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TO: Mr. Benard C. Rusche

FROM: Carolina Power & Light Co. Raleigh, North Carolina E. E. Utley

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DESCRIPTION

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APPENDIX I DISTRIBUTION AFTER ISSUANCE OF A LICENSE

Plant Name:

H. B. Robinson #2

(2-P)

ENCLOSURE

Furnishing Information for 10CFR50 Appendix I Evaluation including figures, tables and drawings.

(50-P)

ACKNOWLEDGED

DO NOT REMOVE

FOR ACTION/INFORMATION 7/14/76 RJL

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Carolina Power & Light Company

July 12, 1976

File: NG-3514 (R)

Serial: NG-76-969

RECEIVED JUL 14 1976 U.S. NUCLEAR REGULATORY COMMISSION Mail Section

Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

H. B. ROBINSON UNIT NO. 2
DOCKET NO. 50-263
INFORMATION FOR 10CFR50 APPENDIX I EVALUATION

Dear Mr. Rusche:

On June 4, 1976, Carolina Power & Light Company (CP&L) submitted information necessary for your Staff to evaluate the means employed for keeping levels of radioactivity in effluent to unrestricted areas as low as practicable at the H. B. Robinson Steam Electric Plant (HBR) Unit No. 2. This information was in response to each item of Enclosures 1 and 2 of your Staff's February 18, 1976, letter on HBR Unit 2.

CP&L's June 4, 1976 submittal indicated that certain required information was unavailable and would be provided at a later time. Accordingly, the following information is provided for your use:

1. Response to Appendix D of Draft Regulatory Guide 1.CC, Data for Radioactive Source Term Calculation. (Included as Attachment A.)

2. Estimates of relative concentration (X/Q) and deposition (D/Q) calculated from site meteorological data, discussion of the model used, and assumptions made in determining estimates. (Included as part of Attachment B.)

3. Discussion of air flow trajectory important in transporting effluents to locations for which dose calculations are made. (Included as part of Attachment B.)

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7058

336 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

As stated in our June 4, 1976 response, CP&L will provide an evaluation showing HBR's capability to meet the requirements set forth in Section II of Appendix I to 10CFR50 by September 15, 1976.

Yours very truly,

E. E. Utley
Vice President
Bulk Power Supply

RGBjr/kr

Attachments

Sworn to and subscribed before me this 12th day of July, 1976.

Marilyn V. Pease
Notary Public

My Commission Expires: October 19, 1980

ATTACHMENT A

RESPONSE TO APPENDIX D

Data for Radioactive Source Term Calculations
for H. B. Robinson Unit No. 2

I. GENERAL

A. The maximum core thermal power evaluated for safety consideration in the SAR. (NOTE: All of the following responses should be adjusted to this power level.)

<u>Response</u>: The maximum core thermal power will be 2300 MWt.

<u>Reference</u>: FSAR, Page 1-1.

B.1 The total mass (lbs) of uranium and plutonium in the equilibrium core.

<u>Response</u>: The total mass of uranium and plutonium after 30,000 MWD per metric ton burnup is, respectively, 144,478.5 lbs. and 963.4 lbs.

<u>Reference</u>: Internal memorandum from L. E. Smith to J. M. Sell dated May 19, 1976; File No. 902.01.

B.2 The percent enrichment of uranium in reload fuel.

<u>Response</u>: The fuel is 2.90% U-235.

<u>Reference</u>: Internal memorandum from L. E. Smith to J. M. Sell dated May 19, 1976; File No. 902.01.

B.3 The percent fissile plutonium in reload fuel.

<u>Response</u>: Reload fuel contains 0.0% plutonium.

<u>Reference</u>: Internal memorandum from L. E. Smith to J. M. Sell dated May 19, 1976; File No. 902.01.

C. If the methods and parameters used in estimating the source terms in primary coolant are different from those given in Regulatory Guide 1.BB, describe in detail the methods and parameters used.

<u>Response</u>: The method and parameters used are the same as those given in Regulatory Guide 1.BB.

D. The quantity of tritium released in liquid and gaseous effluents.

<u>Response</u>: 624 curies of tritium were released in liquid effluents and 193 curies of tritium were released in gaseous effluents during 1975. The capacity factor was 67%. The FSAR estimates a total of 3,820 curies of tritium is released per year.

<u>References</u>: 1975 Semi-Annual Operating Reports and the FSAR, Chapter 11.

II. PRIMARY SYSTEM

A. The total mass of coolant in the primary system, excluding the pressurizer and primary coolant purification system, at full power.

Response: The mass of the coolant excluding the pressurizer and purification system is 352,805 lbs.

Reference: Environmental Report and FSAR Table 4.1-3.

B. The average primary system let-down rate to the primary coolant purification system.

Response: 60 gpm.

Reference: Final Environmental Statement.

C. The average flow rate through the primary coolant purification system cation demineralizers. (NOTE: The let-down rate should include the fraction of time the cation demineralizers are in service.)

Response: The let-down rate is 60 gpm the fraction of time the cation demineralizers are utilized is 0.1, and could be increased if required.

Reference: FSAR Table 9.2-4.

D. The average shim bleed flow rate.

Response: The shim bleed rate averages 1.2 gpm.

Reference: Final Environmental Statement, Table 3.4.

III. SECONDARY SYSTEM

A. The number and type of steam generators, and the carryover factor used in our evaluation for iodine and nonvolatiles.

Response: Three steam generators are utilized. The carryover factor utilized is 0.01 for iodine and 0.001 for nonvolatiles.

Reference: Draft Final Environmental Statement, Table 3.4 for iodine and Regulatory Guide 1.BB for nonvolatiles.

B. The total steam flow in the secondary system.

Response: 9,470,000 lb/hr represents total steam flow.

Reference: Final Environmental Statement, Table 3.4.

C. The mass of steam in each steam generator at full power.

Response: Each steam generator contains 5,000 lbs of steam at full power.

Reference: Final Environmental Statement, Table 3.4.

D. The mass of liquid in each steam generator at full power.

Response: Each steam generator contains 72,600 lbs of liquid at full power.

Reference: Final Environmental Statement, Table 3.4.

E. The total mass of coolant in the secondary system at full power excluding the condenser hotwell.

Response: The total secondary system coolant mass excluding the condenser hotwell is 9.8×10^5 lbs.

Reference: Total Secondary Volume; FSAR Chapter 10.

F. The primary to secondary leakage rate used in the evaluation.

Response: A 48 lb/day primary to secondary leakage rate is assumed for the evaluation.

Reference: Amendment 1 to WCAP 8253, Source Term Data for Westinghouse Water Reactors.

G. Description of the steam generator blowdown and blowdown purication systems. The average steam generator blowdown rate used in the evaluations.

Response: Blowdown from a steam generator can be routed to an atmospherically vented flash tank, the waste disposal system, or the condensate storage system. Normally, when radioanalysis indicates the primary to secondary boundary is intact, the blowdown is directly to the flash tank. In this mode, the blowdown rate is a nominal 26.5 gpm per steam generator with the liquid phase routed to the condenser discharge pipe and the gaseous phase vented to atmosphere. If radioanalysis indicates the primary to secondary boundary is not intact, the blowdown from the faulty steam generator is routed to the Waste Holdup Tank for processing. Under this condition, the blowdown rate is reduced to prevent overloading the waste processing system. Blowdown rates in this mode have ranged from 1 to 15 gpm. The return to the condensate storage system is not normally used.

Reference: Plant Operating Reports.

H. The fraction of the steam generator feedwater processed through condensate demineralizers and the DF used in the evaluation.

Response: Condensate demineralizers are not utilized.

Reference: Not applicable.

I. Condensate Demineralizers

1. Average flow rate
2. Demineralizer type
3. Number and size
4. Regeneration frequency
5. Ultrasonic resin cleaning
6. Regenerant volume and activity

Response: Condensate demineralizers are not utilized.

Reference: Not applicable.

IV. LIQUID WASTE PROCESSING SYSTEM

A. For each liquid waste processing system (including shim bleed, steam generator blowdown and detergent waste processing), provide in tabular form the following information:

1) Sources, flow rates, and expected activities (fractions of primary coolant activity) for all inputs to each system.

2) Holdup times associated with collection, processing, and discharge of all liquid streams.

3) Capacities of all tanks and processing equipment considered in calculating holdup times.

4) Decontamination factor for each processing step.

5) Fraction of each processing stream expected to be discharged over the life of the plant.

6) For demineralizer regeneration provide: time between regenerations, regenerate volumes and activites, treatment of regenerants, and fraction of regenerants discharged. Include parameters used in making these determinations.

7) Liquid source term by radionuclide in Ci/year for normal operation including anticipated occurrences.

Response: Items 1, 2, 4 and 5 are tabularized in Table A.
Item 3 is tabularized in Table B.
Item 6 is not applicable.

TABLE A
LIQUID PROCESSING SYSTEM

	NAME OF STREAM	WASTE VOL (GPD)	FRACTION PCA	DECAY COLLECTION (DAYS)	DECAY PROCESS (DAYS)	FRACTION OF VOLUME DISCHARGE	PROCESS STEP	DF IODINE	DF CESIUM RUBIDIUM	DF OTHER
1)	Shim Bleed	1728	1	12	1.16	0.95	M.B.	10	2	10
							G.S.	1	1	1
							Evap.	100	1000	1000
							Anion	100	1	1
							Total	100,000	2000	10,000
2)	Equip. Drain Waste	1760	1	12	1.16	0.95	M.B.	10	2	10
							G.S.	1	1	1
							Evap.	100	1000	1000
							Anion	100	1	1
							Total	100,000	2000	10,000
3)	Clean Waste									
4)	Dirty Waste	457	0.05	22	3	1.0	Evap.	1000	10,000	10,000
							M.B.	100	2	100
							Total	100,000	20,000	1,000,000
5)	Blowdown Waste	114,480		0	0	1.0	None	1	1	1
6)	Regenerant Waste	0								
7)	Laundry Waste	175		0	3	1.0		1	1	1

TABLE B

Liquid Processing System

Tanks	Number	Capacity
Holdup	3	52,000 gal
Monitor	2	10,000 gal
Waste Holdup	1	25,000 gal
Waste Condensate	2	1,000 gal
Chemical Drain	1	375 gal
Laundry & Hot Shower	2	600 gal

Process Equipment	Number	Capacity
Boric Acid Evaporator	2	12.5 gpm
Gas Stripper	2	12.5 gpm
Waste Evaporator	1	2 gpm

TABLE C

Liquid Waste Processing Source Term
(Extracted from 1975 Semi-annual Operating Reports)

Nuclide	Curies per Year
Cesium - 134	5.57 E-2
Cesium - 137	5.67 E-2
Iodine - 131	3.36 E-3
Cobalt - 58	8.83 E-2
Cobalt - 60	6.84 E-2
Iron - 59	8.69 E-4
Zinc - 65	7.00 E-4
Manganese - 54	8.63 E-3
Chromium - 51	4.59 E-3
Zirconium-Niobium - 95	4.56 E-3
Barium-Lanthanum - 140	1.85 E-3
Cerium - 141	1.96 E-4
Silver - 110m	1.62 E-2
Cobalt - 57	1.25 E-4
Antimony - 125	8.49 E-3
Antimony - 124	2.95 E-2
Sodium - 24	3.01 E-2
Xenon - 133	9.02 E-2
Xenon - 135	6.89 E-3

V. GASEOUS WASTE PROCESSING SYSTEM

A. The volume of gases stripped from the primary coolant.

Response: The gas strippers are not utilized. Gas stripping occurs in the volume control tank and to a lesser extent in the boric acid processing stream. Since nitrogen is used as a cover gas in the CVCS holdup tank, the majority of gas collected and sent to the gas decay tanks is nitrogen. As such, we have no figure for the volume of gas stripped from the primary coolant.

B. Description of the process used to hold up gases stripped from the primary system during normal operation and plant shutdown. If pressurized storage tanks are used, include a process flow diagram of the system indicating the capacities, number, and design and operating storage pressures for the storage tanks.

Response: During normal operation, gases are collected via a pressurized vent header. One waste gas compressor is continually operating, forcing any excess gas to the selected 525 cu. ft. waste gas decay tank. When the selected waste gas decay tank pressure reaches 110 psig (design 150 psig), a preselected back-up tank is automatically placed in service. Normally a tank requires 28 days to fill. Gas held in the tanks may be either utilized as cover gas via the CVCS holdup tank or released directly to the environment via the stack. Normally, the last tank filled is used to supply cover gas. (See VF).

Reference: FSAR Chapter 11.

C. Describe the normal operation of the system, e.g., the number of tanks held in reserve for back-to-back shutdown, fill time for tanks. Indicate the minimum holdup time used in the evaluation and the basis for the number.

Response: The system contains four waste gas decay tanks. Normally, one tank is being filled, one tank is in standby, one tank is supplying cover gas, and one tank is isolated for decay. The fill time is 28 days and the hold time prior to release is 45 days.

Reference: FSAR, Chapter 11.

D. If HEPA filters are used downstream of the pressurized storage tanks, provide the decontamination factor used in the evaluation.

Response: HEPA filters are not utilized.

E. If a charcoal delay system is used, describe this system and indicate the minimum holdup times for each radionuclide considered in the evaluation. List all parameters, including mass of charcoal,

flow rate, operating and dew point temperatures, and dynamic adsorption coefficients for Xe and Kr used in calculating holdup times.

Response: A charcoal delay system is not utilized.

F. Provide piping and instrumentation diagrams and process flow diagrams for the gaseous radwaste systems along with other systems influencing the source term calculations.

Response: The following drawings are found in the FSAR:

1. Fig. No. 11.1-2 Waste Disposal Sheet 2
2. Fig. No. 4.2-1 Reactor Coolant System
3. Fig. No. 9.2-1 CVCS Sheet 1
4. Fig. No. 9.2-2 CVCS Sheet 2
5. Fig. No. 9.2-3 CVCS Sheet 3

The following drawing is included:

Waste Disposal Sheet 1

VI. VENTILATION AND EXHAUST SYSTEM

For each building housing systems that contain radioactive material, the steam generator blowdown system vent exhaust, gaseous waste processing system vent, and the main condenser air removal system, provide the following:

A. Provisions incorporated to reduce radioactivity releases through the ventilation or exhaust system.

B. Decontamination factors assumed and the bases (include charcoal adsorbers, HEPA filters, mechanical devices).

C. Release rates for radioiodine, noble gases, and radioactive particulates, and their bases.

D. Release point description including height above grade, height above and relative location to adjacent structures, relative temperature difference between gaseous effluent and ambient, flow rate, velocity and size and shape of the flow orifice.

E. For the containment building, provide the building free volume, and a thorough description of the internal recirculation system (if provided) including the recirculation rate, charcoal bed depth, operating time assumed, and mixing efficiency. Indicate the expected purge and venting frequencies and duration and continuous purge rate (if used).

Response:

PRIMARY CONTAINMENT:

During normal operation, the reactor containment recirculation cooling system draws air from the containment atmosphere and discharges to a header for distribution to individual areas. Normal flow through this system is 255,000 scfm. While this system does not provide for removal of radioactive materials per se, it does provide the mixing of the containment atmosphere. With a containment free volume of 1.95 E6 cubic feet, the air is recirculated approximately every 15 minutes (mixing efficiency of 0.7).

While not normally operated, the containment charcoal auxiliary filter system provides for the removal of iodine and particulate material. This system consists of two trains, each taking suction from the containment recirculation cooling system distribution header. Each train contains a roughing filter, a HEPA filter, a 1-inch deep charcoal filter, and a 5,000 cfm fan. The effluent discharges directly into containment. The system is normally operated prior to any purge.

The containment purge system is designed to assure a complete purge in two hours. The system consists of purge inlet and exhaust fans designed to exhaust 35,000 cfm directly to the plant stack. At least 10 hours prior to purging, the containment charcoal auxiliary filter system is placed in service. The containment is purged approximately 4 times a year. In addition, the purge isolation valves are tested approximately 20 times a year. During testing, the valves are open for about 2 minutes.

The containment pressure and vacuum relief system is provided to control variations in containment pressure resulting from instrument and service air leakage and barametric pressure changes. Vacuum breakers are utilized for low pressure inside containment. A 6-inch pressure relief line vents the containment through a roughing filter, a HEPA filter and a 1-inch deep charcoal filter directly to the stack. Venting occurs approximately 100 times per year. Venting normally takes 3.5 hours.

Currently, we are assuming the same decontamination factors given by Regulatory Guide 1.BB; i.e., 100 for HEPA particulate removal and 10 for charcoal filter iodine removal.

AUXILIARY BUILDING:

The auxiliary building ventilation system is basically a once-through, low potential to high potential airborne system. There are three basic routings; those which discharge directly to atmosphere, those which discharge directly to the stack through a pre-filter and absolute filter, and those which can be discharged to

the stack through an absolute filter and charcoal filter if plant conditions require. The flow paths are shown diagramtically on the attached drawing.

Normal flow to the stack is 49,650 cfm from the auxiliary building.

FUEL HANDLING BUILDING:

The fuel handling building ventilation system is divided into two systems.

The first services the following areas:

1. Waste Holdup Tank Rooms (3)
2. Gas Decay Tank Room
3. Fuel Handling Building Sump Room
4. Cask Decon Room
5. Tool Room
6. Hot Machine Shop

This system discharges 10,200 cfm through a prefilter and absolute filter directly to atmosphere. The discharge opening is located 29.5 feet above grade on the side of fan room "13" which measures 2' 6.5" by 4' 0.5". The fan room is situated on a roof at 20 foot above grade. The fan room is 14 feet tall. The air exiting is approximately 10°F above ambient and has a velocity of 993 ft/min. We consider this pathway to have negligible significance for normal operations.

The second services the following areas:

1. Spent Fuel Heat Exchanger Room
2. Spent Fuel Pit Pump Room
3. New Fuel Storage Room
4. Spent Fuel Pit

This system discharges 13,400 cfm through a prefilter, absolute filter and 1-inch deep charcoal filter to the stack. We consider this pathway to have negligible significance for normal operation.

TURBINE BUILDING:

The turbine building is open with no ventilation system. However, the steam generator blowdown tank vent is located on the turbine building. This vent is an 18" diameter pipe cut at a 45° angle at the end. The top of the vent is 49 feet above grade. The effluent is 212°F. The assumed flow rate is 1861 cfm which gives an exit velocity of 1053 ft/min (based on 10 gpm blowdown per steam generator).

PLANT STACK:

The plant stack is 54-inch diameter pipe contiguous to the containment. The containment is 139 ft. in diameter and 193.5 ft. in height. The top of the stack is 137 ft. above grade. Normally, the auxiliary building and fuel handling building (as described)

exhaust a total of 63,050 cfm to the stack. During purge, an additional 35,000 cfm is discharged to the stack. The temperature of the effluent is assumed to be 10°F above ambient. Normally the exit velocity is 3,964 ft/min.

VII. SOLID WASTE PROCESSING SYSTEM

A. Provide in tabular form the following information concerning all inputs to the solid waste processing system: source, volume, and activity of principal radionuclides, along with bases for the values given.

Response:

Quantities and Volume of Solid Waste Shipped in 1975

Type	Volume (M^3)	Activity (Ci)
Spent Resin, Filter Sludge, Evaporator Bottoms, etc.	202.8	1286
Dry Compressible Waste, Contaminated Equipment, etc.	153	51.9

Distribution by Type of the Major Radionuclides Shipped from H. B. Robinson During 1975

Element	Resin %	Evaporator Bottoms %	Dry Waste %
Co 57	1.90 E00	1.30 E-01	1.62 E 00
Ce 141	2.29 E-02	-	-
Sb 124	3.17 E-01	2.59 E 00	-
I 131	1.88 E-01	3.59 E 00	-
Co 58	1.39 E 01	2.63 E 01	4.66 E 01
Sb 125	8.07 E-01		7.45 E-01
Cs 134	1.80 E 01	1.80 E 01	-
Cs 137	2.44 E 01	2.04 E 01	-
Ag 110m	2.08 E-02	1.34 E-01	-
Mn 54	3.42 E 00	4.08 E 00	1.28 E 01
Co 60	3.28 E 01	2.04 E 01	2.10 E 01
I 133	1.04 E-02	-	-
Mo 99	5.43 E-02	-	-
Ba 139	4.22 E-02	-	-
Nb 95	9.80 E-03	1.46 E-01	2.43 E-01
Cs 136	1.28 E-02	9.75 E-02	-
Cr 51	9.06 E-02	5.64 E-01	1.12 E 00
Zr 97	-	2.48 E 00	3.84 E 00
Ba 140	-	2.70 E-01	-
Totals:	96%	99.18%	87.97%

B. Onsite storage provisions (location, capacity) and expected storage times for all solid wastes prior to shipment.

Response:

Area	Capacity	Expected Storage Time
Spent Resin Storage Tank	300 cu ft	30 days
Drum Storage Room	175 drums	15 days

C. Provide piping and instrumentation diagrams for the solid radwaste system.

Response: The following drawing is included:

1. Waste Disposal Sheet 1, see V.F.

ATTACHMENT B

DIFFUSION ANALYSIS

FOR

ANNUAL AVERAGE RELATIVE CONCENTRATIONS, CONCENTRATION DEPLETION, AND DEPOSITION

AT THE

H. B. ROBINSON SITE

Carolina Power and Light Company
Raleigh, N. C.

Dames & Moore
Job Number 4845-020
June 24, 1976

1.0 INTRODUCTION

On May 5, 1975, the Nuclear Regulatory Commission (NRC) published Appendix I to 10 CFR Part 50 which set forth numerical guides for design objectives and limiting conditions for operation to meet the criterion "as low as practicable" regarding releases of radioactive materials in effluents from light-water-cooled nuclear reactors. Section V.B of Appendix I requires the holders of permits or licenses authorizing the operation of light-water-cooled reactors, for which application was filed prior to January 2, 1971, to file with the Commission by June 4, 1976:

1. Such information as is necessary to evaluate the means employed for keeping levels of radioactivity in effluents to unrestricted areas as low as practicable, including all such information as is required by paragraphs 50.34a(b) and (c) not already contained in his application; and

2. Plans and proposed Technical Specifications developed for the purpose of keeping releases of radioactive materials in unrestricted areas during normal reactor operations, including expected operational occurrences, as low as practicable.

Guidelines, having been set forth to address Appendix I to 10 CFR Part 50 under the provisions of Section V.B, identify meteorological considerations to be consistent with Regulatory Guide 1.111 (RG 1.111), initially identified as Draft Regulatory Guide 1.DD. Based on the analytical procedures put forth in RG 1.111, estimates of relative concentration (χ/Q) and deposition (D/Q) are required to address Appendix I; such analyses are required at standard and critical distances utilizing recent representative on-site meteorological data meeting the requirements of Regulatory Guide 1.23 (RG 1.23).

This report addresses the requirements stated above for the Carolina Power & Light Company's H. B. Robinson Plant.

2.0 GENERAL REQUIREMENTS TO ADDRESS APPENDIX I TO 10 CFR PART 50

The following items have been identified as the meteorology-related requirements for presentation to the NRC to satisfy the intent of Appendix I:

A. Tabulated critical distances by sector (22.5 degrees centered on cardinal direction) for each of the following:

1. Nearest site boundary

2. Nearest milk cow (to a distance of five miles)

3. Nearest milk goat (to a distance of five miles)

4. Nearest meat animal (to a distance of five miles)

5. Nearest resident (to a distance of five miles)

6. Nearest garden (500 ft^2) (to a distance of five miles)

B. Following RG 1.111 Guidelines, estimated values of χ/Q and D/Q at specified critical distances (above) and at standard distances (0.5, 1.5, 2.5, 3.5, 4.5, 7.5, 15.0, 25.0, 35.0, and 45.0 miles)

C. Description of analytical procedure employed to obtain above estimates including validity and accuracy of the procedure, description of meteorological and plant parameters, and assumptions peculiar to the site.

D. Tabulated monthly and annual joint wind direction, wind speed, and stability class frequency tables with stability class determined from the vertical temperature gradient (ΔT) as specified in Regulatory Guide 1.23.

E. Description of representativeness and quality of available on-site data with respect to long-term climatology.

F. Topographic cross-sections by sector to a distance of ten miles and topographic map of the site environs with a radius of ten miles.

3.0 ANALYSIS AND PRESENTATION

Those items identified in Section 2.0 as general requirements for submittal to the NRC in compliance of Section V.B. of Appendix I to 10 CFR Part 50 have been addressed and are presented below.

3.1 Critical Distances

The critical distances identified in Section 2.0 as item "A" are summarized in Table 3.1.1. Distances greater than the specified five mile limit have been omitted.

3.2 Relative Concentration and Deposition Estimates

The relative concentration estimates (X/Q) have been computed for both the undepleted (X_o/Q) and depleted (X_d/Q) cases at the critical and standard distances. Likewise, the relative deposition estimates (D/Q) have been computed at both sets of distances. The following key identifies the tablulated results:

	Critical Distances	Standard Distances
Undepleted (X/Q)	Table 3.2.1	Table 3.2.2
Depleted (X/Q)	Table 3.2.3	Table 3.2.4
Deposition (D/Q)	Table 3.2.5	Table 3.2.6

Summarizing the results, the maximum (X_o/Q), (X_d/Q), and (D/Q) computed at the site boundary are 9.2E-05 (sec m^{-3}), 8.2E-05 (sec m^{-3}), and 2.7E-07 (m^{-2}), respectively, all of which are projected to occur in the SSE sector at 0.26 miles. The maximum (X/Q)'s and (D/Q) occur in the NNE sector.

3.3 Diffusion Model Description and Assumptions

The use of an elevated or ground release model in calculating the annual average X/Q values was determined by the initial plant parameters. Depletion factors are computed directly from depletion curves presented in RG 1.111 as are the relative deposition rates. For the H. B. Robinson site, the ground release model was considered exclusively.

The annual average relative concentration value is calculated as follows

$$\overline{(X/Q)}D = 2.032 \Sigma_{ij} n_{ij} \left[N x \bar{u} \quad \sum_{zj} \quad (x) \right]^{-1}$$

where:

$(X/Q)D$ - is the average effluent concentration, X, normalized by source strength, Q, at distance, x, in a given downwind direction, D,

2.032 - is $(2/\pi)^{1/2}$ divided by the width, n radians, of a 22.5° sector,

N - is the total number of hours of valid data,

$\bar{U}$ - is the mean wind speed for the hourly observation,

n_{ij} - is the length of time (hours of valid data) weather conditions are observed to be at a given wind direction, wind speed (i), and atmospheric stability (j),

$\sigma_{zj}(X)$ - is the vertical plume spread without volumetric correction at distance, X, for stability class j,

$\Sigma_{zj}(X)$ - is the vertical plume spread with a volumetric correction for a release within the building wake cavity, at a distance, X, for stability class, j; otherwise $\Sigma_{zj}(X) = \sigma_{zj}(X)$;

$$\Sigma_{zj}(X) = (\sigma_{zj}^{2}(X) + 0.5\, D_z^2/\pi)^{1/2} \leq \sqrt{3}\sigma_{zj}(X)$$

where

D_z is the maximum adjacent building height either up- or downwind from the release point;

X is the distance from the release point to the receptor, measured from the lee edge of the complex of adjacent buildings;

Depleted X/Q values were computed by applying the depletion factors provided in Figure 2 of RG 1.111 to the calculated X/Q values. Relative ground deposition rates were calculated as follows:

$$Dep/Q = RDep/\left[\,2\ \mathrm{SIN}\ (11.25)\quad x\,\right]$$

where:

Dep/Q - ground deposition rate

RDep - relative ground deposition rate from curves in RG 1.111

x = calculation distance

The terrain in the vicinity of the plant was assumed open and the appropriate correction factors were applied to the calculated χ/Q and D/Q values. Correction factors for open terrain are provided in RG 1.111.

3.4 Joint Frequency Tables

The joint frequency tables for the period January 1, 1975 to December 31, 1975 were generated on a monthly and annual period of record for each stability class (A-G), the composite (all classes) case, and for each sensor height (10.67 and 60.96 meters). The tabulation consisting of 208 tables is attached as Appendix 1 (key provided). It is summarized by stability class frequency (for 10.67 meter level only), most frequent wind direction, and mean wind speed in Tables 3.4.1 - 3.4.3, respectively, for the 10.67 meter level, and in Tables 3.4.4 - 3.4.5 for the 60.96 meter level.

3.5 Comparison of On-Site Data with Long Term Data

Wind speed and direction measured on-site for the period January 1, 1975 thru December 31, 1975 was compared with the 1941 - 1970 standard climatological normals for the National Weather Service observation station at the Columbia, S. C. Metropolitan Airport located approximately 65 miles southwest of the Robinson site. The results of the comparison are as follows:

	Columbia Metropolitan Airport (1941 - 1970 - approximately 10 m level)	Robinson Site (1/1/75 - 12/31/75) 10.67 m	Robinson Site (1/1/75 - 12/31/75) 60.96 m
Mean Wind Speed (mph)	7.0	5.0	9.1
Prevailing Wind Direction	SW	SSW	SSW

These results indicate that the two years on-site data period is reasonably representative of long term regional conditions.

3.6 Meteorological Data

The meteorological data used for the analysis is on-site data for the period: January 1, 1975 thru December 31, 1975.

3.7 Topographic Cross-Sections and Topographic Map

A topographic base map (1:250,000) is given in Figure 3.7.1 for the H. B. Robinson Plant area to a distance of ten miles. The topographic cross-sections representing the maximum elevation versus distance for each sector centered on the cardinal direction is given in Figures 3.7.2 - 3.7.3.

3.8 Airflow Trajectories

The airflow characteristics of the region reflect the modified monsoonal regime which is typical of the southeastern U.S. The prevailing airflow is from the colder continental interior toward the warmer ocean during the winter and the reverse during the summer. The topography of the site region is gently rolling; no hills greater than 60 feet above plant grade exist with ten miles of the site. No significant hill-valley terrain configurations exist which might act to channel and confine airflow trajectories in any particular region.

TABLE 3.1.1

Survey of Critical Distances (Miles)
Robinson Site
Ground Release

Sector	Site Boundary	Milk Cow	Milk Goat	Meat Animal	Nearest Resident	Nearest Garden
NNE	1.26	---	---	1.65	1.51	1.43
NE	1.01	---	---	1.16	1.13	1.11
ENE	0.86	---	---	2.41	0.85	1.11
E	0.61	---	---	3.12	0.94	3.08
ESE	0.50	---	---	1.99	0.66	0.64
SE	0.29	---	---	---	0.30	1.93
SSE	0.26	---	---	---	0.34	0.79
S	0.28	---	---	2.32	0.28	0.26
SSW	0.29	4.54	---	2.08	0.29	0.39
SW	0.36	---	---	2.27	0.49	0.53
WSW	0.36	---	---	2.69	0.37	0.47
W	0.50	---	---	3.97	0.49	0.49
WNW	0.55	---	---	4.07	0.66	0.59
NW	1.23	---	---	1.60	1.33	2.00
NNW	1.89	---	---	2.84	2.89	2.99
N	1.94	---	---	2.93	2.56	2.89

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.2.1

Undepleted Mean Relative Concentration ($sec\,m^{-3}$)
Robinson Site
Ground Release

Sector	Site Boundary	Milk Cow	Milk Goat	Meat Animal	Nearest Resident	Nearest Garden
NNE	5.1E-06	---	---	2.8E-06	3.4E-06	3.8E-06
NE	6.3E-06	---	---	4.5E-06	4.8E-06	5.0E-06
ENE	4.8E-06	---	---	4.9E-07	4.9E-06	2.6E-06
E	9.3E-06	---	---	2.9E-07	3.7E-06	3.0E-07
ESE	1.5E-05	---	---	7.9E-07	9.6E-06	1.0E-05
SE	4.6E-05	---	---	---	4.3E-05	1.1E-06
SSE	9.2E-05	---	---	---	5.8E-05	1.4E-05
S	6.0E-05	---	---	8.6E-07	6.0E-05	6.8E-05
SSW	4.4E-05	2.1E-07	---	8.6E-07	4.4E-05	2.7E-05
SW	2.2E-05	---	---	5.2E-07	1.4E-05	1.2E-05
WSW	1.3E-05	---	---	2.2E-07	1.2E-05	8.5E-06
W	5.7E-06	---	---	7.9E-08	5.9E-06	5.9E-06
WNW	4.8E-06	---	---	7.6E-08	3.6E-06	4.3E-06
NW	1.3E-06	---	---	7.0E-07	1.1E-06	4.4E-07
NNW	8.3E-07	---	---	3.8E-07	3.7E-07	3.4E-07
N	1.7E-06	---	---	7.6E-07	9.8E-07	7.8E-07

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.2.2

Undepleted Mean Relative Concentration (secm^{-3})
Robinson Site
Ground Release

Sector	Standard Distances (miles) 0.5	1.5	2.5	3.5	4.5	7.5	15.0	25.0	35.0	45.0
NNE	3.5E-05	3.4E-06	1.2E-06	6.6E-07	4.3E-07	2.0E-07	7.6E-08	4.0E-8	2.6E-08	1.9E-08
NE	2.6E-05	2.5E-06	9.0E-07	4.9E-07	3.2.E-07	1.5E-07	5.6E-08	2.9E-08	1.9E-08	1.4E-08
ENE	1.3E-05	1.3E-06	4.6E-07	2.5E-07	1.6E-07	7.5E-08	2.8E-08	1.5E-08	9.8E-09	7.2E-09
E	1.3E-05	1.2E-06	4.4E-07	2.4E-07	1.5E-07	7.1E-08	2.7E-08	1.4E-08	9.4E-09	6.9E-09
ESE	1.5E-05	1.4E-06	5.1E-07	2.7E-07	1.8E-07	8.2E-08	3.1E-08	1.6E-08	1.1E-08	7.9E-09
SE	1.9E-05	1.8E-06	6.5E-07	3.5E-07	2.3-07	1.1E-07	4.1E-08	2.1E-08	1.4E-08	1.0E-08
SSE	3.1E-05	2.9E-06	1.0E-06	5.7E-07	3.8E-07	1.8E-07	6.8E-08	3.6E-08	2.4E-08	1.7E-08
S	2.2E-05	2.1E-06	7.5E-07	4.1E-07	2.7E-07	1.3E-07	4.9E-08	2.6E-08	1.7E-08	1.3E-08
SSW	1.8E-05	1.7E-06	6.0E-07	3.2E-07	2.1E-07	9.6E-08	3.6E-08	1.9E-08	1.2E-08	1.0E-09
SW	1.3E-05	1.2E-06	4.3E-07	2.3E-07	1.5E-07	6.7E-08	2.5E-08	1.3E-08	8.5E-09	6.2E-09
WSW	7.7E-06	7.3E-07	2.5E-07	1.3E-07	8.5E-08	3.8E-08	1.4E-08	7.3E-09	4.8E-09	3.5E-09
W	5.7E-06	5.5E-07	1.9E-07	9.9E-08	6.4E-08	2.9E-08	1.1E-08	5.4E-09	3.6E-09	2.6E-09
WNW	5.6E-06	5.4E-07	1.9E-07	9.9E-08	6.4E-08	2.9E-08	1.1E-08	5.6E-09	3.7E-09	2.7E-09
NW	8.5E-06	8.1E-07	2.8E-07	1.5E-07	9.7E-08	4.5E-08	1.7E-08	8.7E-09	5.7E-09	4.2E-09
NNW	1.4E-05	1.4E-06	4.8E-07	2.6E-07	1.7E-07	7.8E-08	2.9E-08	1.5E-08	1.0E-08	7.4E-09
N	3.0E-05	2.9E-06	1.0E-06	5.6E-07	3.7E-07	1.7E-07	6.5E-08	3.4E-08	2.2E-08	1.7E-08

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.2.3

Depleted Mean Relative Concentration
Robinson Site
Ground Release

Sector	Site Boundary	Milk Cow	Milk Goat	Meat Animal	Nearest Resident	Nearest Garden
NNE	3.9E-06	---	---	2.1E-06	2.6E-06	2.9E-06
NE	5.0E-06	---	---	3.5E-06	3.8E-06	3.9E-06
ENE	3.9E-06	---	---	3.5E-06	4.0E-06	2.0E-06
E	7.8E-06	---	---	2.0E-07	2.9E-06	2.0E-07
ESE	1.3E-05	---	---	5.8E-07	7.9E-06	8.3E-06
SE	4.1E-05	---	---	---	3.8E-05	7.8E-07
SSE	8.2E-05	---	---	---	5.1E-05	1.1E-05
S	5.3E-05	---	---	6.1E-07	5.3E-05	6.1E-05
SSW	3.9E-05	1.3E-07	---	6.2E-07	3.9E-05	2.3E-05
SW	1.9E-05	---	---	3.7E-07	1.2E-05	9.9E-06
WSW	1.1E-05	---	---	1.5E-07	1.1E-05	7.2E-06
W	4.9E-06	---	---	5.2E-08	5.0E-06	5.0E-06
WNW	4.0E-06	---	---	5.0E-08	3.0E-06	3.6E-06
NW	9.9E-07	---	---	5.2E-07	8.2E-07	3.2E-07
NNW	6.1E-07	---	---	2.6E-07	2.5E-07	2.4E-07
N	1.2E-06	---	---	5.2E-07	6.9E-07	5.4E-07

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.2.4

Depleted Mean Relative Concentration (secm^{-3})
Robinson Site
Ground Release

Sector	Standard Distances (miles) 0.5	1.5	2.5	3.5	4.5	7.50	15.0	25.0	35.0	45.0
NNE	2.9E-05	2.6E-06	8.6E-07	4.4E-07	2.8E-07	1.2E-07	3.7E-08	1.7E-08	9.6E-09	6.3E-09
NE	2.2E-05	1.9E-06	6.3E-07	3.2E-07	2.0E-07	8.5E-08	2.7E-08	1.2E-08	7.0E-09	4.6E-09
ENE	1.1E-05	9.9E-07	3.2E-07	1.7E-07	1.0E-07	4.3E-08	1.4E-08	6.2E-09	3.6E-09	2.[illegible]-09
E	1.1E-05	9.3E-07	3.1E-07	1.6E-07	9.9E-08	4.1E-08	1.3E-08	5.9E-09	3.4E-09	2.3E-09
ESE	1.3E-05	1.1E-06	3.6E-07	1.8E-07	1.1E-07	4.8E-08	1.5E-08	6.8E-09	3.9E-09	2.6E-09
SE	1.6E-05	1.4E-06	4.6E-07	2.4E-07	1.5E-07	6.2E-08	2.0E-08	8.9E-09	5.2E-09	3.4E-09
SSE	2.6E-05	2.2E-06	7.4E-07	3.8E-07	2.4E-07	1.0E-07	3.3E-08	1.5E-08	8.6E-09	5.7E-09
S	1.9E-05	1.6E-06	5.3E-07	2.8E-07	1.7E-07	7.4E-08	2.4E-08	1.1E-08	6.3E-09	4.2E-09
SSW	1.5E-05	1.3E-06	4.2E-07	2.2E-07	1.3E-07	5.6E-08	1.8E-08	7.8E-09	4.5E-09	3.0E-09
SW	1.1E-05	9.3E-07	3.0E-07	1.5E-07	9.4E-08	3.9E-08	1.2E-08	5.4E-09	3.1E-09	2.0E-09
WSW	6.5E-06	5.5E-07	1.8E-07	8.8E-08	5.5E-08	2.2E-08	7.0E-09	3.0E-09	1.8E-09	1.[illegible]-09
W	4.9E-06	4.2E-07	1.3E-07	6.6E-08	4.1E-08	1.7E-08	5.2E-09	2.3E-09	1.3E-09	8.5E-10
WNW	4.7E-06	4.1E-07	1.3E-07	6.6E-08	4.1E-08	1.7E-08	5.3E-09	2.4E-09	1.4E-09	8.9E-10
NW	7.2E-06	6.1E-07	2.0E-07	1.0E-07	6.2E-08	2.6E-08	8.2E-09	3.6E-09	2.1E-09	1.4E-09
NNW	1.2E-05	1.0E-06	3.4E-07	1.7E-07	1.1E-07	4.5E-08	1.4E-08	6.4E-09	3.7E-09	2.4E-09
N	2.5E-05	2.2E-06	7.2E-07	3.7E-07	2.3E-07	9.8E-08	3.2E-08	1.4E-08	8.2E-09	5.4E-09

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.2.5

Mean Relative Deposition (M^{-2})
Robinson Site
Ground Release

Sector	Site Boundary	Milk Cow	Milk Goat	Meat Animal	Nearest Resident	Nearest Garden
NNE	1.5E-09	---	---	7.3E-09	9.1E-09	1.1E-08
NE	2.4E-09	---	---	1.6E-08	1.7E-08	1.8E-08
ENE	2.0E-08	---	---	1.4E-09	2.1E-08	1.0E-08
E	3.2E-08	---	---	5.4E-10	1.1E-08	5.6E-10
ESE	4.7E-08	---	---	1.7E-09	2.9E-08	3.1E-08
SE	1.4E-07	---	---	---	1.4E-07	2.2E-09
SSE	2.7E-07	---	---	---	1.8E-07	3.9E-08
S	2.0E-07	---	---	1.9E-09	2.0E-07	2.2E-07
SSW	2.5E-07	5.5E-10	---	3.2E-09	2.5E-07	1.6E-07
SW	1.4E-07	---	---	2.1E-09	9.2E-08	7.5E-08
WSW	1.2E-07	---	---	1.2E-09	1.2E-07	7.8E-08
W	4.1E-08	---	---	2.9E-10	4.3E-08	4.3E-08
WNW	3.5E-08	---	---	2.8E-10	2.5E-08	3.1E-08
NW	6.2E-09	---	---	3.1E-09	5.0E-09	1.8E-09
NNW	2.7E-09	---	---	1.0E-09	9.8E-10	9.1E-10
N	4.1E-09	---	---	1.5E-09	2.1E-09	1.6E-09

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.2.6

Mean Relative Deposition (m^{-2})
Robinson Site
Ground Release

	Standard Distances (miles)									
ector	0.5	1.5	2.5	3.5	4.5	7.5	15.0	25.0	35.0	45.0
IE	1.3E-07	9.3E-09	2.6E-09	1.2E-09	7.0E-10	2.6E-10	7.0E-11	2.7E-11	1.4E-11	8.2E-12
:	1.1E-07	8.2E-09	2.3E-09	1.1E-09	6.2E-10	2.3E-10	6.2E-11	2.4E-11	1.2E-11	7.2E-12
IE	6.2E-08	4.5E-09	1.2E-09	5.8E-10	3.4E-10	1.2E-10	3.4E-11	1.3E-11	6.6E-12	3.9E-12
	4.5E-08	3.2E-09	9.0E-10	4.2E-10	2.4E-10	8.9E-11	2.4E-11	9.3E-12	4.8E-12	2.8E-12
E	4.7E-08	3.4E-09	9.5E-10	4.4E-10	2.6E-10	9.5E-11	2.6E-11	9.8E-12	5.1E-12	3.0E-12
:	6.0E-08	4.3E-09	1.2E-09	5.5E-10	3.2E-10	1.2E-10	3.2E-11	1.2E-11	6.3E-12	3.8E-12
E	9.4E-08	6.7E-09	1.9E-09	8.7E-10	5.1E-10	1.9E-10	5.1E-11	1.9E-11	1.0E-11	6.0E-12
	7.8E-08	5.6E-09	1.6E-09	7.2E-10	4.2E-10	1.5E-10	4.2E-11	1.6E-11	8.3E-12	4.9E-12
W	1.0E-07	7.4E-09	2.1E-09	9.5E-10	5.6E-10	2.0E-10	5.6E-11	2.1E-11	1.1E-11	6.5E-12
	8.3E-08	6.0E-09	1.7E-09	7.7E-10	4.5E-10	1.7E-10	4.5E-11	1.7E-11	8.8E-12	5.3E-12
W	7.1E-08	5.1E-09	1.4E-09	6.6E-10	3.8E-10	1.4E-10	3.8E-11	1.5E-11	7.5E-12	4.5E-12
	4.1E-08	3.0E-09	8.3E-10	3.9E-10	2.2E-10	8.3E-11	2.2E-11	8.6E-12	4.4E-12	2.6E-12
W	4.1E-08	3.0E-09	8.3E-10	3.8E-10	2.2E-10	8.2E-11	2.2E-11	8.5E-12	4.4E-12	2.6E-12
	5.1E-08	3.7E-09	1.0E-09	4.7E-10	2.8E-10	1.0E-10	2.8E-11	1.1E-11	5.4E-12	3.2E-12
W	6.8E-08	4.9E-09	1.4E-09	6.4E-10	3.7E-10	1.4E-10	3.7E-11	1.4E-11	7.3E-12	4.3E-12
	1.1E-07	8.0E-09	2.2E-09	1.0E-09	6.0E-10	2.2E-10	6.0E-11	2.3E-11	1.2E-11	7.0E-12

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.4.1

Stability Class Frequency (%) 1975
Robinson Site
Ground Release

	A	B	C	D	E	F	G	ALL
JAN	3	2	4	31	35	15	10	
FEB	0	0	0	28	50	13	9	
MAR	16	3	5	28	29	10	9	
APR	46	6	6	15	17	6	4	
MAY	52	5	2	14	16	8	2	
JUN	37	4	4	20	22	10	4	
JUL	30	3	4	29	28	6	0	
AUG	26	4	3	19	31	14	2	
SEP	10	2	5	44	29	8	2	
OCT	18	4	4	24	26	16	9	
NOV	16	3	4	23	22	11	20	
DEC	9	3	3	30	24	99	22	
ANNUAL	22	3	4	25	27	11	8	

Period of Record: January 1, 1975 to December 31, 1975

10.67 Meters

TABLE 3.4.2
Sensor Height 10.67 M

Most Frequent Wind Direction
Robinson Site
Ground Release

	A	B	C	D	E	F	G	ALL
JAN	SSW	SW	SW+	WSW	SW	SSW	SSW+	SW
FEB	-	-	-	NNE	SW	SW+	S	SW
MAR	NE+	ENE	NE	SW	NNW	SSW	N	SSW
APR	SSW+	S	SSW	SSW+	NNW	NNW	NNW	NNW
MAY	NNE	SE+	SE	SSE	NNW	S	SSW	SSW
JUN	SW	SW	SW	NNE	SSW	S	S+	SW
JUL	S	SSW	SSE	S	SSW	SSW	-	SSW
AUG	SW	ENE+	SW	NNE	SSW	SSW	WSW+	SSW
SEP	NE	NE	NE	NNE	S	NNW	SW+	NE
OCT	SW	ESE	SE	NNE	N+	NNW	NNW	NNE
NOV	ENE+	NE	NNE+	SSE	S	NNW	NNW	NNW
DEC	SSW	WSW	NW+	NE	SSW+	NNW+	NNW	NNW
ANNUAL	SSW	ENE	NE	NNE	SSW	SSW	NNW	SSW

Period of Record: January 1, 1975 to December 31, 1975.

(+)- and others

TABLE 3.4.3
Sensor Height 10.67 M

Mean Wind Speed (mps)
Robinson Site
Ground Release

	A	B	C	D	E	F	G	ALL
JAN	3.43	3.91	3.66	2.37	2.54	1.04	0.64	2.17
FEB	-	-	-	3.10	2.52	1.37	0.71	2.37
MAR	3.75	3.23	3.04	3.07	2.16	1.77	0.69	2.59
APR	3.33	2.80	2.32	2.32	1.56	1.02	0.51	2.52
MAY	2.14	1.98	1.99	1.79	1.09	0.83	0.63	1.77
JUN	2.70	2.47	2.61	2.37	1.42	0.99	0.57	2.09
JUL	2.24	2.43	2.32	1.83	1.23	0.89	-	1.75
AUG	2.44	1.89	1.72	1.86	1.26	0.91	0.71	1.66
SEP	3.53	2.93	2.54	3.07	2.16	1.38	0.77	2.63
OCT	3.30	3.04	3.06	3.18	2.41	1.77	1.58	2.62
NOV	2.80	2.72	2.89	2.81	2.03	1.53	1.50	2.23
DEC	3.49	3.54	3.31	2.92	2.70	1.84	1.68	2.57
ANNUAL	2.80	2.70	2.69	2.65	2.00	1.31	1.19	2.25

Period of Record: January 1, 1975 to December 31, 1975

TABLE 3.4.4.
Sensor Height 60.96 M

Most Frequent Wind Direction
Robinson Site
Ground Release

	A	B	C	D	E	F	G	ALL
JAN	NE	SW	SW	ENE	SW	SW	S	SW
FEB	-	-	-	NNE	SW	SW+	SSW	SW
MAR	N	ENE	NE	W	NNW	W	SSW+	SSW
APR	SSW	SSW	SSW	SSW	N	N	WSW	SSW
MAY	NNE+	SSE	NNE	SSE	SSE	WSW	WSW+	NNE
JUN	SW	SW	SW	SSW	SW+	SSW	W	SW
JUL	S	SSW+	SE	S+	SSW	SSW	-	S
AUG	SW	ENE+	N	NNE	SSW	SSW	SSW	SSW
SEP	NE	NE	NNE	NNE	S	N	WSW+	NE
OCT	SW	ESE	SE	N	N	SW	WSW	N
NOV	N	NNE+	NNE	SSW	S	W+	SW	S
DEC	SSW	WSW	W	NNE	SSW	SSW	SSW	SSW
ANNUAL	SSW	ENE	NNE	NNE	SSW	SSW	SSW	SSW

Period of Record: January 1, 1975 to December 31, 1975.

(+) - and others

TABLE 3.4.5
Sensor Height 60.96 M
Mean Wind Speed (mps)
Robinson Site
Ground Release

	A	B	C	D	E	F	G	ALL
JAN	5.50	5.67	5.43	3.76	4.71	3.61	3.14	4.15
FEB	-	-	-	4.67	4.64	3.92	3.63	4.47
MAR	6.60	5.62	5.44	5.87	4.57	4.38	3.61	5.25
APR	5.93	6.09	5.48	5.98	4.99	4.63	2.23	5.55
MAY	3.62	4.07	4.11	4.09	3.46	3.35	2.89	3.66
JUN	4.37	3.97	4.44	4.69	4.13	4.11	3.84	4.32
JUL	3.27	3.88	3.60	3.11	3.11	3.31	-	3.20
AUG	3.61	2.87	2.89	3.33	3.16	3.04	2.93	3.27
SEP	4.70	3.85	3.32	4.03	3.47	2.91	3.59	3.80
OCT	4.32	3.55	3.12	4.60	3.82	3.30	3.04	3.90
NOV	3.53	3.04	4.16	4.25	4.10	3.44	2.79	3.67
DEC	4.32	4.70	3.62	3.99	4.67	3.81	2.88	3.93
ANNUAL	4.36	4.23	4.19	4.25	4.08	3.56	3.06	4.05

Period of Record: January 1, 1975 to December 31, 1975

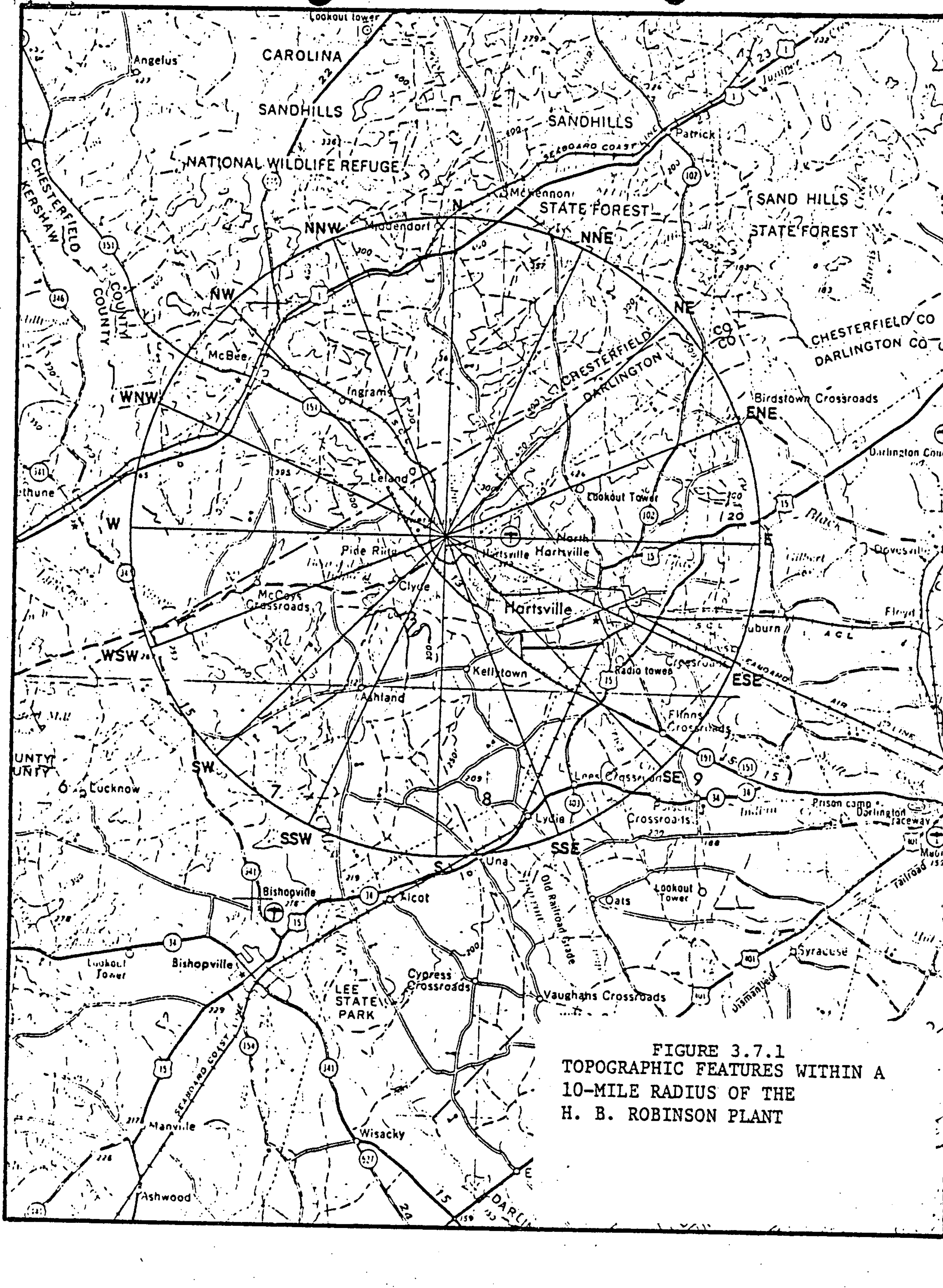

FIGURE 3.7.1
TOPOGRAPHIC FEATURES WITHIN A
10-MILE RADIUS OF THE
H. B. ROBINSON PLANT

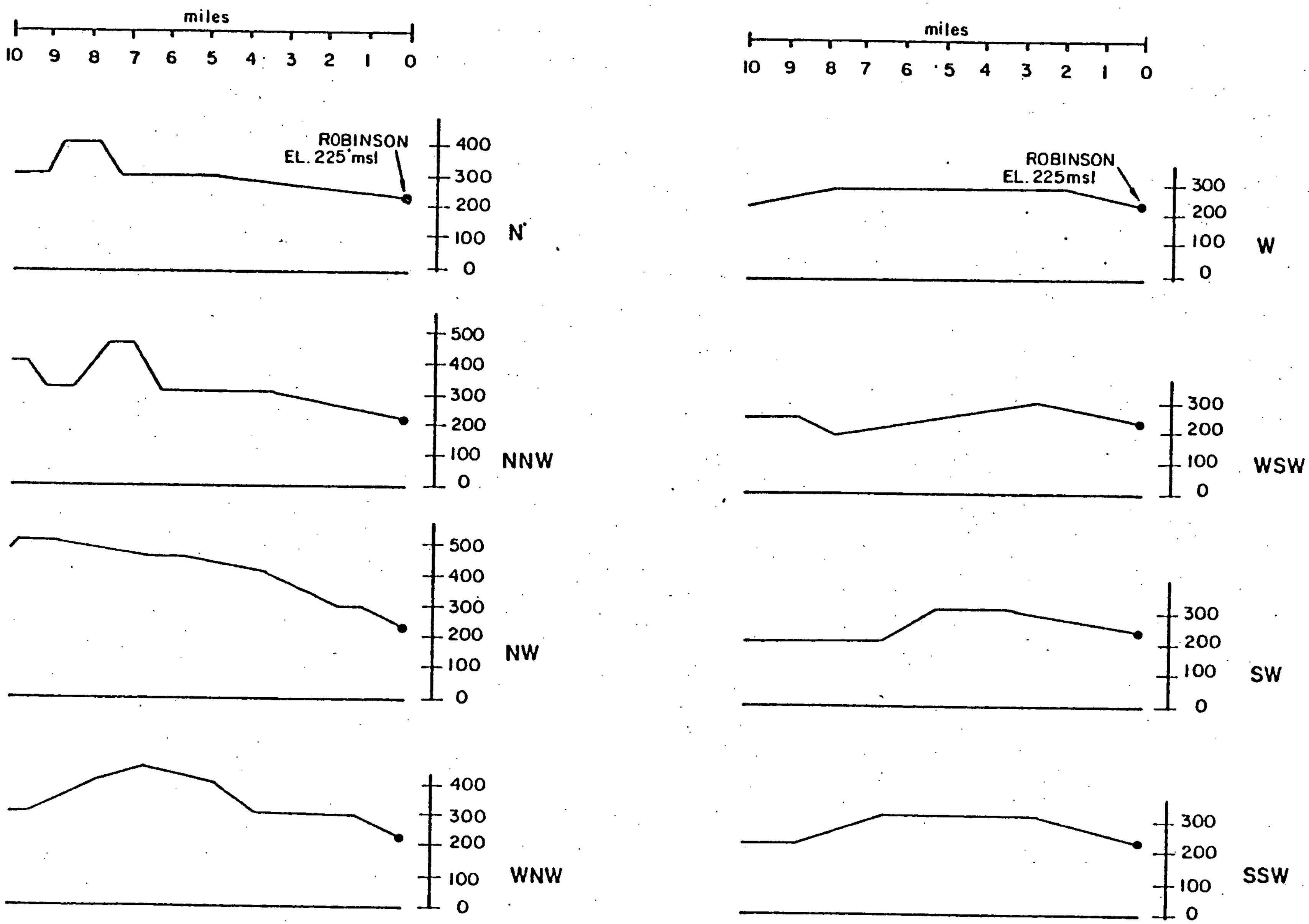

FIGURE 3.7.2

CROSS SECTIONS FOR MAJOR COMPASS POINTS WITHIN A 10-MILE RADIUS OF H. B. ROBINSON PLANT

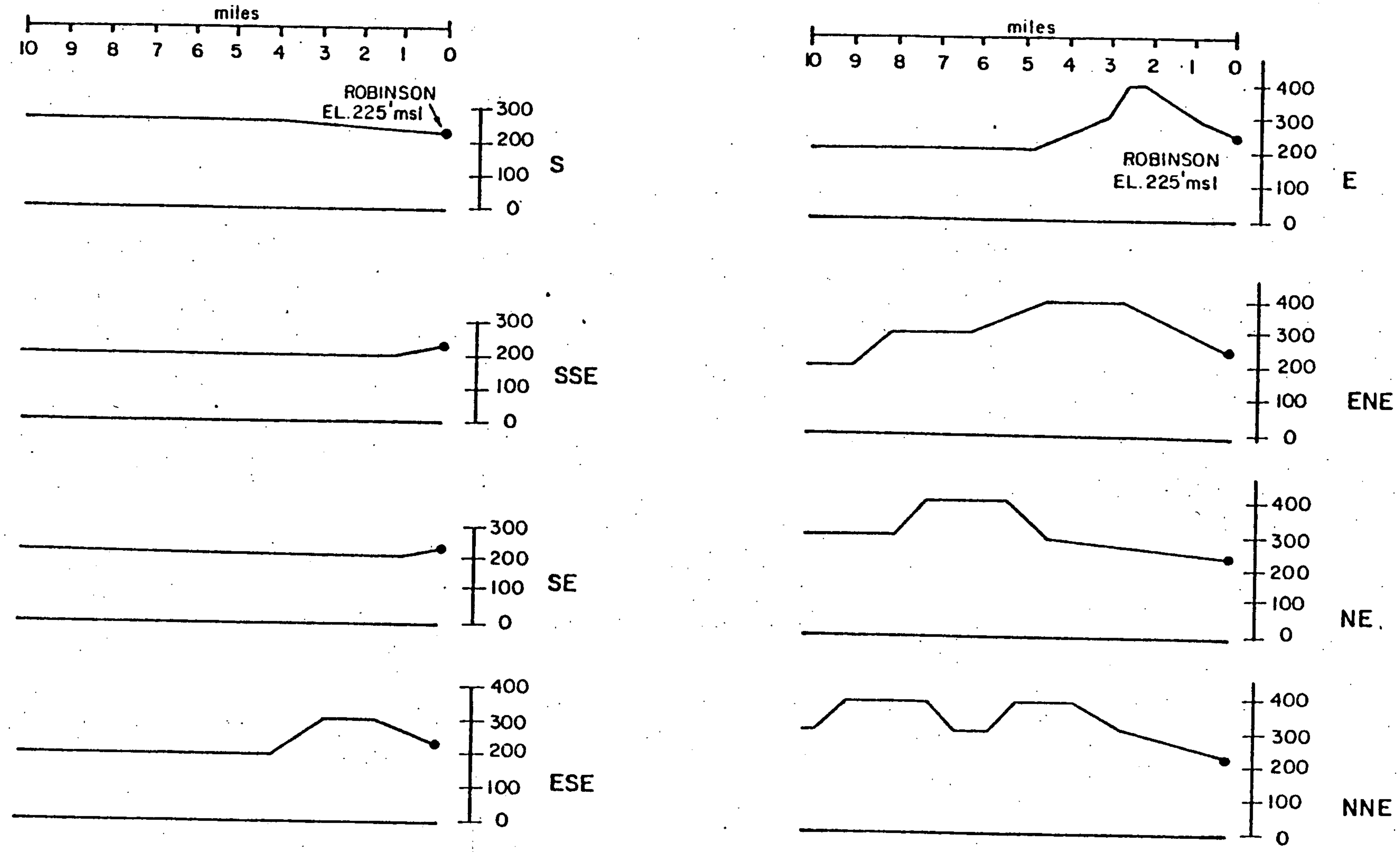
miles
10 9 8 7 6 5 4 3 2 1 0
ROBINSON
EL.225'msl
300
200
100
0
S
SSE
SE
400
ESE
E
ENE
NE
NNE

FIGURE 3.7.3