



PLANT MANUAL SECTION:
EMERGENCY PLAN
PROCEDURE

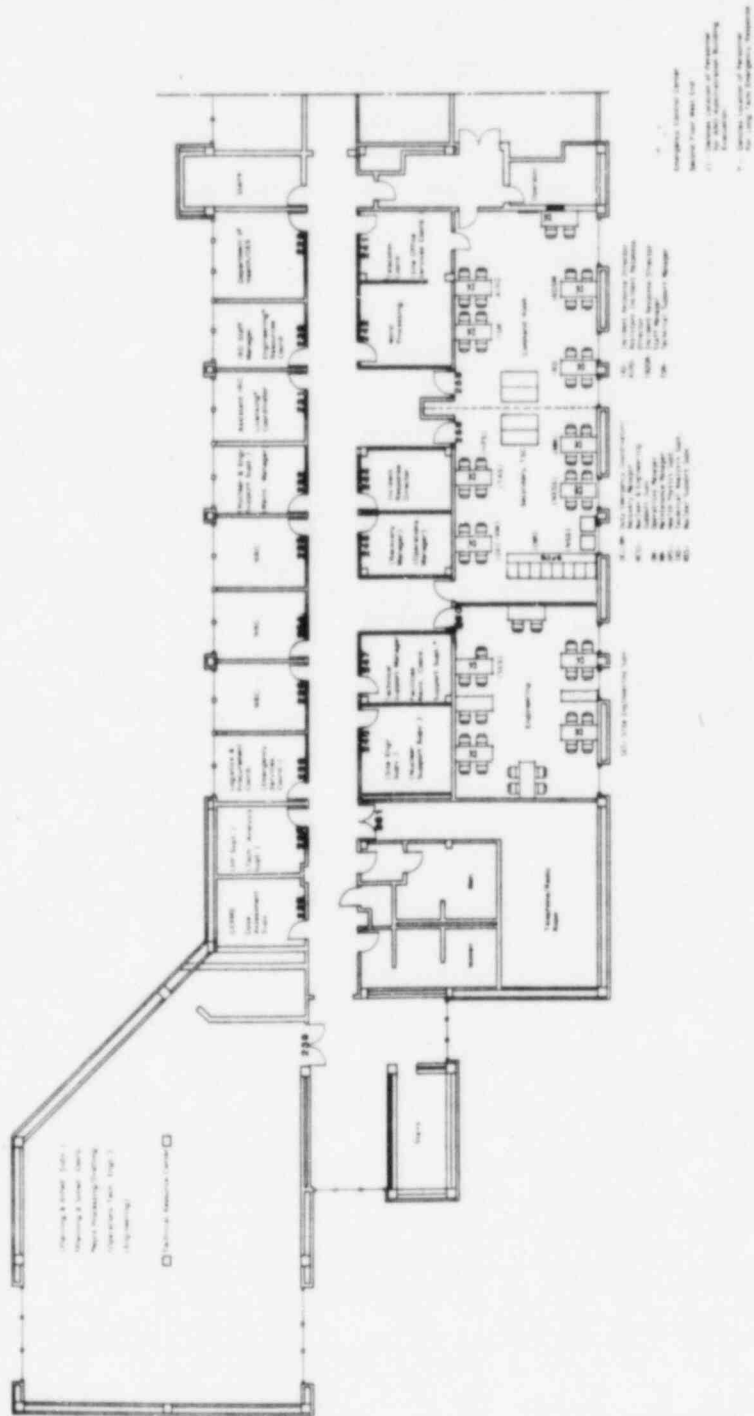
PROCEDURE/WORK PLAN TITLE:
PLANT EVACUATION

NO:
1903.30

ARKANSAS NUCLEAR ONE

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ATTACHMENT 3



8303250005 830321
PDR ADOCK 05000313
F PDR



PLANT MANUAL SECTION:
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ATTACHMENT 4



APL
1903.30
02/10/83



PLANT MANUAL SECTION:
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PROCEDURE

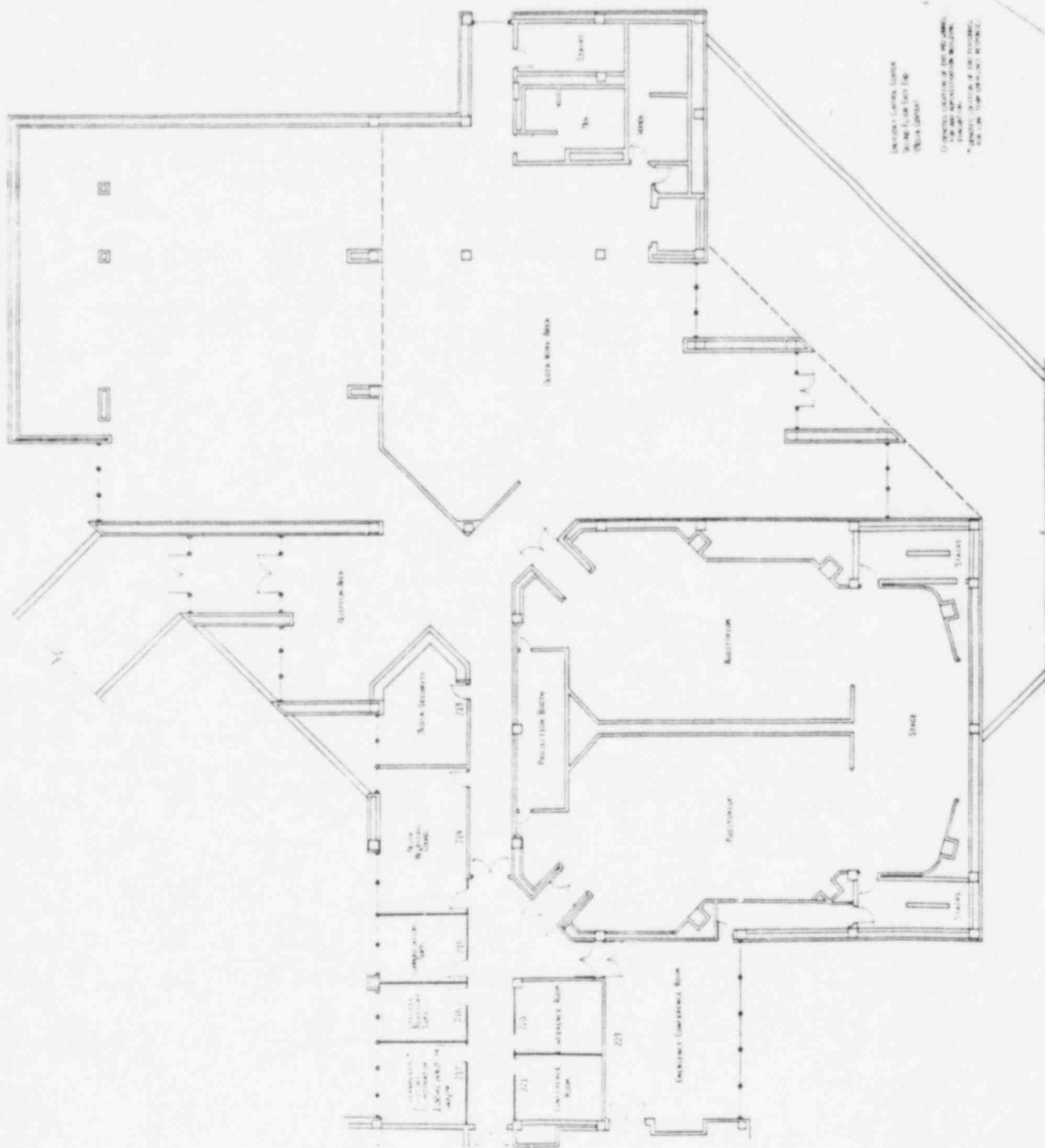
PROCEDURE/WORK PLAN TITLE:
PLANT EVACUATION

NO:
1903.30

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ATTACHMENT 5





PLANT MANUAL SECTION:
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PROCEDURE

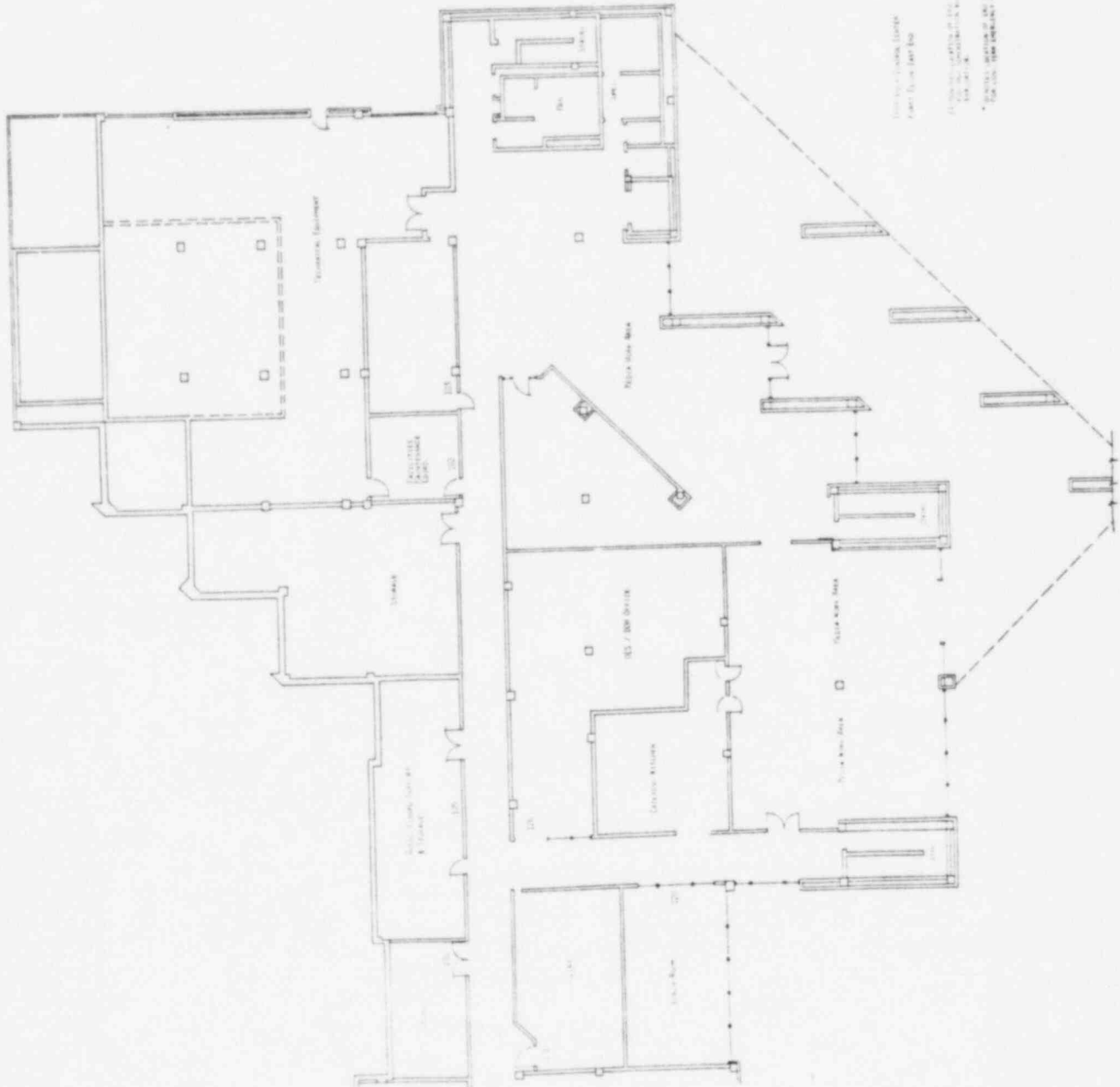
PROCEDURE/WORK PLAN TITLE:
PLANT EVACUATION

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1903 30

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ATTACHMENT 6



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ARKANSAS POWER & LIGHT COMPANY

Arkansas Nuclear One

TITLE: RECORD OF CHANGES AND REVISIONS

FORM NO. 1000.06A

EMERGENCY PLAN

REV. #12 PC #

Safety Related YES NO

EMERGENCY RESPONSE ORGANIZATION
1903.50 REV. 6

UN-CONTROLLED COPY # 106

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APPROVED BY:

James M. Lewis

(General Manager)

APPROVAL DATE

3/10/83

REQUIRED EFFECTIVE DATE:



PLANT MANUAL SECTION:	PROCEDURE/WORK PLAN TITLE:	NO:
EMERGENCY PLAN	EMERGENCY RESPONSE ORGANIZATION	1903.50
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5.35 The Utility Advisory Supervisor is responsible for releasing information to Arkansas Power & Light employees, other utilities, and utility information service organizations such as Atomic Industrial Forum, Electric Power Research Institute, Edison Electric Institute, and the Institute of Nuclear Power Operations.

This position should be filled by the designated Communications Editor.

5.36 The Governmental Advisory Coordinator is responsible for providing information to elected state and federal officials on a regular basis.

This position should be filled by the Director of State Governmental Affairs.

5.37 The Local Advisory Supervisor is responsible for assisting the Governmental Advisory Coordinator by informing the elected officials of the communities and counties in the area of the plant. He is also responsible for ensuring that a representative of the Arkansas Power & Light organization is available to each principal offsite governmental emergency operations center (e.g. County Emergency Operations Center) to provide assistance to the governmental groups.

This position should be filled by the Russellville District Manager.

5.38 The Planning and Scheduling Coordinator is responsible for preparing schedules to coordinate and track the progress of Emergency Response Organization activities in response to an incident.

This position should be assigned by the Support Superintendent.

5.39 The TOCC Liaison is responsible for providing assistance to the Technical Operations Control Center staff, as necessary.

This position should be filled by an individual from the Technical Advisory Personnel Roster (1903.10, Att. 8).



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EMERGENCY PLAN

EMERGENCY RESPONSE ORGANIZATION

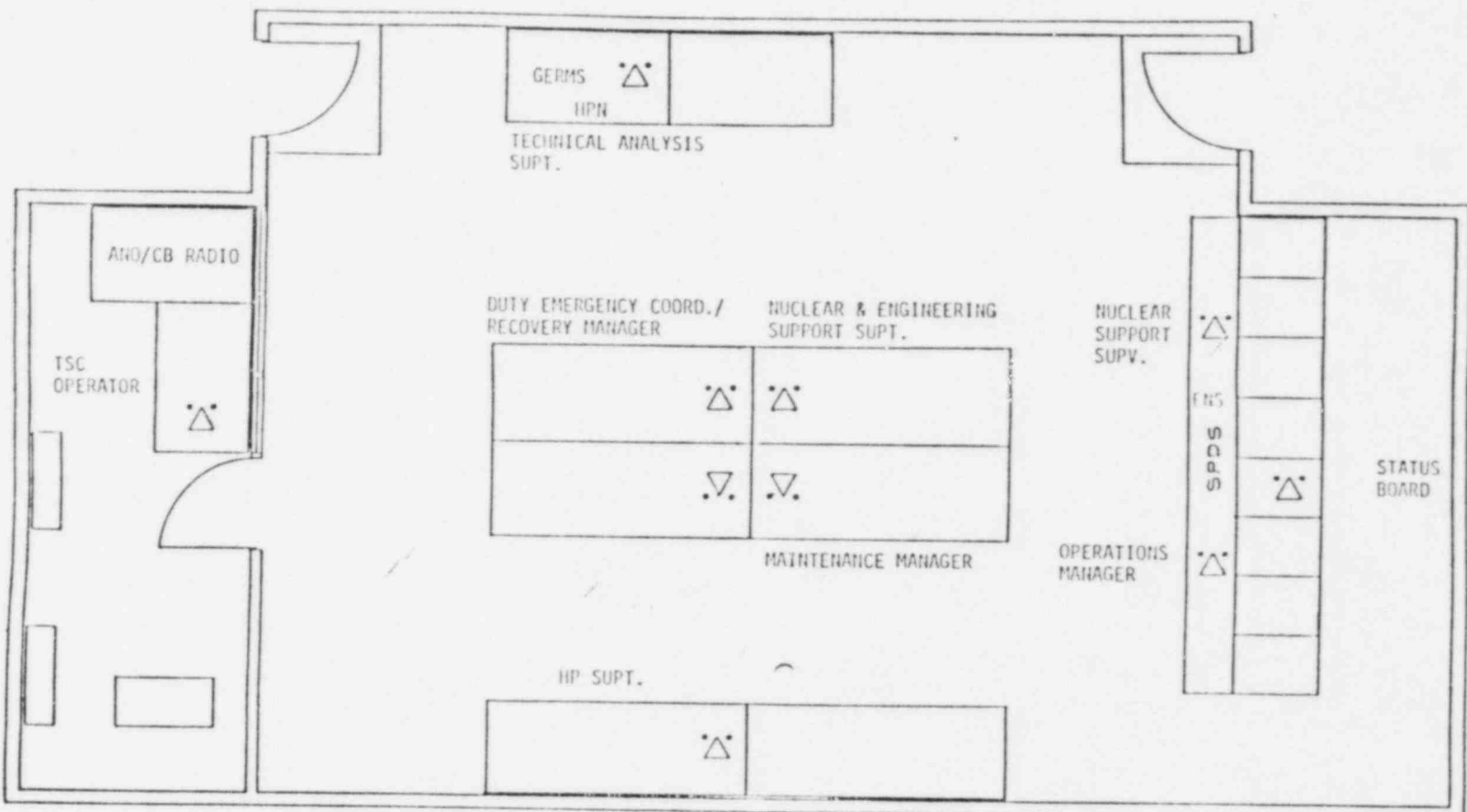
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ATTACHMENT 3

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△ - TELEPHONE STATION

TECHNICAL SUPPORT CENTER 1/4" = 1'-0"
(3rd. FLOOR SOUTH CONFERENCE ROOMS AND ANO ADMINISTRATION BLDG)
NRC OFFICE SPACE PROVIDED ADJACENT TO TSC





ARKANSAS POWER & LIGHT COMPANY

Arkansas Nuclear One

TITLE: RECORD OF CHANGES AND REVISIONS

FORM NO. 1000.06A

OFFSITE DOSE PROJECTIONS

REV. #12 PC #

Safety Related YES NO

RADIOLOGICAL PLUME TRACKING AND DOSE INTEGRATION
1904.06 REV. 1

UN-Controlled Gov # 106

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APPROVED BY:

APPROVAL DATE

James M. Lewis

(General Manager)

2/1/85

REQUIRED EFFECTIVE DATE:



PLANT MANUAL SECTION:
OFFSITE DOSE
PROJECTIONS

PROCEDURE/WORK PLAN TITLE:
RADIOLOGICAL PLUME TRACKING
AND DOSE INTEGRATION

NO:
1904.06

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1.0 PURPOSE

This procedure provides a manual method for estimating the location of airborne radioactive materials offsite under changing release and meteorological conditions, and for estimating the maximum integrated dose commitments at 0.65, 1.0, 2.0, 5.0, and 10.0 mile radii.

2.0 SCOPE

- 2.1 This procedure is applicable to airborne radioactive releases from either ANO-1 or ANO-2.
- 2.2 This procedure does not calculate the fine structure (actual distribution) of integrated doses offsite.
- 2.3 This procedure does not take into account effects caused by precipitation and terrain channelling.
- 2.4 The data generated from this procedure is used as input for procedure 1904.07, "Protective Action Recommendations" and no notifications are required.

3.0 REFERENCES

3.1 References Used in Procedure Preparation

- 3.1.1 Emergency Dose Calculation Package Methodology Manual, Applied Physical Technology, July 1981

3.2 References Used in Conjunction with this Procedure

- 3.2.1 1904.02, "Offsite Dose Projections - Pocket Computer Method"
- 3.2.2 1904.07, "Protective Action Recommendations"

3.3 Related ANO References

None

4.0 RESPONSIBILITIES

- 4.1 The Dose Assessment Supervisor in the Emergency Response Organization, or his designee, is responsible for long-term radiological plume tracking and dose integration.
- 4.2 The Duty Emergency Coordinator, or his designee, should initiate radiological plume tracking and dose integration as soon as possible after the TSC is activated and continue until relieved by the Dose Assessment Supervisor.



PLANT MANUAL SECTION:
OFFSITE DOSE
PROJECTIONS

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RADIOLOGICAL PLUME TRACKING
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5.0 LIMITS AND PRECAUTIONS

- 5.1 Actual integrated doses will generally be lower than predicted by this procedure due to typical wind direction meander.
- 5.2 In order to be meaningful, the dose integration must cover the entire release period (i.e. all plume segments).

6.0 DEFINITIONS

- 6.1 Plume Segment - An air parcel containing radioactive material emitted at a relatively uniform release rate and under relatively uniform meteorological conditions.

7.0 DOSE RATE PROJECTION SUMMARY

- 7.1 Transfer the dose projection input and output data from Form 1904.02D to Form 1904.06A for each dose projection as it is performed, i.e. therefore the oldest data will appear closer to the top of the form. Include all dose projections previously calculated by Control Room personnel since the beginning of the release. The time on Form 1904.06A refers to the time recorded on 1904.02A.

- 7.2 For each projection, compute the "segment length (miles)" by multiplying the then-current windspeed (mph) by the total elapsed time between the current and previous data collection times (hours). Record the "segment length" on Form 1904.06A for each dose projection (plume segment).

NOTE: The elapsed time for the first plume segment is the time period from the start of the release to the first data collection time.

- 7.3 Combine sequential dose projections which have similar meteorological and release rate characteristics into a single plume segment. This reduces subsequent plotting and integration tasks.

7.3.1 The criteria for grouping are:

Wind direction $\pm 10^\circ$
Wind speed ± 1 MPH under 5 MPH or $\pm 20\%$ over 5 MPH
Stability class no change
Release rates $\pm 20\%$

All tolerances are expressed as maximum deviation from the first segment in the group. The characteristics of the combined segment are the average of the respective characteristics of the component segments.

- 7.3.2 Draw brackets on the left hand margin of 1904.06A to indicate the grouping of segments.



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7.3.3 The characteristics of the combined segment are those of the first segment of the group.

8.0 PLUME CENTERLINE PLOTTING

8.1 Obtain a 360° protractor, ruler, stability class overlays, map, calculator, and pad of tracing paper (11" x 17", ruled 10 x 10 to the inch) from the appropriate emergency kit:

8.1.1 Technical Support Center

8.1.2 Emergency Control Center

8.2 Select an origin and north-south axis on the tracing paper, taking into consideration the general direction of plume development.

8.3 Refer to Form 1904.06A to determine the downwind direction and segment length of the most recently emitted plume segment.

8.4 Center the protractor on the origin of the tracing paper.

8.5 Turn the protractor until the downwind direction angle (indicated on the outer ring) is aligned with either the north or the south direction on the tracing paper.

8.6 Draw the segment centerline along the indicated side of the protractor's central straightedge, depending on whether the downwind angle was aligned with north or south on the paper.

8.7 Use a ruler to draw the plume segment length to scale (1" = 1 mile).

8.8 Mark the segment endpoint. This is the starting point for the next (older) plume segment.

8.9 Label the segment centerline with its initial release time. Mark the segment endpoint with the total broken-path plume length at that point.

8.10 Center the protractor over the starting point for the next older segment.

8.11 Refer to Form 1904.06A to determine the downwind directions and lengths of successively older plume segments, repeating Steps 8.5 through 8.10 until all plume segments have been plotted which fall within a 10-mile radius of ANO.

9.0 PLUME OUTLINE DRAWING

NOTE: This section must be completed only if a graphic plume drawing is required: normally once every 30 minutes.



PLANT MANUAL SECTION:

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9.1 For each plume segment, beginning with the one emitted most recently:

- 9.1.1 Select the overlay corresponding to the atmospheric stability when that segment was released.
- 9.1.2 Using the total broken-path distance to the segment starting point (as recorded on the centerline plot), mark the segment starting point on the centerline of the stability overlay.
- 9.1.3 Place the overlay under the tracing paper bearing the centerline plot, aligning the segment starting points and centerlines.
- 9.1.4 Trace the bounding X/Q lines for the segment, connecting smoothly with the adjacent segment. (It is usually helpful to extend the boundary lines an inch or so beyond the segment endpoint).

9.2 Darken the plume outline.

9.3 Affix the tracing sheet to a 10-mile radius emergency planning map, aligning the north-south directions, and centering the starting point of the youngest plume segment over the plant site.

10.0 DOSE COMMITMENT INTEGRATION

10.1 At the top, leftmost open column on Form 1904.06B, list the starting and ending times for the earliest segment not previously listed. Subtract the starting time from the ending time to determine the duration of this integration period in hours. A separate set of forms must be maintained for whole body and for child thyroid doses.

10.2 Record the child thyroid and whole body dose rates associated with the plume segment currently crossing the radii listed on Pages 1-5 of 1904.06B. Record the centerline dose rate on the line for the sector where the intersection occurs.

10.2.1 For the most recently emitted plume segment, the most recent centerline dose rates tabulated on Form 1904.06A may be used.

10.2.2 For substantially curved portions of the plume:

- A. Note which plume segment is currently crossing the radius of interest.
- B. Reposition the X/Q overlay for that segment over the plume outline, aligning the centerline axes.
- C. The total broken-path distance to the segment starting point must coincide with the straight line source-to-segment start distance on the overlay.



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- D. Interpolate the X/Q value at the plume centerline where it crosses the radius of interest.
- E. Divide the local X/Q by the bounding X/Q for that plume as shown on Form 1904.06A, then multiply by 0.050 mR/hr to obtain the whole body dose rate at the radius of interest.
- F. Obtain the child thyroid dose rate at the radius of interest by dividing the result from Step 5 by the whole body dose rate for the corresponding radius for that plume segment from Form 1904.06A, then multiplying by the child thyroid dose rate.

10.3 Multiply the dose rates obtained in Step 10.2.1.A or Step 10.2.1.B times the duration to determine the incremental whole body and child thyroid integrated doses. Record these in the ' Δ ' Dose column on the whole body and child thyroid worksheets (Form 1904.06B), on the appropriate sector/radius line.

NOTE: When the plume centerline falls between two sectors, add the incremental doses to both sectors.

10.4 For each sector/radius line on Form 1904.06B, add the entry in the current ' Δ ' Dose column to the entry in the previous ' Σ ' Dose column and record the new total integrated dose in the current ' Σ ' Dose column. This will result in a running total being generated from left to right across the page.

NOTE: The integrated doses at all offsite locations are assumed to be zero prior to an incident; therefore, the first ' Σ ' Dose column of an incident will equal the first ' Δ ' Dose column.

10.5 Circle the highest integrated exposure value for each major radius (0.65, 1.0, 2.0, 5.0, and 10.0 miles) and for both dose types (whole body and child thyroid).

11.0 PROTECTIVE ACTION RECOMMENDATIONS

11.1 Recommend protective action in affected offsite subsectors when trends indicate that:

11.1.1 Whole body integrated dose may approach 1 R (1000 mR), or

11.1.2 Child thyroid integrated dose may approach 5 R (5000 mR).

11.2 Recommend protective action in affected onsite (exclusion area) subsectors when trends indicate that:

11.2.1 Whole body integrated dose may approach 0.5 R (500 mR), or

11.2.2 Child thyroid integrated dose may approach 1.0 R (1000 mR).



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ARKANSAS POWER & LIGHT COMPANY Arkansas Nuclear One

TITLE: DOSE PROJECTION SUMMARY FORM NO. 1904.06A

REV. # * PC #

DOSE PROJECTION SUMMARY (ACTUAL METEOROLOGY)		RADIUS (MILES)	WHOLE BODY (MR/HR)	CHILD THYROID (MR/HR)
1.0	TIME: WINDSPEED: (MPH)	0.65		
	DOWNWIND DIRECTION: (DEG)	1.0		
	STABILITY CLASS:	2.0		
	BOUNDING X/Q: (SEC/M ³)	5.0		
	SEGMENT LENGTH: (MILES)	10.0		
	INITIAL: _____			
2.0	TIME: WINDSPEED: (MPH)	0.65		
	DOWNWIND DIRECTION: (DEG)	1.0		
	STABILITY CLASS:	2.0		
	BOUNDING X/Q: (SEC/M ³)	5.0		
	SEGMENT LENGTH: (MILES)	10.0		
	INITIAL: _____			
3.0	TIME: WINDSPEED: (MPH)	0.65		
	DOWNWIND DIRECTION: (DEG)	1.0		
	STABILITY CLASS:	2.0		
	BOUNDING X/Q: (SEC/M ³)	5.0		
	SEGMENT LENGTH: (MILES)	10.0		
	INITIAL: _____			
4.0	TIME: WINDSPEED: (MPH)	0.65		
	DOWNWIND DIRECTION: (DEG)	1.0		
	STABILITY CLASS:	2.0		
	BOUNDING X/Q: (SEC/M ³)	5.0		
	SEGMENT LENGTH: (MILES)	10.0		
	INITIAL: _____			
5.0	TIME: WINDSPEED: (MPH)	0.65		
	DOWNWIND DIRECTION: (DEG)	1.0		
	STABILITY CLASS:	2.0		
	BOUNDING X/Q: (SEC/M ³)	5.0		
	SEGMENT LENGTH: (MILES)	10.0		
	INITIAL: _____			
6.0	TIME: WINDSPEED: (MPH)	0.65		
	DOWNWIND DIRECTION: (DEG)	1.0		
	STABILITY CLASS:	2.0		
	BOUNDING X/Q: (SEC/M ³)	5.0		
	SEGMENT LENGTH: (MILES)	10.0		
	INITIAL: _____			

Reviewed By _____



PLANT MANUAL SECTION:
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ARKANSAS POWER & LIGHT COMPANY Arkansas Nuclear One

TITLE INTEGRATED EXPOSURE WORKSHEET

FORM NO. 1904.06B

REV. # PC #

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WHOLE BODY CHILD THYROID

FROM (TIME)	UNTIL (TIME)	DURATION (HR)	Dose			Dose			Dose			Dose		
			Rate	Δ	I	Rate	Δ	I	Rate	Δ	I	Rate	Δ	I
1	0.65 mi													
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
Initial														

NOTE: All dose rates in mR/hr. All doses in mR.

Reviewed By _____



PLANT MANUAL SECTION:
OFFSITE DOSE
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RADIOLOGICAL PLUME TRACKING
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ARKANSAS POWER & LIGHT COMPANY Arkansas Nuclear One

TITLE INTEGRATED EXPOSURE WORKSHEET

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WHOLE BODY CHILD THYROID

FROM (TIME)	UNTIL (TIME)	DURATION (HR)	Dose Rate		Δ Dose		I Dose		Dose Rate		Δ Dose		I Dose	
			Rate	Dose	Dose	Rate	Dose	Dose	Rate	Dose	Dose	Rate	Dose	Dose
1	1.0 mi													
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
Initial														

NOTE: All dose rates in mR/hr. All doses in mR.

Reviewed By _____



PLANT MANUAL SECTION:
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TITLE INTEGRATED EXPOSURE WORKSHEET

FORM NO. 1904.06B

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WHOLE BODY CHILD THYROID

FROM (TIME)														
UNTIL (TIME)														
DURATION (HR)														
SECTOR/RADIUS	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose
1 2.0 mi														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
Initial														

NOTE: All dose rates in mR/hr. All doses in mR.

Reviewed By _____



PLANT MANUAL SECTION:
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RADIOLOGICAL PLUME TRACKING
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FORM NO. 1904.06B

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WHOLE BODY CHILD THYROID

FROM (TIME)												
UNTIL (TIME)												
DURATION (HR)												
SECTOR/RADIUS	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose
1	5.0 mi											
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
Initial												

NOTE: All dose rates in mR/hr. All doses in mR.

Reviewed By _____



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	ARKANSAS POWER & LIGHT COMPANY Arkansas Nuclear One											
	TITLE: INTEGRATED EXPOSURE WORKSHEET	FORM NO. 1904.06B REV. #1 PC #										
<input type="checkbox"/> WHOLE BODY <input type="checkbox"/> CHILD THYROID		Page 5 of 5										
FROM (TIME)												
UNTIL (TIME)												
DURATION (HR)												
SECTOR/RADIUS	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose	Dose Rate	Δ Dose	Σ Dose
1 10.0 mi												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
Initial												
NOTE: All dose rates in mR/hr. All doses in mR.												
Completed by _____												



ARKANSAS POWER & LIGHT COMPANY

Arkansas Nuclear One

TITLE: RECORD OF CHANGES AND REVISIONS

FORM NO. 1000.06A

OFFSITE DOSE PROJECTIONS PROCEDURE

REV. #12 PC #

Safety Related YES NO

PROTECTIVE ACTION RECOMMENDATIONS
1904.07 REV. 1

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9	1										
10	1										
11	1										
12	1										

APPROVED BY:

James M. Lewis

(General Manager)

APPROVAL DATE

3/10/83
REQUIRED EFFECTIVE DATE:



PLANT MANUAL SECTION: OFFSITE DOSE PROJECTIONS PROC	PROCEDURE/WORK PLAN TITLE: PROTECTIVE ACTION RECOMMENDATIONS	NO: 1904 07
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1.0 PURPOSE

This procedure provides a rapid and reproducible method for generating offsite protective action recommendations due to airborne radiological releases based upon current best estimates of plant and meteorological trends.

2.0 SCOPE

2.1 This procedure is primarily a screening procedure which can be used to determine if immediate action is needed, or if additional time is available to wait for improved conditions which are reasonably certain to occur, but whose timing is unknown.

2.2 Some subjective factors are included, the importance of which must be evaluated at the time of the incident.

3.0 REFERENCES

3.1 References used in procedure preparation:

- 3.1.1 "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents", Environmental Protection Agency; Revised February 1980
- 3.1.2 "Workbook of Atmospheric Dispersion Estimates," U.S. Department of Health, Education, and Welfare, D. Bruce Turner, 1970
- 3.1.3 "Meteorology and Atomic Energy", U.S. Atomic Energy Commission, D. H. Slade, July 1968
- 3.1.4 "Arkansas Nuclear One Evacuation Time Study", ANO Emergency Plan Appendix I, March 1981
- 3.1.5 1904.05, "Atmospheric Stability Class Determination"

3.2 References used in conjunction with this procedure:

- 3.2.1 1904.02, "Offsite Dose Projections - Pocket Computer Method"
- 3.2.2 1904.06, "Radiological Plume Tracking and Dose Integration"
- 3.2.3 1903.10, "Emergency Action Level Response"

3.3 Related ANO references:

None



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4.0 RESPONSIBILITIES

- 4.1 The Shift Administrative Assistant is responsible for formulating protective action recommendations and communicating them to the Duty Emergency Coordinator for the initial notifications per procedure 1904.02, "Offsite Dose Projections - Pocket Computer Method".
- 4.2 The TSC staff as designated by the Duty Emergency Coordinator, or the ECC staff as directed, is responsible for formulating protective action recommendations for followup notifications as outlined by this procedure.
- 4.3 The ERO Technical Support Manager, or his designee, is responsible for preparing protective action recommendations for the remainder of a radiological incident.

5.0 LIMITS AND PRECAUTIONS

- 5.1 The "latest evacuation start time" calculated in this procedure allows one hour for preliminary governmental actions, sufficient time for evacuation, plus two hours for verification of evacuation.
- 5.2 If the current Emergency Action Level is "Unusual Event" or "None", this procedure need not be completed.
- 5.3 Calculations in this procedure are conservative; however, actual offsite doses and decision times may be higher or lower, and new recommendations should be considered whenever updated information becomes available.
- 5.4 Integrated offsite doses are required as input for this procedure. This data may be obtained from:
 - 5.4.1 Procedure 1904.06, "Radiological Plume Tracking and Dose Integration".
 - 5.4.2 Direct measurements (i.e. from portable ion chambers, TLD's, etc.).
 - 5.4.3 Integrated doses supplied by other computer models such as the NRC, state and GERMS.

6.0 EVACUATION RECOMMENDATIONS

- 6.1 Attach form 1904.07A to the most recent offsite dose projection forms (1904.02A-E).



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- 6.2 Complete form 1904.07A to determine the appropriate evacuation recommendation.
- 6.3 If box d) is checked in section 18 of form 1904.07A, consider a recommendation of delaying evacuation due to the factors listed after the evacuation recommendation statements.
- 6.4 If evacuation is recommended for any radius, rerun this procedure to determine protective action recommendations for the next larger evacuation test radius (i.e., 0.65, 2.0, or 5.0 miles).

7.0 NOTIFICATIONS

Make notifications and continue with offsite dose projections by re-starting procedure 1904.02, "Offsite Dose Projections - Pocket Computer Method" from Step 11.2.

8.0 ATTACHMENTS AND FORMS

- 8.1 Form 1904.07A - Protective Action Selection
- 8.2 Attachment 1 - X/Q Ratios



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1.0 Check current Emergency Action level:

1	2	3	4	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O.K.	U.E.	ALERT	S.E.	G.E.

If box 1 or 2 was checked, check box a) in section 18.0 and terminate the procedure.

2.0 Request the forecast average airborne radioactive release rate for the duration of the incident, based upon considerations of system temperature, pressure, planned remedial actions, probable failures, etc. (factor above current) from the Shift Operations Supervisor:

_____ (factor)

3.0 Request the forecast release continuation time in hours from the Shift Operations Supervisor and/or the Recovery Manager:

_____ (hours)

4.0 Refer to the table in Attachment 1 which applies to the current date and most closely approximates the current sky conditions. Select the predicted X/Q ratio which corresponds to the release continuation time from line 3.0.

NOTE: For overcast (i.e., 100% cloud cover) sky conditions, the predicted X/Q ratio is always 1.0. Predicted X/Q ratio: _____

5.0 Record the current windspeed and direction:

Wind direction (from) _____ Wind speed (MPH) _____

6.0 Obtain a weather forecast from the National Weather Service. (Note: A limited forecast may be obtained by calling the Middle South System Dispatcher at extension 4882; request forecast for Arkansas Zone 5) and record the windspeeds (averages, not gusts) and directions forecast for the duration of the release period only:

a.	Wind Direction (from)	Wind Speed (MPH)	Time Period
b.	Wind Direction (from)	Wind Speed (MPH)	Time Period
c.	Wind Direction (from)	Wind Speed (MPH)	Time Period
d.	Wind Direction (from)	Wind Speed (MPH)	Time Period

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NOTE: The National Weather Service uses the following forecasting periods:

TODAY - 6 a.m. to 6 p.m. Standard (7-7 daylight)

TONIGHT - 6 p.m. to 6 a.m. Standard (7-7 daylight)

TOMORROW - 6 a.m. to 6 p.m. Standard (7-7 daylight)

TOMORROW NIGHT - 6 p.m. to 6 a.m. Standard (7-7 daylight)

7.0 Average the current windspeed from line 5.0 with all forecast windspeeds (use the midpoint of forecast ranges of windspeed from Section 5.0):

_____ MPH

8.0 Divide the current windspeed in line 5) by the average windspeed from line 7.0 to obtain the windspeed ratio:

_____ (ratio)

9.0 Based upon the current and forecast wind directions, check the boxes for potentially affected sectors. Include any sectors covered by the transition between forecast wind directions.

Affected Sector	Wind Direction (from)	Downwind Direction (degrees)	Evacuation Zone
<input type="checkbox"/> 1	S	348.8 - 11.3	London
<input type="checkbox"/> 2	SSW	11.3 - 33.8	Russellville
<input type="checkbox"/> 3	SW	33.8 - 56.3	Russellville
<input type="checkbox"/> 4	WSW	56.3 - 78.8	Russellville
<input type="checkbox"/> 5	W	78.8 - 101.3	Russellville
<input type="checkbox"/> 6	WNW	101.3 - 123.8	Russellville
<input type="checkbox"/> 7	NW	123.8 - 146.3	Russellville
<input type="checkbox"/> 8	NNW	146.3 - 168.8	Dardanelle



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Affected Sector	Wind Direction (from)	Downwind Direction (degrees)	Evacuation Zone
<input type="checkbox"/> 9	N	168.8 - 191.3	Dardanelle
<input type="checkbox"/> 10	NNE	191.3 - 213.8	Dardanelle
<input type="checkbox"/> 11	NE	213.8 - 236.3	Delaware
<input type="checkbox"/> 12	ENE	236.3 - 258.8	Delaware
<input type="checkbox"/> 13	E	258.8 - 281.3	Delaware
<input type="checkbox"/> 14	ESE	281.3 - 303.8	London
<input type="checkbox"/> 15	SE	303.8 - 326.3	London
<input type="checkbox"/> 16	SSE	326.3 - 348.8	London

10.0 Check the smallest standard radius for which no protective action recommendation has been issued in any downwind direction:

0.65 mi 2.0 mi 5.0 mi

11.0 Complete the following table using data for the radius from 10.0 above and from the instructions in the note below:

	Column 1 Current Doserate (mR/hr)	Column 2 Forecast Average Doserate (mR/hr)	Column 3 Current Max. In- tegrated Dose Downwind (mR)	Column 4 Forecast Max. In- tegrated Dose (mR)	Yes No
a) Whole Body					Exceeds 1000 mR? <input type="checkbox"/> <input type="checkbox"/>
b) Child Thyroid					Exceeds 5000 mR? <input type="checkbox"/> <input type="checkbox"/>

NOTE: Column 1 = Form 1904.02D, Section 5.1.5
Calculations for columns 2, 3, and 4 are computed using the formulas below.

$$\text{Column 2a} = \text{Column 1a} \times \text{Line 2.0} \times \text{Line 4.0} \times \text{Line 5.0}$$



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(Note Continued)

$$\text{Column 2b} = \text{Column 1b)} \times \text{Line 2.0} \times \text{Line 4.0} \times \text{Line 3.0}$$

Column 3 = Zero for initial recommendation; or use 1904.06 max. dose in an affected sector at the appropriate radius

$$\text{Column 4a} = (\text{Column 2a} \times \text{Line 3.0}) + \text{Column 3a}$$

$$\text{Column 4b} = (\text{Column 2b} \times \text{Line 3.0}) + \text{Column 3b}$$

12.0 If both "no" boxes were checked in the table above, check box number b) in section 15.0 and terminate the procedure.

13.0 Calculate the PAG dose accumulation time:

$$13.1 \text{ [1000 (mR)} - \frac{\text{Column 3a}}{\text{Column 2a}} \text{ (mR)}] + \frac{\text{Column 4a}}{\text{Column 2a}} \text{ (mR/hr)} = \text{Whole Body (hr)}$$

$$13.2 \text{ [5000 (mR)} - \frac{\text{Column 3b}}{\text{Column 2b}} \text{ (mR)}] + \frac{\text{Column 4b}}{\text{Column 2b}} \text{ (mR/hr)} = \text{Child Thyroid (hr)}$$

13.3 Enter the lesser of line 13.1 or line 13.2:

_____ (hr)

14.0 Estimate the evacuation time of potentially affected sectors. Based upon the road conditions forecast for the end of the PAG dose accumulation time in 13.3 above, circle the evacuation time in the following table for each potentially evacuated zone (from line 9.0).

Evacuation Zone	5PM-6PM Weekday	5PM-6AM Week Night	5PM Fri. 6AM Mon.) Weekend	Adverse
				Road Conditions (Weekday)
London	2.5 hrs.	2.6 hrs.	2.7 hrs.	3.3 hrs.
Russellville	3.8 hrs.	3.0 hrs.	5.4 hrs.	5.1 hrs.
Dardanelle	2.1 hrs.	2.1 hrs.	2.6 hrs.	2.1 hrs.
Delaware	2.1 hrs.	2.1 hrs.	2.1 hrs.	2.1 hrs.



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X/Q RATIOS

TABLE 1A: CLEAR SKIES (Feb. 16 - Apr. 22)

Current Time	Release Continuation Time Ranges (Hr)										
	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
11 PM- 1 AM	1.0	1.0	0.83	0.69	0.58	0.50	0.45	0.41	0.40	0.46	0.50
1 AM- 3 AM	1.0	0.78	0.61	0.50	0.42	0.37	0.34	0.34	0.40	0.46	0.50
3 AM- 5 AM	0.67	0.48	0.37	0.31	0.26	0.24	0.26	0.34	0.40	0.46	0.50
5 AM- 7 AM	0.68	0.50	0.41	0.35	0.36	0.45	0.75	0.99	1.19	1.34	1.47
7 AM- 9 AM	0.69	0.59	0.54	0.63	0.98	1.98	2.73	3.31	3.77	4.16	4.04
9 AM- 11 AM	1.0	1.0	1.39	2.51	5.49	7.62	9.22	10.46	11.46	11.05	10.34
11 AM- 1 PM	1.0	1.52	2.89	6.39	8.73	10.40	11.65	12.62	12.06	11.19	10.34
1 PM- 3 PM	1.78	3.52	7.74	10.27	11.96	13.17	14.07	13.29	12.21	11.19	10.34
3 PM- 5 PM	1.86	3.90	4.91	5.52	5.93	6.22	5.79	5.25	4.77	4.37	4.04
5 PM- 7 PM	1.95	2.27	2.43	2.53	2.59	2.36	2.11	1.89	1.72	1.57	1.47
7 PM- 9 PM	1.0	1.0	1.0	1.0	0.89	0.78	0.68	0.61	0.56	0.52	0.50
9 PM- 11 PM	1.0	1.0	1.0	0.86	0.74	0.64	0.57	0.51	0.47	0.46	0.50

TABLE 1B: 60% CLOUD COVER (Feb. 16 - Apr. 22)

Current Time	Release Continuation Time Ranges (Hr)										
	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
11 PM- 1 AM	1.0	1.0	0.89	0.83	0.73	0.65	0.60	0.60	0.60	0.63	0.66
1 AM- 3 AM	1.0	0.86	0.79	0.68	0.60	0.54	0.55	0.55	0.60	0.63	0.66
3 AM- 5 AM	0.79	0.72	0.60	0.52	0.47	0.48	0.50	0.55	0.60	0.63	0.66
5 AM- 7 AM	1.0	0.78	0.68	0.61	0.68	0.72	0.84	0.94	1.01	1.07	1.12
7 AM- 9 AM	0.68	0.57	0.52	0.61	0.68	0.82	0.93	1.01	1.08	1.13	1.12
9 AM- 11 AM	1.0	1.0	1.43	1.69	2.17	2.52	2.78	2.98	3.15	3.11	3.08
11 AM- 1 PM	1.0	1.57	1.86	2.41	2.78	3.04	3.23	3.39	3.32	3.27	3.08
1 PM- 3 PM	1.86	2.15	2.76	3.13	3.38	3.55	3.68	3.58	3.49	3.27	3.08
3 PM- 5 PM	1.0	1.22	1.34	1.41	1.45	1.49	1.42	1.38	1.27	1.19	1.12
5 PM- 7 PM	1.34	1.45	1.51	1.54	1.57	1.49	1.42	1.31	1.21	1.13	1.12
7 PM- 9 PM	1.0	1.0	1.0	1.0	0.93	0.88	0.80	0.73	0.68	0.67	0.66
9 PM- 11 PM	1.0	1.0	1.0	0.91	0.86	0.77	0.70	0.64	0.64	0.63	0.66

NOTE: For release continuation times on the borderline between two ranges, use the higher range. Example - A six-hour continuation time would fall within the 6-8 hour range.



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X/Q RATIOS

TABLE 2A: CLEAR SKIES (Apr. 23 - Aug. 22)

Current Time	Release Continuation Time Ranges (Hr)										
	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
11 PM- 1 AM	1.0	1.0	0.83	0.67	0.57	0.49	0.44	0.39	0.39	0.44	0.49
1 AM- 3 AM	1.0	0.78	0.59	0.48	0.41	0.36	0.32	0.32	0.39	0.44	0.49
3 AM- 5 AM	0.67	0.46	0.36	0.29	0.25	0.22	0.24	0.32	0.39	0.44	0.49
5 AM- 7 AM	0.57	0.42	0.35	0.31	0.28	0.38	0.70	0.94	1.14	1.30	1.44
7 AM- 9 AM	1.0	1.0	1.0	1.0	2.00	4.63	6.60	8.13	9.36	10.37	10.08
9 AM- 11 AM	1.0	1.0	1.0	2.20	5.23	7.40	9.03	10.29	11.30	10.91	10.08
11 AM- 1 PM	1.0	1.0	2.50	6.08	8.47	10.17	11.45	12.45	11.90	10.91	10.08
1 PM- 3 PM	1.0	3.0	7.35	9.96	11.70	12.95	13.88	13.11	11.90	10.91	10.08
3 PM- 5 PM	4.0	9.47	12.20	13.84	14.94	15.72	14.63	13.11	11.90	10.91	10.08
5 PM- 7 PM	1.95	2.27	2.43	2.53	2.59	2.36	2.09	1.87	1.70	1.55	1.44
7 PM- 9 PM	1.0	1.0	1.0	1.0	0.89	0.77	0.68	0.60	0.55	0.50	0.49
9 PM- 11 PM	1.0	1.0	1.0	0.86	0.73	0.63	0.56	0.50	0.45	0.44	0.49

TABLE 2B: 60% CLOUD COVER (Apr. 23 - Aug. 22)

Current Time	Release Continuation Time Ranges (Hr)										
	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
11 PM- 1 AM	1.0	1.0	0.89	0.76	0.67	0.58	0.54	0.50	0.51	0.55	0.59
1 AM- 3 AM	1.0	0.86	0.70	0.60	0.51	0.47	0.44	0.45	0.51	0.55	0.59
3 AM- 5 AM	0.79	0.60	0.50	0.42	0.38	0.36	0.39	0.45	0.51	0.55	0.59
5 AM- 7 AM	0.68	0.57	0.46	0.44	0.43	0.51	0.66	0.77	0.86	0.94	1.0
7 AM- 9 AM	1.0	0.79	0.84	0.87	1.18	1.67	2.04	2.32	2.55	2.74	2.74
9 AM- 11 AM	0.69	0.79	0.84	1.22	1.78	2.19	2.49	2.72	2.91	2.90	2.74
11 AM- 1 PM	1.78	2.04	3.28	4.98	6.12	6.93	7.54	8.01	7.91	7.42	7.02
1 PM- 3 PM	1.0	1.57	2.33	2.79	3.09	3.31	3.47	3.39	3.15	2.95	2.74
3 PM- 5 PM	1.86	2.78	3.23	3.51	3.69	3.82	3.68	3.39	3.15	2.90	2.74
5 PM- 7 PM	1.34	1.45	1.51	1.54	1.57	1.49	1.34	1.24	1.13	1.06	1.0
7 PM- 9 PM	1.0	1.0	1.0	1.0	0.93	0.82	0.75	0.67	0.63	0.59	0.59
9 PM- 11 PM	1.0	1.0	1.0	0.91	0.80	0.71	0.63	0.59	0.55	0.55	0.59

NOTE: For release continuation times on the borderline between two ranges, use the higher range. Example - A six-hour continuation time would fall within the 6-8 hour range.



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X/Q RATIOS

TABLE 3A: CLEAR SKIES (Aug. 23 - Oct. 25)

Release Continuation Time Ranges (Hr)												
Current Time	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	
11 PM- 1 AM	1.0	1.0	0.83	0.69	0.58	0.50	0.45	0.41	0.40	0.46	0.50	
1 AM- 3 AM	1.0	0.78	0.61	0.50	0.42	0.37	0.34	0.34	0.40	0.46	0.50	
3 AM- 5 AM	0.67	0.48	0.37	0.31	0.26	0.24	0.26	0.34	0.40	0.46	0.50	
5 AM- 7 AM	0.68	0.50	0.41	0.35	0.36	0.45	0.75	0.99	1.19	1.34	1.47	
7 AM- 9 AM	0.69	0.59	0.54	0.63	0.98	1.98	2.73	3.31	3.77	4.16	4.04	
9 AM- 11 AM	1.0	1.0	1.39	2.51	5.49	7.62	9.22	10.46	11.46	11.05	10.34	
11 AM- 1 PM	1.0	1.52	2.89	6.39	8.73	10.40	11.65	12.62	12.06	11.19	10.34	
1 PM- 3 PM	1.78	3.52	7.74	10.27	11.96	13.17	14.07	13.29	12.21	11.19	10.34	
3 PM- 5 PM	1.86	3.90	4.91	5.52	5.93	6.22	5.79	5.25	4.77	4.37	4.04	
5 PM- 7 PM	1.95	2.27	2.43	2.53	2.59	2.36	2.11	1.89	1.72	1.57	1.47	
7 PM- 9 PM	1.0	1.0	1.0	1.0	0.89	0.78	0.68	0.61	0.56	0.52	0.50	
9 PM- 11 PM	1.0	1.0	1.0	0.86	0.74	0.64	0.57	0.51	0.47	0.46	0.50	

TABLE 3B: 60% CLOUD COVER (Aug. 23 - Oct. 25)

Release Continuation Time Ranges (Hr)												
Current Time	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	
11 PM- 1 AM	1.0	1.0	0.89	0.83	0.73	0.65	0.60	0.60	0.60	0.63	0.66	
1 AM- 3 AM	1.0	0.86	0.79	0.68	0.60	0.54	0.55	0.55	0.60	0.63	0.66	
3 AM- 5 AM	0.79	0.72	0.60	0.52	0.47	0.48	0.50	0.55	0.60	0.63	0.66	
5 AM- 7 AM	1.0	0.78	0.68	0.61	0.68	0.72	0.84	0.94	1.01	1.07	1.12	
7 AM- 9 AM	0.68	0.57	0.52	0.61	0.68	0.82	0.93	1.01	1.08	1.13	1.12	
9 AM- 11 AM	1.0	1.0	1.43	1.69	2.17	2.52	2.78	2.98	3.15	3.11	3.08	
11 AM- 1 PM	1.0	1.57	1.86	2.41	2.78	3.04	3.23	3.39	3.32	3.27	3.08	
1 PM- 3 PM	1.86	2.15	2.76	3.13	3.38	3.55	3.68	3.58	3.49	3.27	3.08	
3 PM- 5 PM	1.0	1.22	1.34	1.41	1.45	1.49	1.42	1.38	1.27	1.19	1.12	
5 PM- 7 PM	1.34	1.45	1.51	1.54	1.57	1.49	1.42	1.31	1.21	1.13	1.12	
7 PM- 9 PM	1.0	1.0	1.0	1.0	0.93	0.88	0.80	0.73	0.68	0.67	0.66	
9 PM- 11 PM	1.0	1.0	1.0	0.91	0.86	0.77	0.70	0.64	0.64	0.63	0.66	

NOTE: For release continuation times on the borderline between two ranges, use the higher range. Example - A six-hour continuation time would fall within the 6-8 hour range.



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X/Q RATIOS

TABLE 4A: CLEAR SKIES (Oct. 26 - Feb. 15)

Current Time	Release Continuation Time Ranges (Hr)										
	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
11 PM- 1 AM	1.0	1.0	1.0	0.86	0.74	0.64	0.58	0.55	0.59	0.63	0.66
1 AM- 3 AM	1.0	1.0	0.83	0.69	0.58	0.52	0.49	0.55	0.59	0.63	0.66
3 AM- 5 AM	1.0	0.78	0.61	0.50	0.44	0.42	0.49	0.55	0.59	0.63	0.66
5 AM- 7 AM	0.67	0.48	0.37	0.32	0.33	0.42	0.49	0.55	0.59	0.63	0.66
7 AM- 9 AM	0.68	0.50	0.46	0.57	0.96	1.24	1.45	1.61	1.74	1.85	1.94
9 AM- 11 AM	0.69	0.79	1.28	2.61	3.51	4.14	4.62	4.99	5.29	5.53	5.30
11 AM- 1 PM	1.78	3.52	7.74	10.27	11.96	13.17	14.07	14.78	15.34	14.58	13.58
1 PM- 3 PM	1.86	3.90	4.91	5.52	5.93	6.22	6.44	6.61	6.22	5.75	5.30
3 PM- 5 PM	1.95	2.27	2.43	2.53	2.59	2.64	2.67	2.49	2.27	2.08	1.94
5 PM- 7 PM	1.0	1.0	1.0	1.0	1.0	1.0	0.91	0.82	0.75	0.69	0.66
7 PM- 9 PM	1.0	1.0	1.0	1.0	1.0	0.90	0.80	0.72	0.66	0.63	0.66
9 PM- 11 PM	1.0	1.0	1.0	1.0	0.89	0.78	0.68	0.62	0.59	0.63	0.66

TABLE 4B: 60% CLOUD COVER (Oct. 26 - Feb. 15)

Current Time	Release Continuation Time Ranges (Hr)										
	0-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
11 PM- 1 AM	1.0	1.0	1.0	0.91	0.86	0.77	0.74	0.73	0.75	0.78	0.79
1 AM- 3 AM	1.0	1.0	0.89	0.83	0.73	0.71	0.69	0.73	0.75	0.78	0.79
3 AM- 5 AM	1.0	0.86	0.79	0.68	0.66	0.65	0.69	0.73	0.75	0.78	0.79
5 AM- 7 AM	0.79	0.72	0.60	0.59	0.59	0.65	0.69	0.73	0.75	0.78	0.79
7 AM- 9 AM	1.0	0.78	0.84	0.87	1.00	1.10	1.17	1.23	1.27	1.31	1.34
9 AM- 11 AM	0.68	0.78	0.84	1.01	1.12	1.20	1.26	1.31	1.34	1.37	1.34
11 AM- 1 PM	1.86	2.15	2.76	3.13	3.38	3.55	3.68	3.79	3.87	3.76	3.68
1 PM- 3 PM	1.0	1.22	1.34	1.41	1.45	1.49	1.51	1.53	1.48	1.43	1.34
3 PM- 5 PM	1.34	1.45	1.51	1.54	1.57	1.58	1.60	1.53	1.48	1.37	1.34
5 PM- 7 PM	1.0	1.0	1.0	1.0	1.0	1.0	0.94	0.90	0.84	0.81	0.79
7 PM- 9 PM	1.0	1.0	1.0	1.0	1.0	0.94	0.89	0.82	0.79	0.78	0.79
9 PM- 11 PM	1.0	1.0	1.0	1.0	0.93	0.88	0.80	0.77	0.75	0.78	0.79

NOTE: For release continuation times on the borderline between two ranges, use the higher range. Example - A six-hour continuation time would fall within the 6-8 hour range.