CAROLINA POWER & LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT

UNIT 0

INITIAL DOSE PROJECTIONS

PLANT EMERGENCY PROCEDURE: PEP-03.4.1

VOLUME XIII

Rev. 006

Recommended By: _____ Date: 6/21/83
Director - Administrative Support

Approved By: _____ Date: 6/22/83
General Manager

LIST OF EFFECTIVE PAGES

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1.0 Responsible Individual and Objectives

This procedure is intended to be used by Control Room personnel until the Dose Projection Team can be activated in the Technical Support Center.

2.0 Scope and Applicability

This procedure is intended to enable a rapid determination of the severity of an emergency. It should be implemented as the first step subsequent to recognition that an unplanned off-site release has occurred or could have occurred. The procedure can be used to make either whole body or thyroid dose projections. Thyroid dose projections made using this procedure are extremely conservative and are realistic only if there is reasonable assurance that significant quantities of iodine are being released.

The dose projections calculated by use of this procedure are to be compared against pre-established criteria (Emergency Action Levels and Protective Action Guidelines) for possible consequences off site. These projections pertain to the radioactive gases at ground level and do not include radiation from an overhead cloud that may contribute to the whole body dose at ground level. Under certain meteorological conditions (elevated release and E, F, or G stability classes), direct radiation from an overhead plume may produce somewhat higher doses than those calculated by this procedure.

A simplified formula for estimating radiological consequences of an accidental release to the atmosphere is:

$$D = \frac{x}{Q} \bullet Q \bullet DCF$$

where D = Dose in rem.

x/Q = Atmospheric Dispersion Factor in units of sec/m^3, and with values determined by atmospheric stability and wind speed.

Q = Source Term in curies per second.

DCF = Dose Conversion Factor.

NOTE: This procedure makes use of scientific notation, i.e., 2E-6 is the same as 2×10^{-6}.

3.0 Actions

List of Exhibits

3.4.1-1 Initial Dose Projection Record Sheet

3.1 Obtain a copy of Exhibit 3.4.1-1 (Initial Dose Projection Record Sheet) and record time and your initials in column 1.

3.2 Record in column 2 whether this calculation is for whole body or thyroid dose projections. Recall that thyroid dose projections should only be made using this procedure if there is reasonable assurance that significant quantities of iodine are being released.

3.3 Determine wind speed, wind direction, and stability class using one of the following five methods listed in order of preferred use. Record in column 3 of Exhibit 3.4.1-1.

NOTE: USE UPPER WIND SPEED AND DIRECTION FOR A STACK RELEASE; OTHERWISE USE LOWER WIND SPEED AND DIRECTION.

3.3.1 If operable, use the plant computer or E&RC computer to obtain the wind speed, wind direction, and stability class.

3.3.2 Call E&RC and request meteorological data in accordance with PEP-02.6.20, Exhibit 2.6.20-1.

3.3.3 Call National Weather Service for area conditions (PEP Appendix A-4).

3.3.4 Call corporate meteorologists and request assistance from meteorological section (PEP Appendix A-4).

3.3.5 If there is no meteorological data readily available, a general estimate of the current Atmospheric Stability Class can be made by visual observation, using the following table:

	Sunny Day	Cloudy Day	Cloudy Night	Clear Night
light wind or calm (≤ 4 m/sec or 8.9 mph)	B	C	E	F
moderately strong wind (> 4 m/sec or 8.9 mph)	C	D	D	D

NOTE: Assume Stability Class D whenever it is raining.

3.4 Determine the x/Q value

3.4.1 If the release is from the stack, use Table 3.4.1-1. (If not, go to Step 3.4.3.) Read across the appropriate row based on wind speed to the x/Q value under the Atmospheric Stability Class determined in Step 3.3.

TABLE 3.4.1-1
METEOROLOGICAL DISPERSION (x/Q) VALUE AT
BSEP PROPERTY BOUNDARY (4000 FEET)

ELEVATED LEVEL RELEASE*

Wind Speed		x/Q Values By Atmospheric Stability Class (Units: sec/m^3)						
mph	m/sec	A	B	C	D	E	F	G
1.0	0.4	4.1 E-6	2.1 E-5	3.0 E-5	5.2 E-6	1.4 E-7	6.5 E-12	2.0 E-22
2.0	0.9	2.1 E-6	1.1 E-5	1.5 E-5	2.6 E-6	6.8 E-8	3.3 E-12	9.9 E-23
3.0	1.3	1.4 E-6	7.1 E-6	1.0 E-5	1.7 E-6	4.6 E-8	2.2 E-12	6.6 E-23
4.0	1.8	1.0 E-6	5.3 E-6	7.6 E-6	1.3 E-6	3.4 E-8	1.6 E-12	4.9 E-23
5.0	2.2	8.3 E-7	4.3 E-6	6.1 E-6	1.0 E-6	2.7 E-8	1.3 E-12	4.0 E-23
6.0	2.7	6.9 E-7	3.6 E-6	5.1 E-6	8.7 E-7	2.3 E-8	1.1 E-12	3.3 E-23
7.0	3.1	5.9 E-7	3.0 E-6	4.4 E-6	7.5 E-7	2.0 E-8	9.3 E-13	2.8 E-23
8.0	3.6	5.2 E-7	2.7 E-6	3.8 E-6	6.6 E-7	1.7 E-8	8.2 E-13	2.5 E-23
9.0	4.0	4.6 E-7	2.4 E-6	3.4 E-6	5.8 E-7	1.5 E-8	7.2 E-13	2.2 E-23
10.0	4.5	4.1 E-7	2.1 E-6	3.0 E-6	5.2 E-7	1.4 E-8	6.5 E-13	2.0 E-23
11.0	4.9	3.8 E-7	1.9 E-6	2.8 E-6	4.8 E-7	1.2 E-8	5.9 E-13	1.8 E-23
12.0	5.4	3.5 E-7	1.8 E-6	2.5 E-6	4.4 E-7	1.1 E-8	5.4 E-13	1.6 E-23
13.0	5.8	3.2 E-7	1.6 E-6	2.3 E-6	4.0 E-7	1.1 E-8	5.0 E-13	1.5 E-23
14.0	6.2	3.0 E-7	1.5 E-6	2.2 E-6	3.7 E-7	9.8 E-9	4.7 E-13	1.4 E-23
15.0	6.7	2.8 E-7	1.4 E-6	2.0 E-6	3.5 E-7	9.1 E-9	4.3 E-13	1.3 E-23
16.0	7.2	2.6 E-7	1.3 E-6	1.9 E-6	3.3 E-7	8.5 E-9	4.1 E-13	1.2 E-23
17.0	7.6	2.4 E-7	1.3 E-6	1.8 E-6	3.1 E-7	8.8 E-9	3.8 E-13	1.2 E-23
18.0	8.0	2.3 E-7	1.2 E-6	1.7 E-6	2.9 E-7	7.6 E-9	3.6 E-13	1.1 E-23
19.0	8.5	2.2 E-7	1.1 E-6	1.6 E-6	2.8 E-7	7.2 E-9	3.4 E-13	1.0 E-23
20.0	8.9	2.1 E-7	1.1 E-6	1.5 E-6	2.6 E-7	6.8 E-9	3.3 E-13	9.9 E-24
21.0	9.4	2.0 E-7	1.0 E-6	1.5 E-6	2.5 E-7	6.5 E-9	3.1 E-13	9.4 E-24
22.0	9.8	1.9 E-7	9.7 E-7	1.4 E-6	2.4 E-7	6.2 E-9	3.0 E-13	9.0 E-24
23.0	10.3	1.8 E-7	9.3 E-7	1.3 E-6	2.3 E-7	5.9 E-9	2.8 E-13	8.6 E-24
24.0	10.7	1.7 E-7	8.9 E-7	1.3 E-6	2.2 E-7	5.7 E-9	2.7 E-13	8.2 E-24
25.0	11.2	1.7 E-7	8.5 E-7	1.2 E-6	2.1 E-7	5.5 E-9	2.6 E-13	7.9 E-24
26.0	11.6	1.6 E-7	8.2 E-7	1.2 E-6	2.0 E-7	5.3 E-9	2.5 E-13	7.6 E-24
27.0	12.1	1.5 E-7	7.9 E-7	1.1 E-6	1.9 E-7	5.1 E-9	2.4 E-13	7.3 E-24
28.0	12.5	1.5 E-7	7.6 E-7	1.1 E-6	1.9 E-7	4.9 E-9	2.3 E-13	7.1 E-24
29.0	13.0	1.4 E-7	7.4 E-7	1.1 E-6	1.8 E-7	4.7 E-9	2.2 E-13	6.8 E-24
30.0	13.4	1.4 E-7	7.1 E-7	1.0 E-6	1.7 E-7	4.6 E-9	2.2 E-13	6.6 E-24

*For stack release using upper level wind speed.

NOTE: If wind speed is between adjacent values, use the lower value to find x/Q.

3.4.2 Record the selected x/Q value in column 4 of Exhibit 3.4.1-1.

3.4.3 If release is NOT from the stack, use Table 3.4.1-2. Read across the appropriate row based on wind speed to the x/Q value under the Atmosphere Stability class determined in Step 3.3, Table 3.4.1-2.

TABLE 3.4.1-2

METEOROLOGICAL DISPERSION (x/Q) VALUE AT
BSEP PROPERTY BOUNDARY (4,000 FT.)
GROUND LEVEL RELEASE*

Wind Speed		x/Q Values By Atmospheric Stability Class (Units: sec/m^3)						
mph	m/sec	A	B	C	D	E	F	G
1.0	0.4	4.2 E-6	2.8 E-5	7.7 E-5	2.3 E-4	4.7 E-4	1.1 E-3	2.5 E-3
2.0	0.9	2.1 E-6	1.4 E-5	3.9 E-5	1.2 E-4	2.3 E-4	5.4 E-4	1.2 E-3
3.0	1.3	1.4 E-6	9.3 E-6	2.6 E-5	7.8 E-5	1.6 E-4	3.6 E-4	8.2 E-4
4.0	1.8	1.0 E-6	7.0 E-6	1.9 E-5	5.8 E-5	1.2 E-4	2.7 E-4	6.1 E-4
5.0	2.2	8.4 E-7	5.6 E-6	1.5 E-5	4.7 E-5	9.4 E-5	2.1 E-4	4.9 E-4
6.0	2.7	7.0 E-7	4.7 E-6	1.3 E-5	3.9 E-5	7.8 E-5	1.8 E-4	4.1 E-4
7.0	3.1	6.0 E-7	4.0 E-6	1.1 E-5	3.3 E-5	6.7 E-5	1.5 E-4	3.5 E-4
8.0	3.6	5.2 E-7	3.5 E-6	9.7 E-6	2.9 E-5	5.9 E-5	1.3 E-4	3.1 E-4
9.0	4.0	4.7 E-7	3.1 E-6	8.6 E-6	2.6 E-5	5.2 E-5	1.2 E-4	2.7 E-4
10.0	4.5	4.2 E-7	2.8 E-6	7.7 E-6	2.3 E-5	4.7 E-5	1.1 E-4	2.5 E-4
11.0	4.9	3.8 E-7	2.5 E-6	7.0 E-6	2.1 E-5	4.3 E-5	9.8 E-5	2.2 E-4
12.0	5.4	3.5 E-7	2.3 E-6	6.5 E-6	1.9 E-5	3.9 E-5	8.9 E-5	2.0 E-4
13.0	5.8	3.2 E-7	2.1 E-6	6.0 E-6	1.8 E-5	3.6 E-5	8.3 E-5	1.9 E-4
14.0	6.2	3.0 E-7	2.0 E-6	5.5 E-6	1.7 E-5	3.4 E-5	7.7 E-5	1.8 E-4
15.0	6.7	2.8 E-7	1.9 E-6	5.2 E-6	1.6 E-5	3.1 E-5	7.2 E-5	1.6 E-4
16.0	7.2	2.6 E-7	1.7 E-6	4.8 E-6	1.5 E-5	2.9 E-5	6.7 E-5	1.5 E-4
17.0	7.6	2.5 E-7	1.6 E-6	4.6 E-6	1.4 E-5	2.8 E-5	6.3 E-5	1.4 E-4
18.0	8.0	2.3 E-7	1.6 E-6	4.3 E-6	1.3 E-5	2.6 E-5	6.0 E-5	1.4 E-4
19.0	8.5	2.2 E-7	1.5 E-6	4.1 E-6	1.2 E-5	2.5 E-5	5.6 E-5	1.3 E-4
20.0	8.9	2.1 E-7	1.4 E-6	3.9 E-6	1.2 E-5	2.3 E-5	5.4 E-5	1.2 E-4
21.0	9.4	2.0 E-7	1.3 E-6	3.7 E-6	1.1 E-5	2.2 E-5	5.1 E-5	1.2 E-4
22.0	9.8	1.9 E-7	1.3 E-6	3.5 E-6	1.1 E-5	2.1 E-5	4.9 E-5	1.1 E-4
23.0	10.3	1.8 E-7	1.2 E-6	3.4 E-6	1.0 E-5	2.8 E-5	4.7 E-5	1.1 E-4
24.0	10.7	1.7 E-7	1.2 E-6	3.2 E-6	9.7 E-6	2.0 E-5	4.5 E-5	1.0 E-4
25.0	11.2	1.7 E-7	1.1 E-6	3.1 E-6	9.4 E-6	1.9 E-5	4.3 E-5	9.8 E-5
26.0	11.6	1.6 E-7	1.1 E-6	3.0 E-6	9.0 E-6	1.8 E-5	4.1 E-5	9.4 E-5
27.0	12.1	1.6 E-7	1.0 E-6	2.9 E-6	8.7 E-6	1.7 E-5	4.0 E-5	9.1 E-5
28.0	12.5	1.5 E-7	1.0 E-6	2.8 E-6	8.4 E-6	1.7 E-5	3.8 E-5	8.8 E-5
29.0	13.0	1.5 E-7	9.6 E-7	2.7 E-6	8.1 E-6	1.6 E-5	3.7 E-5	8.4 E-5
30.0	13.4	1.4 E-7	9.3 E-7	2.6 E-6	7.8 E-6	1.6 E-5	3.6 E-5	8.2 E-5

*For vent release using lower level wind speed.

NOTE: If wind speed is between adjacent values, use the lower value to find x/Q.

3.4.4 Record the selected x/Q value in column 4 of Exhibit 3.4.1-1.

3.5 Determine Source Term

3.5.1 Determine which effluent radiation monitor is (or monitors are) indicating an abnormal release.

3.5.2 Determine the release rate (μCi/sec) indicated by this monitor(s) as per PEP-03.6.1, "Release Estimates Based upon Stack/Vent Readings."

3.5.3 For whole body dose projections, calculate the release rate in Ci/sec = (μCi/sec) X (1.0×10^{-6} Ci/μCi).

OR

3.5.4 For thyroid dose projections, calculate the release rate in Ci/sec = (μCi/sec) X (1.0×10^{-6} Ci/μCi) X (0.15).

3.5.5 Record the results of either Steps 3.5.3 or 3.5.4 in column 5 of Exhibit 3.4.1-1.

3.6 Determine Dose Conversion Factor

3.6.1 Use Table 3.4.1-3 to determine the Whole Body or Thyroid Dose Conversion Factor (DCF). Record the appropriate DCF in column 6 of Exhibit 3.4.1-1.

TABLE 3.4.1-3

DOSE CONVERSION FACTORS (Rem/hr)/(Ci/m^3)

Accident Condition	Whole Body	Thyroid
Unknown/unidentified	287	7.49E+5
Major damage to fuel cladding	287	7.49E+5
RCS leaks or steam line leaks but no major cladding failure	133	1.25E+6
Accidental discharge of waste gas	45	2.06E+6
Fuel handling accident	19	2.94E+6

3.7 To obtain the projected dose at the property boundary, multiply column 4 x column 5 x column 6 = column 7. Record the product in column 7 of Exhibit 3.4.1-1.

NOTE: If the release was via the stack (elevated), maximum radiological exposures could occur beyond the property boundary depending on stability class. Step 3.8 projects doses at distances beyond the property boundary for both elevated and ground level releases.

3.8 Determine Extrapolation Factor

3.8.1 If the release is from the stack, use Table 3.4.1-4. (If not, go to Step 3.8.3.) Read across the appropriate row based on distance from the plant to the extrapolation factor under the atmospheric stability class determined in Step 3.3.

NOTE: With an elevated release, maximum radiological exposures may occur beyond the property boundary depending on stability class. The following table indicates the downwind distance where maximum exposures are likely to occur as the result of an elevated release.

Stability Class	Downwind Distance
A	0.27 miles (0.43 km)
B	0.45 miles (0.72 km)
C	0.76 miles (1.22 km)(Property Boundary)
D	1.8 miles (2.9 km)
E	3.5 miles (5.6 km)
F	9 miles (14.5 km)
G	33 miles (53 km)

TABLE 3.4.1-4

EXTRAPOLATION FACTOR FOR ESTIMATING DOSES BEYOND
BSEP PROPERTY BOUNDARY (4,000 ft.)
ELEVATED RELEASE

DISTANCE FROM PLANT		EXTRAPOLATION FACTORS BY ATMOSPHERIC STABILITY CLASS						
Miles	km	A	B	C	D	E	F	G
1	1.6	4.2 E-1	6.6 E-1	9.2 E-1	2.1	8.4 E+0	2.3 E+2	4.2 E+5
2	3.2	5.2 E-2	1.9 E-1	3.8 E-1	3.4	6.7 E+1	8.8 E+4	8.5 E+11
3	4.8	1.6 E-2	8.4 E-2	2.0 E-1	2.8	8.7 E+1	3.3 E+5	3.4 E+13
4	6.4	6.5 E-3	4.7 E-2	1.2 E-1	2.2	8.6 E+1	5.8 E+5	1.8 E+14
5	8.0	3.4 E-3	3.1 E-2	8.2 E-2	1.8	8.0 E+1	7.3 E+5	4.6 E+14
6	9.7	2.0 E-3	2.1 E-2	5.9 E-2	1.4	7.3 E+1	8.1 E+5	8.4 E+14
7	11.3	1.2 E-3	1.5 E-2	4.5 E-2	1.2	6.6 E+1	8.8 E+5	1.3 E+15
8	12.9	8.2 E-4	1.2 E-2	3.6 E-2	1.0	6.0 E+1	8.8 E+5	1.6 E+15
9	14.5	5.8 E-4	9.4 E-3	2.8 E-2	8.6 E-1	5.5 E+1	8.8 E+5	2.2 E+15
10	16.1	4.3 E-4	7.6 E-3	2.4 E-2	7.6 E-1	4.9 E+1	8.8 E+5	2.5 E+15

3.8.2 Record the selected extrapolation factor in column 8 of Exhibit 3.4.1-1.

3.8.3 If the release is not from the stack, use Table 3.4.1-5. Read across the appropriate row based on distance from the plant to the extrapolation factor under the atmospheric stability class determined in Step 3.3.

TABLE 3.4.1-5

EXTRAPOLATION FACTOR FOR ESTIMATING DOSES BEYOND BSEP PROPERTY BOUNDARY (4,000 ft.) GROUND LEVEL RELEASE

DISTANCE FROM PLANT		EXTRAPOLATION FACTORS BY ATMOSPHERIC STABILITY CLASS						
Miles	km	A	B	C	D	E	F	G
1	1.6	4.3 E-1	[illegible]-1	6.1 E-1	6.4 E-1	6.3 E-1	6.5 E-1	6.5 E-1
2	3.2	5.3 E-2	1.[illegible]	1.7 E-1	2.2 E-1	2.3 E-1	2.3 E-1	2.4 E-1
3	4.8	1.6 E-2	6.5 E-2	[illegible] E-2	1.2 E-1	1.3 E-1	1.3 E-1	1.4 E-1
4	6.4	6.5 E-3	3.7 E-2	4.[illegible]	7.8 E-2	8.4 E-2	9.3 E-2	1.0 E-1
5	8.0	3.4 E-3	2.4 E-2	3.2 E[illegible]	6 E-2	6.3 E-2	7.0 E-2	7.6 E-2
6	9.7	2.0 E-3	1.6 E-2	2.4 E-2	[illegible]-2	4.9 E-2	5.6 E-2	6.1 E-2
7	11.3	1.2 E-3	1.2 E-2	1.8 E-2	3.[illegible]	4.0 E-2	4.4 E-2	5.0 E-2
8	12.9	8.2 E-4	9.1 E-3	1.4 E-2	2.8 E-2	3.4 E-2	3.7 E-2	4.3 E-2
9	14.5	5.8 E-4	7.3 E-3	1.2 E-2	2.3 E-2	2.9 E-2	3.3 E-2	3.8 E-2
10	16.1	4.3 E-4	5.9 E-3	9.4 E-3	2.0 E-2	2.5 E-2	2.8 E-2	3.3 E-2

3.8.4 Record selected extrapolation factor in column 8 of Exhibit 3.4.1-1.

3.9 To obtain projected dose at points beyond the property boundary, multiply column 7 x column 8 = column 9. Record the product in column 9 of Exhibit 3.4.1-1. Indicate the distance from the property boundary the projected dose represents.

3.10 Report the projected doses to the Site Emergency Coordinator or Radiological Control Director.

3.11 Refer to PEP-02.1, Section 4, "Abnormal Radiological Effluent or Radiation Levels" to determine if any EAL has been met or exceeded. If the EAL for a general emergency has been met, refer to Exhibit 2.5-4 for recommended protective actions.

3.12 Repeat this procedure whenever source term or meteorological conditions change or as directed.

EXHIBIT 3.4.1-1

INITIAL DOSE PROJECTION RECORD SHEET

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9
TIME/ INITIAL	WHOLE BODY OR THYROID	WIND SPEED (MPH) / WIND DIRECTION (BLOWING FROM) / STABILITY CLASS	χ/Q	SOURCE TERM (Ci/sec)	DOSE CONVERSION FACTOR	DOSE AT PROPERTY BOUNDARY (Rem/hr)	EXTRAPOLATION FACTOR	DOSE BEYOND PROPERTY BOUNDARY (Rem/hr) "INDICATE DISTANCE"

CAROLINA POWER & LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT

UNIT 0

RELEASE ESTIMATES BASED UPON STACK/VENT READINGS

PLANT EMERGENCY PROCEDURE: PEP-03.6.1

VOLUME XIII

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FOR INFORMATION ONLY

LIST OF EFFECTIVE PAGES

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1.0 Responsible Individual and Objectives

The Radiological Control Director is responsible to the Site Emergency Coordinator for determining the magnitude and rate of radioactive release to the environment. The Radiological Control Director may delegate the calculational aspects of this procedure to the Dose Projection Coordinator. This procedure may be used by the Control Room personnel until the dose projection team is activated in the Technical Support Center.

2.0 Scope and Applicability

This procedure shall be implemented by the Site Emergency Coordinator, or by the Radiological Control Director, whenever an abnormal radiological release through an identifiable release point is suspected, including any Site or General Emergency. The only apparatus required is a scientific calculator.

3.0 Actions and Limitations

NOTE: The detector response will depend on the specific isotopic mixture being released at various times. Grab samples must be taken, analyzed and evaluated to provide an exact relationship; however, the predetermined relationship used in this procedure should be sufficiently accurate to guide initial emergency response actions and assessments.

List of EXHIBITS:

3.6.1-1 Source Term Calculation from Plant Stack Monitors
3.6.1-2 Source Term Calculation from #1 RX Gas (1-CAC-AQH-1264-3)
3.6.1-3 Source Term Calculation from #1 Turbine Vent
3.6.1-4 Source Term Calculation from #2 Rx Gas (2-CAC-AQH-1264-3)
3.6.1-5 Source Term Calculation from #2 Turbine Gas (2-VA-AQH-3215-3) (Low Range)
3.6.1-6 Source Term Calculation from #2 Turbine Building Vent (High Range)

3.1 Depending upon alarming channel(s), use appropriate EXHIBIT (EXHIBIT 3.6.1-1 through EXHIBIT 3.6.1-6) to calculate the release source term.

Note: If the time duration of the release is unknown, assume 60 minutes and perform this procedure as directed by the Radiological Control Director.

3.2 If only one channel is alarming or reading abnormally high, the source term determined on the appropriate EXHIBIT is the total.

3.3 If multiple building vent radiation monitors are alarming (and not monitoring the same point), calculate the individual source terms and sum them to obtain the total source term.

NOTE: Source terms calculated for the stack should not be added to source terms calculated for alarming vent monitors since stack source terms represent elevated rather than ground level releases. If the stack and vent monitors are alarming, then separate elevated and ground level source terms should be calculated and applied separately to dose calculations. The resultant off-site dose projections can then be summed to assess the total impact of the releases.

3.4 Report the source term to the Radiological Control Director (Radiological Control Manager after the Emergency Operations Facility is activated) for use in appropriate dose projection procedure from PEP-Section 3.4.

EXHIBIT 3.6.1-1

SOURCE TERM CALCULATION FROM STACK MONITORS

Release rate is read in µCi/sec directly from 2-D12-RR-4600 (effluent channel) when the 2-VA-FT-3359 flow instrument loop is operational. The following calculations are necessary when this loop is not operational.

TIME	MONITOR[1] READING (µCi/cc)	FLOW[2] (cfm)	CONVERSION FACTOR $\frac{cc/sec}{cfm}$	RELEASE RATE[3] (µCi/sec)
			472	

[1] The monitor automatically selects the most accurate operational channel, either low, mid, or high range. Read the µCi/cc from the appropriate channel (low, mid, or high) of 2-D12-RR-4599.

[2] If not available, use the sum of design flows for systems exhausting to the stack:

Steam Jet Air Ejectors (A & B)	300 SCFM ea.
Radwaste Bldg. Vent (2 fans)	23,100 SCFM ea.
Purge Fans (2 fans)	7,200 SCFM ea.
Standby Gas (per train - 2 trains)	3,500 SCFM ea.

[3] Release rate (µCi/sec) = µCi/cc X cfm X 472

EXHIBIT 3.6.1-2

SOURCE TERM CALCULATION FROM #1 Rx GAS (1-CAC-AQH-1264-3)				
TIME	METER READING (cpm)	FLOW[1] (cfm)	EFFICIENCY[2] FACTOR	RELEASE[3] RATE (µCi/sec)

(1) If not available use 43,200 cfm per discharge fan times the number of fans operating.

(2) The efficiency factors posted on the front panel of the stack, reactor buildings monitors. If not posted, these values can be obtained from E&RC File 13324, or use 8.6E-6.

(3) Release Rate = cpm X cfm X Efficiency Factor

EXHIBIT 3.6.1-3

SOURCE TERM CALCULATION FROM #1 TURBINE VENT

Release rate is read in µCi/sec directly from 1-D12-RR-4549 (effluent channel) when the 1-VA-FT-3358 flow instrument loop is operational. The following calculations are necessary when this loop is not operational.

TIME	MONITOR READING[1] (µCi/cc)	FLOW[2] (cfm)	CONVERSION FACTOR cc/sec / cfm = 472	RELEASE RATE[3] (µCi/sec)

(1) The monitor automatically selects the most accurate operational channel, either low, mid, or high range. Read the µCi/cc from the appropriate channel (low, mid, or high) of 2-D12-RR-4548.

(2) If not available, use 15,000 cfm.

(3) Release Rate (µCi/sec) = µCi/cc X cfm X 472

EXHIBIT 3.6.1-4

SOURCE TERM CALCULATION FROM #2 Rx GAS (2-CAC-AQH-1264-3)				
TIME	METER READING (cpm)	FLOW[1] (cfm)	EFFICIENCY[2] FACTOR	RELEASE[3] RATE (µCi/sec)

(1) If not available use 43,200 cfm per discharge fan times the number of fans operating.

(2) The efficiency factors posted on the front panel of the stack, reactor buildings monitors. If not posted, these values can be obtained from RC&T File 13324, or use 9.26E-6.

(3) Release Rate = cpm X cfm X Efficiency Factor

EXHIBIT 3.6.1-5

SOURCE TERM CALCULATION FROM #2 TURBINE GAS (2-VA-AQH-3215-3) (LOW RANGE)				
TIME	METER READING (cpm)	FLOW[1] (cfm)	EFFICIENCY[2] FACTOR	RELEASE[3] RATE (µCi/sec)

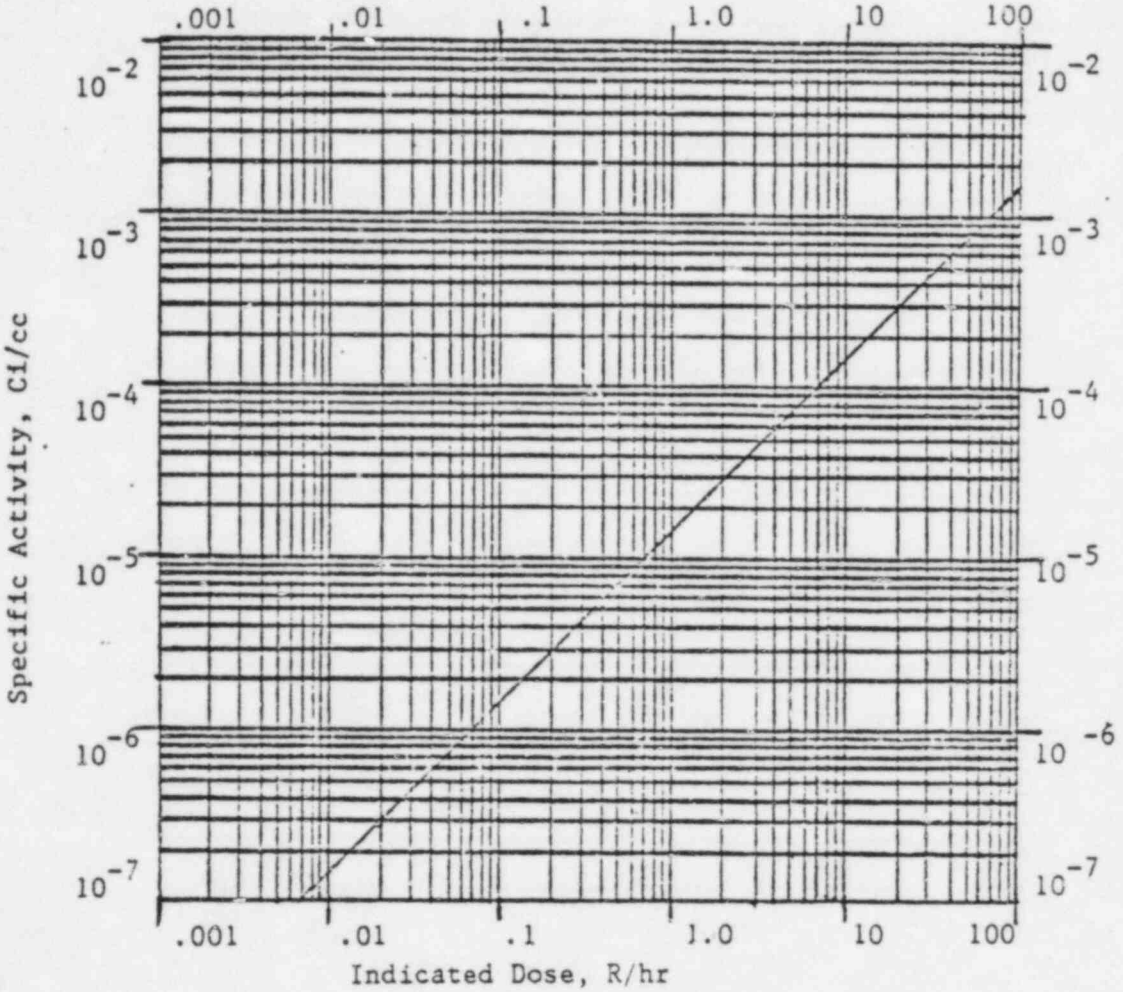
(1) If not available, use 15,000 cfm.

(2) The efficiency factors posted on the front panel of the stack, reactor buildings monitors. If not posted, these values can be obtained from RC&T File 13324, or use 1.11E-5.

(3) Release Rate = cpm X cfm X Efficiency Factor

EXHIBIT 3.6.1-6

Source Term Calculation from Unit No. 2
Turbine Building Vent (High Range)



TEMPORARY GASEOUS EFFLUENT RADIATION MONITORS

To determine total release activity (microcuries/sec) from a Turbine Building vent:

1. Read the "actual specific activity (curies/cc)" from the graph as a function of the dose rate (R/hr) indicated on the meter.

2. Read flowmeter for the specific release point (SCFM).

3. Calculate total release (μCi/sec) = Specific Activity (Ci/cc) x Flow Rate (SCFM) x 28300 (cc/SCF) x .0167 (min/sec) x 1.0 x 10^{+6} (μCi/Ci)

Graph parameters based on the projected isotopic distribution 30 minutes after a TMI-based accident. Reference: PM-79-296.

CAROLINA POWER & LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT

UNIT 0

EMERGENCY RESPONSE RESOURCES

PLANT EMERGENCY PROCEDURES: PEP-APPENDIX A

VOLUME XIII

Rev. 008

Recommended By: _____ Date: 6/14/83
Director - Administrative Support

Approved By: _____ Date: 6/15/83
General Manager

dj

LIST OF EFFECTIVE PAGES

PEP-APPENDIX A

Pages	Revision
1 - 5	8
6	7
7	8
8 - 9	7
10	8

CORPORATE EMERGENCY RESPONSE PLAN
TELEPHONE DIRECTORY

AMERICAN NUCLEAR INSURERS (ANI)

Richmond (after hours)

Connecticut

ATOMIC INDUSTRIAL FORUM (AIF)

Maryland (after hours)

CORPORATE EMERGENCY RESPONSE CENTER (CERC)

OJRP

System Operator's PBX-393

Reception Area/Floor Security -

Team Work Areas:

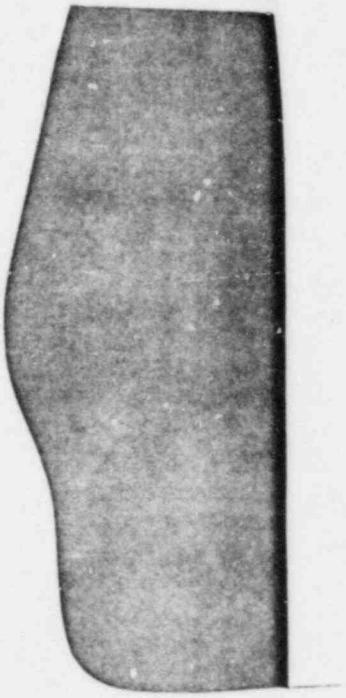
Administrative Services
Design & Construction Support
Advisory Support
Technical Support
Scheduling/Planning

5th Floor OJRP Office Numbers

F. M. Alligood -
R. L. Baldwin -
R. H. Leasburg -
H. L. Miller -
W. L. Stewart -

C&P TELEPHONE COMPANY (North Anna)

Primary	Sheldon R. Lesh	Business Home
Alternate	J. R. Werner	Business Home
Emergency Center		
	Bob Dawdson	Business Home



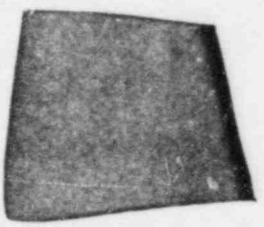
For Pay Telephone Trailers (North Anna) *

Primary	K. C. Moore	Business Home Home
Alternate	George A. Bruner, Jr.	Business Home

* In case of an emergency, Pay Telephone Trailers are available from C&P or Continental Telephone for Surry.

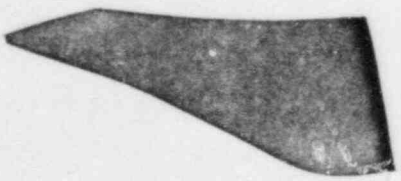
CONTINENTAL TELEPHONE COMPANY (Surry)

Primary	Dan Stainback	Business Home
Alternate	Hal Willson	Business Home



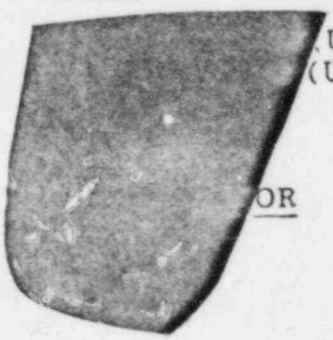
CONTROL ROOMS

North Anna



OR

Surry



(Unit #1)
(Unit #2)

OR

RADIATION EMERGENCY ASSISTANCE CENTER/TRAINING OFFICE (REAC/TS)

(Oak Ridge, TN)

Emergency No. (

RUMOR CONTROL CENTER

STONE & WEBSTER

Boston, Mass.	Gordon Burroughs	Business Home
North Anna	C. H. Wilbur	Business Home
Surry	A. K. Banerjee	Business Home

TECHNICAL SUPPORT CENTERS (TSC)

North Anna

Louisa County

(Via Richmond -

Emergency Director
Health Physics
Operations
Technical Services
Maintenance

Surry

Surry County

TELECOPIER NUMBERS

North Anna
(Admin. Bldg.)

Surry
(Admin. Bldg.)

Public News Center
(OJRP Auditorium)

Local Media Center

North Anna
(Mineral Fire Dept.)

Surry
(Lebanon Elementary

INPO ((Emergency)
(Atlanta) (Regular)

NRC
(Bethesda)

NRC
(Atlanta)

Stone & Webster
(Boston)

Westinghouse
(Pittsburgh)

State Office of Emergency and Energy Services (SOEES)

State Emergency Operations Center (EOC)
(24 hr. operation)

WATS/ECON-CALL NUMBERS

WATS - (Virginia) 710 + 1 + area code (if other than 804) + 7-digit number

WATS - (Interstate) 715 + 1 + area code + 7-digit number

Econo-Call 717 + (area code) + 7-digit number
(Do not dial the prefix "1" as is required for WATS and Direct Long Distance)

CERP TELEPHONE DIRECTORY

Name	CPIP	Home	Office
Adams, R. H.	3		
Ahladas, J. A.	1		
Alligood, F. M., Jr.	1		
Anderson, L. M.	3		
Arrington, D. P.	3		
Arritt, C. E.	3		
Austin, C. B.	3		
Austin, J.	2		
Bailey, T. Y.	3		
Baldwin, R. L.	1/3		
Ballard, T. M.	2		
Barr, J. M., Jr.	2		
Baucom, P. K.	3		
Baum, E. A.	1/2		
Beament, P. R.	1		
Beck, R. L.	2		
Beckwith, R. E.	8		
Benthall, W. R.	1		
Berryman, R. M.	6		
Board, V. M.	2		
Bowling, M. L.	7		
Boyce, N. W.	4		
Brand, R. B.	2		
Brown, M. L.	3		
Brown, S. C.	1		
Buck, J. A.	2		
Bullock, C. E.	3		
Burnette, D.	2		
Busto, C. J.	2		
Cameron, W. W.	8		
Carmichael, F. C.	2		
Carter, G. L.	4		
Carter, M. L.	3		
Cartwright, W. R.	1		
Cochran, D. F.	2		
Cockerham, R.	1/9		
Colbert, V. L.	4		
Comstock, L. L.	3		
Craft, W. D.	6		
Cross, R. W., III	6		
Crow, N. S.	1		
Crump, E. L.	2		

Note: All numbers shown as they would be dialed from Richmond.
SPS Extensions can be reached from OJRP with 62 + extension.
NAPS Extensions can be reached from OJRP with 67 + extension.

CERP TELEPHONE DIRECTORY (Cont.)

Name	CPIP	Home	Office
Danylo, J. C.	7		
Davis, D. S.	2		
Deal, M. W.	3		
Deacon, M. G.	7		
DeWandel, E. P.	3		
Dingledine, W. S.	1/9		
Douberly, E.	3		
Downs, J. L.	4		
Driscoll, R. F.	2		
Dye, T. L.	2		
Eastwood, J. O.	6		
Edwards, P. G.	1/2		
Ellis, F. R.	2		
Ferguson, J. C.	3		
Field, M. M.	3		
Folz, C. E.	2		
Fortin, D. J.	3		
Fortune, H. J., Jr.	7		
Franklin, Y. C.	3		
Frazier, J. R., Jr.	2		
Garber, B. A.	2		
Gardner, S. N.	2		
Garvey, J. R.	3		
Gayle, B.	2		
Geddy, A. L.	2		
Gibson, D. F.	2		
Gilmer, L.	2		
Girvin, L. M.	1		
Greer, R. S., Jr.	6		
Grier, A. M.	2		
Harrell, E. W.			
Harrell, M. S.	3		
Harrington, P. M.	4		
Harris, J. C., Jr.	7		
Harrison, J. V.	1		
Healy, M. N.	2		
Hedgepeth, D. W.	2		
Hedgepeth, L. A.	2		
Hendrix, B. H.	3		

CERP TELEPHONE DIRECTORY (Cont.)

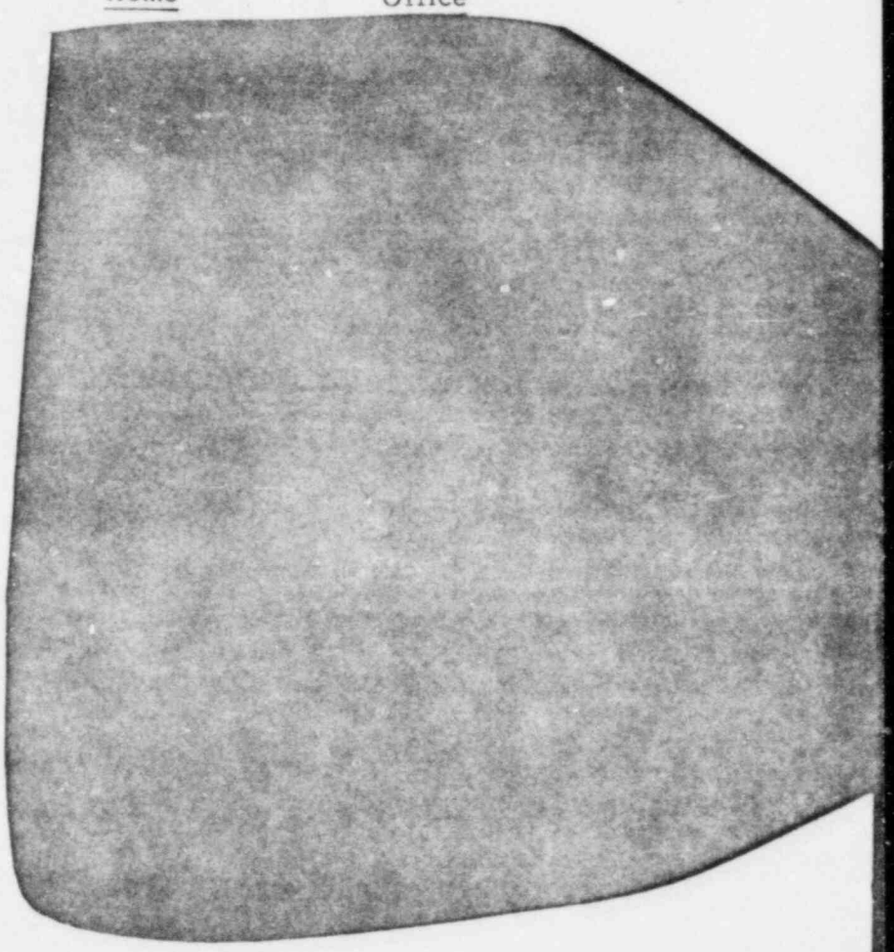
Name	CPIP	Home	Office
Herndon, J. A.	2		
Hill, B. F.	6		
Higgins, K. G.	3		
Hogg, A. L.	2		
Hogwood, H. P.			
Holderfield, B. F.	2		
Holt, S. R.	2		
Horton, J. H.	6		
Hostetler, D. R.	1		
Hudgins, D. F.	3		
Hunter, R. H.	3		
Hutcherson, C.	3		
Irwin, R. R.	2		
Jenkins, M. H.	2		
Jewell, N. J.	2		
Johnson, D. L.	2		
Johnson, J. M.	3		
Johnson, R. T.	2		
Johnson, M. L.	2		
Jones, D. D.	3		
Jones, W. E.	3		
Kahnhauser, H. F.	8		
Lawler, J. A.	3		
Kaplan, L. A.	3		
Kirkham, S. D.	2		
Kube, C. E., Jr.	1/3		
Lambert, R. P.	4		
Lawler, J. A.	3		
Leasburg, R. H.	1		
Leberstien, J. H.	6		
LeFevre, K. R.	8		
Lifrage, E. G.	7		
Lippard, D. W.	6		
Logan, J. B.	3		
Maciejewski, John	3		
Maciejewski, Pat	3		
Martin, D. C.	3		
Martin, F. B.	6		
Martin, J. W. Jr.	8		
		or	
McAvoy, J. M.	3		
McGee, A. C.	3		
Miller, H. L.	1/8		

CERP TELEPHONE DIRECTORY (Cont.)

Name	CPIP	Home	Office
Miller, R. A.	1		
Moore, C. F.	3		
Munsey, E.	1/2		
Musser, E. H.	2		
Neblett, C. F.	3		
Ogren, J. W.	8		
Parent, G. F.	3		
Parham, N. W.	2		
Parrish, A. L., III	7		
Patteson, B. J.	3		
Paxton, G. J.	3		
Perkins, J. L.	7		
Pheris, W. E.	3		
Pickett, D. A.	3		
Purnell, B. B.	2		
Rentz, F. L.	2		
Rhodes, J. T.	1/2		
Robinson, C. M., Jr.	7		
Rodill, W. B.	7		
Roth, David B.	6		
Runner, W. R.	3		
Salkin, H. M.	3		
Sarver, S. P.	8		
Sharp, B. J.	3		
Sherry, J. P.	2		
Shupe, F. L.	3		
Smith, D. L.	3		
Smith, E. R., Jr.	1/6		
Smith, J. S.	2		
Smith, M. L.	6		
Smith, R. A.	2		
Smith, R. G.	3		
Smith, V. R.	3		
Speidell, D. W. Jr.	6		
Spencer, W. C.	1/7		
Stafford, A. H.	8		
Starkey, P. L.	2		
Stewart, W. L.	1/8		

CERP TELEPHONE DIRECTORY (Cont.)

Name	CPIP	Home	Office
Tatum, C.	1/9		
Taylor, I. B.	3		
Taylor, R. M.	6		
Tegethoff, R. F.	3		
Thomas, W. N.	1		
Thomasson, F. L., Jr.	6		
Thompson, W. L.	6		
Thornton, W. A.	6		
Topping, E. M.	8		
Tracey, E. T.	3		
Turner, D. S.	2		
Valentine, V. G.	3		
VanDyke, H.	3		
Vaughan, S. M.	3		
Waddill, J. W.	1/7		
Wagner, D. S.	6		
Wallmeyer, A. J.	2		
Walters, P. A.	2		
Washington, R. A.	3		
Washington, O. G.	3		
Wheeler, C. F.	3		
Williford, U. G.	3		
Wilson, J. L.	1		
Wine, J. R.	3		
Wroniewicz, G.	1		



APPENDIX A.1 - BSEP PERSONNEL

	Home Phone	Office
GENERAL MANAGER (SITE EMERGENCY COORDINATOR)		
C. R. Dietz	Pager	
ALTERNATES		
MANAGER - PLANT OPERATIONS		
J. L. Harness	Pager	
MANAGER - ENVIRONMENTAL & RADIATION CONTROL (RADIOLOGICAL CONTROL DIRECTOR)		
A. G. Cheatham		
MANAGER - MAINTENANCE (EMERGENCY REPAIR DIRECTOR)		
J. P. Dimmette		
MANAGER - OPERATIONS (PLANT OPERATIONS DIRECTOR)		
J. W. Chase		
Alternate		
A. S. Hegler		
ASSISTANT TO THE GENERAL MANAGER (LOGISTIC SUPPORT DIRECTOR)		
L. E. Boyer	Pager	
Alternate		
J. A. Smith		
MANAGER - TECHNICAL SUPPORT (ACCIDENT ASSESSMENT LEADER)		
E. A. Bishop	Pagers and	
Alternate		
J. S. Boone		

	Home Phone	Office
RADIATION CONTROL SUPERVISOR I (PERSONNEL PROTECTION AND DECONTAMINATION LEADER)		
L. F. Tripp		
Alternate		
Radiation Control Foreman (See Attached)		
RADIATION CONTROL SUPERVISOR II (PLANT MONITORING LEADER)		
J. D. Henderson		
Alternate		
Radiation Control Foreman (See Attached)		
ENVIRONMENTAL AND CHEMISTRY SUPERVISOR (ENVIRONMENTAL MONITORING LEADER)		
C. E. Robertson		
Alternate		
A. H. Caylor		
PRINCIPAL SPECIALIST - RADIATION CONTROL (DOSE PROTECTION COORDINATOR)		
R. F. Queener		
Alternate		
R. C. Specialist (See Attached)		
MECHANICAL MAINTENANCE SUPERVISOR (DAMAGE CONTROL LEADER)		
G. G. Campbell		
C. R. Treubel		
I&C/ELECTRICAL MAINTENANCE SUPERVISOR (DAMAGE CONTROL LEADER)		
T. L. Brown		
R. D. Creech		
SENIOR SPECIALIST ELECTRICAL/MECHANICAL (OPERATIONAL SUPPORT CENTER LEADER)		
C. D. Aldridge		
C. D. Parker		
D. Stidham		

	Home Phone	Office
SECURITY SPECIALIST (EMERGENCY SECURITY LEADER)		
W. R. Hatcher		
Alternate		
G. Spies		
COST CONTROL SPECIALIST (EVACUATION ASSEMBLY LEADER)		
J. L. Boyte		
Alternate		
R. G. Lee		
REGULATORY COMPLIANCE (EMERGENCY COMMUNICATOR)		
K. E. Enzor		
D. E. Novotny	Pagers and	
R. M. Poulk	Pagers and	

Environmental and Radiation Control

Home | Office

Foremen

A. H. Caylor (E&C)
W. L. Conn (RC)
T. W. Doudna (RC)
B. E. Failor (RC)
J. B. Keyser (RC)
M. L. Millinor (E&C)
W. A. Nurnberger (E&C)
R. S. Otey (RC)
C. L. Priest (RC)
H. M. Shaver (RC)
J. D. Ward (RC)

Specialists

J. W. Davis (E&C)
J. L. Kiser (RC ALARA)
R. E. Queener (RC)
P. B. Snead (RC)
R. E. Pennock (RC)
S. B. Potter (RC)
J. B. Cook (RC)

Operations

Shift Operating Supervisors

C. F. Blackmon
P. T. McNeill
W. L. Johnson
J. D. Lichty
D. C. Cooper
R. A. LaBelle
R. D. Tart

Shift Foremen

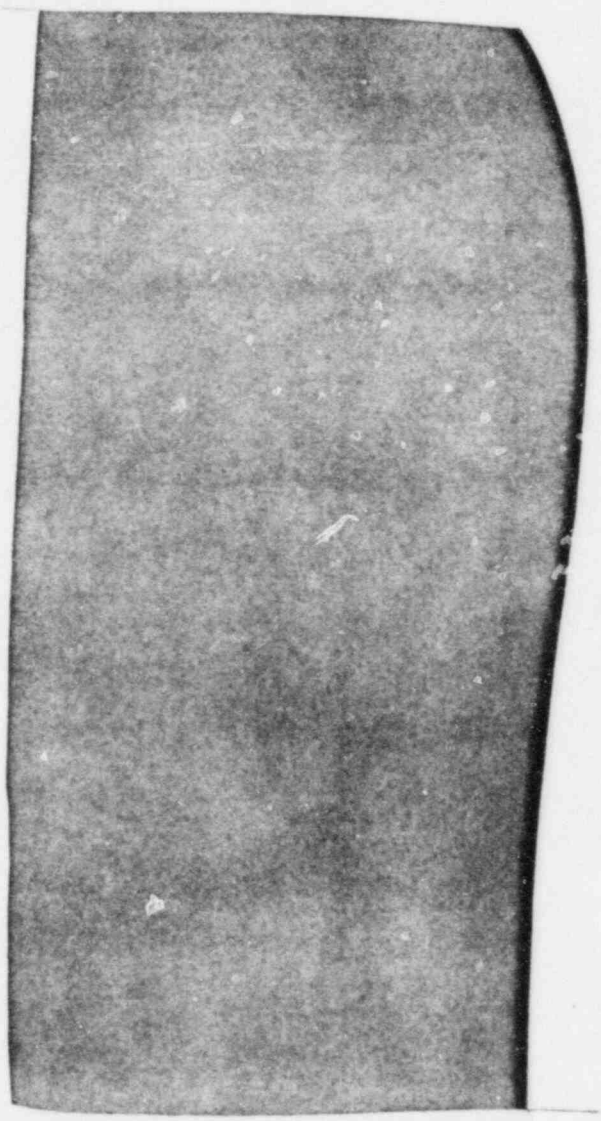
M. R. Foss
W. D. Link
J. L. Simon
S. B. York
C. S. Briney
E. C. Hawkins
K. F. Horn
B. S. Strickland
B. A. Harris
D. Pate

Qualified Operators for Emergency Switchboard

Home Office

Annette Clemmons
Charlotte Frye
Kay Hewett
Sandy Knight
Rosetta Meachem

EOF Personnel



EOF Communicator

Mike Jones
Wayne Martin

Phone Talkers TSC/EOF

Cindy Long
Brenda Unger
Evelyn Johnson

Status Board Plotter

Doug Allen
George Milligan

Log Keeper

Ray White
Bob Beverage

SRO

Norvell Stewart
Ed Thorndyke

Data Logger

Barbara Hart
Lynn Pierce

Clerk

Connie Cathey

APPENDIX A.2 - FEDERAL, STATE, AND COUNTY AGENCIES

U.S. NUCLEAR REGULATORY COMMISSION, REGION II

Atlanta, Georgia

HPN - Black Phone System

(Daytime, Nights and Holidays)
Rotary Dial
Touch Tone

Bethesda, Maryland

HPN - Black Phone System

(Upon failure of Red Phone ENS)
Rotary Dial
Touch Tone

(To operate the HPN System, lift receiver and dial the desired party. No dial tone is heard.)

DEPARTMENT OF ENERGY

Savannah River Operations Office
Radiological Assistance Teams
W. T. Thornton

S. R. Wright

	Primary (During Normal Working Hours)	Alternate
STATE OF NORTH CAROLINA		
State Warning Point	*	
Highway Patrol		
Radiological Health Branch		
Mr. Dayne Brown		
BRUNSWICK COUNTY		
Warning Point	*	
(County Sheriff)		
Civil Preparedness		
(Mr. Cecil Logan)		
NEW HANOVER COUNTY		
Warning Point	*	
(County Sheriff - Sheriff J. McQueen)		
Civil Preparedness		
(Mr. Ben Washburn)		
U.S. COAST GUARD		
Marine Safety Office		(Duty Officer, Wrightsville Beach)
FEDERAL AVIATION ADMINISTRATION		

*Automatic Ring-Down dedicated telephone line

GENERAL ELECTRIC
San Jose, California 408/971-1038

UNITED ENGINEERS AND CONSTRUCTORS
Philadelphia, Pennsylvania 215/422-4844

BABCOCK AND WILCOX EMERGENCY PROTOCOL
For Postaccident Sample Analysis

Emergency Contacts

The following individuals are the points of contact within B&W for emergency notification that BSEP is preparing to ship a postaccident sample to the Lynchburg Research Center (LRC):

Emergency Control Officer: Mr. J. P. (Pat) Doran

Work Phone
Home Phone

Emegency Control Officer - Alternate: Mr. A. F. (Arne) Olsen

Work Phone
Home Phone

Required Information

When notifying the B&W Emergency Control Officer (ECO), the caller should be prepared to supply the following information:

1. The plant involved, the name of the individual making contact, and the name and telephone numbers of the responsible person at the utility to whom follow-up communication should be addressed.

2. The number and type of samples to be shipped; i.e., liquid, gaseous and/or charcoal cartridge.

3. Measured radiation levels from the shipping container at the surface and at three feet.

4. The estimated shipping time and time of arrival at the Lynchburg (Virginia) Municipal Airport. (If shipment by other than air transport is intended, the carrier and time of arrival at the Lynchburg Research Center should be specified.)

RADIATION EMERGENCY ASSISTANCE CENTER/TRAINING SITE (REAC/TS)
Dr. Karl Hubner