Superseded pages per Rev. 2 + Rev. 4 to EDA Manual dtd. 8/30/89

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DUKE POWER COMPANY

EMERGENCY DOSE ASSESSMENT MANUAL

August 24, 1989

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EDA - 02

"Off-Site Dose Projections for
Catawba Nuclear Station"

K E Harris
Approved By

3/7/89
Date

Rev. 3
March 7, 1989

OFF-SITE 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/0/B/1000/10, Determination of Radiation Monitor Setpoints

2.2 HP/0/B/1009/06, Alternative Method for Determining Dose Rate Within the Reactor Building

2.3 HP/0/B/1009/14, Health Physics Actions Following an Uncontrolled Release of Liquid Radioactive Material

2.4 HP/0/B/1009/17, Unit 1 Post-Accident Containment Air Sampling System

2.5 HP/0/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 Worksheet (Enclosure 5.1):

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 704-359-8466). 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, page 2):

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 $\overline{X/Q}$:

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

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:

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

where:

R/hr	=	EMF26, EMF27, EMF28, EMF29, EMF10, EMF11, EMF12, EMF13 reading
VOPEN	=	time the valve is open in seconds
LBM	=	lbm released for the time the valve was open
CF	=	the correction factor per Enclosure 5.5.

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, page 2.

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 and flowpath not isolated,
EMF = 39(H), if EMF39(L) is offscale and EMF39(H) > 100 cpm and flowpath not isolated,
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 x CF x LR

where;

PACS = µCi/ml (Reference 2.4)

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

LR = Leak rate, as determined in Step 4.3.1.1 above

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

4.3.2.1 Based on Q_{NG};

$Q_I = Q_{NG}$ x 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 (if flowpath is not isolated);

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

where:

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

9.82E-20 = 4.0E-5 µCi/cpm x .25 min/ft^3 (inverse of EMF flow rate) x 3.53-5 ft^3/ml x 1Ci/1E6 µCi x 1 hr/3600 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 = PACS x CF x LR

where;

PACS = (μCi/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

4.3.3 Record Q_{NG} and Q_I on Enclosure 5.1, page 2.

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_{NG} = EMF x CF x CFM

where:

EMF = 36(L) if EMF36(L) < 1E7 cpm,
EMF = 36(H) if EMF36(L) is offscale and EMF36(H) > 100 cpm and compressor not tripped,
EMF = 54 if EMF36(H) is offscale,
CF = unit vent factor per Enclosure 5.12
CFM = unit vent flow rate (ft^3/min)

4.4.1.2 Based on unit vent sample, where;

Q_{NG} = Unit Vent Sample x CF x CFM

where:

Unit Vent Sample = (μCi/ml) per Reference 2.5

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

CFM = unit vent flow rate (ft^3/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};

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

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 (if compressor not tripped);

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

where:

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

1.11E-13 = 4.0E-5 µCi/cpm x 0.1667 min/ft^3 (inverse of EMF flow rate) x 1Ci/1E6 µCi x 1 min/60 sec.

4.0E-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:

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

where:

Unit vent sample = (µCi/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, page 2.

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 and record on Enclosure 5.1, page 1.

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 Circle on Enclosure 5.1 the Protective Action Zones (PAZ), based upon 1) the wind speed and wind direction, using Enclosure 5.3; and 2) the projected dose from Enclosure 5.1 compared to the following.

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

4.6.3 If the projected dose in a PAZ is 1 - 5 rem whole body or 5 - 25 rem thyroid, then recommend evacuate children and pregnant women and shelter others (actions B and E).

4.6.4 If the projected dose in a PAZ is > 5 rem whole body or > 25 rem thyroid, then recommend evacuate everyone (action C).

4.6.5 Recheck meteorology conditions approximately every 15 minutes to ensure that other sectors have not been affected.

4.7 Emergency Classification (Enclosure 5.1)

4.7.1 Check the box indicating the emergency classification based upon the following.

4.7.2 If the dose rate at the site boundary is $\geq$ 5.0E-4 rem/hr whole body then recommend an Alert.

4.7.3 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.

4.7.4 If the dose rate at the site boundary is $\geq$ .5 rem/hr whole body or $\geq$ 2.5 rem/hr thyroid, then recommend a Site Area Emergency if readings last 2 minutes.

4.7.5 If the dose rate at the site boundary is $\geq$ 1 rem/hr whole body or $\geq$ 5 rem/hr thyroid, then recommend a General Emergency.

5.0 ENCLOSUES

5.1 Sample of Meteorology 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

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CATAWBA NUCLEAR STATION
EDA-02
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

7. 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.

8. 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.
   (e) - 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

4. Dose Projection Data
   Windspeed ____ mph Wind Direction ____ degrees from North
   Release Type: Ground Weighted Dose 33.6 (R/hr/Ci/m^3) whole body
   Conversion Factor 2.26E6 (R/hr/Ci/m^3) thyroid
   Stability Class ____
   Radiological Release: Noble Gas Equivalent - _____ Ci/sec
   Iodine Equivalent - _____ Ci/sec

5. 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.

6. Release (a)___ will begin/ (b)___ began at: _____.

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

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

9. Dose Projections

Distance	Dose Commitment Whole Body rem/hr	Dose Commitment Child Thyroid rem/hr	Projected Integrated Dose Base on _____ hrs of release Whole Body rem	Projected Integrated Dose Base on _____ hrs of release Child Thyroid rem
Site Boundary	_____	_____	_____	_____
2 miles	_____	_____	_____	_____
5 miles	_____	_____	_____	_____
10 miles	_____	_____	_____	_____

10. Field measurement of dose rate (mr/hr) or contamination (dpm/100 cm^2)

Time	Zone	Distance	Direction	Whole Body	Child Thyroid
____	____	_____	_____	_____	_____
____	____	_____	_____	_____	_____
____	____	_____	_____	_____	_____

==========

Miles	.5	1	2	4	5	7	8
PAZ	A0	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
2. LOCA (charcoal)
3. Melted Core
4. Melted Core (charcoal)
5. Tube Rupture
6. New Fuel Accident (< 100 days old)
7. Old Fuel Accident (> 100 days old)
8. Waste Gas Decay Tank

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

<----< Adult whole body <----< >----> Child thyroid >---->

2 hr

Dose = 2 x DRwb = 33.6 x TQ_{NG} x $\bar{X}/Q$ x 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

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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

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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

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

Report # _____

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

Calculations based on _____Melted Core _____LOCA

NOBLE GAS

based on EMF26 or EMF10

SG_{NG}

_____ R/hr x $\left|\frac{1}{\text{____sec}}\right|$ x _____lbm x _____ Ci/lbm R/hr = _____ Ci/sec
(Encl. 5.5)

based on EMF27 or EMF11

_____ R/hr x $\left|\frac{1}{\text{____sec}}\right|$ x _____lbm x _____ Ci/lbm R/hr = _____ Ci/sec
(Encl. 5.5)

based on EMF28 or EMF12

_____ R/hr x $\left|\frac{1}{\text{____sec}}\right|$ x _____lbm x _____ Ci/lbm R/hr = _____ Ci/sec
(Encl. 5.5)

based on EMF29 or EMF13

_____ R/hr x $\left|\frac{1}{\text{____sec}}\right|$ x _____lbm x _____ Ci/lbm R/hr = _____ Ci/sec
(Encl. 5.5)

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

IODINE

From all Steam Relief valves

Q_I

Q_{NG} x _____ I131 eqv./Xe 133 eqv. ratio (Encl. 5.6) = _____ Ci/sec

☐ Emergency ☐ Drill Prepared by: _____

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CATAWBA NUCLEAR STATION
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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
≥ 2	3.971
≥ 4	4.041
≥ 8	4.029
≥ 24	3.332
≥ 48	2.647
≥ 100	2.438
≥ 250	2.438
≥ 500	2.438
≥ 720	2.438

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

* Enclosure 5.5 is the correlation factor per Reference 2.13 x
$2.83E4\ \frac{ml}{ft^3} \times .41\ \frac{ft^3}{lbm} \times \frac{m^3}{1E6\ ml}$

.41 = specific gravity of steam per Reference 2.13.

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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 7.217E-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

Report # _____

Reactor Trip _____/_____ (Date/Time) 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)

(circle one) ____ 1" 2" 4" 6" 8" 12" 18" 34" diameter opening
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

EMF (cpm or R/hr) _____ x CF _____ (Encl. 5.8) x LR _____ml/hr = Q_{NG} _____ Ci/sec

(Note on Encl. 5.9)

based on
PACS sample

_____ µCi/ml x 2.78E-10 Ci hr / sec µCi x _____ml/hr = _____ Ci/sec

IODINE
based on
Q_{NG}

_____ Ci/sec x _____ I131 eqv./Xe133 eqv. ratio (Encl. 5.6) = Q_I _____ Ci/sec

based on EMF40

LR

_____Δcpm / _____Δmin x 9.82E-20 Ci hr min / sec ml cpm x _____ml/hr = _____ Ci/sec

based on PACS sample

_____ µCi/ml x 2.78E-10 Ci hr / sec µCi x _____ml/hr = _____ Ci/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 x $\frac{\text{hr}}{\text{3600 sec}}$ x $\frac{\text{Ci}}{\text{1E6 µCi}}$

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

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

Enclosure 5.9 is the realistic leakage rate (m^3/sec) per Reference 2.12 x 1E6 ml/m^3 x 3600 sec/hr.

* 2.081E5 ml/hr is derived as follows:

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

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/ft^3 x 60 min/hr.

DUKE POWER COMPANY
CATAWBA NUCLEAR STATION
EDA-02
ENCLOSURE 5.11
SOURCE TERM ASSESSMENT - UNIT VENT

Report # _____

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

Calculations based on _____Melted Core _____LOCA

CFM = _____ ft^3/min

NOBLE GAS

based on (check one)

☐ EMF36(L) if < 1E7 cpm ☐ EMF36(H) if > 100 cpm ☐ EMF54 if 36(H) is offscale

EMF		CF		CFM		Q_{NG}
_____cpm or R/hr	x	_____ (Encl. 5.12	x	_____ $\frac{ft^3}{min}$	=	_____ $\frac{Ci}{sec}$

based on Unit Vent Sample

_____µCi/ml x 4.72E-4 $\frac{Ci\ min\ ml}{sec\ ft^3\ \mu Ci}$ x _____ $\frac{ft^3}{min}$ = _____ $\frac{Ci}{sec}$

IODINE

based on Q_{NG} Q_I

_____ $\frac{Ci}{sec}$ x _____ I131 eqv./Xe133 eqv. ratio (Encl. 5.6) = _____ $\frac{Ci}{sec}$

based on EMF37 CFM

_____ $\frac{\Delta cpm}{\Delta min}$ x 1.11E-13 $\frac{Ci\ min\ min}{sec\ ft^3\ cpm}$ x _____ $\frac{ft^3}{min}$ = _____ $\frac{Ci}{sec}$

based on Unit Vent Sample

_____µCi/ml x 4.72E-4 $\frac{Ci\ min\ ml}{sec\ ft^3\ \mu Ci}$ x _____ $\frac{ft^3}{min}$ = _____ $\frac{Ci}{sec}$

☐ Emergency ☐ Drill Prepared by: _____

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 x 2.83E4 $\frac{\text{ml}}{\text{ft}^3} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{\text{Ci}}{1\text{E6 } \mu\text{Ci}}$

CRISIS MANAGEMENT PLAN

IMPLEMENTING PROCEDURE

EDA - 09

"Environmental Monitoring for Emergency Conditions for McGuire Nuclear Station"

R E Harris
Approved By

8/11/89
Date

Rev. 1
August 11, 1989

ENVIRONMENTAL MONITORING FOR EMERGENCY CONDITIONS FOR MCGUIRE NUCLEAR STATION

1.0 Purpose

1.1 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 release of radioactive material.

2.0 References

2.1 Station Directive 3.8.1 "Site Assembly and Evacuation".

2.2 HP/0/B/1009/20, "Manual Procedure for Offsite Dose Projections".

2.3 HP/0/B.1009/16, "Distribution of KI Tablets in the Event of a Radioiodine Release".

2.4 Station Radiation Protection Manual; Section 15.21, "Set-Up and Operation of the Quantum Portable MCA System".

2.5 PT/0/A/4600/11, "Function Check of Emergency Vehicle and Equipment. Sampling Equipment".

2.6 Crisis Management Implementing Procedures, CMIP-7, "Radiological Assessment Group Implementing Procedure."

2.7 Crisis Management Plan, Section H, "Emergency Facility and Equipment," Section I, "Accident Assessment".

2.8 Duke Power Company Radio Operators Manual.

2.9 System Radiation Protection Manual, Duke Power Company, Rev. 4.

2.10 NUREG-0654, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants".

2.11 FEMA REP-2, Rev. 1, "Guidance on Offsite Emergency Radiation Measurement Systems, Phase 1 - Airborne Release".

2.12 Code of Federal Regulations, Title 10, Part 20.

3.0 Precautions and Limitations

3.1 Enclosure 5.1, SRWP 98, contains protective clothing, dosimetry, and respiratory equipment criteria for field monitoring. Depending upon conditions, the Field Monitoring Coordinator (FMC) in either the Technical Support Center (TSC) or in the Crisis Management Center (CMC) can change these criteria.

3.2 FMT members should follow the protective guidance as listed in Enclosure 5.1.

3.3 Upon activation of the CMC, the FMC in the TSC will become an extension of the CMC organization and will direct the Field Monitoring Teams (FMTs) under the guidance of the CMC's FMC. The CMC FMC will monitor FMT communications and report field measurements to the CMC Dose Assessment Coordinator as appropriate.

3.4 The Field Monitoring Teams (FMTs) should park vehicles completely off the road when sampling and use emergency flashers while stopped.

3.5 Once a release has occurred, vehicle windows should be closed with ventilation off or ventilation on recirculation to minimize contamination until the plume area is identified.

3.6 Each FMT shall maintain open radio communications with the FMC. If the radio becomes inoperable, telephone:

FMC at TSC (telephone #) or 4674

FMC at CMC (704) 382-0735/0736 for MNS, CNS or
(803) 885-4804 for ONS

3.7 Ensure that count rate meter is on and is monitored during transport to sampling locations.

3.8 If any equipment becomes inoperable, notify the FMC and await further instructions.

3.9 Personnel not trained for emergency response may assist a trained Radiation Protection technician to do surveys and/or drive the vehicle.

3.10 The radio operator should follow the radio operation guidance described in reference 2.9; providing pertinent, general information. Care should be taken to NOT provide detailed, specific plant information.

3.11 During a drill, repeat the statement, "This is a drill, this is a drill" with each radio transmission.

NOTE: The base radio call sign is (WQC700).
The mobile unit radio call sign if (KA82138).

3.12 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.

NOTE: For any backup sampling vans from other stations, the call sign shall be preceded by the station name (ex. (Oconee) sample van 1).

4.1.2 Initial survey FMT will perform a survey of the security area boundary fence, as directed by the FMC.

4.1.3 Activate remaining FMTs in accordance with Enclosure 5.2.

NOTE: Emergency materials/equipment available to FMTs are listed in station reference 2.6.

4.1.4 The FMC should 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 FMC, the FMTs will generally be dispatched as follows:

Alpha, Bravo, Charlie, Delta - performance of beta/gamma radiation surveys on the edges of the suspected area to determine plume boundaries, utilizing a station vehicle.

Sample Van 1, 2 - performance of air sample surveys, beta/gamma radiation surveys and mobile analyses at or beyond the site boundary fence, utilizing an emergency van.

Sample Boat 1, 2, etc. - performance of beta/gamma radiation surveys on adjacent lake areas, utilizing an emergency boat.

NOTE: If not dose prohibitive, the FMC may direct the FMTs to traverse the plume.

4.2.2 The FMC will direct FMTs to systematically survey the suspected areas in a continuous mode and to obtain air samples and beta/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).

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 (colored) 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 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 5.3.

4.2.2.4 While enroute and at sampling locations, survey teams shall report the maximum radiation level to the FMC.

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.

4.2.3 The FMC may use Enclosure 5.4 as a log to document instructions to the radio operator regarding FMT movement and utilization.

4.2.4 The radio operator may use Enclosure 5.5 or site area maps to record FMT movement and field data such as beta/gamma surveys, air samples, and/or special samples.

4.2.5 The FMC should periodically provide information to the FMTs on the emergency classification, wind speed, wind direction, zones affected and other pertinent information, using Enclosure 5.6. Typically information provided by the Emergency Coordinator or Recovery Manager during P.A. announcements could be used to update FMT's.

4.2.6 The FMC should periodically check and track FMT member's radiation exposures, using Enclosure 5.7.

4.3 Special Sampling, as directed:

4.3.1 Collect additional special samples including but not limited to: smears of surrounding areas, integrated dose over a period of time with TLDs, vegetation, sediment, water, and milk, as requested by the FMC. Label and save each for analysis.

NOTE: FMTs may also be requested to retrieve and replace environmental air samplers and/or TLDs.

4.3.1.1 To collect vegetation samples, use the shears to cut enough broad leaf vegetation to fill a 12"x12" poly bag.

4.3.1.2 To collect a soil sample, estimate one square foot of soil and dig out one inch deep.

4.3.1.3 To collect a water sample, use the limnological sampler to fill a one gallon cubitainer.

4.3.1.4 Smears should be taken on stationary, horizontal surfaces, e.g. mailboxes, gas pumps, etc., NOT on Automobiles !

4.4 FMT Turnover

4.4.1 FMTs shall be relieved as directed by the FMC.

4.4.2 The FMTs shall provide turnover to the relief FMTs, consisting of the following:

4.4.2.1 Dose rates and other sample data from areas previously surveyed.

4.4.2.2 Sampling van emergency supplies or emergency kit inventory consumed.

4.4.2.3 Equipment operating status.

4.4.2.4 Any sampling problems.

4.4.2.5 Emergency classification.

4.4.2.6 Wind speed.

4.4.2.7 Wind direction.

4.4.2.8 Zones affected.

4.4.3 FMTs shall turn in all data sheets to the FMC as directed.

4.4.4 Following turnover, relieved FMT members should report to a counting facility designated by the FMC for a post-job BBA.

5.0 Enclosures

5.1 SRWP #98

5.2 Suggested Field Monitoring Team Checklist for Initial Response

5.3 Predetermined Sampling Locations (including Air, TLD, Water and Milk Sample Locations)

5.4 FMC Instruction Log

5.5 Field Monitoring Survey Data Sheet

5.6 Periodic Status Update for Field Monitoring Teams

5.7 Field Monitoring Team Radiation Exposure Record

RADIATION WORK PERMIT
DUKE POWER COMPANY
McGUIRE NUCLEAR STATION

Date 07/17/89 Time 1000 (S)RWP Number 89-98 Rev. 0

Job Description: Field Monitoring Team Emergency Response Activities

Location: Building/Unit N/A Room/Elevation N/A Area 10 Mile EPZ

SPECIAL INSTRUCTIONS/PRECAUTIONS

[x] Notify FMC prior to start of work or changing work locations.
[x] Contact FMC for expected conditions during job.
[x] Utilize RCZ/laundry bins/& Radioactive waste containers.
[ ] Radiation Protection 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.
[x] Enter time in RCA/RCZ on Daily Exposure Time Record Card.
[ ] Review area Radiological Status Sheet prior to entry.
[x] Low dose-rate areas are identified.
[x] Personnel/tool/equipment monitoring required when leaving RCA/RCZ.
[ ] Housekeeping tour required before RWP termination.

REFER TO COMMENTS SECTION FOR ADDITIONAL INSTRUCTIONS/INFORMATION

Radiation Protect. Coverage Required	Radiation Monitoring Required		ALARA Considerations
[x] Continuous	TYPE	_x_ Radiation Level	[x] Pre-Job Briefing
[ ] Intermittent	[ ] Alpha	_x_ Contamination	[x] Post-Job Debriefing
[ ] Start of Work	[x] Beta	_x_ Airborne Particulate	[ ] Tool List
[ ] Dose Controller	[ ] Gamma	_x_ Airborne Iodine	[ ] Temp. Shielding
[ ] _____	[x] Beta-Gamma	___ Gaseous Activity	[x] Post-job BBA
	[ ] Neutron	See survey and/or supplemental sheets for specific levels.	[ ] Additional Sheet

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.

Comments: * Information/Direction provided by FMC
A: No Core Damage ; No Release
B: No Core Damage ; Release
C: Core Damage ; No Release
D: Core Damage ; Release
Outside of vehicle; Contamination
≥ 450 ccpm with HP 210/260 on RM-14

PROTECTIVE CLOTHING AND EQUIPMENT REQUIRED

Job Classification Refer to Comments Section	A	B	C	D	E
[x] Hood					
Disposable					
Cloth				x	
Wetsuit					
[x] Coveralls					
Disposable					
Cloth				x	
Wetsuit					
[x] Gloves					
Cotton		x		x	
Rubber		x		x	
Surgical					
Cotton Work					
Heavy Rubber					
Leather					
[x] Shoe Covers					
Disposable		x		x	
Cloth					
Rubber		x		x	
Heavy Rubber					
[x] TAPE REQUIRED				x	
[ ] NO PERSONAL OUTER CLOTHING					
[x] 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					
[x] RESPIRATORY					
Full-Face Particulate		*		*	
Air Line					
SCBA					
Air Supplied Suit/Hood					
Potasium Iodine (KI) Tab				*	

SRWP Approval Radiation Protection Manager or RP General Supervisor (Date/Time)

(S)RWP Approval Radiation Protect. Title Date/Time

(S)RWP Terminated Radiation Protection Title Date/Time

XC: Supervisor/Worker S&C Radiation Protection Change Room Control Point RP Shift ALARA

Example Guidelines for Field Monitoring Teams

_____ 1. Obtain vehicle keys, where applicable.

_____ 2. Assemble in designated area.

_____ 3. Proceed to suitable area for Equipment Dispatch/Checkout.

_____ 4. Check instruments and take readings of area.

_____ 5. Ensure that Kits/Equipment have not been tampered with. If so, take appropriate actions.

_____ 6. Make radio contact with the FMC.

_____ 7. Start vehicle engines, particularly the Sampling Vans, to stabilize inside temperature for MCA Detectors. If needed, obtain gas for vehicle.

_____ 8. Report status to FMC, particularly any equipment problems, malfunctions, radiological conditions, etc.

_____ 9. When prepared to depart from site, notify the FMC and await further instructions.

_____ 10. Ensure that TLDs, dosecard, and High and Low range pocket dosimeters are donned and serial numbers are noted for later transmission to FMC via radio.

_____ 11. When directed, teams shall be dispatched as per RP Manual Section 18.2/FMC direction to assigned locations.

NOTE: (These items are only suggested guidelines and are intended to be an aid in the effective completion of Procedural requirements during an Emergency Activation.)

LIST OF DESIGNATED LIMNOLOGICAL SAMPLE POINTS

Davidson Intakes - Sector A (North-Northeast) 5-6 miles

Sample elevation - 736'

Accessible by land on SR 2195 (Torrence Chapel Road)

Charlotte Intakes - Section E (South) 5-6 miles

Sample elevation 635' - Unit 1 intake

640 - Unit 2 intake

637' - Unit 3 intake

Accessible by land on SR 2004 (Mt. Holly-Huntersville Road)

(Pump Station Road)

NOTE: 1. Full lake elevation is 760'.

2. Catawba River spillway elevation (for Charlotte intakes) is 647'6"

-- DETAILED GUIDE TO ALL TLD SAMPLE LOCATIONS

This enclosure is meant to provide a guide to one who is not familiar with the environmental TLD sample route. Appropriate deviations from this sequence and route may be made as necessary.

A. Sample location numbers:

143 - Point of land north of intake pumps.

144 - On the fence, at air sampling site #120, near R.P. Boat House.

145 - On the fence, at air sampling site #121, near guard house at Training and Technology Center.

146 - Shoreline of discharge canal, below the bridge.

147 - On the fence, at the Training and Technology Center, Environmental Laboratory.

148 - Second utility pole on the right-hand side of McGuire Construction Entrance.

149 - Near site fence, 200 feet east of U-2 Access Road on Hwy. 73.

150 - On the site fence, 800 feet west of U-2 Access Road on Hwy. 73.

151 - Fence east side inside O.C. (Owner Controlled) Gate #2.

152 - Near railroad tracks west of N.P. (Nuclear Production) entrance.

153 - Clearing on the left, inside O.C. (Owner Controlled) Gate #4 (S. River Gate).

154 - Edge of river bank, access O.C. (Owner Controlled) Gate #5 (Lower Dam Access).

155 - Bottom of earthen dam embankment, access O.C. (Owner Controlled) Gate #6 (Lower Dam Access).

156 - Top of earthen dam, access O.C. (Owner Controlled) Gate #7.

157 - Williamson access area sign on the Mecklenburg Neck.

158 - End of state maintained Road #2189 (Bethel Church Road).

159 - Anchorage Marine Shipyard at Holiday Harbor Marina.

160 - On the fence, at Anchorage Maine Showroom.

161 - Main power pole at the intersection of Hwy. #21 and Sam Furr Road.

162 - Fist power pole at the intersection of Gilead Road and State Road #2139.

163 - Duke Power substation at the intersection of Hambright Road and McCoy Road (State Road #2138).

164 - Power pole at the intersection of Beatties Ford Road and Hambright Road.

165 - Approximately 2 miles down power plant road from River Bend Steam Station.

166 - Water tank across from River Bend Steam Station.

167 - Behind Lucia Volunteer Fire Department.

168 - Power pole at State Road #1511 at Killiam Creek.

169 - Last power pole on Kincaid Road.

170 - Second utility pole on right from intersection of Hwy. #73 and State Road #1386.

171 - Utility pole at Triangle Hardware.

172 - Power pole at the home of T.L. McConnell.

173 - Power pole at the home of M.S. Glover.

174 - On the fence, at air sampling site #134, near East Lincoln Junior High School.

175 - Utility pole at the home of Steve Mooneyhan.

176 - Behind the home or R.G. McGee, on cedar post.

177 - Power pole at the home of J.R. Leonard.

178 - Duke Power Substation at Florida Steel Corporation.

179 - Power pole at the home of Dan Rains.

180 - Mooresville Water Treatment Plant.

181 - Davidson Water Treatment Plant.

182 - On the fence, at air sampling site #133, at Cornelius substation.

183 - Intake pumping station for Charlotte drinking water, Gar Lake.

B. Directions to sampling locations:

NOTE: Contact Security at Ext. 4460 to open all O.C. (Owner Controlled) Gates.

Location #156 --	Proceed to the McGuire Nuclear Station main entrance and then follow the black topped road to behind the paved parking lots. Continue on this road until it becomes a dirt road then turn onto the first dirt road on the right. At the end of this road, turn right again and proceed up the incline to the right. At the top of the incline, make a sharp left turn and follow to the top of the dam embankment. Enter O.C. Gate #7 and travel the length of the dam, until you reach the concrete dam portion of Cowan's Ford Dam. The TLD will be on your left near the base of the cement barrier.
Location #154 (WSW)	Return to the place where the dirt road becomes a black topped road and turn onto the dirt road on the right. Follow the dirt road to the SMS Supply Shelter and turn right. Continue until you enter O.C. Gate #5 then follow the dirt/grass path. As the path bends to the right, there is a grassy embankment on the left. The TLD is located in a plastic bag tied to a stake beside a rocky area ≅ 400 feet from the top of the embankment.
Location #155 (W)	From the grassy embankment, return to the dirt/grass path and proceed to the end of the path. The TLD is located on the right in a plastic bag tied to a stake.
Location #153 (SW)	Exit O.C. Gate #5. Return to road in from of Chemistry Waste Treatment Building. Bear to the right and proceed to O.C. Gate #4. Go through O.C. Gate #4 to a clearing on the left (approximately halfway down the road toward the continuous water sampler). The TLD is located in the clearing near the edge of the embankment in a plastic bag.
Location #151 (S)	The TLD is located on the left as you leave O.C. Gate #2 approximately 50 feet on the left across the cement drainage pipe just before the S.P. entrance.
Location #152 (SSW)	Exit past the McGuire entrance and turn right onto Hwy. #73. The TLD is located at the RR right-of-way approximately 200 feet west of the S.P. entrance, in a clear bag.
Location #150 (SSE)	Drive east of Hwy. #73. The TLD is located on the double gates at the site fence in a plastic bag.
Location #149 (SE)	The TLD is located near the site fence approximately 25 feet off Hwy. #73 and approximately 300 feet east of Location #150 between two stakes under some pine trees.
Location #148 (ESE)	Drive east on Hwy. #73. Turn left at the Construction Entrance. The TLD is located on the second utility pole holding the overhang direction sign on the right side of the road.

Location #147 (E)	Continue toward the McGuire Construction entrance. Turn right into the Environmental Laboratory. The TLD is located on the fence, on the right near the small blue storage building.
Location #146 (ENE)	Turn right into the Training and Technology Center. The TLD is located on a utility pole on the right just before you cross the bridge.
Location #145 (NE)	Proceed to the guard house at the Training and Technology Center. The TLD is located to the right of the guard house on the knoll. It is attached to the fence at air sampling site #121.
Location #143 (N)	Proceed past the guard house and Training Center. Bear left on the first dirt road you come to, then right on the second gravel road you come to. Follow this road to the point. The TLD is in a clear bag at the very end of the island.
Location #144 (NNE)	Return from the point and turn left where the two dirt roads intersect. Follow this road until it intersects the main road and turn left. The TLD is located on your left, on the fence at air sampling site #120 near Radiation Protection boathouse.
Location #158 (NNE)	Return to Hwy. #73 and turn left. At the intersection of Bethel Church Road. (S.R. #2189) and Hwy. #73 turn left. The TLD is on the last power pole on the left of Bethel Church Road. (corner of Lola and Bethel Church Road).
Location #159 (NE)	Return to Hwy. #73, turn left, and turn left on Henderson Road leading to Anchorage Maine shipyard at Holiday Harbor Marina. Follow this road to marina area. The TLD is on the power pole behind the shipyard warehouse.
Location #160 (ENE)	Return to Hwy. #73, turn left and follow Hwy. #73 until it crosses over I-77. Take the first right after crossing I-77. Follow Hwy. #21 until it intersects S.R. #2147. Anchorage Marina showroom will be on the left. The TLD is on the fence surrounding the showroom.
Location #161 (E)	Return to Hwy. #21 and proceed south. The TLD is located on the right on the main power pole that feeds the meter pole at the intersection of Hwy. #21 and Sam Furr Road.

Location #178 (SE)
Follow Hwy. #21 until it intersects Gilead Road and turn left. Follow Gilead Road until it intersects Hwy. #115S (Old Statesville Hwy.) and turn to the right. Follow Hwy. #115S until you come to Florida Steel in the Croft Community. The TLD is on the fence inside the Duke Power substation to the right of Florida Steel, as you approach the plant.

Location #179 (ESE)
Return to Hwy. #115 and turn left. Follow Hwy. #115N until it is joined by Eastfield Road. Turn right on Eastfield Road. Follow Eastfield Road until it intersects Prosperity Church Road. Turn right on Prosperity Church Road. The TLD is located approximately 2 miles down the road on the right, on the telephone pole across from a 'red barn' house.

Location #163 (SE)
Return to Hwy. #115 and turn right. Proceed to Hambright Road (S.R. #2117) and turn left. Proceed to McCoy Road (S.R. #2120) and turn left. The TLD is on the right, inside the fence at the Duke Power substation at the right back leg of the transformer.

Location #164 (SSE)
From Hwy. #115 turn left onto Hambright Road. Follow Hambright Road until it intersects Beatties Ford Road. The TLD is located on the left on the power pole where these two roads intersect.

Location #162 (ESE)
Turn right onto Beatties Ford Road and follow it until it intersects Gilead Road. Turn right onto Gilead Road. Follow Gilead Road to Ramson Road (S.R. #2139) and turn left. The TLD is located on the left on a power pole in front of the David Young residence.

Location #182 (ENE)
Return to Hwy. #115 and turn left. Follow Hwy. #115N into Cornelius. Turn right off to Hwy. #115N, just past the First Union National Bank in front of Fred's Shoe Shop, than left on Zion Street. The next TLD is located on the right, inside the Duke Power substation, at air sampling site #133.

Location #181 (NE)
Return to Hwy. #115, and turn right. Follow Hwy. #115N until it intersects with Potts Street (street just before railroad overpass) and turn left. Follow Potts Street until it intersects with W. Walnut Street and turn left. The TLD is located on the power pole at the rear of the Davidson Water Works Building. The Davidson Water Works Building will be the first building on the right after turning onto W. Walnut Street.

Location #157 (N)
Proceed to the end of Walnut Street and turn left onto Gamble Road. There will be a Day Care area in front of your. Turn right at the end of this road onto Jetton Road. Follow this road until it ends and turn left.

Location #157 (cont'd)	You will see I-77. Go north on I-77. Take exit #33 off I-77, turn left, cross back over I-77. Follow this road until it intersects S.R. #1100 (Brawley School Road) turn left on S.R. #110 and follow this road until it intersects S.R. #2160. Follow S.R. #2160 until you see the Duke Power sign at the Williamson Access area. The TLD is in a clear bag on the sign post.
Location #180	Return to Brawley School Road and follow to stop sign. Continue straight toward Mooresville. Turn left onto Hwy. #21N. Follow Hwy. #21N. The Mooresville Water Treatment Plant is on the left approximately .5 mile up Hwy. #21N. The TLD is on the telephone pole near the parking lot on the right.
Location #173 (N)	Return to Hwy. #150 and turn right. Follow Hwy. #150W to the Grey-Seal Paint store and turn left. Proceed to the caution light in Denver and turn left. Follow Campground Road (into Catawba County) until it intersects S.R. #1899 (just before Barkley's Mini Market) and turn left. Follow S.R. #1899 to S.R. #1845 and turn left. Follow S.R. #1845 until it intersects S.R. #1981 and turn left. The TLD is located on the fist power pole on your left.
Location #172 (NNW)	Return to Campground Road and turn left toward Denver. Pass Barkley's Mini-Mart on the right. Proceed to Fairfield Drive in the Westport Community. Turn left onto Fairfield Road and follow until it intersects S.R. #1389 to Lake Shore. Turn left onto Golf Course Lane. The TLD is located on the telephone pole in the front yard of house number 625.
Location #171 (NW)	Return to Hwy. #16 south. The TLD is located at the south side of the Triangle Hardware Store on the utility pole.
Location #170 (WNW)	Return to Hwy. #16 south. Follow Hwy. #16S until it intersects Hwy. #73. Turn right onto Hwy. #73. Follow Hwy. #73 until it intersects S.R. #1386. Turn left on S.R. 1386. The TLD is located up an embankment on the second utility pole on the right from the intersection.
Location #174 (WNW)	Return to Hwy. #73W. The TLD is located at East Lincoln Junior High, west of the main campus beside the well house. The TLD is on the fence at the air sampling site #134.
Location #175 (WNW)	Return to Hwy. #73, turn right and follow Hwy. #73 until it joins Hwy. #27. Follow Hwy. #27 into Boger City. At the intersection of Hwy. #27 and Buffalo Shoals Rd. (S.R. #1003, in front of Carolina Shopping Center) turn right. Follow this road until it intersects with Highland Rd. Turn left on to Highland and then right onto Hoyle. The TLD is located on the right side of a utility building at the residence of Steve Mooneyhan, the 5th house on the right.

Location #176 (SW)	Return to Hwy. #27 and turn left. Follow Hwy. #27E through Stanley. At the intersection of Hwy. #27E and E. Dallas Road turn to the right. Follow E. Dallas Road, until it intersects S. Main Street and turn left. Follow Hwy. #275 (to the right of Nichol's Service Station and Grocery) until it intersects S.R. #2001 (dirt road) and turn left. Follow S.R. #2001 until it intersects S.R. #2393 (hard surface road) and turn left. The TLD is located on a cedar post in the back yard at the home of R.G. McGee. His is the 9th house on the left of S.R. #2393.
Location #168 (WSW)	Return to Hwy. #16 and turn left. Continue north on Hwy. #16 until it intersects Old Plank Road (S.R. #1511) and turn left. The TLD is located on the left on the last power pole before crossing Killiam Creek.
Location #169 (W)	Return to Hwy. #16 and turn left. Follow Hwy. #16 until it intersects Kincaid Road. (Kincaid Road is the road immediately north of Hills Chapel United Methodist Church on Hwy. #16). Turn left on Kincaid Road. The TLD is located on the last power pole on the right at the end of the road.
Location #167 (SW)	Return to Hwy. #16 and turn right. The next TLD is located on the left hand side of the road behind the Lucia Volunteer Fire Department Building. It is in a clear bag at the edge of the trees.
Location #166 (SSW)	Turn left onto Hwy. #16 and proceed to Power Plant Road. The next TLD is located on your right, on the water tank across from River Bend Steam Station.
Location #165 (S)	Proceed down Power Plant Road for approximately 2 miles. The TLD is on the fence post on the right at the sharp bend (90°) in the road.
Location #177 (S)	Return to Hwy. #16 and turn left. Follow Hwy #16S until it intersects Kentberry Drive in the Coulwood Community and turn to the right. Turn left at the intersection of Kentberry and Belmorrow Drive. The TLD is located on the power pole in the front yard of J.R. Leonard at 908 Belmorrow Drive.
Location #183 (S) (control)	Return to Hwy. #16 and turn left. Turn right at the intersection of Mt. Holly-Huntersville Rd. (S.R. #2204). Follow Mt. Holly-Huntersville Road to Pump Station Road (S.R. #2001) and turn right. Follow Pump House Road until it dead ends. The TLD is located along the river bank just at the edge of the tall grass in a clear bag.

LIST OF DESIGNATED MILK SAMPLE LOCATIONS

This enclosure is meant to provide a guide to one who is not familiar with the environmental milk sample route. Appropriate deviations from this sequence and route may be made as necessary.

5. Milk Samples

A. Sample location numbers:
139 - William Cook Dairy
138 - Henry Cook Dairy
140 - David Kidd Dairy
141 - Keever Dairy

B. Directions to sampling locations:

Location #138 William Cook Dairy	Turn left when leaving MNS main entrance and proceed to Oliver Hager Rd. (SR #2142) on your right. Follow road to the large main house. Behind the house is a garage storage area. The milk will be in a refrigerator in the garage area.
Location #138 Henry Cook Dairy	Return to Hwy. 73 and turn left. Proceed to Beatties Ford Rd. (Rd. beside Phillips 73 General Store) and turn left. Follow Beatties Ford Rd. approximately .5 miles to Gilead Rd. Turn left. Follow Gilead Rd. approximately 4 mi. to Ervin Cook Rd. Turn left. Henry Cooks Daily will be the second dairy on your left, approx. 1 mi. It will be on your left just before the road ends. The milk will be in a refrigerator in the white wooden building on your right.
Location #140 Kidd's Dairy	Return to Beatties Ford Road and make a left. Proceed to Jim Kidd Road (approximately 1.0 miles) and turn right. Proceed approximately .5 of a mile and look for a white house on the right. Follow the dirt road to the rear of the house. The milk sample is taken from the vat located in the block building behind the house.
Location 141 Keever's Dairy	Return to Beatties Ford Road and turn left. Proceed to Hwy. #73 and turn left. Take Hwy. #73 past East Lincoln High School. Take the next right (at the overpass). Turn left at the top of the exit ramp. Proceed approximately 2.8 miles to a large "open" barn on your right. Turn right into dirt driveway. Milk vat is in building at far end of parking area.

DIRECTIONS FOR PREDETERMINED SURVEY/SAMPLING LOCATIONS

Example: A - 2 - 1
A = Evacuation Zone
2 = Mile Radius
1 = Sample

A-2-1 From the intersection of Hwy. 73 and Jetton Road (SR2151), go west on Jetton Road 2.0 miles. Turn left onto Old Beatties Ford Road (SR2149) and go 1.1 miles.

A-3-1 From the intersection of Hwy. 73 and Jetton Road (SR2151), go west on Jetton 3.8 miles to dead end.

A-3-2 From the intersection of Hwy. 73 and Jetton Road (SR2151), go west on Jetton Road 2.0 miles to the intersection of Jetton Road and Old Beatties Ford Road (SR2149).

A-3-3 From the intersection of Hwy. 73 and Nance Road (SR2148), go west on Nance Road. Go to end of Nance Road.

A-5-1 From the intersection of Williamson Road (SR1109) and Brawley School Road (SR1100), go west 8.0 miles on Brawley School Road to dead end at water. NOTE: Brawley School Road becomes Mayhew Road at Meckenburg County Line.

A-5-2 From the intersection of Hwy. 73 and Bethel Church Road (SR2189), go north on Bethel Chuch Road to the end of Bethel Church Road.

A-5-3 Knox's Grill at Hwy. 73. From the main plant entrance, go east on Hwy. 73 6.4 miles to Knox's Grill at intersection of Hwy. 73 and Henderson Raod (SR2159).

A-6-1 From the intersection of Williamson Road (SR1109) and Brawley School Road (SR1109), go west 6.9 miles on Brawley School Road. Turn left on Torrence Chappel Road (SR2065), go .1 mile. Stop on roadside. NOTE: Brawley School Road becomes Mayhew Road at Mecklenburg County Line. Torrence Chappel Road is the first left after the county line.

B-1-1 One mile from plant on Lake Norman. (WNW)

B-1-2 One mile from plant on Lake Norman. (NW)

B-1-3 One mile from plant on Lake Norman. (NNW)

B-1-4 One mile from plant on Lake Norman. (N)

B-1-5 One mile from plant on Lake Norman. (NNE)

B-1-6 Emergency Boat House and dock.

B-1-7 One and ½ miles from plant on Lake Norman (NE) directly east of TTC.

B-1-8 One and ¼ miles from plant on Lake Norman (NE) at mouth of discharge canal.

B-1-9 One and ½ miles from plant on Lake Norman (ENE).

B-1-10 Bridge over discharge canal on road to TTC.

B-1-11 The intersection of U-2 access road and the road to TTC.

B-1-12 On the roadside of U-2 access road .2 miles off of Hwy. 73.

B-1-13 The intersection of Hwy. 73 and the U-2 access road.

B-1-14 The intersection of Hwy. 73 and the access road to the firing range.

B-1-15 U-1 main entrance.

B-1-16 Right past the bridge on Hwy. 73 over the Catawba River (below the dam).

B-1-17 The east side of Cowans Ford Dam, access through O.C. Gate #5 (lower dam access).

B-2-1 2 miles from plant on Lake Norman (NE).

B-2-2 From McGuire main entrance, go east on Hwy. 73 2.5 miles. Turn left on Terry Lane (SR2255). Go 0.5 miles to the end of Terry Lane (SR2255).

B-3-1 From McGuire main entrance, go east on Hwy. 73 3.8 miles. Turn left on Norman Island Drive (SR2145). Go to the end of of Norman Island Drive.

C-1-1 At the intersection of Hubbard Road and Hwy. 73 turn on Hubbard Road (SR2134) and stop on roadside.

C-1-2 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south 1.3 miles on Beatties Ford Road. Turn right onto Cashion Road (SR2133), go to end of road.

C-2-1 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south 1.3 miles on Beatties Ford Road to the intersection of Beatties Ford Road and Cashion Road (SR2133).

C-2-2 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south 1.5 miles on Beatties Ford Road. Turn right on Stephens Road (SR2132), go .7 miles to dead end at gate.

D-2-1 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south .3 miles on Beatties Ford Road to the intersection of Beatties Ford Road and Gilead Road (SR2136).

D-3-1 From McGuire main entrance go east on Hwy. 73 3.8 miles to intersection of Sam Furr Road (SR2145) and Hwy. 73.

D-3-2 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go .3 miles south on Beatties Ford Road. Turn left on Gilead Road (SR2136), go 1.2 miles to the intersection of Gilead Road and Bud Henderson Road (SR2131).

D-3-3 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 2.4 miles to the intersection of Beatties Ford Road and Jim Kidd Road (SR2129).

D-3-4 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 3.5 miles. Turn right on Neck Road (SR2074), go 2.4 miles to the intersection of Neck Road and Allison Ferry Road (SR2127).

D-3-5 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 3.5 miles. Turn right on Neck Road (SR2074), go 2.4 miles. Turn right on Allison Ferry Road (SR2127), go .7 miles to dead end.

D-5-1 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road .3 miles. Turn left on Gilead Road (SR2136), go 3.0 miles to the intersection of Gilead Road and Remson Road (SR2139).

D-5-2 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 4.2 miles. Turn left on Hambright Road (SR2117), go 1.6 miles to the intersection of Hambright Road and McCoy Road (SR2120).

D-5-3 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 4.2 miles to the intersection of Beatties Ford Road and Hambright Toad (SR2117).

D-5-4 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 5.0 miles to the intersection of Beatties Ford Road and Sample Road (SR2125).

D-5-5 From the intersection of Beatties Ford Road (SR2128) and Hwy. 73, go south on Beatties Ford Road 3.5 miles. Turn right on Neck Road (SR2074), go 2.4 miles. Bear to left and continue .6 miles. Stop on roadside.

E-6-1 From the intersection of Beatties Ford Road (SR2128) and Mt. Holly Huntersville Road (SR2004), go west on Mt. Holly-Huntersville Road to the intersection of Mt. Holly-Huntersville Road and Sunset Road (SR2042).

E-7-1 From the intersection of Beatties Ford Road (SR2128) and Mt. Holly-Huntersville Road (SR2004), go west on Mt. Holly-Huntersville Road 3.2 miles to the intersection of Mt. Holley-Huntersville Road and Pump Station Road (SR2001).

E-8-1 From the intersection of Beatties Ford Road (SR2128) and Miranda Road (SR2025), go west on Miranda Road to the intersection of Miranda Road and Sunset Road (SR2042).

E-8-2 From the intersection of Mt. Holly-Huntersville Road (SR2004) and Hwy. 16, go south on Hwy. 16 to intersection of Hwy. 16 and Pleasant Road (SR2008).

E-8-3 From the intersection of Mt. Holly-Huntersville Road (SR2004) and Hwy. 16, go west on Mt. Holly-Huntersville .8 miles to the intersection of Mt. Holly-Huntersville Road and SR1667. (No sign, directly across from Mountainair Road).

E-10-1 From the intersection of Beatties Ford Road (SR2128) and Sunset Road (SR2108), go west on Sunset .7 miles. Turn left on Peachtree Road (SR2019), go 1.3 miles to the intersection of Peachtree Road and Oak Road (SR2027).

E-10-2 From the intersection of Mt. Holly-Huntersville Road (SR2004) and Hwy. 16, go south on Hwy. 16 1.5 miles. Turn right on Valleydale Road, then make an immediate right (50 ft.) onto Gumbranch Road. Go .7 miles on Gumbranch. Turn left on Cathey Road, go 1.0 miles to the intersection of Cathey Road and Tom Saddler Road.

F-5-1 From the intersection of US21 and Gilead Road (SR2136), go south on US21 .9 miles to the intersection of US21 and Mt. Holly-Huntersville Road (SR2004).

F-7-1 From the intersection of US21 and Gilead Road (SR2136), go south on US21 2.9 miles. Turn right on Alexanderana Road (SR2116), go 1.0 miles to the intersection of Alexanderana Road and Mt. Holly-Huntersville Road (SR2004).

F-8-1 From the intersection of I-77 and Gilead Road (SR2136) - Exit #23, go south to I-77 to the intersection of I-77 and Reames Road (SR2110) - Exit #18.

F-9-1 From the intersection of US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Continue straight on Huntersville-Concord Road (SR2426) 3.6 miles to the intersection of Hunterville-Concord Road and McAuley Road.

F-9-2 From the intersection of US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Continue straight on Huntersville-Concord Road (SR2426) 2.4 miles. Turn right on Asbury Chapel Road (SR2442), go 2.4 miles to the intersection of Asbury Chapel Road and Trails End Road (SR2445).

F-10-1 From the intersection of US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Turn right on Hwy. 115, go 2.9 miles. Turn left on Alexanderana Road (SR2116), go .9 miles. Turn left on Eastfield Road (SR2459), to 2.3 miles to the intersection of Eastfield Road and Prosperity Church Road (SR2475).

F-10-2 From the intersection of US21 and Gilead Road (SR2136), go south on US21 5.2 miles. Turn left on Lakeview Road (SR2112), go 1.0 miles. Turn right on Hwy. 115, go .7 miles to the intersection of Hwy. 115 and Victoria Road (Beachwood Mobile Home Park Road).

G-5-1 From the intersection of US21 and Gilead Road (SR2136), go north on US21 3.8 miles to the intersection of US21 and Westmoreland (SR2147).

G-5-2 From the intersection of US21 and Gilead Road (SR2136), go north on US21 2.3 miles to the intersection of US21 and Sam Furr Road (SR2145).

G-6-1 From the intersection of US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Turn left on Hwy. 115, go 3.7 miles to the intersection of Hwy. 115 and Bailey Road (SR2416).

G-6-2 From the intersection of US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Turn left on Hwy. 115, go 1.6 miles. Turn right on McCord Road (SR2427), go .3 miles. Turn right on Hagers Road (SR2438), go .5 miles to dead end.

G-8-1 From the intersection of US21 and Gilead Road (SR2136), go north on US21 2.3 miles. Turn right on Sam Furr Road (SR2145), go 3.9 miles. Turn left on Davidson-Concord Road (Hwy. 73) and continue to intersection of Hwy. 73 and Rockey River Road (SR2420).

G-8-2 From the intersection os US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Turn left on Hwy. 115, go .7 miles. Turn right on Ramah Church Road (SR2439), go 2.4 miles to the intersection of Ramah Church Road and McCord Road (SR2427).

G-10-1 From the intersection of US21 and Gilead Road (SR2136), go east on Gilead Road .7 miles. Turn left on Hwy. 115, go 2.0 miles. Turn right on Sam Furr Road (SR2145), go 2.7 miles. Turn left on Davidson-Concord Road, go 2.3 miles. Turn right on Rocky River Road (SR2420), go 2.3 miles. Turn left on Shearer Road (SR2418), go 2.6 miles to the intersection of Sherarer Road and Fisher Road (SR2419).

H-6-1 From the intersection of US21 and Hwy. 73, to east on Hwy. 73 .9 miles to the intersection of Hwy. 73 and Hwy. 115.

H-7-1 From the intersection of I-77 and Hwy. 73 (Exit #28), go north on I-77 to the intersection of I-77 and Griffith Street (SR2158) (Exit #30).

H-7-2 From the intersection of I-77 and Griffith Street (SR2158) Exit #30, go east on Griffith Street .9 miles to Sadler Square Shopping Center.

I-7-1 From the intersection of Brawley School Road (SR1100) amd Williamson Road (SR1109), go west on Brawley School Road 5.2 miles to the intersection of Brawley School Road and Garden Road (SR1111).

I-7-2 From the intersection of Brawley School Road (SR1100) and Williamson Road (SR1109), go west on Brawley School Road 2.7 miles. Turn left on Isle of Pines Road (SR1113), go 3.4 miles to dead end.

E-8-1 From the intersection of Brawley School Road (SR1100) and Williamson Road (SR1109), go west on Brawley School Road 3.8 miles. Turn right on Chuckwood Road (SR1177), go to end.

I-9-1 From the intersection of Brawley School Road (SR1100) and Williamson Road (SR1109), go west on Brawley School Road 3.8 miles to the intersection of Brawley School Road and Chuckwood Road (SR1177).

I-10-1 From the intersection of Brawley School Road (SR1100) and Williamson Road (SR1109), go west on Brawley School Road 3.2 miles. Turn right onto McKendries Road (SR1115), go 1.6 miles to the intersection of McKendries Road and Lakeview Drive (SR1455).

J-7-1 From the intersection of I-77 and US21 (Exit #33), go west on US21 over I-77 .2 miles. Turn left on Alcove Road (SR1206), go 1.8 miles. Turn right on Langtree Road (SR1102), go 2.0 miles to entrance of All Seasons Campground.

J-9-1 From the intersection of I-77 and Griffith Street (Exit #30), go east on Griffith Street (SR2158) 1.0 mile. Turn left on Hwy. 115, go 1.4 miles to the intersection of Hwy. 115 and Midway Lake Road (SR1137).

J-10-1 From the intersection of I-77 and US21 (Exit #33), go west on US21 over I-77 .2 miles. Turn left on Alcove Road (SR1206) then bear right on Catalina Road (SR1110) go .6 miles. Bear right on Malibur Road go .4 miles to dead end at Cul-de-sac.

J-10-2 From the intersection of I-77 and US21 (Exit #33), go east on US21 .1 miles. Turn right on Fairview Road, go .9 miles. Turn right on Hwy. 115, go .3 miles. Turn left at Faith Road (SR1136), go .8 miles to the intersection of Faith Road and Midway Lake Road (SR1137).

K-9-1 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 6.6 miles. Turn right on Campground Road (SR1373), go 2.8 miles to the intersection of Slanting Bridge Road (SR1373) and Keistler Store Road (SR1899). NOTE: Campground Road turns into Slanting Bridge Road at Catawba County Line.

K-9-2 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 6.6 miles. Turn right on Campground Road (SR1373), go 4.8 miles. Turn right on Hwy. 150, go 1.7 miles. Turn right on Kiser Island Road (SR1841), go 3.1 miles to dead end at circle. NOTE: Campground Road turns into Slanting Bridge Road at Catawba County Line.

L-1-1 From the McGuire main entrance, go west on Hwy. 73 .5 miles to the Cowans Ford Dam (Lower) overlook.

L-1-2 From the McGuire main entrance, go west on Hwy. 73 1.5 miles. Turn right onto Cowans Ford Country Club Road (SR1395), go .8 miles to Cowans Ford overlook.

L-2-1 From the McGuire main entrance go 1.5 miles to the intersection of Hwy. 73 and Cowans Ford Country Club Road.

L-2-2 North from Plant on lake - 1.7 miles.

M-1-1 From the McGuire main entrance, go west on Hwy. 73 .9 miles to the intersection of Hwy. 73 and Caswell Road (SR1578).

M-2-1 From the McGuire main entrance, go west on Hwy. 73 2.3 miles. Turn left onto Killian Road (SR1396), go 2.2 miles. Stop on roadside of railroad crossing.

N-2-1 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 .6 miles. Turn right onto Hagers Ferry Road (SR1393), go 1.4 miles. Bear left onto unmarked road (SR1393), go .5 miles to where pavement ends (at "Gusto Bay" sign).

N-3-1 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 .6 miles. Turn right onto Hagers Ferry Road (SR1393), go .9 miles to the intersection of Hagers Ferry Road and Lake Drive (SR1568)

N-3-2 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 2.1 miles. Turn right on Unity Church Road (SR1439), go .3 miles. Turn right on Graham Road, go 1.6 miles to end of road.

N-4-2 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 2.1 miles. Turn right on Unity Church road (SR1439), go 2.4 miles to Beatties Ford Access Area.

N-5-1 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 3.2 miles. Turn right on Lakeshore Drive (SR1456) go 1.3 miles. Turn right on Island View Center (SR1656) go .1 miles to dead end.

O-3-1 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 2.0 miles. Turn left on Sifford Road (SR1397), go 1.2 miles to the intersection of Sifford Road and Mac Road.

O-4-1 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 1.2 miles. Stop on roadside at Hills Knob Methodist Church.

O-4-2 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 .6 miles to the intersection of Hwy. 16 and Pilot Knob Road (SR1394).

O-5-1 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 2.2 miles. Turn right on Old Plank Road (SR1511), go 1.0 miles. Stop on roadside passed bridge.

P-5-1 From the intersection of Hwy. 73 an Hwy. 16, go west on Hwy. 73 1.5 miles to the intersection of Hwy. 73 and Little Egypt Road (SR1386).

P-5-2 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 1.5 miles. Turn right on Little Egypt Road (SR1386), go 1.9 miles. Turn right on Optimist Club Road (SR1380), go .4 miles. Stop on roadside.

P-6-1 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 3.6 miles. Turn right on Schronce Road (SR1385). Go to intersection of Schronce Road (SR1385) and Ingleside Farm Road (SR1383).

P-6-2 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 1.5 miles. Turn right on Little Egypt Road (SR1386), go 3.2 miles to the intersection of Little Egypt Road and Kidville Road (SR1381).

P-6-3 From the intersection of Hwy. 73 and Hwy. 16, go north on Hwy. 16 4.9 miles. Turn right on Webb's Chapel Road (SR1379), go 1.6 miles to the intersection of Webb's Chapel Road and Burton Road.

P-8-1 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 5.3 miles. Turn right on Beth Haven Church Road (SR1360), go 1.4 miles. Stop on roadside past bridge.

P-8-2 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 2.5 miles. Turn right on Ingleside Farm Road (SR1383), go .1 mile and bear left 3.2 miles more. Turn right on Beth Haven Church Road (SR1360), go 1.3 miles. Turn right on Forney Hill Road (SR1373), go .7 miles. Stop on roadside passed bridge.

P-8-3 From the intersection of Hwy. 73 and Hwy. 16, go North on Hwy. 16 to the intersection of 16 and State Road 1375 (about 7.8 miles). Turn right on State Road 1375 and go to the intersection of State Road 1375 and State Road 1635 (about 1.8 miles).

P-10-1 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 6.8 miles to the intersection of Hwy. 73 and Amity Church Road (SR1362).

P-10-2 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 2.5 miles. Turn right on Ingleside Farm Road (SR1383), go .1 miles and bear left 3.2 miles more. Turn right on Beth Haven Church Road (SR1360), go 2.8 miles to the intersection of Beth Haven Church Road and Mundy Road (SR1349).

Q-6-1 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 2.5 miles. Turn right on Ingleside Farm Road (SR1383), go .1 mile bear right and go 1.7 miles more. Turn left on Old Plank Road (SR1511), go .6 miles to the intersection of Old Plank Road and Mariposa (SR1412).

Q-8-1 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 5.3 miles. Turn left on Brevard Place road (SR1360), go .1 mile. Turn left on Old Plank Road (SR1511), go 1.0 mile. Turn right on Mt. Zion Church Road (SR1404), go 1.9 miles. Stop on road side passed bridge.

Q-8-2 From the intersection of Hwy. 73 and Hwy. 16, to west on Hwy. 73 5.3 miles. Turn left on Brevard Place Road (SR1360), go .1 miles. Turn left on Old Plank Road (SR1511), go 1.0 miles to the intersection of Old Plank Road and Mt. Zion Church Road (SR1404).

Q-10-1 From the intersection of Hwy. 73 and Hwy. 16, go west on Hwy. 73 5.3 miles. Turn left on Brevard Place Road (SR1360), go 3.4 miles to the intersection of Brevard Place Road and Paysour Road (SR1361).

R-3-1 From the main entrance to McGuire go west on Hwy. 73 2.3 miles. Turn left on Killian Road (SR1396), go 3.4 miles. Stop on roadside (just past Gaston County sign).

R-5-1 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 6.2 miles. Turn left on Horseshoe Bend Beach Road (SR1912), go 2.0 miles. Stop on roadside passed curve.

R-5-2 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 6.2 miles. Turn left on Horseshoe Bend Beach Road (SR1912), go 1.0 miles. Stop on roadside.

R-5-3 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 6.2 miles to the intersection of Hwy. 16 and Horseshoe Bend Beach Road (SR1912).

R-5-4 From the intersection of Hwy. 73 and Hwy. 16, go south on Hwy. 16 4.3 miles to the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905).

S-7-1 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go west on Stanley-Lucia Road 2.0 miles. Stop on roadside at Macedona Church parking lot.

S-7-2 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go west on Stanley-Lucia Road 1.1 miles. Turn right on Alexis-Lucia road (SR1820), go 1.6 miles to intersection of Alexic-Lucia Road and (SR1907).

S-8-1 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go south on Hwy. 16 2.0 miles. Turn right on Hwy. 273, go to the intersection of Hwy. 273 and Sand Ford Road (SR1918).

S-8-2 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go west on Stanley-Lucia Road 3.2 miles. Bear left at curve and continue 1.5 miles to the intersection of SR1935 and Old NC 27 (SR1923).

S-8-3 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go west on Stanley-Lucia Road 3.2 miles. Bear left at curve and continue .7 miles to the intersection of Stanley-Lucia Road and Sand Ford Road (SR1918).

S-8-4 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go west on Stanley-Lucia Road 1.1 miles. Turn right on Alexis Lucia (SR1820), go 2.2 miles to the intersection of Alexis-Lucia Rod and Mariposa Road (SR1412).

S-9-1 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go west on Stanley-Lucia Road 1.1 miles. Turn right on Alexis Lucia Road (SR1820), go 2.2 miles. Turn left on Mariposa (SR1412), go 1.5 miles. Turn right on Airport Road (SR1903), go .6 miles to the intersection of Airport Road and Hwy. 27.

S-10-2 From the intersection of Hwy. 16 and Stanley-Lucia Road (Blacksnake Road-SR1905), go south on Hwy. 16 2.0 miles. Turn right on Hwy. 273, go 4.7 miles to the intersectionof Hwy. 273 and N. Main Street.

EDA-9
Enclosure 5.4

FMC/OMC INSTRUCTION LOG

Team	Location		Sample Type (Check)		Special (Fill in)
	From	To	B-G	Air	

FIELD MONITORING SURVEY DATA SHEET

Time	Team	Zone	Mile	Location	Beta	Gamma	Air (Child I-131 equivalent, μCi/ml)	Special

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: _____

_____

FIELD MONITORING TEAM RADIATION EXPOSURE RECORD

Team Name	S.V.1		S.V.2		Alpha		Bravo		Charlie		Delta			
Name														
TLD #														
Initial Dose														
Subsequent Dose														
Running Total														
Subsequent Dose														
Running Total														
Subsequent Dose														
Running Total														
Subsequent Dose														
Running Total														
Subsequent Dose														
Running Total														