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
8.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00
10.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00E+00	0.000E+00	0.000E+00	0.000E+00	0.000000E+00

RECEPTOR CONDITIONS

RING DISTANCE	X (miles)	Y (miles)	PROJECTED UNCLE BOBY TOTAL DOSE-GR (Rem)	PROJECTED WINDRID TOTAL DOSE-GR (Rem)
0.5	0.33	0.32	1.03E-04	0.00E+00
	0.43	0.25	2.83E-04	0.00E+00
	0.46	0.17	7.99E-04	0.00E+00
	0.49	0.08	2.29E-03	9.30E-01
	0.50	0.00	6.62E-03	1.25E+01
	0.49	0.08	2.29E-03	9.30E-01
	0.46	0.17	7.99E-04	0.00E+00
	0.43	0.25	2.83E-04	0.00E+00
	0.33	0.32	1.03E-04	0.00E+00
1.0				

1.00	0.00	3.03E-03	4.17E-03
0.98	0.17	6.05E-04	3.03E-04
0.93	0.34	1.10E-04	0.00E+00
2.0			
1.96	0.34	1.28E-04	0.00E+00
2.00	0.00	2.12E-03	1.79E+00
1.96	0.34	1.29E-04	0.00E+00
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			

1.00	0.00	3.03E-03	4.17E-03
0.98	0.17	6.05E-04	3.03E-04
0.93	0.34	1.10E-04	0.00E+00
2.0			
1.96	0.34	1.28E-04	0.00E+00
2.00	0.00	2.12E-03	1.79E+00
1.96	0.34	1.29E-04	0.00E+00
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			

AVAILABLE OPTIONS

- PRINT - TO SEE THE REPORT
- REVIEW - TO SEE THE INPUT DATA
- RELEASE - TO SEND THE REPORT
- RETRIEVE - TO SEE OAC DATA
- END - TO RETURN TO COMMAND LEVEL
- ENTER OPTION: REVIEW

OCC NUCLEAR STATION UNIT 1 DATE: 01/30/73 TIME: 0:00

1.	NO WIND SPEED MW TW	2.500	MPH
2.	NO WIND SPEED RV SITE	0.800	MPH
3.	NO WIND DIRECTION MW TW - FROM	20.000	DEG
4.	NO WIND DIRECTION RV SITE - FROM	55.000	DEG
5.	NO DELTA TEMP	1.000	DEG C
6.	NO AMBIENT AIR TEMP	15.000	DEG C
7.	NO DEW POINT TEMP	10.000	DEG C
8.	NO PRECIP DURING LAST 15 MIN	0.000	INCH
9.	REACTOR BLDG PRESS CH A	1.000	PSIG
10.	REACTOR BLDG PRESS CH B	0.422	PSIG
11.	100 HR CONT AREA MON TR A		R/HR
			PSIG

17.	170 HI HI RANGE	7.4789E+01	R/HR
18.	170 HI HI RANGE	0.0000E+00	CFM
19.	170 HI HI RANGE	1.0270E+02	CFM
20.	170 HI HI RANGE	4.2903E+04	CFM
21.	200 HI HI RANGE		R/HR
22.	200 HI HI RANGE		CFM
23.	200 HI HI RANGE		CFM
24.	200 HI HI RANGE		CFM
25.	200 HI HI RANGE		R/HR
26.	200 HI HI RANGE		CFM
27.	200 HI HI RANGE		CFM
28.	200 HI HI RANGE		CFM
29.	200 HI HI RANGE		R/HR
30.	200 HI HI RANGE		CFM
31.	200 HI HI RANGE		CFM
32.	200 HI HI RANGE		CFM
33.	200 HI HI RANGE		CFM
34.	200 HI HI RANGE		CFM
35.	200 HI HI RANGE		CFM
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37.	200 HI HI RANGE		CFM
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41.	200 HI HI RANGE		CFM
42.	200 HI HI RANGE		CFM
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93.	200 HI HI RANGE		CFM
94.	200 HI HI RANGE		CFM
95.	200 HI HI RANGE		CFM
96.	200 HI HI RANGE		CFM
97.	200 HI HI RANGE		CFM
98.	200 HI HI RANGE		CFM
99.	200 HI HI RANGE		CFM
100.	200 HI HI RANGE		CFM

MANUAL INPUT

STABILITY CLASS 6
 RELEASE MODE 0
 DELTA TEMP 1.000
 FINE SCALE DIVISION 2.000 HRS

CONTAMINANT

TYPE OF ACCIDENT 1
 VOLUME LEAK RATE 1.000E+01
 RELEASE CONCENTRATION 2.000E+00
 LISTED CONCENTRATION 1.000E+00

WIND

STEADY

PROJECTED TWO HOUR DATA

MANUAL INPUT

TOWER WIND SPEED 21.000 MPH
 TOWER WIND DIRECTION 000

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 8

"Environmental Monitoring for Emergency Conditions for
Catawba Nuclear Station"

R E Harris

Approved By

9/19/88

Date

Rev. 3
September 15, 1988

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
ENVIRONMENTAL MONITORING FOR
EMERGENCY CONDITIONS WITHIN THE
TEN MILE RADIUS OF CATAWBA NUCLEAR STATION

1.0 PURPOSE

To provide a method for identifying airborne plumes or liquid effluents, and obtaining field data indicative of the radiation exposure to the general public following a suspected uncontrolled release of radioactive material.

2.0 REFERENCES

- 2.1 HP/O/B/1000/06 Emergency Equipment Functional Check and Inventory
- 2.2 HP/O/B/1002/12 Radiological Environmental Sample Collection
- 2.3 HP/O/B/1003/05 Operating and Calibration Procedure: Eberline Model PIC-6A Portable Ion Chamber
- 2.4 HP/O/B/1003/12 Operating and Calibration Procedure: Eberline Model E-520 Portable Beta-Gamma Geiger Counter
- 2.5 HP/O/B/1001/23 Operation and Calibration: Quantum Portable MCA
- 2.6 HP/O/B/1003/31 Operation and Calibration: Eberline Model E140N Portable Count Rate Meter
- 2.7 HP/O/B/1009/16 Distribution of Potassium Iodide Tablets in the Event of a Radioiodine Release
- 2.8 HP/O/B/1009/19 Emergency Radio System Operations, Maintenance and Communications
- 2.9 HP/O/B/1003/41 Operation and Calibration: Bicron Model RSO-50

3.0 LIMITS AND PRECAUTIONS

- 3.1 The Field Monitoring Teams (FMT) should park vehicles completely off the road when sampling and use vehicle emergency flashers while stopped.
- 3.2 Enclosure 5.1 contains protective clothing, dosimetry, and respiratory equipment criteria for field monitoring. The Field Monitoring Coordinator (FMC) in the Technical Support Center (TSC) or the Offsite Monitoring Coordinator (OMC) in the Crisis Management Center (CMC) can change these criteria depending upon conditions.
- 3.3 FMT members should don Anti-Cs before leaving the station.
- 3.4 Radiation surveys shall consist of gamma readings unless otherwise directed by FMC to perform beta surveys.

- 3.5 If the team members are expected to be exposed to I-131 in excess of 70 MPC (6.1×10^{-7} μ Ci/ml), and directed by the FMC, each team member should ingest a tablet of potassium iodide per Reference 2.7.
- 3.6 While performing instrument surveys in the field, if any FMT except Foxtrot notes an instrument reading of ≥ 2 mR/hr, they shall retreat from the area to an area of < 2 mR/hr. The FMT shall report results to FMC and await further instructions. Foxtrot team shall use ≥ 50 mR/hr as action level.
- 3.7 Environmental sampling during emergency conditions shall not replace, but rather supplement normal environmental monitoring.
- 3.8 Minimum labeling requirements for all samples are as follows:
 - 3.7.1 Date and time.
 - 3.7.2 Location.
 - 3.7.3 Volume of the sample (if applicable).
- 3.9 All FMTs shall repeat directions given by Radio Operator whenever possible, to ensure effective monitoring techniques. Also, survey results shall be repeated by Radio Operator whenever possible to ensure correct, accurate data transmission.
- 3.10 Each FMT shall maintain open radio communications with the FMC per Reference 2.8. If a radio becomes inoperable telephone the following:
 - 3.10.1 FMC in the TSC at 831-8182 (Lake Wylie/Charlotte).
 - 3.10.2 Station PBX Operator at 831-3000 (Lake Wylie/Charlotte), 861-0331 (Gaston County), 324-3128 (Rock Hill/Fort Mill), and request ext. 8182 for FMC.
 - 3.10.3 OMC in the CMC at (704) 382-0735/0736.
- 3.11 If any equipment becomes inoperable, notify the FMC.
- 3.12 Personnel not trained for emergency response may assist a trained Health Physics technician to do surveys and/or drive the vehicle.
- 3.13 Ensure that count rate portable survey instrumentation is on and audibly monitored during transport to all sampling locations.
- 3.14 The helicopter team shall be used for qualitative (plume location and/or "hot spot" location) and not quantitative analysis.
- 3.15 When returning kits to the Emergency Kit Storage Room, perform an equipment inventory check using the Environmental Survey Kits List of Contents (Reference 2.1). Note deviations and forward to the Respiratory/Instrument Calibration Supervisor.
- 3.16 When returning kit(s) to the Health Physics Instrument Issue Area, perform an equipment inventory check using the Protected Area Survey Kit List of Contents (Reference 2.1). Note deviations and forward to the Respiratory/Instrument Calibration Supervisor.

4.0 PROCEDURE

4.1 Field Monitoring Team (FMT) Activation

4.1.1 Form as many survey teams and sampling van teams as possible, based upon the number of personnel available and field monitoring required.

<u>Team Call Signs</u>	<u>Number of Members</u>	<u>Transportation</u>
Sample Van 1	2	Emergency Van
Sample Van 2	2	Emergency Van
Alpha	2	Land Vehicle
Bravo	2	Land Vehicle
Charlie	2	Land Vehicle
Delta	2	Land Vehicle
Echo	1	Helicopter
Foxtrot	2	(Onsite Team)

4.1.2 Upon notification and assembly, FMT Foxtrot will obtain a portable radio, a site map, portable survey instruments, and a respirator with GMRI canister from the HP Instrument Issue Area.

4.1.2.1 Team Foxtrot will obtain direction concerning the use of Respirators from the FMC.

4.1.2.2 Team Foxtrot will then be dispatched, per the FMC, up to the security area boundary fence at the estimated plume location.

4.1.3 The Emergency Sample Van FMT members shall:

4.1.3.1 Pick up van keys at the PAP.

4.1.3.2 Pick up portable generator from the Emergency Kit Storage Room.

4.1.4 The remaining FMT members shall:

4.1.4.1 Report to the Emergency Kit Storage Room in the Temporary Administration Building to obtain Environmental Survey Kits. If dispatched, Charlie and Delta Teams shall contact FMC for equipment acquisition.

4.1.4.2 Ensure the tamper seal on the Environmental Survey kits have not been broken and inventory any that have (Reference 2.1).

4.1.4.3 Perform a communication check with FMC, using the portable FM radios and the radio in the vans.

4.1.4.3.1 Perform a battery check and survey the area for higher than background radiation levels.

4.1.4.3.2 Report any above background radiation levels to the FMC. As advised by the FMC, move to a low background area to complete source checks.

4.1.5 All FMT members shall:

4.1.5.1 Source check survey instruments (References 2.3, 2.4, 2.6, 2.9) if applicable.

4.1.5.1.1 Turn the E140N Count Rate Meter on and continuously monitor the audible signal while locating and tracking the plume.

4.1.5.2 Don TLD, high and low range dosimetry, and fill out dose cards.

4.1.5.3 Obtain emergency vehicles as directed in Enclosure 5.12.

4.1.5.4 Inform the FMC when you are prepared to leave the station.

4.1.5.5 Each FMT will be dispatched per the FMC.

4.1.5.6 The radio operator in the TSC shall complete Field Monitoring Survey Data Sheet (Enclosure 5.6), with the appropriate information.

4.2 Locating and Tracking the Plume

4.2.1 Unless otherwise directed by the FMC or OMC, the FMT's will generally be dispatched as follows:

Alpha; - performance of gamma radiation surveys on
Bravo, the edges of the suspected area to determine
Charlie, plume boundaries, utilizing a station vehicle.
Delta

Foxtrot - performance of (on-site, near-site) gamma radiation surveys along the security area boundary fence, mobile or on foot, as directed.

Sample - performance of air sample and gamma radiation
Van 1, 2 surveys and mobile analyses at or beyond the site boundary fence, utilizing an emergency van.

Helicopter - performance of aerial gamma radiation surveys, utilizing a helicopter.

- 4.2.2 The FMC will direct FMT's to systematically survey the suspected areas in a continuous mode and to obtain air samples and gamma measurements as conditions warrant utilizing quadrants, major roads, and/or predetermined sampling locations.
- 4.2.2.1 Each quadrant consists of a four square mile area (two miles on each side). This area is then sub-divided into four sub-quadrants of one square mile each.
- 4.2.2.1.1 A quadrant on the EPZ Map will be identified by, 1) the letter depicting the column and 2) the number depicting the row (ex. H-12).
- Note: The letter "I" has been omitted to eliminate possible confusion with the number (1).
- 4.2.2.1.2 A sub-quadrant will be described as either the upper left (UL), upper right (UR), lower left (LL), or lower right (LR).
- 4.2.2.2 Major roadways delineate major territories surrounding the plant. Either all or a portion of these sections would be expected to be affected to some degree by radioactivity released from the plant. Major roadways are therefore utilized to provide access to suspected regions (outer edges, leading edge(s), centerline) of the plume, as necessary.
- 4.2.2.2.1 Major roadways on the EPZ map are identified by numerical designations and responsibility level (federal, state, county or city) designations.
- 4.2.2.2.2 Selected roadways on the EPZ map are identified by a specific name, rather than a numerical responsibility designation.
- 4.2.2.3 Each predetermined sampling location is denoted by a (brown) dot on the map. The sampling point designator indicates the protective action zone the point is in and the mileage from the plant.
- 4.2.2.3.1 The field monitoring coordinator (FMC) should use the points as landmarks when directing the teams.

- 4.2.2.3.2 The point locations can be read directly from the map or from the directions in Enclosure 5.4.
- 4.2.2.4 Survey teams shall report the maximum radiation level to the FMC or OMC, as directed.
- 4.2.2.5 Sample van teams shall report the maximum radiation level of the instantaneous cloud, the average radiation level while inside the plume, and air sample data to the FMC or OMC, as directed.
- 4.2.3 The FMC/OMC may use Enclosure 5.5 as a log to document instructions to the radio operator regarding FMT movement and utilization.
- 4.2.4 The radio operator shall use Enclosure 5.6 to log FMT movement and field data such as gamma surveys, air samples, and/or special samples.
- 4.2.5 The FMC shall periodically provide information on the emergency classification, wind speed, wind direction, zones affected and other pertinent information to the FMT's, using Enclosure 5.9.
- 4.2.6 The FMC shall periodically check and track FMT members radiation exposures, using Enclosure 5.10.
- 4.2.7 At the assigned survey point, the FMT shall perform a general area Gamma survey. This method should be used to locate center and width of plume.
 - 4.2.7.1 Record date, time, location and dose rate (mr/hr) on the Field Monitoring Survey Data Sheet (Enclosure 5.6). Ensure accurate data prior to transmission to FMC.
- 4.2.8 If survey results are less than or equal to expected background, call in the results to the FMC and wait for further instructions.
- 4.2.9 If survey results are greater than background, take protective actions as necessary. Then, if directed, take an air sample (volume should be $\geq 10^6$ ml) equipped with a Silver Zeolite Cartridge and particulate filter.
 - 4.2.9.1 Insert cartridge with arrow pointing in.
 - 4.2.9.2 Insert filter paper with smooth side facing out.
 - 4.2.9.3 Calculate required sample time per Enclosure 5.7.

- 4.2.9.4 Place the electrical generator (gas powered or mounted generator in the vans) in service and start the air sampler ensuring the sampler is approximately two feet above the ground or higher.
 - 4.2.9.4.1 Gas power generators should be kept from wet areas and handle with electrical gloves contained in the environmental monitoring kit.
 - 4.2.9.4.2 Ensure caution is taken when starting the generator, (i.e. keep hands from moving parts, stay clear of carburetor system).
 - 4.2.9.4.2 Mounted electrical generation located in the emergency vans should be operated as follows to
 - 4.2.9.4.2.1 Ensure the engine of the van is running before energizing the generator.
 - 4.2.9.4.2.2 Ensure the engine is running continuously if the generator is being used.
 - 4.2.9.4.3 Ensure all sampling equipment is off the roadway for safety reasons.
 - 4.2.9.5 When air sampling is complete, place the Silver Zeolite Cartridge in a thin plastic bag (baggie) for analysis. For transporting or storage place this into a labeled "zip-lock" bag.
 - 4.2.9.6 Place filter in a separate plastic bag and label.
 - 4.2.9.7 As directed by the FMC, transport the completed sample to a vehicle that is carrying a Portable MCA for analysis per Enclosure 5.8.
 - 4.2.9.8 Wait for further instructions from the FMC.
- 4.3 Special Sampling, as directed:
- 4.3.1 When sampling away from the emergency vehicles and no one is present to monitor the radio do the following:
 - 4.3.1.1 For the emergency vans, ensure the exterior speaker is on and volume turned up. Switch located near the radio monitor on the right side of the drivers seat.

- 4.3.1.2 For other Station vehicles or personnel vehicles, carry the portamobile radio to the sampling location.
- 4.3.2 All sampling immediately outside of the Auxiliary, Service and Turbine Buildings should be done by Team Foxtrot.
- 4.3.3 Take smears and place them in separate plastic bags, label and retain for later analysis.
- 4.3.4 Count smears on E140N and record on Field Monitoring Survey Data Sheet (Enclosure 5.6). Call in results to FMC.
- 4.3.5 Collect surface water sample(s) as follows:
 - 4.3.5.1 Use the limnological sampler (bucket) to collect water from the top surface layer of water.
 - 4.3.5.2 Attach a rope to the sampler if the body of water being sampled may not be easily reached.
 - 4.3.5.3 Pour the water sample into a cubitainer or some other appropriate container.
 - 4.3.5.4 Seal the container and label with; the date, time and sample location; and retain for later analysis.
- 4.3.6 Collect composite water samples per Reference 2.2 and retain for further analysis.
- 4.3.7 Collect broadleaf vegetation sample(s) as follows:
 - 4.3.7.1 Estimate an approximate square meter plot of vegetation.

NOTE: Leaves in the shape of needles, i.e. pine or spruce needles, are not considered to be broad leaf vegetation.
 - 4.3.7.2 Using shears or scissors, cut and collect the vegetation approximately one inch from the top.
 - 4.3.7.3 Place the vegetation in a plastic sample bag.
 - 4.3.7.4 Seal the bag and label with; the date, time and sample location; and retain for later analysis.

- 4.3.8 Collect shoreline sediment sample(s) as follows:
 - 4.3.8.1 Use a small hand spade or another similar object to collect shoreline sediment just above where the water is lapping up on the shore.
 - 4.3.8.2 Place the sample in a one liter wide-mouth bottle or another appropriate container. Avoid filling the bottle with rocks or water.
 - 4.3.8.3 Seal the container and label with; the date, time and sample location; and retain for later analysis.
- 4.3.9 Collect milk sample(s) per Reference 2.2 and retain for later analysis. Locations are listed in Sample Enclosure 5.3.
- 4.3.10 Place TLD's in the environment as per Reference 2.2.
- 4.3.11 Retrieve and replace air sample(s) and/or TLD's that are already located in the environment as per Reference 2.2. Locations are listed in Enclosure 5.2. Retain sample(s) for later analysis.
- 4.4 Contamination Control Considerations
 - 4.4.1 Don Anti-Cs inside the vehicle before leaving the vehicle.
 - 4.4.2 Once a release has occurred, vehicle windows should be closed with ventilation off (unless filtration or recirculation is available on the ventilation) to minimize contamination until the plume area is identified. Depending on weather conditions (extreme heat or cold), this may not be possible.
- 4.5 Turnover
 - 4.5.1 Each FMT shall be relieved as directed by the FMC.
 - 4.5.2 Inform the relief FMT on the status of the following:
 - 4.5.2.1 Radiation surveys and dose rates in the plume area.
 - 4.5.2.2 Kit Inventory consumed.
 - 4.5.2.3 Equipment operating status.
 - 4.5.2.4 Any sampling problems.
 - 4.5.2.5 Plant status information.

- 4.5.3 Direct the relief FMT to don TLD's and pocket dosimetry and fill out dose cards.
- 4.5.4 Return all samples to the Emergency Kit Storage Room as directed by the FMC.
- 4.5.5 Turn in all data sheets to the FMC or his designee.

5.0 ENCLOSURES

- 5.1 Recommended Criteria for Protective Clothing, Dosimetry, and Respiratory Equipment
- 5.2 Air Sampler, TLD, and Water Sample Locations
- 5.3 Milk Sample Locations
- 5.4 Predetermined Sampling Locations
- 5.5 Sample of FMC Instruction Log
- 5.6 Sample of Field Monitoring Survey Data Sheet
- 5.7 Sample Time Required For Minimum Sample Volume
- 5.8 Sample of MCA Operational Guidelines
- 5.9 Periodic Status Update for Field Monitoring Teams
- 5.10 Field Monitoring Team Radiation Exposure Record
- 5.11 TSC Field Monitoring Organization
- 5.12 Emergency Vehicles

Recommended Criteria For Protective Clothing, Dosimetry, and Respiratory Equipment
DUKE POWER COMPANY

CATAWBA NUCLEAR STATION

Date _____ Time _____
Job Description Field Monitoring Team Emergency Response Activities
Location: Building/Unit N/A Room/Elevation N/A Area 10 Mile EPZ

PROTECTIVE CLOTHING AND EQUIPMENT REQUIRED

Job Classification Refer to Comments Section	A	B	C	D
<input checked="" type="checkbox"/> Hood				
Disposable Cloth		X	X	X
Wetsuit				

SPECIAL INSTRUCTIONS/PRECAUTIONS

- Notify FMC/OMC prior to start of work, or changing work locations.
- Contact FMC/OMC for expected conditions during job.
- Utilize RCZ laundry bins/and Radioactive waste containers.
- Health Physics approval required prior to sweeping, brushing, grinding, welding, or use of compressed air and solvents.
- Provide for adequate system drainage and provide absorbent material to pick up water.
- Lay down polyethylene and/or canvas to protect work surfaces and limit contamination.
- Set up local exhaust system with HEPA filter for proper ventilation.
- Enter time in RCA/RCZ on Daily Exposure Time Record Card.
- Review area Radiological Status Sheet prior to entry.
- Low dose-rate areas are identified and posted.
- Personnel/tool/equipment monitoring required when leaving RCA/RCZ.
- Housekeeping tour required before RWP termination.

<input checked="" type="checkbox"/> Coveralls				
Disposable Cloth	X	X	X	X
Wetsuit				

<input checked="" type="checkbox"/> Gloves				
Cotton	X	X	X	X
Rubber		X	X	X
Surgical				
Cotton Work				
Heavy Rubber				
Leather				

Refer to Comments Section for Additional Instructions/Information.

Health Physics Coverage Required	Radiation Monitoring Required	ALARA Considerations
<input checked="" type="checkbox"/> Continuous <input type="checkbox"/> Intermittent <input type="checkbox"/> Start of Work <input type="checkbox"/> Dose Controller <input type="checkbox"/> _____	Type <input type="checkbox"/> Alpha <input checked="" type="checkbox"/> Beta <input type="checkbox"/> Gamma <input checked="" type="checkbox"/> Beta-Gamma <input type="checkbox"/> Neutron	<input checked="" type="checkbox"/> Radiation Level <input checked="" type="checkbox"/> Contamination <input checked="" type="checkbox"/> Airborne Particulate <input checked="" type="checkbox"/> Airborne Iodine <input type="checkbox"/> Gaseous Activity <i>See survey and/or supplemental sheets for specific levels</i>
		<input checked="" type="checkbox"/> Pre-Job Briefing <input checked="" type="checkbox"/> Post-Job Debriefing <input type="checkbox"/> Tool List <input type="checkbox"/> Temp. Shielding <input type="checkbox"/> Additional Sheet

<input checked="" type="checkbox"/> Shoe Covers				
Disposable Cloth		X	X	X
Rubber	X	X	X	X
Heavy Rubber				

<input checked="" type="checkbox"/> Tape Required	X	X	X	X
<input type="checkbox"/> No Personal Outer Clothing				

Comments:	Airborne Activity	Contamination
A <u>B γ Radiation</u> <0.04 mR/hr	<0.25 MPC or <7.5E-10 μCi/ml*	<1000 dpm/100cm ² < 30 ccpm**
B 0.04-0.12 mR/hr	<0.25 MPC or <7.5E-10 μCi/ml*	1000-15000 dpm/100cm ² < 450 ccpm**
C >0.12 mR/hr	≥0.25 MPC or ≥7.5E-10 μCi/ml*	>15,000 dpm/100cm ² <4500 ccpm**
D	≥745 MPC-hrs or ≥6.7E-6 μCi/ml***	

<input checked="" type="checkbox"/> Dosimetry				
Whole-Body TLD	X	X	X	X
Extremity TLD				
Low Range Pocket Dosimeter	X	X	X	X
High Range Pocket Dosimeter	X	X	X	X
Extremity Pocket Dosimeter				
Digital Alarming Dosimeter				

<input checked="" type="checkbox"/> Respiratory				
Full-Face Particulate/Iodine Air Line			X	X
SCBA				
Air Supplied Suit/Hood				
Potassium Iodide Tab.				X

NOTES: *unknown isotopic mixture

**with HP210/260 probe on RM-14 or equivalent

***Iodine-131 equivalent

MPC values from System Health Physics Manual
μCi/ml values from IOCFR20 (.25 x 9E-9)

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	1	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for 1.1 miles to end of road (TLD & Air CNS #200, need key).
A0	1	5	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. for .7 miles, left on Blue Bird Ln. for .1 miles to end (TLD & Air CNS #201, need key).
A0	1	26	Location at the base of Catawba Nuclear Station Meterological Tower (TLD & Air CNS #205, need key).
B1	3	1	Hwy. 49-N for 8 miles, right Hwy. 160 for 2.8 miles, right on Gold Hill Rd. (98) at Tega Cay sign for 1.2 miles, right on gravel road into Duke Power Company substation (TLD & Air CNS #212, need key).
C2	10	5	Hwy. 274-S for 5.1 miles, left Hwy. 161 for 1.3 miles, right on Rawlinson Rd. (56) for 1.8 miles, left on Hwy. 5 for 1.6 miles, right on Heckle Blvd. (901) for 3.3 miles to end of road, left on Hwy. 72 for 1.2 miles, right on dirt road across from Wayne's Auto Service. Go .1 miles to Duke Power Company substation on left (TLD & Air CNS #217, need key).
A0	1	1	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for 1.1 miles to end of road (TLD & Air CNS #200, need key).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	5	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. for .7 miles, left on Blue Bird Ln. for .1 miles to end (TLD & Air CNS #201, need key).
A0	1	8	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. Go .3 miles to first drive on right past Paradise Pl., TLD across road (TLD CNS #202).
A0	1	11	Left exiting Nuclear Production entrance on Concord Rd., for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. for .2 miles. TLD is .1 mi. on left in curve (TLD CNS #223).
A0	1	14	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .2 miles. TLD is .2 mi. on right side of road (TLD CNS #224).
A0	1	17	Left exiting Nuclear Production entrance on Concord Rd. for 1.1 miles to first transmission tower on left after bridge (TLD CNS #225).
A0	1	20	Left exiting Nuclear Production entrance on Concord Rd. for .7 miles. TLD on left just past fence (TLD CNS #226).

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
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ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	23	Left exiting Nuclear Production entrance on Concord Rd. for .4 miles. TLD on left at beginning of guardrail posts (TLD CNS #204).
A1	4	2	Hwy. 49-N for 6.5 miles to the intersection of Pleasant Hill Rd. (1109). TLD is on the transmission tower on left (TLD CNS #232).
A1	4	4	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for .6 miles, left on Zoar Rd. (1105) for .4 miles, right on Thomas Rd. (1104) for .1 miles. TLD is behind second house on.
B1	3	1	Hwy. 49-N for 8 miles, right on Hwy. 160 for 2.8 miles, right on Gold Hill Rd. (98) at Tega Cay sign for 1.2 miles, right on gravel road into Duke Power Company substation (TLD & Air CNS #212, need key).
B1	4	3	Hwy. 49-N for 8 miles, right on Hwy. 160 for 3.9 miles, right on Dam Rd. (99) for 1.9 miles to last gravel road on right in sharp curve before Lake Wylie Dam, left through fence for .2 miles to substation, TLD on right of inner substation fence (TLD CNS #235).
B2	4	2	Hwy. 49-N for 8 miles, right on Hwy. 160 for 2.8 miles to the Home Federal Savings and Loan on left side of road. TLD on left rear corner of barbed wire fence approximately 50 yds. behind bank (TLD CNS #234).

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
EDA-08
ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE & RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
B2 7	6	Hwy. 49-N for 8 miles, right on Hwy. 160 for 7.1 miles, right on Lee St. for .1 miles, left on Self St. for approximately 100 yds. TLD at Fort Mill Municipal Water Supply on right behind Springs Mill (TLD CNS #247, Water CNS #213).
B2 8	1	Hwy. 49-N for 10 miles, right on Carowinds Blvd. (1441) for 1.3 miles, left on Choate Circle for .3 miles, TLD is on the inside of fence left of the guardhouse (TLD CNS #246).
A0 1	26	Location at the base of Catawba Nuclear Station Meterological Tower (TLD & Air CNS #205, need key).
A0 1	29	Left exiting Nuclear Production entrance on Concord Rd. for .1 miles. TLD at Shady Shore Dr. on right corner of.
A0 1	32	Right exiting Nuclear Production entrance on Concord Rd. for .1 miles. TLD is at first dirt road, left, (Valelake Dr.) on right corner, (TLD CNS #228).
A0 1	35	Right exiting Nuclear Production entrance on Concord Rd. for .4 miles. TLD on top of hill on right at the intersection of Catawba Nuclear Station Construction entrance (TLD CNS #206).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	38	Hwy 274-N Rt. at Liberty Hill Rd. right at fork to 3rd power line on rt., walk ~ 200 yards along boundary fence. TLD on fence (TLD CNS #229).
A0	1	41	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for .4 miles. TLD on fence on right (TLD CNS #207).
A0	1	44	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for 1 mile to large rock pile at fence. TLD is on fence (TLD CNS #222).
A0	1	45	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for 1.4 miles to end of road. TLD is on fence on the left side (TLD CNS #203).
C1	4	1	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 5.2 miles, left on India Hook Rd. (30) for .9 miles to the S.C. Wildlife Resources Dept. on left (TLD CNS #236).
C1	4	3	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 3 miles, right on Homestead Rd. (657) for 2.5 miles to end of road. TLD is straight across at intersection of Twin Lakes Rd. (TLD CNS #237).

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
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ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
C1	4	5	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 1.3 miles, right on West Oak Dr. (962) for 1.2 miles to end at fork. TLD on left at fence. (TLD CNS #238).
C2	7	3	Hwy. 274-S for 9.2 miles, right on Herlong Ave. for .3 miles to Piedmont Medical Center emergency entrance to back of hospital. TLD on fence at back right corner of Liquid Oxygen storage area (TLD CNS #248).
C2	8	6	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 1.3 miles, right on Rawlinson Rd. (56) for 1.8 miles, left on Hwy. 5 for .5 miles to Rock Hill Career Development Center on right. TLD on transmission tower in front of building (TLD CNS #249).
C2	10	5	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 1.3 miles, right on Rawlinson Rd. (56) for 1.8 miles, left on Hwy. 5 for 1.6 miles, right on Heckle Blvd. (901) for 3.3 miles to end of road, left on Hwy. 72 for 1.2 miles, right on dirt road across from Wayne's Auto Service. Go .1 miles to Duke Power Company substation on left (TLD & Air CNS #217, need key).
D1	4	2	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 2.3 miles, left on Paraham Road for 1.7 miles.
D1	5	1	Hwy. 274-S for 5 miles to Carter Lumber Co. TLD on fence near gate (TLD CNS #239).

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
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ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
D1	5	4	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3 miles. TLD on left at beginning of fence (TLD CNS #241).
D2	10	4	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3.4 miles, left on Hwy. 49-S for 5.2 miles, left on North Congress St. (64) for .7 miles, left on Hwy. 5 for .2 miles to Duke Power Company Appliance Center on left. TLD on fence in back (TLD CNS #250).
E1	5	2	Hwy. 49-S for 3 miles, right on Paraham Rd. (54) for .7 miles to transmission tower on left after bridge (TLD CNS #242).
E1	5	3	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 2.3 miles, left on Kingsburry Rd. (114) for .4 miles to transmission tower on left (TLD CNS #243).
E2	10	2	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 7.4 miles to Duke Power Company Appliance Center on left. TLD on fence in back of building (TLD CNS #251).
F1	4	1	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 1.5 miles to Bethel School. TLD on side of small building in back (TLD CNS #244).
F1	4	3	Hwy. 274-N for 3.4 miles, left on Glenvista Rd. to Crowders Creek boat landing. TLD to east of parking lot (TLD CNS #245).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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 ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
F1	4	4	Hwy. 274-N for 3.1 miles to River Hills Plantation rear entrance at Robinwood Rd. TLD behind green building on right corner (TLD CNS #230).
F1	4	6	Hwy. 49-N for 4.1 miles to River Hills Plantation entrance guardhouse (TLD CNS #231).
A0	1	46	Left exiting Nuclear Production entrance on Concord Rd. for .7 miles. Turn left just after canal bridge. Go to pier (Water CNS #208, need key).
A1	4	6	Hwy. 49-N for 5.6 miles, left at Camp Steere sign after crossing Buster Boyd Bridge for .7 miles to end of road (Water CNS #215).
B1	4	5	Hwy. 49-N for 8 miles, right on Hwy. 160 for 3.9 miles, right on Dam Rd. (99) for 1.6 miles, left on Gray Rock Rd. (251) for .7 miles to Lake Wylie Dam. Walk through plant to upstream side of the dam (Water CNS #211).
B1	4	6	Hwy. 49-N for 8 miles, right on Hwy. 160 for 3.9 miles, right on Dam Rd. (99) for 1.6 miles, left on Gray Rock Rd. (251) for .7 miles to Lake Wylie Dam. Go to river access on downstream side of dam.
B2	7	6	Hwy. 49-N for 8 miles, right on Hwy. 160 for 7.1 miles, right on Lee St. for .1 miles, left on Self St. for approximately 100 yds. TLD at Fort Mill Municipal Water Supply on right behind Springs Mill (TLD CNS #247, Water CNS #213).

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
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ENCLOSURE 5.2

AIR SAMPLER, TLD, AND WATER SAMPLE LOCATIONS

AIR SAMPLE LOCATIONS (NEED KEY, CPD-1)

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
C2	7	2	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 8.5 miles to the intersection of Cherry Rd. Go to Rock Hill Municipal Water Supply across intersection on left (Water CNS #214).
C2	7	8	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 7.6 miles, left on Hwy. 161 for 1.1 miles, left on Hwy. 21 for .4 miles, left on Grier McGuire Rd. for .5 miles to end of road.
F3	14	4	Hwy. 274-N for 5 miles, right on Pole Branch Rd. (279) for 2.8 miles, right on Hwy. 273 for 7.2 miles into Belmont, right on Catawba St. for .6 miles, left at next light for .2 miles to Belmont Municipal Water Supply (Water CNS #218).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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 ENCLOSURE 5.3
 MILK SAMPLE LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>MILK</u>	<u>DESCRIPTION</u>
D1	6	M	Hwy. 274-S for 5.1 miles, right on Hwy. 161 for 2.1 miles, left on Rd. 1080 for .5 miles to Pursley Dairy.
D2	8	M	Sample location has been deleted.
E2	6	M	Sample location has been deleted.
F1	3	M	Hwy. 274-N for 2.2 miles, right on Lake Wylie Rd. (1099) for .1 miles to first house on left (Ingram Richmond residence).
F2	7	M	Sample location has been deleted.
D1	7	M	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for .1 miles, right on Adnah Church Rd. (81) for 1.4 miles. Woods Dairy is on the left.
F2	13	M	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 9.5 miles through Clover, S.C., right on Lloyd White Rd. (148) for 2.3 miles, left on Crowders Creek Rd. (1103) for 1.3 miles, right on Sparrow Springs Rd. (1125) for .5 miles. Oates Dairy is on the left.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	1	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for 1.1 miles to end of road (TLD & Air CNS # 200, need key).
A0	1	2	Hwy. 274-N for 2.2 miles, right on Lake Wylie Rd. (1099) for 2.2 miles to fork in road, right at fork onto Commodore Pl. for .2 miles, left on Tioga Rd. for .3 miles to end of road.
A0	2	3	Hwy. 274-N for 2.2 miles, right on Lake Wylie Rd. (1099) for 2.2 miles to fork in road where pavement ends.
A0	2	4	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 3 miles to fork in road, left at fork for .6 miles to end at Catawba Yacht Club.
A0	1	5	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. for .7 miles, left on Blue Bird Ln. for .1 miles to end (TLD & Air CNS #201, need key).
A0	1	6	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 2.8 miles, left on Snug Harbor Rd. (1357) for .5 miles, right on Kalabash Rd. for .3 miles, right on Cozy Cove Rd. (1434) for .5 miles to end.
A0	2	7	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 2.8 miles to the intersection of Snug Harbor Rd. (1357).
A0	1	8	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. Go .3 miles to first drive on right past Paradise Pl., TLD across road (TLD CNS #202).
A0	1	9	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
			right on Youngblood Rd. (1102) for 2.3 miles, left on Snug Harbor Rd. (1357) for 1.3 miles to end of road.
A0	2	10	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 2.8 miles, left on Snug Harbor Rd. (1357) for 1.3 miles, left on Crosshavens Dr. for .3 miles to end of road.
A0	1	11	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .3 miles, left on Crepe Myrtle Rd. for .2 miles. TLD is on left in curve (TLD CNS #223).
A0	1	12	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 1.6 miles, left on McKee Rd. (1100) for 1.2 miles, right on Bankhead Rd. for 1.2 miles to end of road.
A0	2	13	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 1.6 miles, left on McKee Rd. (1100) for 1.2 miles, right on Bankhead Rd. for .4 miles to the intersection of Bessbrook Rd.
A0	1	14	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for .3 miles, right on Acacia Rd. for .2 miles. TLD is on right side of road (TLD CNS #224).
A0	1	15	Left exiting Nuclear Production entrance on Concord Rd. for 1.3 miles, left on Kingfisher Dr. for 1.8 miles to Commodore Yacht Club.
A0	1	16	Left exiting Nuclear Production entrance on Concord Rd. for 1.3 miles where pavement ends.
A0	1	17	Left exiting Nuclear Production entrance on Concord Rd. for 1.1 miles to first transmission tower on left after bridge (TLD CNS #225).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	18	Left exiting Nuclear Production entrance on Concord Rd. for 1.7 miles, right on Sandlapper Rd. for .2 miles. Stop at transmission tower.
A0	2	19	Hwy. 274-S for 1.6 miles, left on Allison Creek Rd. (1081) for 3 miles to end of pavement.
A0	1	20	Left exiting Nuclear Production entrance on Concord Rd. for .7 miles. TLD on left just past fence (TLD CNS #226).
A0	1	21	Hwy. 274-S for 1.6 miles, left on Allison Creek Rd. (1081) for 1.7 miles, left on Spratt Rd. to end. (Beware of dogs).
A0	2	22	Hwy. 274-S for 1.6 miles, left on Allison Creek Rd. (1081) for 1.6 miles to intersection of Bardale Rd.
A0	1	23	Left exiting Nuclear Production entrance on Concord Rd. for .4 miles. TLD on left at beginning of guardrail posts (TLD CNS #204).
A0	1	24	Hwy. 274-S for 1.6 miles, left on Allison Creek Rd. (1081) for 1.7 miles, left at Spratt Rd. for .1 miles, left on Morrison Rd., right at first 2 forks then left at next fork to end for a total of .5 miles.
A0	2	25	Hwy. 274-S for 1.6 miles, left on Allison Creek Rd. (1081) for 1.7 miles to intersection of Spratt Rd.
A0	1	26	Location at the base of Catawba Nuclear Station Meterological Tower (TLD & Air CNS #205, need key).
A0	1	27	Right exiting Nuclear Production entrance on Concord Rd. for .1 miles, left on Valelake Rd. for .1 miles to fork in road, left at fork for .5 miles to end of road.
A0	2	28	Hwy. 274-S for 1.6 miles, left on Allison Creek Rd. (1081) for 1 mile to intersection of Colina Rd.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	29	Left exiting Nuclear Production entrance on Concord Rd. for .1 miles. TLD at Shady Shore Dr. on right corner of Bethel Community Clubhouse sign (TLD CNS #227).
A0	1	30	Right exiting Nuclear Production entrance on Concord Rd. for .1 miles, left on Valelake Rd. for .1 miles to fork in road, right at fork for .5 miles to end of road.
A0	2	31	Hwy. 274-S for 1.2 miles to the intersection of Campbell Rd. (80).
A0	1	32	Right exiting Nuclear Production entrance on Concord Rd. for .1 miles. TLD is on right side of entrance to Valelake Rd. (TLD CNS #228).
A0	1	33	Right exiting Nuclear Production entrance on Concord Rd. for 1 mile, left on Pine Point Dr. for .5 miles.
A0	2	34	Hwy. 274-S for .7 miles to Big Allison Creek Bridge.
A0	1	35	Right exiting Nuclear Production entrance on Concord Rd. for .4 miles. TLD on top of hill on right at the intersection of Catawba Nuclear Station Construction entrance (TLD CNS #206).
A0	1	36	Right exiting Nuclear Production entrance on Concord Rd. for .9 miles. Stop at entrance to transmission lines.
A0	2	37	Hwy. 274-N for .5 miles, left on Liberty Hill Rd. for .3 miles, left on Fremont Rd. for .2 miles to end of road.
A0	1	38	Go through Construction Maintenance Dept. (Central) Main Gate for approximately 50 ft., left on Alternate 1 for approximately 200 ft. to stop sign, left on gravel road for .1 miles, left into rebar yard for .7 miles on gravel road to end at chain link fence. Follow chain link fence in a northerly direction for approximately 300 yards. TLD is hanging on fence (TLD CNS #229).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A0	1	39	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for .3 miles to third transmission tower on right.
A0	2	40	Right exiting Nuclear Production entrance on Concord Rd. for 1.3 miles, right on Hwy. 274-N for 1 mile.
A0	1	41	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for .4 miles. TLD on fence on right (TLD CNS #207).
A0	1	42	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for .8 miles to softball field entrance.
A0	2	43	Hwy. 274-N for 2.2 miles, right on Lake Wylie Rd. (1099) for 1.9 miles, right on Beaver Creek Trail for .3 miles to end of road.
A0	1	44	Hwy. 274-N for .5 miles, right on Liberty Hill Rd. for .4 miles to fork in road, right at fork for 1 mile to large rock pile at fence. TLD is on fence (TLD CNS #222).
A0	1	45	Left exiting Nuclear Production entrance on Concord Rd. for 1.2 miles, left on Old Concord Rd. for 1.4 miles to end of road. TLD is on fence on the left side (TLD CNS #203).
A0	1	46	Left exiting Nuclear Production entrance on Concord Rd. for .7 miles. Turn left just after canal bridge. Go to pier (Water CNS #208, need key).
<hr/>			
A1	3	1	Hwy. 49-N for 4.8 miles to the N.C. side of Buster Boyd Bridge.
A1	4	2	Hwy. 49-N for 6.5 miles to the intersection of Pleasant Hill Rd. (1109). TLD is on the transmission tower on left (TLD CNS #232).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
A1	5	3	Hwy. 49-N for 7.8 miles to Steele Creek Volunteer Fire Department on right.
A1	4	4	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for .6 miles, left on Zoar Rd. (1105) for .4 miles, right on Thomas Rd. (1104) for .1 miles. TLD is behind second house on right in pines (TLD CNS #233).
A1	5	5	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for .3 miles, left on Hamilton Rd. (1106) for .7 miles to the intersection of Hwy. 160.
A1	4	6	Hwy. 49-N for 5.6 miles, left at Camp Steere sign after crossing Buster Boyd Bridge for .7 miles to end of road (Water CNS #215).
<hr/>			
A2	10	1	Hwy. 49-N for 11.4 miles to Westinghouse Blvd. Go 1 mile past Westinghouse Blvd. to Roberts Systems 8500 on left.
<hr/>			
A3	10	1	Hwy. 49-N for 10 miles, right on Carowinds Blvd. (1441) for 3 miles, left on Hwy. 51 for 2.1 miles to Sugar Creek Bridge.
<hr/>			
B1	3	1	Hwy. 49-N for 8 miles, right on Hwy. 160 for 2.8 miles, right on Gold Hill Rd. (98) at Tega Cay sign for 1.2 miles, right on gravel road into Duke Power Company substation (TLD & Air CNS #212, need key).
B1	2	2	Hwy. 49-N for 6.5 miles, right on Pleasant Hill Rd. (1109) for .5 miles, right on Youngblood Rd. (1102) for 1.6 miles, left on McKee Rd. (1100) for 1.2 miles, left on Bankhead Rd. for .4 miles, left on Bessbrook Rd. for .8 miles to end of road.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
B1	4	3	Hwy. 49-N for 8 miles, right on Hwy. 160 for 3.9 miles, right on Dam Rd. (99) for 1.9 miles to last gravel road on right in sharp curve before Lake Wylie Dam, left through fence for .2 miles to substation. TLD on right of inner substation (TLD CNS #235).
B1	2	4	Hwy. 49-N for 8 miles, right on Hwy. 160 for 2.8 miles, right on Gold Hill Rd. (98) at Tega Cay sign. Enter Tega Cay following Tega Cay Dr. for 2.6 miles, right on Windjammer Dr. for .6 miles to circle, right at circle for .2 miles, left on Kiwi Point for .2 miles to end of road.
B1	4	5	Hwy. 49-N for 8 miles, right on Hwy. 160 for 3.9 miles, right on Dam Rd. (99) for 1.6 miles, left on Gray Rock Rd. (251) for .7 miles to Lake Wylie Dam. Walk through plant to upstream side of the dam (Water CNS #211).
B1	4	6	Hwy. 49-N for 8 miles, right on Hwy. 160 for 3.9 miles, right on Dam Rd. (99) for 1.6 miles, left on Gray Rock Rd. (251) for .7 miles to Lake Wylie Dam. Go to river access on downstream side of dam.
<hr/>			
B2	8	1	Hwy. 49-N for 10 miles, right on Carowinds Blvd. (1441) for 1.3 miles, left on Choate Circle for .3 miles. TLD is on the inside of fence left of the guardhouse (TLD CNS #246).
B2	4	2	Hwy. 49-N for 8 miles, right on Hwy. 160 for 2.8 miles to the Home Federal Savings and Loan on left side of road. TLD on barbed wire fence approximately 50 yds. behind bank (TLD CNS #234).
B2	5	3	Hwy. 49-N for 8 miles, right on Hwy. 160 for 2.8 miles, left on Gold Hill Rd. (98) for 1 mile, stop at the intersection of Whitley Rd.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
B2	10	4	Hwy. 49-N for 10 miles, right on Carowinds Blvd. (1441) for 3 miles, left on Hwy. 51 for 3 miles, right on Hwy. 521 (Polk St.) for 2.9 miles, right on Dorman Rd. for 1.1 miles, stop at the state line.
B2	5	5	Hwy. 49-N for 8 miles, right on Hwy. 160 for 5.6 miles, right on Sutton Rd. (49) for 1.1 miles to the intersection of Gray Rock Rd. (251).
B2	7	6	Hwy. 49-N for 8 miles, right on Hwy. 160 for 7.1 miles, right on Lee St. for .1 miles, left on Self St. for approximately 100 yds. TLD at Fort Mill Municipal Water Supply on right behind Springs Mill (TLD CNS #247, Water CNS #213).
B2	10	7	Hwy. 49-N for 8 miles, right on Hwy. 160 for 10 miles through Fort Mill to the Sugar Creek Bridge.
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C1	4	1	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 5.2 miles, left on India Hook Rd. (30) for .9 miles to the S.C. Wildlife Resources Dept. on left (TLD CNS #236).
C1	5	2	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 5.6 miles to Red Burketts Body Shop on right.
C1	4	3	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 3 miles, right on Homestead Rd. (657) for 2.5 miles to end of road. TLD is straight across at intersection of Twin Lake Rd. (TLD CNS #237).
C1	5	4	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 3 miles, right on Homestead Rd. (657) for 2.5 miles to end of road.
C1	4	5	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 1.3 miles, right on West Oak Dr. (962) for 1.2 miles to end at fork. TLD on left at fence (TLD CNS #238).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
C1	5	6	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 2.2 miles to fork in road, left at fork for .1 miles, S.C. National Guard Armory on left side of road.
C1	5	7	Hwy. 274-S for 5 miles to Carter Lumber Company.
C2	10	1	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 2.2 miles to fork in road, left at fork on Celanese Rd. (50) for 8.2 miles to the intersection of Springdale Rd.
C2	7	2	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 8.5 miles to the intersection of Cherry Rd. Go to Rock Hill Municipal Water Supply across intersection on left (Water CNS #214).
C2	7	3	Hwy. 274-S for 9.2 miles, right on Herlong Ave. for .3 miles to Piedmont Medical Center emergency entrance to back of hospital. TLD on fence at back right corner of Liquid Oxygen storage area (TLD CNS #248).
C2	10	4	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 5.7 miles, right on Mt. Gallant Rd. (195) for 1.5 miles, right on Hwy. 21-121 Bypass for 2 miles to the Fast Fare on left at the intersection of Springsteen Rd.
C2	10	5	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 1.3 miles, right on Rawlinson Rd. (56) for 1.8 miles, left on Hwy. 5 for 1.6 miles, right on Heckle Blvd. (901) for 3.3 miles to end of road, left on Hwy. 72 for 1.2 miles, right on dirt road across from Wayne's Auto Service. Go .1 miles to Duke Power Company substation on left (TLD & Air CNS #217, need key).
C2	8	6	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for 1.3 miles, right on Rawlinson Rd. (56) for 1.8 miles, left on Hwy. 5 for .5 miles to Rock Hill Career Development Center on right. TLD on transmission tower in front of building (TLD CNS #249).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
C2	10	7	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for .1 miles, right on Adnah Church Rd. (81) for 2.9 miles, right on Hwy. 5 for .2 miles, left on Eastview Rd. (102) for 3.2 miles, right on Hwy. 322 for .1 miles, left on Falls Rd. for .9 miles to the intersection of Oak Park Rd. (103).
C2	7	8	Hwy. 274-S for 3.8 miles, left on Mt. Gallant Rd. (195) for 7.6 miles, left on Hwy. 161 for 1.1 miles, left on Hwy. 21 for .4 miles, left on Grier McGuire Rd. for .5 miles to end of road.
D1	5	1	Hwy. 274-S for 5 miles to Carter Lumber Company. TLD on fence near gate (TLD CNS #239).
D1	4	2	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 2.3 miles, left on Paraham Rd. (54) for 1.5 miles to transmission tower on right. TLD on power pole (TLD CNS #240).
D1	5	3	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 2.3 miles, left on Paraham Rd. (54) for .6 miles, right on Harper Rd. (815) for 1.4 miles to Allison Creek Bridge.
D1	5	4	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3 miles. TLD on left at beginning of fence (TLD CNS #241).
D2	10	1	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for .1 miles, right on Adnah Church Rd. (81) for 2.9 miles, right on Hwy. 5 for .2 miles, left on Eastview Rd. (102) for 1 mile, right on Holland Rd. (157) for .7 miles, right on Turkey Farm Rd. (1172) for 1.2 miles, left on Russell Rd. (536) for .2 miles.

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
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ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
D2	10	2	Hwy. 274-S for 5.1 miles, left on Hwy. 161 for .1 miles, right on Adnah Church Rd. (81) for 2.9 miles, right on Hwy. 5 for .3 miles, left on Billy Wilson Rd. (1451) for 2.2 miles, right on Turkey Farm Rd. (1172) for .8 miles, left on Benfield Rd. for .3 miles to Fishing Creek Bridge.
D2	10	3	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3.4 miles, left on Hwy. 49-S for 5 miles. Stop at Pantry on left.
D2	10	4	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3.4 miles, left on Hwy. 49-S for 5.2 miles, left on North Congress St. (64) for .7 miles, left on Hwy. 5 for .2 miles to Duke Power Company Appliance Center on left. TLD on fence in back (TLD CNS #250).
D2	10	5	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3.4 miles, left on Hwy. 49-S for 1.7 miles, right on Old Limestone Rd. (172) for 4.3 miles to end of road.
E1	5	1	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 3.4 miles to the intersection of Hwy. 49.
E1	5	2	Hwy. 49-S for 3 miles, right on Paraham Rd. (54) for .7 miles to transmission tower on left after bridge (TLD CNS #242).
E1	5	3	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 2.3 miles, left on Kingsburry Rd. (114) for .4 miles to transmission tower on left (TLD CNS #243).
E1	5	4	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 2.3 miles to the intersection of Kingsburry Rd. (114).
E2	5	1	Hwy. 274-S for 1.2 miles, right on Campbell Rd. (80) for 2.3 miles, right on Paraham Rd. (54) for .9 miles to the intersection of Dr. Nichols Rd. (819).

DUKE POWER COMPANY
 CATAWBA NUCLEAR STATION
 EDA-08
 ENCLOSURE 5.4
 PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
E2	10	2	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 7.4 miles to Duke Power Company Appliance Center on left. TLD on fence in back of building (TLD CNS #251).
E2	10	3	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 7.3 miles to the Pantry on left at the intersection of Hwy. 321 (behind Pantry).
F1	4	1	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 1.5 miles to Bethel School. TLD on side of small building in back (TLD CNS #244).
F1	5	2	Hwy. 274-N for 2.1 miles, left on Hwy. 55 for 1.5 miles, right on Bethel School Rd. (152) for 1 mile to the intersection of Holland Dr.
F1	4	3	Hwy. 274-N for 3.4 miles, left on Glenvista Rd. to Crowders Creek boat landing. TLD to east of parking lot (TLD CNS #245).
F1	4	4	Hwy. 274-N for 3.1 miles to River Hills Plantation rear entrance at Hamilton's Ferry Rd. TLD behind green building on right corner (TLD CNS #230).
F1	5	5	Hwy. 49-N for 2.9 miles to Sherer Memorial Presbyterian Church parking lot on left.
F1	4	6	Hwy. 49-N for 4.1 miles to River Hills Plantation entrance guardhouse (TLD CNS #231).
F1	5	7	Hwy. 49-N for 3.6 miles, left on Montgomery Rd. for 1 mile. Stop in horseshoe curve near lake.
F2	10	1	Hwy. 274-N for 4.2 miles, left on Hwy. 557 for 2.2 miles, right on Ridge Rd. (27) for 5 miles to Bowling Green Presbyterian Church.
F2	5	2	Hwy. 274-N for 4.2 miles, left on Hwy. 557 for .6 miles to Pine Grove Baptist Church.

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
EDA-08
ENCLOSURE 5.4
PREDETERMINED SAMPLING LOCATIONS

<u>ZONE</u>	<u>& RADIUS (Mi)</u>	<u>No.</u>	<u>DESCRIPTION</u>
F3	10	1	Hwy. 274-N for 4.2 miles, left on Hwy. 557 for .9 miles, right on Oakridge Rd. (435) at Bethel Fire Dept. for 5.4 miles to the intersection of Hwy. 274 (in N.C.)
F3	10	2	Hwy. 274-N for 5 miles, right on Pole Branch Rd. (279) for 5.8 miles to Friendship Baptist Church on left.
F3	10	3	Hwy. 274-N for 5 miles, right on Pole Branch Rd. (279) for 2.8 miles, right on Hwy. 273 for 3 miles to Allen Steam Plant Bridge.
F3	14	4	Hwy. 274-N for 5 miles, right on Pole Branch Rd. (279) for 2.8 miles, right on Hwy. 273 for 7.2 miles into Belmont, right on Catawba St. for .6 miles, left at next light for .2 miles to Belmont Municipal Water Supply (Water CNS #218).

EDA-08
ENCLOSURE 5.8
QUANTUM PORTABLE MCA OPERATIONAL GUIDELINES

5.8.1 Operations

- 5.8.1.1 Verify that the system has been calibrated and that the calibration is current.
- 5.8.1.2 Connect the system components together by attaching the 65-pin cable from the Xtend computer to the instrument chassis. There is only one port on each device to which this cable can connect. Connect the printer cable to the other-port on the computer and to the printer.
- 5.8.1.3 Insure sufficient electrical power is available, then plug the instrument chassis, the ACE-Mate, the printer, and the Xtend computer into proper receptacles.
- 5.8.1.4 Power up the instrument chassis by turning the power switch at the rear of the right side to "on" (up).
- 5.8.1.5 Verify that the HV switch on the ACE-Mate is off, then power up the ACE-Mate with the front-panel toggle switch. The red light above the switch should illuminate.
- 5.8.1.6 Install the detector in the shield, then connect the signal and high voltage cables to their respective receptacles.
- 5.8.1.7 Verify that the Bias knob on the ACE-Mate front panel is set to 0, then turn on the HV switch. The red "HV on" light should illuminate.
- 5.8.1.8 Apply the specified high voltage (normally about 0.80 kvolts) to the detector by unlocking the Bias knob and rotating clockwise. The voltage applied may be observed by depressing the select button below the LED display until the KV light is illuminated. The voltage may also be adjusted by observing the vernier on the Bias knob. For example, 0.80 kvolts would be indicated by 80 in the lower window and 0 in the upper window.
- 5.8.1.9 Power up the Xtend computer with the switch on the right side of the computer power supply (mounted on top of the computer). Power up the Think Jet Printer.

ENCLOSURE 5.8
QUANTUM PORTABLE MCA OPERATIONAL GUIDELINES

5.8.1.11 Energy Calibration and QC Check

- 5.8.1.11.1 Place the calibration source on shelf 0 of the detector. Press 2 to start source check, then strike a key when ready. Data acquisition will begin and the spectrum will be displayed. (NOTE: Ensure printer is ON.)
- 5.8.1.11.2 When the acquisition is complete, the software will perform an energy calibration and activity report.
- 5.8.1.11.3 The calibration and QC check should be considered acceptable if the address channel of the 1173 keV peak of Co-60 is 294 ± 7 channels.

5.8.1.12 Sample Analysis

- 5.8.1.12.1 Place the sample to be counted on the detector in the desired geometry.
- 5.8.1.12.2 Press the number key to select count/analyze for cartridge or particulate sample.
- 5.8.1.12.3 Press the number key to select the desired count time and shelf. (Normally select 5 minutes, shelf 0).
- 5.8.1.12.4 When the sample spectrum acquisition is complete, the analysis software will interactively query the operator for sample date, time, and volume. The sample analysis results will be printed on the printer.
- 5.8.1.12.5 Report isotopes identified and the Dose Equivalent Iodine Concentration (uCi/cc).

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
EDA-08

ENCLOSURE 5.9
PERIODIC STATUS UPDATE FOR FIELD MONITORING TEAMS

Time: _____ hours

Classification: _____

Wind Speed: _____ mph

Wind Direction: from _____ °

Zones Affected: _____

Other: _____

Time: _____ hours

Classification: _____

Wind Speed: _____ mph

Wind Direction: from _____ °

Zones Affected: _____

Other: _____

Time: _____ hours

Classification: _____

Wind Speed: _____ mph

Wind Direction: from _____ °

Zones Affected: _____

Other: _____

Time: _____ hours

Classification: _____

Wind Speed: _____ mph

Wind Direction: from _____ °

Zones Affected: _____

Other: _____

Time: _____ hours

Classification: _____

Wind Speed: _____ mph

Wind Direction: from _____ °

Zones Affected: _____

Other: _____

Time: _____ hours

Classification: _____

Wind Speed: _____ mph

Wind Direction: from _____ °

Zones Affected: _____

Other: _____

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
EDA-08
ENCLOSURE 5.11
TSC FIELD MONITORING ORGANIZATION

<u>POSITION</u>	<u>NAME</u>	<u>BUSINESS PHONE</u>	<u>HOME PHONE</u>
Field Monitoring Coordinators:			
Primary:	C. V. Wray	803/831-3000	803/329-1953
Alternate:	Don Sexton	803/831-3000	803/684-7364
TSC Radio Operators:			
Primary:	P. W. Sturgis	803/831-3000	803/329-3727
Alternate:	Earl Russell	803/831-3000	803/366-4428

Field Monitoring Teams:

All Health Physics personnel with Field Monitoring Training.

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
EDA-08
ENCLOSURE 5.12
EMERGENCY VEHICLES

- 5.9.1 The two designated emergency vehicles are the white Ford vans, vehicle #'s 1620 and 1622. The two vehicles are to be obtained (as directed by the FMC) by doing the following.
- 5.9.1.1 Vehicle # 1620
- 5.9.1.1.1 Obtain keys from the Pap.
- 5.9.1.1.2 If the vehicle is off-site request the FMC to contact the vehicle by TSC radio, have the vehicle to return to site immediately and obtain use when it returns.
- 5.9.1.2 Vehicle # 1622
- 5.9.1.2.1 Obtain keys from the Pap.
- 5.9.1.2.2 If the vehicle is off-site request the FMC to contact the vehicle by TSC radio, have the vehicle return to site immediately and obtain use when it returns.
- 5.9.2 Obtain any other Station vehicle (if available) as directed by the FMC.
- 5.9.3 Voluntary use of personnel vehicles is another alternative that may be considered but should be a last option.

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 9

"Environmental Monitoring for Emergency Conditions for
McGuire Nuclear Station"

RE Harris
Approved By

8/10/87
Date

Rev. 0
August 15, 1987

DUKE POWER COMPANY
ENVIRONMENTAL MONITORING FOR EMERGENCY CONDITIONS
FOR
MCGUIRE NUCLEAR STATION

1.0 PURPOSE

To provide a systematic method for identifying airborne plumes or liquid effluents, and obtaining field data indicative of the radiation exposure to the general public following a suspected uncontrolled release of radioactive material.

2.0 REFERENCES

- 2.1 Crisis Management Implementing Procedures, CMIP-7, "Radiological Assessment Group Implementing Procedure."
- 2.2 Crisis Management Plan, Section H, "Emergency Facility and Equipment," Section I, "Accident Assessment."
- 2.3 Duke Power Company Radio Operators Manual.
- 2.4 NUREG-0654, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants."
- 2.5 FEMA REP-2, Rev. 1, "Guidance on Offsite Emergency Radiation Measurement Systems, Phase 1 - Airborne Release."

3.0 LIMITS AND PRECAUTIONS

- 3.1 Enclosure 5.1 contains protective clothing, dosimetry, and respiratory equipment criteria for field monitoring. The Offsite Monitoring Coordinator (OMC) can change these criteria depending upon conditions.
- 3.2 Open radio communications shall be maintained between the OMC and the FMT's. If the radio becomes inoperable, the FMT's shall telephone the OMC in the Crisis Management Center (CMC).
- 3.3 The radio operator should use the radio operation guidance per reference 2.3.
- 3.4 During a drill, repeat the statement, "This is a drill, this is a drill" at the beginning and end of each radio transmission.

NOTE: The radio call sign is WQC-700.

- 3.5 A helicopter team may be activated for radiological surveillance as determined by the OMC per reference 2.1.

- 3.6 The helicopter team shall be used for qualitative (plume location) and not quantitative analysis.
- 3.7 Backup sampling vans and FMT members shall be provided by the unaffected stations upon request from the OMC to the respective Station Health Physicist.
- 3.8 Environmental sampling during emergency conditions shall not replace, but rather supplement normal environmental monitoring.

4.0 PROCEDURE

4.1 Field Monitoring Team (FMT) Activation

- 4.1.1 Form as many survey teams and sampling van teams as possible, based upon the number of personnel available and field monitoring required.

<u>Call Sign</u>	<u>Members</u>	<u>Transportation</u>
Alpha	2	Emergency Van
Bravo	2	Land Vehicle
Charlie	2	Land Vehicle
Delta	2	Emergency Van
Echo	2	Helicopter
Gamma	2	Emergency Boat

For any backup sampling vans from other stations, the call sign shall be preceded by the station name (ex. Catawba Alpha Team).

- 4.1.2 The OMC shall coordinate with the station Field Monitoring Coordinatro (FMC) to ensure that at least one FMT member from the affected station is on each FMT in the event that backup sampling vans/FMT members are provided from other stations.

4.2 Locating and Tracking the Plume

- 4.2.1 Unless otherwise directed by the OMC, the FMT's will generally be dispatched as follows:

- Alpha - performance of air sample and beta/gamma radiation surveys and mobile analyses beyond the 0.5 mile radius from the plant, utilizing an emergency van.
- Bravo - performance of beta/gamma radiation surveys on the right lateral edge of the suspected area to determine plume boundaries, utilizing a

station vehicle.

Charlie - performance of beta/gamma radiation surveys on the left lateral edge of the suspected area to determine plume boundaries, utilizing a station vehicle.

Delta - performance of air sample and beta/gamma radiation surveys and mobile analyses beyond the 0.5 mile radius from the plant, utilizing an emergency van.

Echo - performance of aerial beta/gamma radiation surveys, utilizing a helicopter.

Gamma - performance of beta/gamma radiation surveys on adjacent lake areas, utilizing an emergency boat.

4.2.1.1 The OMC may direct the FMT's to traverse the plume, if not dose prohibitive.

4.2.1.2 The OMC may direct the helicopter team to conduct aerial radiation surveys to locate "hot spots" within the plume path.

4.2.2 Utilizing preselected monitoring locations and/or the quadrants depicted on the station EPZ map, the OMC will direct FMT's to systematically survey the suspected areas and to obtain air samples as conditions warrant.

4.2.2.1 The preselected monitoring locations are shown on the Catawba Nuclear Station Emergency Planning Zone map as orange dots and labelled with orange print (ex. C2-10-7, where: C2 is the zone, 10 is the approximate distance from the station in miles, and 7 is the location number).

4.2.2.2 Each quadrant consists of a four square mile area (two miles on each side). This area is then sub-divided into four sub-quadrants of one square mile each.

4.2.2.2.1 A quadrant on the EPZ Map will be identified by, 1) the letter depicting the

column and 2) the number depicting the row (ex. H-12).

NOTE: The letter "I" has been omitted to eliminate possible confusion with the number one (1).

4.2.2.2.2 A sub-quadrant will be described as either the upper left (UL), upper right (UR), lower left (LL), or lower right (LR).

4.2.2.3 FMT's shall report the location, and radiation levels, including the highest and the approximate average radiation levels within the sub-quadrant to the OMC.

4.2.3 The radio operator shall use the Field Monitoring Survey Data Sheet (Enclosure 5.2) to log FMT movement and field data such as beta/gamma surveys, air samples, and smears.

4.2.4 The OMC shall periodically provide information on the emergency classification, wind speed, wind direction and sectors affected to the FMT's.

4.2.5 If FMT's are expected to be working in plume exposure dose rates of >500 mR/hr, then the OMC shall periodically check and track FMT members radiation exposures using Enclosure 5.3.

4.3 Special Sampling, as directed:

4.3.1 The OMC may request FMT members to collect additional special samples including but not limited to: smears of surrounding areas, integrated dose over a period of time with TLD's, broad-leaf vegetation, shoreline sediment, and milk. FMT's may also be requested to retrieve and replace environmental air samples and/or TLD's.

4.4 FMT Turnover

4.4.1 Each FMT shall be relieved as directed by the OMC.

4.4.2 The OMC shall direct the FMT's to provide turnover to the relief FMT's.

NOTE: Relief FMT's must bring their own dosimetry.

4.5.4 FMT's shall turn in all data sheets to the OMC or designee, as directed.

5.0 ENCLOSURES

- 5.1 Recommended Criteria for Protective Clothing, Dosimetry, and Respiratory Equipment
- 5.2 Field Monitoring Survey Data Sheet
- 5.3 Field Monitoring Team Radiation Exposure Record

Recommended Criteria for Protective Clothing, Dosimetry, and Respiratory Equipment
DUKE POWER COMPANY

_____ **MCGUIRE** _____ **NUCLEAR STATION**

Date _____ Time _____
 Job Description Field Monitoring Emergency Response Activities

 Location: Building/Unit N/A Room/Elevation N/A Area 10 Mile EPZ

PROTECTIVE CLOTHING AND EQUIPMENT REQUIRED				
Job Classification Refer to Comments Section	A	B	C	D
<input type="checkbox"/> Hood				
Disposable		X	X	X
Cloth				
Wetsuit				

SPECIAL INSTRUCTIONS/PRECAUTIONS

- Notify FMC/OMC prior to start of work, or changing work locations.
 - Contact FMC/OMC for expected conditions during job.
 - Utilize RCZ/ _____ laundry bins/and Radioactive waste containers.
 - Health Physics approval required prior to sweeping, brushing, grinding, welding, or use of compressed air and solvents.
 - Provide for adequate system drainage and provide absorbent material to pick up water.
 - Lay down polyethylene and/or canvas to protect work surfaces and limit contamination.
 - Set up local exhaust system with HEPA filter for proper ventilation.
 - Enter time in RCA/RCZ on Daily Exposure Time Record Card.
 - Review area Radiological Status Sheet prior to entry.
 - Low dose-rate areas are identified.
 - Personnel/tool/equipment monitoring required when leaving RCA/RCZ.
 - Housekeeping tour required before RWP termination.
- Refer to Comments Section for Additional Instructions/Information.**

<input type="checkbox"/> Coveralls				
Disposable		X	X	X
Cloth				
Wetsuit				
<input checked="" type="checkbox"/> Gloves				
Cotton Liner		X	X	X
Rubber		X	X	X
Surgical				
Cotton Work				
Heavy Rubber				
Leather				

Health Physics Coverage Required	Radiation Monitoring Required	ALARA Considerations												
<input checked="" type="checkbox"/> Continuous <input type="checkbox"/> Intermittent <input type="checkbox"/> Start of Work <input type="checkbox"/> Dose Controller <input type="checkbox"/> _____	<table border="0"> <tr> <td>Type</td> <td><input checked="" type="checkbox"/> Radiation Level</td> </tr> <tr> <td><input type="checkbox"/> Alpha</td> <td><input checked="" type="checkbox"/> Contamination</td> </tr> <tr> <td><input checked="" type="checkbox"/> Beta</td> <td><input checked="" type="checkbox"/> Airborne Particulate</td> </tr> <tr> <td><input type="checkbox"/> Gamma</td> <td><input checked="" type="checkbox"/> Airborne Iodine</td> </tr> <tr> <td><input checked="" type="checkbox"/> Beta-Gamma</td> <td><input type="checkbox"/> Gaseous Activity</td> </tr> <tr> <td><input type="checkbox"/> Neutron</td> <td><i>See survey and/or supplemental sheets for specific levels</i></td> </tr> </table>	Type	<input checked="" type="checkbox"/> Radiation Level	<input type="checkbox"/> Alpha	<input checked="" type="checkbox"/> Contamination	<input checked="" type="checkbox"/> Beta	<input checked="" type="checkbox"/> Airborne Particulate	<input type="checkbox"/> Gamma	<input checked="" type="checkbox"/> Airborne Iodine	<input checked="" type="checkbox"/> Beta-Gamma	<input type="checkbox"/> Gaseous Activity	<input type="checkbox"/> Neutron	<i>See survey and/or supplemental sheets for specific levels</i>	<input checked="" type="checkbox"/> Pre-Job Briefing <input checked="" type="checkbox"/> Post-Job Debriefing <input type="checkbox"/> Tool List <input type="checkbox"/> Temp. Shielding <input type="checkbox"/> _____ <input type="checkbox"/> Additional Sheet
Type	<input checked="" type="checkbox"/> Radiation Level													
<input type="checkbox"/> Alpha	<input checked="" type="checkbox"/> Contamination													
<input checked="" type="checkbox"/> Beta	<input checked="" type="checkbox"/> Airborne Particulate													
<input type="checkbox"/> Gamma	<input checked="" type="checkbox"/> Airborne Iodine													
<input checked="" type="checkbox"/> Beta-Gamma	<input type="checkbox"/> Gaseous Activity													
<input type="checkbox"/> Neutron	<i>See survey and/or supplemental sheets for specific levels</i>													

<input checked="" type="checkbox"/> Shoe Covers				
Disposable		X	X	X
Cloth				
Rubber				
Heavy Rubber				
<input checked="" type="checkbox"/> Tape Required				
	X	X	X	X
<input type="checkbox"/> No Personal Outer Clothing				

Notice: Each radiation worker is responsible for knowing their work area dose rates and the location of low dose-rate waiting areas. Each radiation worker is responsible for following the requirements of this RWP.

	β - γ Radiation (mR/hr)	Airborne Activity (MPC/ μ Ci/ml)	Contamination (dpm/100 cm ² /ccpm*)
A	≤ 0.04	< 0.25	< 1000
		$< 2.3 E^{-9}$	< 30
B	0.04-0.12	< 0.25	1000-15,000
		$< 2.3 E^{-9}$	< 450
C	0.12	≥ 0.25	15,000-150,000
		$> 2.3 E^{-9}$	< 4500
		≥ 745	*with HP210/260 probe
		$\geq 6.7 E^{-6}$	on RM-14 or equivalent

<input checked="" type="checkbox"/> Dosimetry				
Whole-Body TLD		X	X	X
Extremity TLD				
Low Range Pocket Dosimeter	X	X	X	X
High Range Pocket Dosimeter	X	X	X	X
Extremity Pocket Dosimeter				
Digital Alarming Dosimeter				
<input checked="" type="checkbox"/> Respiratory				
Full-Face Particulate/Iodine			X	X
Air Line				
SCBA				
Air Supplied Suit/Hood				
Potass. Iodide Tablet				X

Field Monitoring Team
Radiation Exposure Record

FIELD MONITORING TEAMS' TLD BADGE NUMBERS

ENTER _____
EXIT _____
CUMULATIVE
TOTAL

ENTER _____
EXIT _____
CUMULATIVE
TOTAL

ENTER _____
EXIT _____
CUMULATIVE
TOTAL

ENTER _____
EXIT _____
CUMULATIVE
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ENTER _____
EXIT _____
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EXIT _____
CUMULATIVE
TOTAL

ENTER _____
EXIT _____
CUMULATIVE
TOTAL

CRISIS MANAGEMENT PLAN
IMPLEMENTING PROCEDURE

EDA - 10

"Environmental Monitoring for Emergency Conditions for
Oconee Nuclear Station"

K E Harris

Approved By

8/10/87

Date

Rev. 0
August 15, 1987

DUKE POWER COMPANY
ENVIRONMENTAL MONITORING FOR EMERGENCY CONDITIONS
FOR
OCONEE NUCLEAR STATION

1.0 PURPOSE

To provide a systematic method for identifying airborne plumes or liquid effluents, and obtaining field data indicative of the radiation exposure to the general public following a suspected uncontrolled release of radioactive material.

2.0 REFERENCES

- 2.1 Crisis Management Implementing Procedures, CMIP-7, "Radiological Assessment Group Implementing Procedure."
- 2.2 Crisis Management Plan, Section H, "Emergency Facility and Equipment," Section I, "Accident Assessment."
- 2.3 Duke Power Company Radio Operators Manual.
- 2.4 NUREG-0654, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants."
- 2.5 FEMA REP-2, Rev. 1, "Guidance on Offsite Emergency Radiation Measurement Systems, Phase 1 - Airborne Release."

3.0 LIMITS AND PRECAUTIONS

- 3.1 Enclosure 5.1 contains protective clothing, dosimetry, and respiratory equipment criteria for field monitoring. The Offsite Monitoring Coordinator (OMC) can change these criteria depending upon conditions.
- 3.2 Open radio communications shall be maintained between the OMC and the FMT's. If the radio becomes inoperable, the FMT's shall telephone the OMC in the Crisis Management Center (CMC).
- 3.3 The radio operator should use the radio operation guidance per reference 2.3.
- 3.4 During a drill, repeat the statement, "This is a drill, this is a drill" at the beginning and end of each radio transmission.

NOTE: The radio call sign is WQC-699.

- 3.5 A helicopter team may be activated for radiological surveillance as determined by the OMC per reference 2.1.

- 3.6 The helicopter team shall be used for qualitative (plume location) and not quantitative analysis.
- 3.7 Backup sampling vans and FMT members shall be provided by the unaffected stations upon request from the OMC to the respective Station Health Physicist.
- 3.8 Environmental sampling during emergency conditions shall not replace, but rather supplement normal environmental monitoring.

4.0 PROCEDURE

4.1 Field Monitoring Team (FMT) Activation

- 4.1.1 Form as many survey teams and sampling van teams as possible, based upon the number of personnel available and field monitoring required.

<u>Call Sign</u>	<u>Members</u>	<u>Transportation</u>
Alpha	2	Land Vehicle
Bravo	2	Land Vehicle
Charlie	2	Land Vehicle
Delta	2	Land Vehicle
Foxtrot	2	(Security Area Fence)
Sampling Van 1	2	Emergency Van
Sampling Van 2	2	Emergency Van
Sampling Boat 1, 2, etc.	2	Emergency Boat(s)

For any backup sampling vans from other stations, the call sign shall be preceded by the station name (ex. McGuire sampling van 1).

- 4.1.2 The OMC shall coordinate with the station Field Monitoring Coordinatro (FMC) to ensure that at least one FMT member from the affected station is on each FMT in the event that backup sampling vans/FMT members are provided from other stations.

4.2 Locating and Tracking the Plume

- 4.2.1 Unless otherwise directed by the OMC, the FMT's will generally be dispatched as follows:

Alpha - performance of beta/gamma radiation surveys on the left lateral edge of the suspected area to determine plume boundaries, utilizing a station vehicle.

Bravo - performance of beta/gamma radiation

surveys on the right lateral edge of the suspected area to determine plume boundaries, utilizing a station vehicle.

- Charlie - performance of beta/gamma radiation surveys on the left lateral edge of the suspected area to determine plume boundaries, utilizing a station vehicle.
- Delta - performance of beta/gamma radiation surveys on the right lateral edge of the suspected area to determine plume boundaries, utilizing a station vehicle.
- Foxtrot - performance of beta/gamma radiation surveys along the security area boundary fence, mobile or on foot, as directed.
- Sample Van 1 - performance of air sample and beta/gamma radiation surveys and mobile analyses beyond the 0.5 mile radius from the plant, utilizing an emergency van.
- Sample Van 2 - performance of air sample and beta/gamma radiation surveys and mobile analyses beyond the 0.5 mile radius from the plant, utilizing an emergency van.
- Sample Boat 1, 2, etc. - performance of beta/gamma radiation surveys on adjacent lake areas, utilizing emergency boat(s).
- Helicopter - performance of aerial beta/gamma radiation surveys.

4.2.1.1 The OMC may direct the FMT's to traverse the plume, if not dose prohibitive.

4.2.1.2 The OMC may direct the helicopter team to conduct aerial radiation surveys to locate "hot spots" within the plume path.

4.2.2 Utilizing preselected monitoring locations and/or the quadrants depicted on the station EPZ map, the OMC will direct FMT's to systematically survey the suspected areas and to obtain air

samples as conditions warrant.

4.2.2.1 The preselected monitoring locations are shown on the Catawba Nuclear Station Emergency Planning Zone map as orange dots and labelled with orange print (ex. C2-10-7, where: C2 is the zone, 10 is the approximate distance from the station in miles, and 7 is the location number).

4.2.2.2 Each quadrant consists of a four square mile area (two miles on each side). This area is then sub-divided into four sub-quadrants of one square mile each.

4.2.2.2.1 A quadrant on the EPZ Map will be identified by, 1) the letter depicting the column and 2) the number depicting the row (ex. H-12).

NOTE: The letter "I" has been omitted to eliminate possible confusion with the number one (1).

4.2.2.2.2 A sub-quadrant will be described as either the upper left (UL), upper right (UR), lower left (LL), or lower right (LR).

4.2.2.3 FMT's shall report the location, and radiation levels, including the highest and the approximate average radiation levels within the sub-quadrant to the OMC.

4.2.3 The radio operator shall use the Field Monitoring Survey Data Sheet (Enclosure 5.2) to log FMT movement and field data such as beta/gamma surveys, air samples, and smears.

4.2.4 The OMC shall periodically provide information on the emergency classification, wind speed, wind direction and sectors affected to the FMT's.

4.2.5 If FMT's are expected to be working in plume exposure dose rates of >500 mR/hr, then the OMC shall periodically check and track FMT members radiation exposures using Enclosure 5.3.

4.3 Special Sampling, as directed:

4.3.1 - The OMC may request FMT members to collect additional special samples including but not limited to: smears of surrounding areas, integrated dose over a period of time with TLD's, broad-leaf vegetation, shoreline sediment, and milk. FMT's may also be requested to retrieve and replace environmental air samples and/or TLD's.

4.4 FMT Turnover

4.4.1 Each FMT shall be relieved as directed by the OMC.

4.4.2 The OMC shall direct the FMT's to provide turnover to the relief FMT's.

NOTE: Relief FMT's must bring their own dosimetry.

4.5.4 FMT's shall turn in all data sheets to the OMC or designee, as directed.

5.0 ENCLOSURES

5.1 Recommended Criteria for Protective Clothing, Dosimetry, and Respiratory Equipment

5.2 Field Monitoring Survey Data Sheet

5.3 Field Monitoring Team Radiation Exposure Record

**Recommended Criteria for Protective Clothing, Dosimetry, and Respiratory Equipment
DUKE POWER COMPANY**

OCONEE NUCLEAR STATION

Date _____ Time _____
Job Description Field Monitoring Emergency Response Activities

Location: Building/Unit N/A Room/Elevation N/A Area 10 Mile EPZ

PROTECTIVE CLOTHING AND EQUIPMENT REQUIRED

Job Classification Refer to Comments Section	A	B	C	D
<input type="checkbox"/> Hood				
Disposable Cloth		X	X	X
Wetsuit				

SPECIAL INSTRUCTIONS/PRECAUTIONS

- Notify FMC/OMC prior to start of work, or changing work locations.
- Contact FMC/OMC for expected conditions during job.
- Utilize RCZ/ _____ laundry bins/and Radioactive waste containers.
- Health Physics approval required prior to sweeping, brushing, grinding, welding, or use of compressed air and solvents.
- Provide for adequate system drainage and provide absorbent material to pick up water.
- Lay down polyethylene and/or canvas to protect work surfaces and limit contamination.
- Set up local exhaust system with HEPA filter for proper ventilation.
- Enter time in RCA/RCZ on Daily Exposure Time Record Card.
- Review area Radiological Status Sheet prior to entry.
- Low dose-rate areas are identified.
- Personnel/tool/equipment monitoring required when leaving RCA/RCZ.
- Housekeeping tour required before RWP termination.

Refer to Comments Section for Additional Instructions/Information.

<input type="checkbox"/> Coveralls				
Disposable Cloth	X	X	X	X
Wetsuit				

<input checked="" type="checkbox"/> Gloves				
Cotton Liner	X	X	X	X
Rubber		X	X	X
Surgical				
Cotton Work				
Heavy Rubber				
Leather				

Health Physics Coverage Required	Radiation Monitoring Required	ALARA Considerations												
<input checked="" type="checkbox"/> Continuous <input type="checkbox"/> Intermittent <input type="checkbox"/> Start of Work <input type="checkbox"/> Dose Controller <input type="checkbox"/> _____ <input type="checkbox"/> _____	<table border="1"> <tr> <th>Type</th> <th>Level</th> </tr> <tr> <td><input type="checkbox"/> Alpha</td> <td><u>X</u> Radiation Level</td> </tr> <tr> <td><input checked="" type="checkbox"/> Beta</td> <td><u>X</u> Contamination</td> </tr> <tr> <td><input type="checkbox"/> Gamma</td> <td><u>X</u> Airborne Particulate</td> </tr> <tr> <td><input checked="" type="checkbox"/> Beta-Gamma</td> <td><u>X</u> Airborne Iodine</td> </tr> <tr> <td><input type="checkbox"/> Neutron</td> <td>_____ Gaseous Activity</td> </tr> </table> <p><i>See survey and/or supplemental sheets for specific levels</i></p>	Type	Level	<input type="checkbox"/> Alpha	<u>X</u> Radiation Level	<input checked="" type="checkbox"/> Beta	<u>X</u> Contamination	<input type="checkbox"/> Gamma	<u>X</u> Airborne Particulate	<input checked="" type="checkbox"/> Beta-Gamma	<u>X</u> Airborne Iodine	<input type="checkbox"/> Neutron	_____ Gaseous Activity	<input checked="" type="checkbox"/> Pre-Job Briefing <input checked="" type="checkbox"/> Post-Job Debriefing <input type="checkbox"/> Tool List <input type="checkbox"/> Temp. Shielding <input type="checkbox"/> _____ <input type="checkbox"/> Additional Sheet
Type	Level													
<input type="checkbox"/> Alpha	<u>X</u> Radiation Level													
<input checked="" type="checkbox"/> Beta	<u>X</u> Contamination													
<input type="checkbox"/> Gamma	<u>X</u> Airborne Particulate													
<input checked="" type="checkbox"/> Beta-Gamma	<u>X</u> Airborne Iodine													
<input type="checkbox"/> Neutron	_____ Gaseous Activity													

<input checked="" type="checkbox"/> Shoe Covers				
Disposable Cloth		X	X	X
Rubber				
Heavy Rubber				

Notice: Each radiation worker is responsible for knowing their work area dose rates and the location of low dose-rate waiting areas. Each radiation worker is responsible for following the requirements of this RWP.

<input checked="" type="checkbox"/> Tape Required	X	X	X	X
<input type="checkbox"/> No Personal Outer Clothing				

	B-γ Radiation (mR/hr)	Airborne Activity (MPC/μCi/ml)	Contamination (dpm/100 cm ² /ccpm*)
A	≤0.04	<0.25	<1000
		<2.3 E ⁻⁹	<30
B	0.04-0.12	<0.25	1000-15,000
		<2.3E ⁻⁹	<450
C	0.12	≥0.25	15,000-150,000
		>2.3E ⁻⁹	<4500
		≥745	*with HP210/260 probe
		≥6.7E ⁻⁶	on RM-14 or equivalent

<input checked="" type="checkbox"/> Dosimetry				
Whole-Body TLD	X	X	X	X
Extremity TLD				
Low Range Pocket Dosimeter	X	X	X	X
High Range Pocket Dosimeter	X	X	X	X
Extremity Pocket Dosimeter				
Digital Alarming Dosimeter				

<input checked="" type="checkbox"/> Respiratory				
Full-Face Particulate/Iodine			X	X
Air Line				
SCBA				
Air Supplied Suit/Hood				
Potass. Iodide Tablets				X

