December 28, 1989

Subject: Offsite Dose Calculation Manual
Revision 27

The General Office Radiation Protection Staff is transmitting to you this date, Revision 27 of the Offsite Dose Calculation Manual. As this revision only affects Oconee Nuclear Station, the approval of other station managers is not required. Please update your copy No. 30, and discard the affected pages.

REMOVE THESE PAGES		INSERT THESE PAGES	
Figure A1.0-1	Rev. 11	Figure A1.0-1	Rev. 27
Figure A1.0-2 (all four pages)	No Rev. *	Figure A1.0-2 (all four pages)	Rev. 27
A-3	Rev. 18	A-3	Rev. 27
A-5	Rev. 23	A-5	Rev. 27
A-6	Rev. 27	A-6	Rev. 27
A-7	Rev. 15	A-7	Rev. 27
A-8	Rev. 23	A-8	Rev. 27
A-10	Rev. 11	A-10	Rev. 27
A-14	Rev. 23	A-14	Rev. 27
Pages A-16 thru	Rev. 23	Pages A-16 thru	Rev. 27
Page A-24	Rev. 23	Page A-24	Rev. 27
A-25	Rev. 23	A-25	Rev. 27
Table A5.0-2	Rev. 21	Table A5.0-2	Rev. 27

NOTE: As this letter, with it's attachments, contains "LOEP" information, please insert this letter in front of the December 27, 1989.

Approval Date: Dec. 21, 1989

Effective Date: 1/1/90

Mary L. Birch

Mary L. Birch
Radiation Protection Manager

Approval Date: Dec. 19, 1989

Effective Date: 1/1/90

M. S. Tuckman

M. S. Tuckman, Manager
Oconee Nuclear Station

If you have any questions concerning Revision 27, please call Jim Stewart at (704) 373-5444.

James M. Stewart, Jr.

James M. Stewart, Jr.
Scientist
Radiation Protection

Enclosure

9003090350 900228
PDR ADOCK 05000269
P PNU

JUSTIFICATIONS FOR REVISION 27

Figure A1.0-1	Replaced figure with CAD drawing. Updated to reflect actual station operation and/or to provide additional information.
Figure A1.0-2 (4 pages)	Replaced figure with CAD drawing. Updated to reflect actual station operation and/or to provide additional information.
Page A-3	Changed wording to reflect actual station operation. Changed the minimum dilution flow rate available from 17054 gpm to 3.41E+04 gpm in order to take credit for the additional dilution flow provided by the Keowee Hydro Fire Protection-LWR Mixing Line.
Page A-5	Corrected typo errors in Table Numbers.
Page A-6	Provided additional information for clarity purposes and changed mileage information for consistency purposes.
Page A-7	Corrected typo errors in Table Numbers.
Page A-8	Corrected "dispersion/dispersion" to "dispersion/deposition". Provided additional information for clarity purposes and changed mileage information for consistency purposes.
Page A-10	Changed wording to reflect actual station operation.
Page A-14	Added "is" to sentence and corrected "SAS" to "gas".
Section A4.3 Pages A-16 thru A-24	Updated section using dose calculations based on 1989 Effluent Release data (first nine months) and the 1989 Land Use Census Data.
Page A-25	Changed wording to reflect actual station operation. Changed the dates the latest Land Use Census was preformed.
Table A5.0-2	Changed per attached August 29, 1989 letter from C. T. Yongue.

August 29, 1989

Dr. W. A. Haller, Manager
Nuclear Technical Services

ATTENTION: [redacted]

SUBJECT: Oconee Nuclear Station
Radiological Environmental Monitoring Program
File: OS-778.00

I am making the requests listed below as a result of the closing of the Clemson Water Plant. As of July 1 of this year, the University's drinking water plant was shut down with no plans to restart the facility. Clemson University now obtains drinking water from the Anderson water system.

- Delete the drinking water location 065, Clemson, from Table A5.0-2 and Figure A5.0-1 at the next revision to the ODCM. Redmarked copies of the needed changes are attached. In addition to the deletion, please correct the sector listed for location 073 from NNW to NW.

- Identify in the next Semi-Annual Effluent Release Report the deletion of the Clemson drinking water sample point from Oconee's Radiological Environmental Monitoring Program.

- Review the ODCM and make any necessary changes to effluent dose calculation parameters due to the plant's closing.

- Review the need to add a drinking water location further downstream of Anderson, if possible. Oconee Technical Specification 4.11, Table 4.11-1, specifies that the monitoring program include 3 drinking water sites. Anderson is currently the only site downstream of plant discharges. Seneca and Greenville both use Lake Keowee as their reservoir. We have installed a sampler to collect from the water used to supply the steam plant at the University. This water is collected from the same line that fed the water plant. The difference is that the sample will be raw water rather than finished water. This sample point will be considered a special supplemental sample since it is neither a drinking water or surface water sample, and it will not be included in the ODCM. The sample results will be trended and used in the evaluation of surface water and drinking water results as needed.

Please contact Libby Wehrman at extension 3207 to discuss these requests.

Charlie Yongue

C. T. Yongue, Manager
Radiation Protection

xc: J. W. Crain
C. F. Lan
S. A. Coy
J. J. Sevic
M. D. Lane

TABLE [illegible]-2
(1 OF 1)

OCONEE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS
(OTHER SAMPLING LOCATIONS)

CODE:

W - Weekly (≤ 7 days)
SM - Semimonthly (≤ 15 days)
M - Monthly (≤ 31 days)
SA - Semiannually (≤ 184 days)

	SAMPLING LOCATION DESCRIPTION	Air Radioiodines and Particulates	Surface Water	Drinking Water	Shoreline Sediment	Milk	Fish	Broadleaf Vegetation
028	Site Boundary (0.5 miles S)							M
060	New Greenville Water Intake Rd. (2.5 miles NNE) *	W		M			SA	M
061	Old Hwy. 183 (1.5 miles SSW)	W						
062	Lake Keowee/Hydro Intake (0.7 mile ENE) (CONTROL)		M					
063	Lake Hartwell - Hwy 183 Bridge (0.8 mile ESE) (000.7)		M		SA		SA	
064	Seneca (6.7 miles SW) (004.1) (CONTROL)			M				
065	Clemson (8.1 miles SSE) (006.1) DELETED			M				
066	Anderson (19.0 miles SSE) (012) (CONTROL FOR MILK ONLY)			M		SM		
067	Lawrence Ramsey Bridge, Hwy 27 (4.2 miles SSE) (005.2)				SA		SA	
068	High Falls County Park (2.0 miles W) (CONTROL)				SA			
069	Powell Residence (4.5 miles WNW) (002.1)					SM		
071	Clemson Dairy (10.3 miles SSE) (006.3)					SM		
072	Hwy 130 (1.7 miles S)	W						
073	Tamassee Dar School (9.0 miles NNW) (CONTROL)	W						M
074	Keowee Key Resort (1.7 miles NNW)	W						
075	Willimon Residence (6.0 miles NE) DELETED					SM		

* Control for Fish only

Rev. 21
8/1/88

You may place this entire package behind the "Oconee" tab replacing only Figures A5.0-1 (page 1 of 2) and Figure A5.0-1 (page 2 of 2).

(last two pages of existing Oconee document)

APPENDIX A

OCONEE NUCLEAR STATION

SITE SPECIFIC INFORMATION

APPENDIX A-TABLE OF CONTENTS

A1.0 OCONEE NUCLEAR STATION RADWASTE SYSTEMS

A1.1 LIQUID RADWASTE PROCESSING

The liquid radwaste system at Oconee Nuclear Station (ONS) is used to collect and treat fluid chemical and radiochemical by-products of unit operation. The systems produce effluents which can be reused in the plant or discharged in small, dilute quantities to the environment. The means of treatment vary with waste type and desired product in the various systems:

A) Filtration - waste sources are filtered prior to processing as necessary.

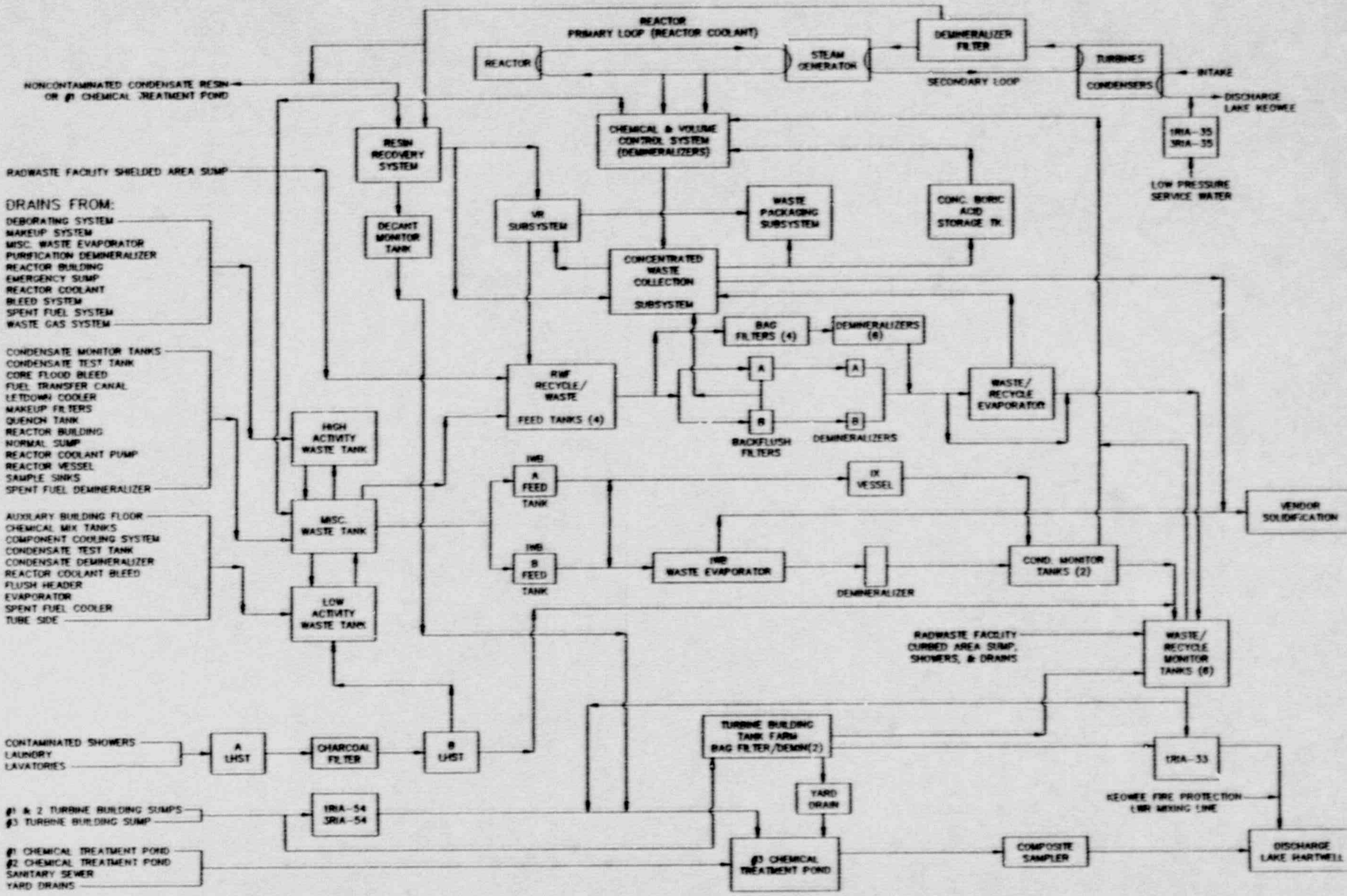
B) Ion Exchange - ion exchange is used to remove radioactive ions from solution. Also, ion exchange is normally used in removing cations (cobalt, manganese) and anions (chloride, fluoride) from evaporator feed and/or distillates in order to purify the distillates for reuse as makeup water. Distillate from the Waste Evaporator System or the Waste and Recycle Evaporator can be treated by this method.

C) Gas Stripping - removal of gaseous radioactive fission products is accomplished in Evaporators and the venting of atmospheric holdup tanks.

D) Distillation - production of pure water from the waste by boiling it away from the contaminated solution which originally contained it is accomplished by both evaporators. Proper control of the process will yield water which can be reused for makeup. Polishing of this product can be achieved by ion exchange as pointed out above.

E) Concentration - in all Evaporators, radioactivity and dissolved chemicals are concentrated as water is boiled away. In the case of the Waste Evaporator, the volume of water containing waste chemicals and radionuclides is reduced so that the waste may be more easily and cheaply solidified and shipped for burial. In the case of the VR dryer, all water is removed and the dry salts are solidified for burial.

Figure A1.0-1 is a schematic representation of the liquid radwaste system at Oconee.



LIQUID RADWASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-1

REVISION 27
1/1/90
N89120A

A1.2 GASEOUS WASTE PROCESSING

The purpose of the gaseous waste disposal system is to:

(1) Maintain a non-oxidizing cover gas of nitrogen in tanks and equipment that contain potentially radioactive gas.

(2) Hold up radioactive gas for decay.

(3) Release gases (radioactive or non-radioactive) to the atmosphere under controlled conditions.

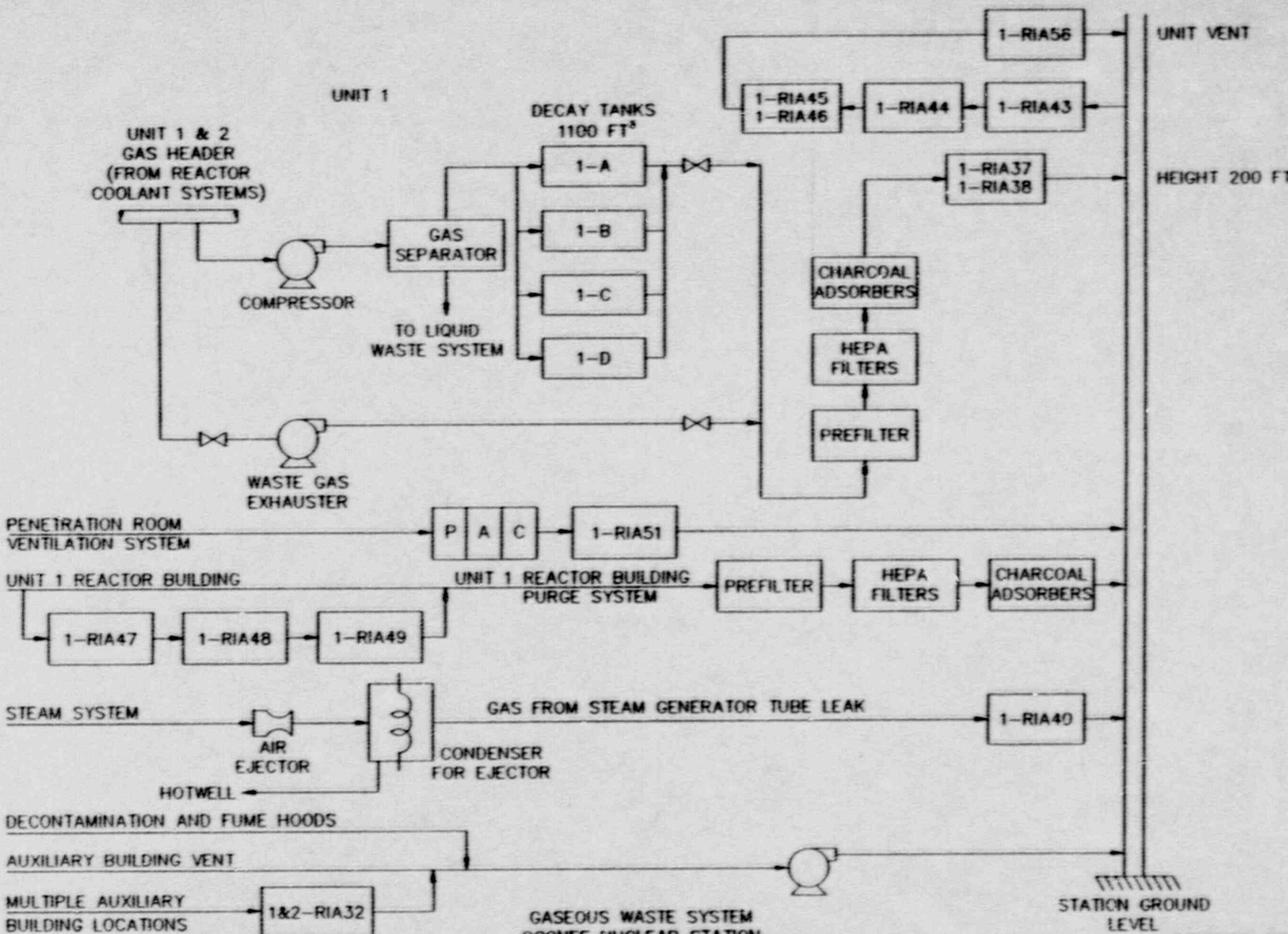
During power operation of the facilities, radioactive materials released to the atmosphere in gaseous effluents include low concentrations of fission product noble gases (krypton and xenon), halogens (mostly iodines), tritium contained in water vapor and particulate material including both fission products and activated corrosion products.

The primary source of gaseous radioactive wastes is from the degassing of the primary coolant during letdown of the cooling water into the various holding tanks. Additional sources of gaseous waste activity include the auxiliary building exhaust, spent fuel area exhaust, the discharge from the steam jet air ejectors, purging of the reactor containment building and ventilation air exhausted from the turbine building.

All components that can contain potentially radioactive gases are vented to a vent header. The vent gases are subsequently drawn from this vent header by one of three waste gas compressors or a waste gas exhauster. The waste gas compressor discharges through a waste gas separator to one of seven waste gas tanks. The waste gas tanks and the waste gas exhauster discharge to the unit vent after passing through a filter bank consisting of a prefilter, an absolute filter, and a charcoal filter.

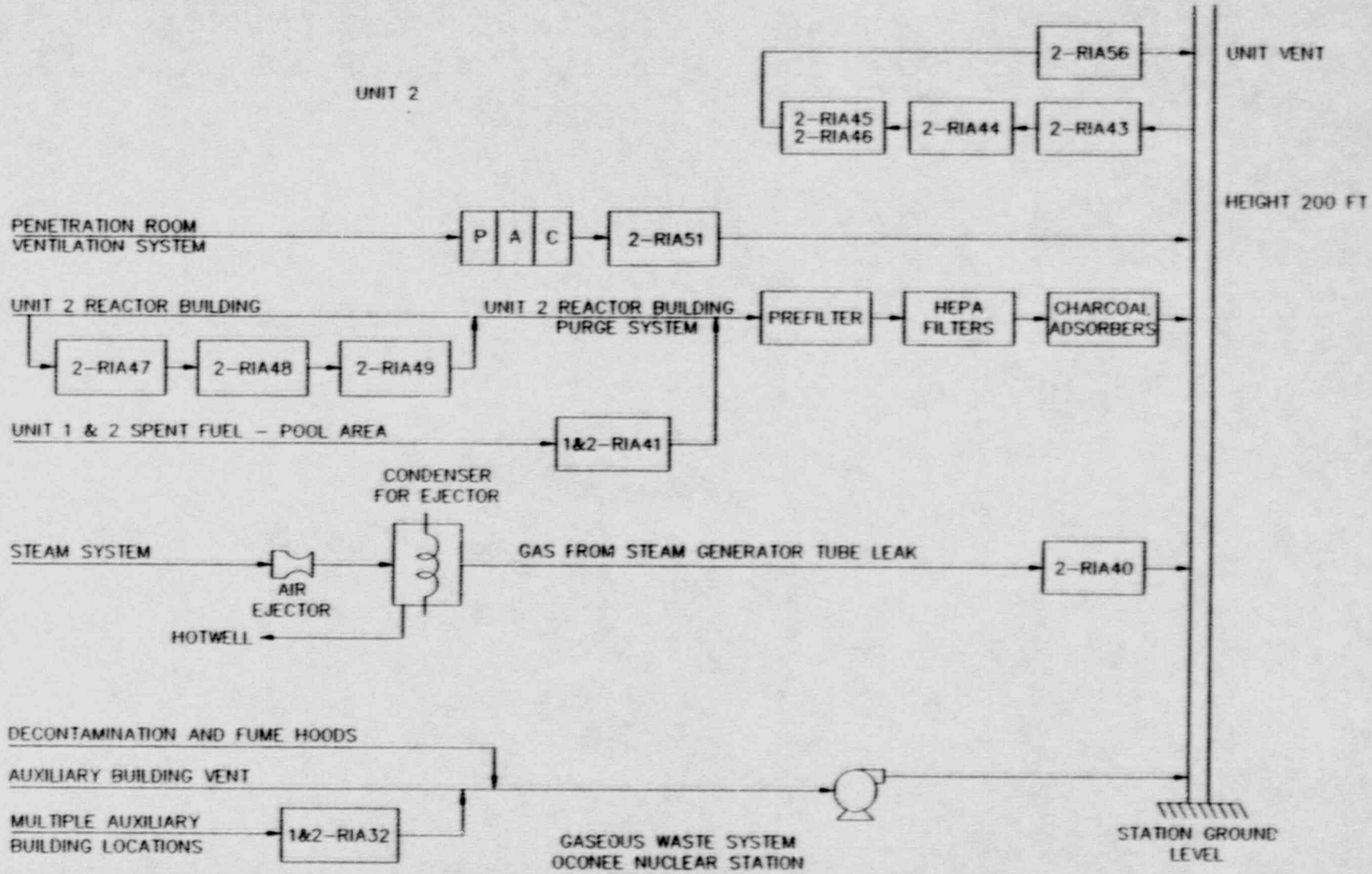
Radioactive gases may be released inside the reactor containment building when components of the primary system are opened to the building atmosphere for operational reasons or where minor leaks occur in the primary system. Prior to access, the reactor containment atmosphere will be monitored for activity and, when necessary, purged through prefilters, high-efficiency particulate air (HEPA) filters and charcoal adsorbers and released to atmosphere through the unit vent. The purge equipment is sized for a flow rate of 50,000 cfm providing approximately 1.5 air changes per hour in the reactor building. Units 1, 2 & 3 have a separate vent stack from each reactor building.

The gaseous waste handling and treatment systems for the Oconee Nuclear Station are shown schematically in Fig. A1.0-2.



GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
PAGE 1 OF 4

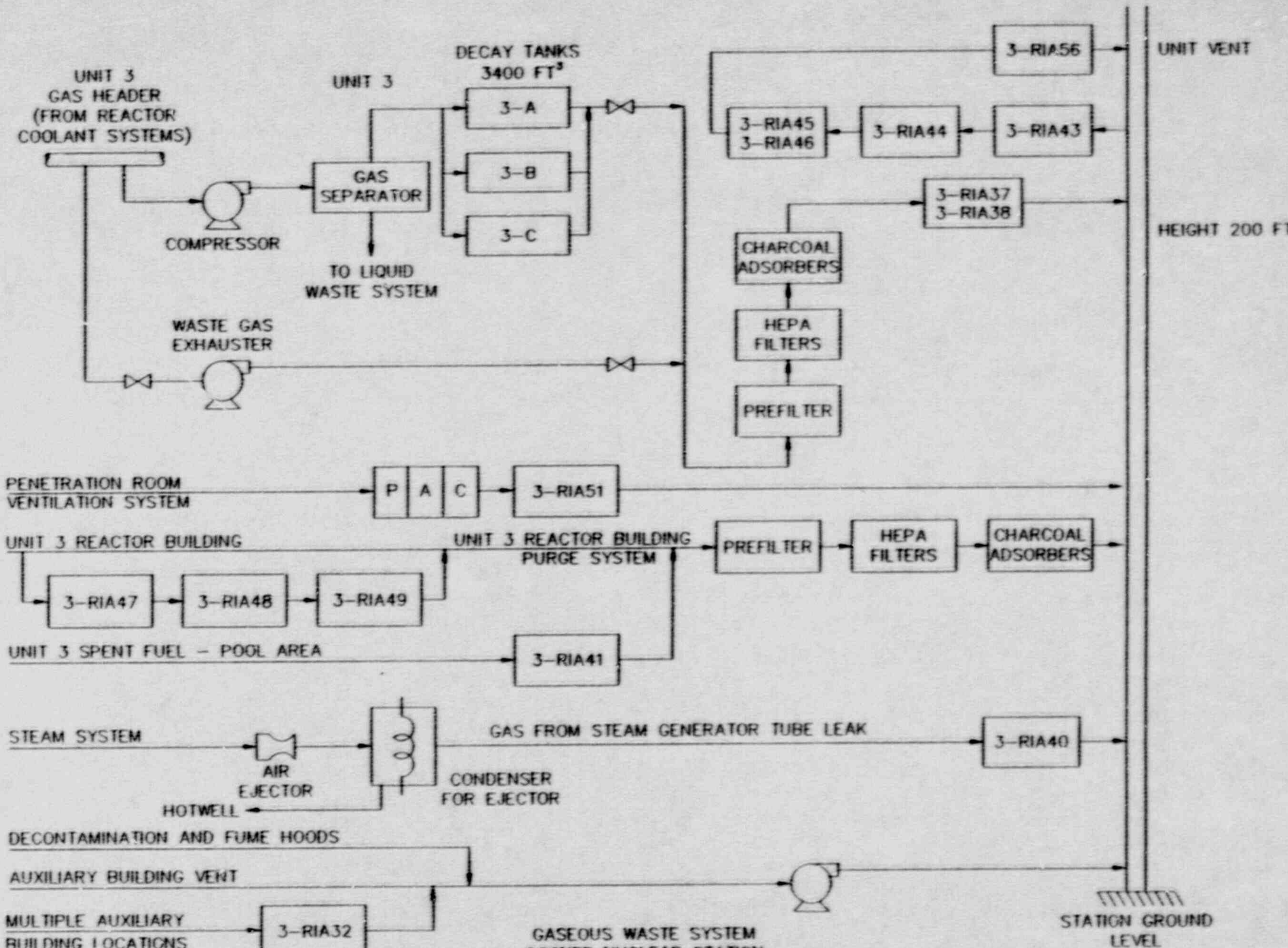
REVISION 27
1/1/90
N89120B



GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
PAGE 2 OF 4

REVISION 27
1/1/90

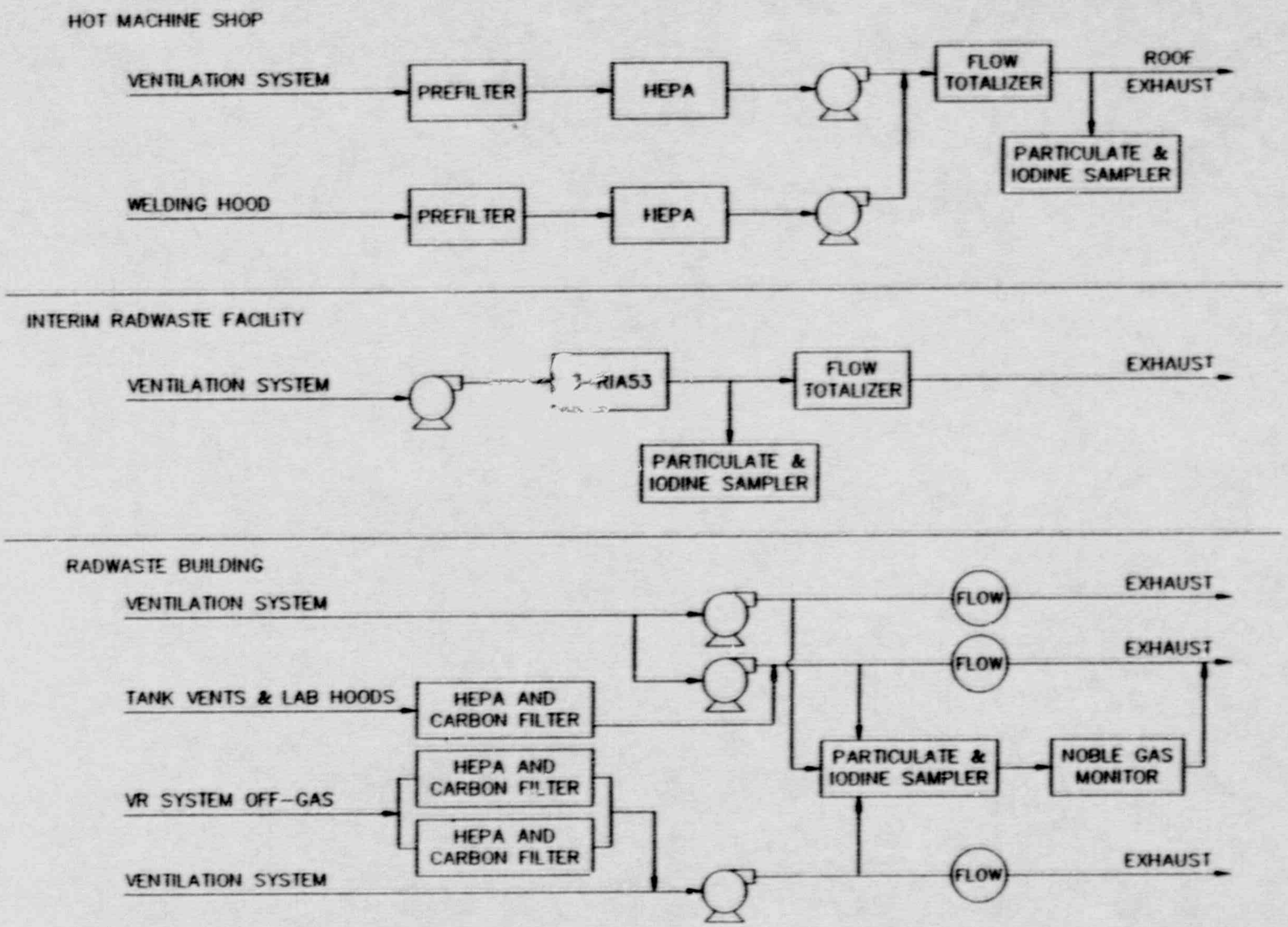
N89120C



GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
PAGE 3 OF 4

REVISION 27
1/1/90

1189120D



GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
PAGE 4 OF 4

REVISION 11
9/12/86

N89120E

A2.0 RELEASE RATE CALCULATION

Generic release rate calculations are presented in Section 1.0; these calculations will be used to calculate release rates from Oconee Nuclear Station.

A2.1 LIQUID RELEASE RATE CALCULATIONS

There are two potential release points at Oconee, the liquid radwaste effluent line to the Keowee Hydroelectric Unit Tailrace and the #3 Chemical Treatment Pond effluent line to the Keowee River.

A2.1.1 Liquid Radwaste Effluent Line To The Keowee Hydroelectric Unit Tailrace

To simplify calculations for the liquid radwaste effluent line, it is assumed that no activity above background is present in the #3 Chemical Treatment Pond effluent. This assumption shall be confirmed by radiation monitoring and/or the sampling of the pond's radioactive inputs, and by periodic analysis of the composite sample collected at the #3 Chemical Treatment Pond discharge. For the liquid radwaste effluent line the following calculation shall be performed to determine a discharge flow, in gpm:

$$f \leq F \div [\sigma \sum_{i=1}^{n} \frac{C_i}{MPC_i}]$$

where:

f = the undiluted effluent flow, in gpm.

C_i = the concentration of radionuclide, 'i', in undiluted effluent as determined by laboratory analyses, in μCi/ml.

MPC_i = the concentration of radionuclide, 'i', from 10CFR20, Appendix B, Table II, Column 2. If radionuclide, 'i', is a dissolved noble gas, the MPC_i = 2.0E-4 μCi/ml.

F = the dilution flow available, in gpm

typical flow rates are:

3.41E+04 gpm (based on a leakage rate of 38 cfs, plus the Keowee Hydro Fire Protection - LWR mixing line whose flow rate is 38 cfs)

2.9E+6 gpm (based on one hydro unit operating at 50% power, 6600 cfs)

σ = the recirculation factor at equilibrium is 1.0. (See Section 1.1)

A2.1.2 #3 Chemical Treatment Pond Effluent Line

The #3 Chemical Treatment Pond effluent is the release point for station effluents that are normally considered to be non-radioactive; that is, the pond's effluent will not normally contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring measurements on the pond's inputs and/or by periodic analyses of the composite sample collected at the pond's discharge point. Inputs to this pond include the plant's yard drain system, the decant water from the Powdex system, the discharge from the Turbine Building Sump system, and Radwaste Facility monitor tanks whose contents have been determined to be below background. Inputs that have radiation monitors associated with them will be set to assure that Technical Specification 3.9.1 will not be exceeded.

The #3 Chemical Treatment Pond may also be the discharge path for large volumes of slightly contaminated water following a primary-secondary leak so long as administrative procedures are implemented to assure that release rate calculations similiar to that used in Section A2.1.1 are performed, that all detectable radionuclides will be accounted for, and that no station limits will be exceeded.

A2.1.3 Low Pressure Service Water Effluent Line

The Low Pressure Service water effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring measurements. Radiation monitoring alarm setpoints, in conjunction with administrative controls, assure that release limits are not exceeded.

A2.2 GASEOUS RELEASE RATE CALCULATIONS FOR SEMI-ELEVATED RELEASE POINTS

The unit vents are the release points for waste gas decay tanks, containment building purges, the condenser air ejector, and auxiliary building ventilation. The unit vent is treated as a semi-elevated release point. The applicable dispersion and deposition parameters are provided in Tables A4.0-1a and A4.0-1b respectively.

The condenser air ejector effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measureable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring measurements and by analyses of periodic samples collected from this source. Radiation monitoring alarm/trip setpoints in conjunction with administrative controls assure that release limits are not exceeded; see section on radiation monitoring setpoints.

The following calculations, when solved for flowrate, are the release rates for noble gases and for radioiodines, particulates and other radionuclides with half-lives greater than 8 days; the most conservative of release rates calculated in A2.2.1 and A2.2.2 shall control the release rates for a single release point.

A2.2.1 Release rate limit for noble gases:

$$\sum_i K_i \, [(\overline{X/Q})\tilde{Q}_i] < 500 \text{ mrem/yr, and}$$

$$\sum_i (L_i + 1.1\, M_i) \, [(\overline{X/Q})\tilde{Q}_i] < 3000 \text{ mrem/yr}$$

where the terms are defined below.

A2.2.2 Release rate limit for all radioiodines and radioactive materials in particulate form and radionuclides other than noble gases:

$$\sum_i P_i \, [W \, \tilde{Q}_i] < 1500 \text{ mrem/yr}$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 1.2-1 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose).

P_i = The dose parameter for radionuclides other than noble gases for the inhalation pathway, in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in $m^2 \cdot$(mrem/yr) per $\mu Ci/sec$ from Table 1.2-2. The dose factors are based on the critical individual organ and most restrictive age group (child or infant).

$\tilde{Q}_i$ = The release rate of radionuclides, i, in gaseous effluent from all release points at the site, in μCi/sec.

$\overline{X/Q}$ = 4.1E-7 sec/m³. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary. The location is the S sector @ 3.5 miles for semi-elevated releases.

W = The highest calculated annual average dispersion/deposition parameter for estimating the dose to an individual at a controlling location in the unrestricted area where the total inhalation, food and ground plane pathway dose resulting from combined ground level and semi-elevated releases is determined to be a maximum based on operational source term data, land use surveys, and NUREG 0133 guidance:

W = 3.0E-8 sec/m³, for the inhalation pathway. The location is the WNW @ 4.0 miles.

W = 9.2E-10 m^{-2}, for the food and ground plane pathways. The location is the WNW @ 4.0 miles.

$$\tilde{Q}_i = k_1 C_i f + k_2 = 4.72E{+}2\ C_i f$$

where:

C_i = the concentration of radionuclide, i, in undiluted gaseous effluent, in μCi/ml.

f = the undiluted effluent flow, in cfm

k_1 = conversion factor, 2.83E+04 ml/ft³

k_2 = conversion factor, 6.0E+01 sec/min

A2.3 GASEOUS RELEASE RATE CALCULATIONS FOR GROUND LEVEL RELEASE POINTS

Hot Machine Shop Building ventilation exhaust, Radwaste Facility Exhaust, and Auxiliary Boiler releases are treated as ground-level release points. The applicable dispersion and deposition parameters are provided in Tables A4.0-2a and A4.0-2b respectively.

It is assumed that no activity is present in effluent from these sources until indicated by radiation monitoring measurements and by analyses of periodic samples collected from these sources. Radiation monitoring alarm/trip setpoints in conjunction with administrative controls assure that release limits are not exceeded; see section on radiation monitoring setpoints.

The following calculations, when solved for flowrate, are the release rates for noble gases and for radioiodines, particulates and other radionuclides with half-lives greater than 8 days; the most conservative of release rates calculated in A2.3.1 and A2.3.2 shall control the release rates for a single release point.

A2.3.1 Release rate limit for noble gases:

$$\sum_i K_i\,[(\overline{X/Q})\tilde{Q}_i] < 500 \text{ mrem/yr, and}$$

$$\sum_i (L_i + 1.1\,M_i)\,[(\overline{X/Q})\tilde{Q}_i] < 3000 \text{ mrem/yr}$$

where the terms are defined below:

A2.3.2 Release rate limit for all radioiodines and radioactive materials in particulate form and radionuclides other than noble gases:

$$\sum_i P_i\,[W\,\tilde{Q}_i] < 1500 \text{ mrem/yr}$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 1.2-1 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose).

P_i = The dose parameter for radionuclides other than noble gases for the inhalation pathway, in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in $m^2\cdot$(mrem/yr) per μCi/sec from Table 1.2-2. The dose factors are based on the critical individual organ and most restrictive age group (child or infant).

$\tilde{Q}_i$ = The release rate of radionuclides, i, in gaseous effluent from all release points at the site, in µCi/sec.

$\overline{X/Q}$ = 9.2E-6 sec/m³. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary. The location is the S sector @ 1.0 miles for ground-level releases.

W = The highest calculated annual average dispersion/deposition parameter for estimating the dose to an individual at a controlling location in the unrestricted area where the total inhalation, food and ground plane pathway dose resulting from combined ground level and semi-elevated releases is determined to be a maximum based on operational and design basis source term data, land use surveys, and NUREG 0133 guidance:

W = 9.80E-08 sec/m³, for the inhalation pathway. The location is the WNW @ 4.0 miles.

W = 2.10E-10 m^{-2}, for the food and ground plane pathways. The location is the WNW @ 4.0 miles.

$$\tilde{Q}_i = k_1 C_i f + k_2 = 4.72E+2\ C_i f$$

where:

C_i = the concentration of radionuclide, i, in undiluted gaseous effluent, in µCi/ml.

f = the undiluted effluent flow, in cfm

k_1 = conversion factor, 2.83E+04 ml/ft³

k_2 = conversion factor, 6.0E+01 sec/min

A3.0 RADIATION MONITOR SETPOINTS

Using the generic calculations presented in Section 2.0, final radiation monitoring setpoints are calculated for monitoring as required by the Technical Specifications.

All final effluent radiation monitors for Oconee are off-line. These monitors alarm on low flow; the minimum flow alarm level for the liquid monitors is 3 gallons per minute and for all gas monitors, except in the Radwaste Facility, is 7 standard cubic feet per minute. These monitors measure the activity in the liquid or gas volume exposed to the detector and are independent of flow rate if a minimum flow rate is assured. The Radwaste Facility gas monitors have a minimum flow alarm level of 2 standard cubic feet per minute and adjusts flow rate as the line flow changes.

Radiation monitoring setpoints calculated in the following sections are expressed in activity concentrations; in reality the monitor readout is in counts per minute, except for the Radwaste Facility gas monitor where its readout is in (µCi/ml). The relationship between concentration and counts per minute shall be established by station procedure using the following relationship: Station radiation monitor setpoint procedures which correlate concentration and counts per minute shall be based on the formula below and will be determined using the monitor's correlation graph. The correlation graph shows concentration (µCi/ml) vs. monitor reading (cpm) based on empirical data.

$$c = \frac{r}{2.22 \times 10^6 e V}$$

where:

- c = the gross activity, in µCi/ml
- r = the count rate, in cpm
- 2.22×10^6 = the disintegration per minute per µCi
- e = the counting efficiency, cpm/dpm
- v = the volume of fluid exposed to the detector, in ml.

A3.1 LIQUID RADIATION MONITORS

A3.1.1 Liquid Radwaste Effluent Line To The Keowee Hydroelectric Unit Tailrace

As described in Section A2.1.1 of this manual on release rate calculations for the waste liquid effluent, the release is controlled by limiting the flow rate of effluent from the station. Although the release rate is flow rate controlled, the radiation monitor setpoint shall be set to terminate the release if the effluent activity should exceed that used to calculate the release rate. Also, a radiation monitor setpoint shall be set to alarm if the effluent activity should exceed that determined by laboratory analyses.

A3.1.2 Turbine Building Sump Discharge Line

As described in Section A2.1.2 of this manual on release rate calculations for the turbine building sump effluent, the effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring and by routine analysis of the composite sample collected at the #3 Chemical Treatment Pond. Since the system discharges automatically, the maximum system concentration, which also is the radiation monitor setpoint, is calculated to assure compliance with release limits.

A typical setpoint is calculated as follows:

$$c \leq \frac{MPC \times F}{\sigma f} = 4.5E\text{-}6\ \mu Ci/ml$$

where:

c = the gross activity in undiluted effluent, in µCi/ml.

f = the flow rate of undiluted effluent which may vary from 0-375 gpm, but is assumed to be 375 gpm.

MPC = 1.0E-07 µCi/ml, the MPC for an unidentified mixture.

σ = 1 (See Section A2.1.1)

F = the flow may vary from 38 to 6,600 cfs, but is conservatively estimated at 38 cfs (1.7E+4 gpm), the minimum flow available.

A3.1.3 Radwaste Facility Effluent Line To CTP #3

As described in Section A2.1.2 of this manual on release rate calculations, the Radwaste Facility Effluent is normally considered non-radioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring and/or by routine analyses of the composite sample collected at the discharge of the #3 Chemical Treatment Pond. In order to assure that no activity is unknowingly discharged into the pond, the inputs to the Radwaste Facility Effluent Line are released in discrete batches where each batch is sampled for activity prior to release.

A3.1.4 Low Pressure Service Water Discharge Line

As described in Section A2.1.3 of this manual on release rate calculations for the Low Pressure Service water effluent, the effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring equipment. Since the system discharges automatically, the maximum system concentration which is also the radiation monitor setpoint, is calculated to assure compliance with release limits.

A typical monitor setpoint is calculated as follows:

$$C \leq \frac{MPC \times F}{\sigma f} = 1.16E\text{-}5\ \mu Ci/ml$$

where:

C = the gross activity in undiluted effluent, in μCi/ml.

f = the flow rate of undiluted effluent which may vary from 0 to 10,500 gpm but is assumed to be 10,500 gpm.

MPC = 1.0E-07 μCi/ml, the MPC for an unidentified mixture.

. = recirculation factor for Lake Keowee, 1.02.

F = the flow rate of the condensate cooling water is based on having seven CCW pumps in operation, 1.24E+06 gpm. Should the number of operating pumps decrease, the setpoint must be recalculated.

A3.2 GASEOUS RADIATION MONITOR SETPOINTS FOR SEMI-ELEVATED RELEASE POINTS

The following equation shall be used to calculate final effluent noble gas radiation monitor setpoints based on Xe-133:

$K(\overline{X/Q})\tilde{Q}_i < 500$ mrem (See Section A2.2.1)

$\tilde{Q}_i = 4.72E{+}2\ C_i f$ (See Section A2.2.2)

$(K)(\overline{X/Q})(472)(C_i)(f) < 500$

$$C_i < \frac{500}{(294)(4.1E{-}7)(472)} \div f$$

$C_i < 8.79E{+}3/f$

where:

C = the gross activity in undiluted effluent, in µCi/ml

f = the flow from the tank or building and varies for various release sources, in cfm

K = from Table 1.2-1 for Xe-133, 2.94E+2 mrem/yr per µCi/m³

$\overline{X/Q}$ = 4.1E-7 sec/m³, as defined in section A2.2.2.

A3.2.1 Gaseous Radwaste Effluent Line - Waste Gas Decay Tanks

As described in Section 2.2, the release is controlled by limiting the flow rate of the effluent from the station. Although the release rate is flow rate controlled, the radiation monitor setpoint shall be set to terminate the release if the effluent activity should exceed that determined by laboratory analyses and that used to calculate the release rate. A typical radiation monitor setpoint may be calculated as follows:

$C < 8.79E{+}3/f = 2.93E{+}02$ µCi/ml

where:

f = 30 cfm

A3.2.2 Unit Vent

As stated in Section A2.2, the unit vent is the release point for waste gas decay tanks, containment building purges, the condenser air ejector, and auxiliary building ventilation. Since all of these releases are through the unit vent, the radiation monitor on the unit vent may be used to assure that station release limits are not exceeded. Depending on the stack flow, a typical radiation monitor setpoint may be calculated as follows:

$$C < 8.79E{+}3/f = 9.25E{-}2\ \mu Ci/ml$$

where:

f = 45,000 cfm (auxiliary building) + 50,000 cfm (containment purge) = 95,000 cfm

or

$$C < 8.79E{+}3/f = 1.95E{-}1\ \mu Ci/ml$$

where:

f = 45,000 cfm (auxiliary building ventilation)

A3.3 GASEOUS RADIATION MONITOR SETPOINTS FOR GROUND-LEVEL RELEASE POINTS

The following equation shall be used to calculate final effluent noble gas radiation monitor setpoints based on Xe-133:

$$K(\overline{X/Q})\tilde{Q}_i < 500 \text{ mrem (See Section A2.2.1)}$$

$$\tilde{Q}_i = 4.72E{+}2\ C_i f \text{ (See Section A2.2.2)}$$

$$(K)(\overline{X/Q})(472)(C_i)(f) < 500$$

$$C_i < \frac{500}{(294)(9.2E{-}6)(472)} \div f$$

$$C_i < 3.92E{+}2/f$$

where:

C = the gross activity in undiluted effluent, in µCi/ml

f = the flow from the tank or building and varies for various release sources, in cfm

K = from Table 1.2-1 for Xe-133, 2.94E+2 mrem/yr per $\mu Ci/m^3$

$\overline{X/Q}$ = 9.2E-6 sec/m^3, as defined in section A2.3.2.

A3.3.1 Interim Radwaste Building Ventilation Exhaust

Ventilation exhaust from the Interim Radwaste Building is considered a separate release point. This exhaust is normally considered non-radioactive; that is, it is possible but unlikely that the effluent will contain measurable activity above background. Since the exhaust is continuous, a maximum concentration of gases in the exhaust, which also is the radiation monitor setpoint, is calculated to assure compliance with release limits. A typical radiation monitor setpoint may be calculated as follows:

$$C < 3.92E{+}2/f = 2.67E{-}2\ \mu Ci/ml$$

where:

f = 1.47E+04 cfm

A3.3.1 Hot Machine Shop Building Ventilation Exhaust

Ventilation exhaust from the Hot Machine Shop is considered to be a separate release point. This filtered exhaust is sampled and analyzed for particulates and radioiodines to assure that the effluent released has not exceeded station release limits. Since it is assumed that no noble gases will be generated by machine shop work, no provision for monitoring noble gas releases are provided.

A3.3.2 Contaminated Oil Burning In Auxiliary Boiler

Contaminated oil is burned in the auxiliary boiler which is not released through the unit vent and is considered a separate release point. The contaminated oil is filtered, mixed, and sampled to determine the total activity to be released and the allowable release (burn) rate.

By Technical Specification, releases from the auxiliary boiler from incineration of contaminated oil must meet the instantaneous release rate for iodines and particulates given in Section A2.2.2. Also, the total dose due to these releases must be less than 0.1% of the allowable yearly dose from particulate gaseous effluents.

Doses from incineration of contaminated oil are calculated for all organs and all pathways using either the models provided in Section 3.1.2.2 of this manual or the GASPAR computer program. Cumulative doses are calculated quarterly at a minimum.

All the activity in the contaminated oil is assumed to be released during incineration and the total is added to the station's quarterly and annual release records.

A3.3.3 Radwaste Facility Ventilation and Process Gas Exhaust

The ventilation and process gas exhaust from the Radwaste Facility is considered a separate release point. This exhaust is sampled continuously for iodine and particulates and noble gases. This data is used in calculations to assure that the effluents released have not exceeded station release limits. A typical radiation monitor setpoint may be calculated as follows:

$$C < 3.92E{+}2/f = 3.02E{-}03\ \mu Ci/ml$$

where:

f = 129,700 cfm, The total combined ventilation and process gas exhaust flow.

A4.0 DOSE CALCULATIONS

A4.1 FREQUENCY OF CALCULATIONS

Dose contributions to the maximum individual shall be calculated at least every 31 days, quarterly, semiannually, and annually (or as required by Technical Specifications) using the methodology in the generic information sections. This methodology shall also be used for any special reports. Dose calculations that are required for individual pre-release calculations, and/or abnormal releases shall not be calculated by using the simplified dose calculations. Station dose projections for these types and others that are known to vary from the station historical averages shall be calculated by using the methodology in the generic information sections. STATION Dose projections may be performed using simplified dose estimates.

Fuel cycle dose calculations shall be performed annually or as required by special reports. Dose contributions shall be calculated using the methodology in the appropriate generic information sections.

A4.2 DOSE MODELS FOR MAXIMUM EXPOSED INDIVIDUAL

A4.2.1 Liquid Effluents

For dose contributions from liquid radioactive effluent releases, it is assumed that the maximum exposed individual is an adult who consumes fish caught in the discharge area and drinks water from the nearest downstream water supply.

A4.2.2 Gaseous Effluents

A4.2.2.1 Noble Gases

For dose contributions from exposure to beta and gamma radiations from noble gases, it is assumed that the maximum exposed individual is an adult at a controlling location in the unrestricted area where the total noble gas dose from combined semi-elevated and ground level releases is determined to be a maximum; this location may not be controlling for semi-elevated or ground level releases considered separately, however.

A4.2.2.2 Radioiodines, Particulates, and Other Radionuclides with T 1/2 > 8 days

For dose contributions from radioiodines, particulates, and other radionuclides; it is assumed that the maximum exposed individual is a child or infant at a controlling location in the unrestricted area where the total inhalation, food and ground plane pathway dose is determined to be a maximum based on operational source term data, land use surveys, and NUREG-0133 guidance. The controlling location is determined based on total combined semi-elevated and ground level radioidine, particulates and other radionuclide releases with T 1/2 > 8 days; this location may not be controlling for semi-elevated or ground-level releases considered separately, however.

A4.3 SIMPLIFIED DOSE ESTIMATES

A4.3.1 Liquid Effluents

For dose estimates, a simplified calculation based on the assumptions presented in Section A4.2.1 and operational source term data is presented below. Updated operational source term data shall be used to revise these calculations as necessary.

$$D_{WB} = 7.13E{+}05 \sum_{\ell=1}^{m} (F_\ell)(T_\ell)\,(C_{Cs-134} + 0.59\, C_{Cs-137})$$

where:

$$7.13E{+}05 = 1.14E{+}05\,(U_{aw}/D_w + U_{af}\,BF_i)\,DF_{ai\tau}\quad(1.23)$$

where:

$1.14E{+}05 = 10^6$ pCi/µCi x 10^3 ml/kg ÷ 8760 hr/yr

U_{aw} = 730 kg/yr, adult water consumption

D_w = 27.5, dilution factor from the near field area to the nearest possible potable water intake.

U_{af} = 21 kg/yr, adult fish consumption

BF_i = 2.00E+03, bioaccumulation factor for Cesium (Table 3.1-1)

$DF_{ai\tau}$ = 1.21E-04, adult, total body, ingestion dose factor (Table 3.1-2)

1.23 = factor derived from the assumption that 81% of dose is from Cs-134 and Cs-137 or 100% ÷ 81% = 1.23

where:

$$F_\ell = \frac{f\sigma}{F + f}$$

f = liquid radwaste flow, in gpm

σ = recirculation factor at equilibrium, 1.0

F = dilution flow, in gpm

and where:

T_ℓ = the length of time, in hours, over which C_{Cs-134}, C_{Cs-137}, and F_ℓ are averaged

C_{Cs-134} = the average concentration of Cs-134 in undiluted effluent, in µCi/ml, during the time period considered.

C_{Cs-137} = the average concentration of Cs-137 in undiluted effluent, in µCi/ml, during the time period considered.

0.59 = the ratio of the adult total body ingestion dose factors for Cs-134 and Cs-137 or 7.14E-05 ÷ 1.21E-04 = 0.59

A4.3.2 Gaseous Effluents From Semi-Elevated Release Points

Meteorological data for Unit Vent releases is provided in Tables A4.0-1a and A4.0-1b.

A4.3.2.1 Noble Gases

For dose estimates, simplified dose calculations based on the assumptions in A4.2.2.1 and operational source term data are presented below. Updated operational source term data shall be used to revise those calculations as necessary. These calculations further assume that the annual average dispersion parameter is used and that Xenon-133 contributes 92% of the gamma air dose and 84% of the beta air dose for semi-elevated releases.

$$D_\gamma = 2.91E\text{-}12 \; [\tilde{Q}]_{Xe\text{-}133} \; (1.09)$$

$$D_\beta = 8.65E\text{-}12 \; [\tilde{Q}]_{Xe\text{-}133} \; (1.19)$$

where:

2.91E-12 = (3.17E-8) (353) $(\overline{X/Q})$, derived from equation presented in Section 3.1.2.1.

8.65E-12 = (3.17E-8) (1050) $(\overline{X/Q})$, derived from equation presented in Section 3.1.2.1.

$[\tilde{Q}]_{Xe\text{-}133}$ = the total Xenon-133 activity released in µCi

$\overline{X/Q}$ = 2.60E-7 sec/m³, the semi-elevated release dispersion parameter $(\overline{X/Q})$ corresponding to the controlling location (S @ 1.0 miles) defined in Section A4.2.2.1.

1.09 = factor derived from the assumption that 92% of the Gamma Air dose is contributed by Xe-133

1.19 = factor derived from the assumption that 84% of the Beta-Air dose is contributed by Xe-133

A4.3.2.2 Radioiodines, Particulates, and Other Radionuclides with T 1/2 > 8 Days

For dose estimates, simplified dose calculations based on the assumptions in A4.2.2.2 and operational source term data are presented below. Updated operational source term data shall be used to revise these calculations as necessary. These calculations further assume that the annual average dispersion/deposition parameter is used and that 99% of the semi-elevated release dose results from Iodine-131 ingested by the maximally exposed individual via the cow milk pathway at the controlling location. The simplified dose estimate for exposure to the thyroid of an infant is:

$$D = 1.53E4\ W\ (\tilde{Q})_{I-131}\ (1.01)$$

where:

W = 9.2E-10, the semi-elevated release deposition parameter $(\overline{D/Q})$ for food and ground plane pathway, in m^{-2} corresponding to the controlling location (WNW @ 4.0 miles) defined in Section A4.2.2.2.

$(\tilde{Q})_{I-131}$ = the total Iodine-131 activity released in µCi.

1.53E4 = (3.17E-08) $(R_i^C\ [\overline{D/Q}])$ with the appropriate substitutions for the cow milk pathway factor, $R_i^C\ [\overline{D/Q}]$, for Iodine-131. See Section 3.1.2.2.

1.01 = factor derived from the assumption that 99% of the total inhalation, food and ground plane pathway dose to the maximally exposed individual is contributed by I-131 via the cow milk pathway.

A4.3.3 Gaseous Effluents From Ground-Level Release Points

Meteorological data for Hot Machine Shop Building Ventilation exhaust, Radwaste Facility exhaust, and Interim Radwaste Building releases is provided in Tables A4.0-2a and A4.0-2b.

A4.3.3.1 Noble Gases

For dose estimates, simplified dose calculations based on the assumptions in A4.2.2.1 and operational and design basis source term data are presented below. These calculations further assume that the annual average dispersion parameter is used and that Xenon-133 contributes 95% of the gamma air dose and 93% of the beta air dose for ground-level releases.

$$D_\gamma = 1.03E-10\ [\ \tilde{Q}\ ]_{Xe-133}\ (1.05)$$

$$D_\beta = 3.06E-10\ [\ \tilde{Q}\ ]_{Xe-133}\ (1.08)$$

where:

1.03E-10 = (3.17E-8) (353) ($\overline{X/Q}$), derived from equation presented in Section 3.1.2.1.

3.06E-10 = (3.17E-8) (1050) ($\overline{X/Q}$), derived from equation presented in Section 3.1.2.1.

$[\tilde{Q}]_{Xe-133}$ = the total Xenon-133 activity released in µCi

$\overline{X/Q}$ = 9.2E-6 sec/m³, the ground level release dispersion parameter ($\overline{X/Q}$) corresponding to the controlling location (S @ 1.0 miles) defined in Section A4.2.2.1.

1.05 = factor derived from the assumption that 95% of the Gamma Air dose is contributed by Xe-133

1.08 = factor derived from the assumption that 93% of the Beta-Air dose is contributed by Xe-133

A4.3.3.2 Radioiodines, Particulates, and Other Radionuclides with T 1/2 > 8 Days

For dose estimates, simplified dose calculations based on the assumptions in A4.2.2.2 and operational and design basis source term data are presented below. These calculations further assume that the annual average dispersion/deposition parameters are used and that 98% of the ground-level release dose is from I-131 ingested by the maximally exposed individual via the cow milk pathway at the controlling location. The simplified dose estimate for exposure to the infant thyroid is:

$$D = 1.53E4\ W\ (\tilde{Q})_{I-131}\ (1.02)$$

where:

W = 2.10E-10 ($\overline{D/Q}$) for food and ground plane pathway, in m^{-2} corresponding to the controlling location (WNW @ 4.0 miles) defined in Section A4.2.2.2.

$(\tilde{Q})_{I-131}$ = the total I-131 activity released from Oconee ground-level release points in µCi.

1.53E4 = (3.17E-08) ($R_i^C[\overline{D/Q}]$) with the appropriate substitutions for the infant-cow milk pathway, ($R_i^C[\overline{D/Q}]$), for I-131. See Section 3.1.2.2.

1.02 = factor derived from the assumption that 98% of the total inhalation, food and ground plane pathway dose to the maximally exposed individual is contributed by I-131 via the cow milk pathway.

A4.4 FUEL CYCLE CALCULATIONS

As discussed in Section 3.3.5, more than one nuclear power station site may contribute to the doses to be considered in accordance with 40CFR190. The fuel cycle dose assessments for Oconee Nuclear Station only include liquid and gaseous dose contributions from Oconee Nuclear Station since no other uranium fuel cycle facility contributes significantly to Oconee's maximum exposed individual. For this dose assessment, the total body and maximum organ dose contributions to the maximum exposed individual from Oconee's liquid and gaseous releases are estimated using the following calculations:

$D_{WB}(T) \quad D_T = D_{WB}(l_o) + D_{WB}(g_e) + D_{WB}(g_g)$

$D_{MO}(T) \quad D_T = D_{MO}(l_o) + D_{MO}(g_e) + D_{MO}(g_g)$

where:

$D_{WB}(T)$ = Total estimated fuel cycle whole body dose commitment resulting from the combined liquid and gaseous effluents from Oconee during the calendar year of interest, in mrem.

$D_{MO}(T)$ = Total estimated fuel cycle maximum organ dose commitment resulting from the combined liquid and gaseous effluents from Oconee during the calendar year of interest, in mrem.

A4.4.1 LIQUID EFFLUENTS

Liquid pathway dose estimates are based on values and assumptions presented in Section A.4.3.1. Station operational source terms shall be used to update these simplified calculations as necessary.

Based on operational history, the Oconee fuel cycle maximum exposed individual whole body dose resulting from Oconee's liquid effluent releases ($D_{WB}(l_o)$) is estimated using the simplified dose calculation given below:

$$D_{WB}(l_o) = (\ 7.13E5\ )\ (\ F_\ell\ )\ (\ T_\ell\ )\ (\ C_{Cs-134} + 0.59\ C_{Cs-137}\ )$$

where:

$$7.13E5 = 1.14E{+}05\ (\ U_{aw} / D_w + U_{af} \times BF_i\ )\ (\ DF_{ait}\ )\ (\ 1.23\ )$$

where:

$1.14E{+}05 = (\ 1.0E{-}06\ pCi/uCi \times 1.0E{+}03\ ml/kg\ ) / (\ 8760\ hr/yr\ )$

U_{aw} = 730 ℓ/yr, Adult water consumption

D_w = 27.5, Dilution factor from the near field area to the nearest possible potable water intake

U_{af} = 21 kg/yr, Adult fish consumption

BF_i = 2.00E+03, Bioaccumulation factor for Cesium (Table 3.1-1)

DF_{ait} = 1.21E-04, Adult total body ingestion dose factor for Cs-134 (Table 3.1-2)

1.23 = Factor derived from the assumption that 81% of the dose is derived from Cs-134 and Cs-137 or 100% / 81% = 1.23

where:

$F_{\ell} = (f)\ (\sigma)\ /\ (F + f)$

where:

f = Oconee's liquid radwaste flow, in gpm

F = Oconee's dilution flow, in gpm

σ = 1.0, the recirculation factor at equilibrium

where:

T_{ℓ} = 8760 hours, the time period of time over which C_{Cs-134}, C_{Cs-137} and F_{ℓ} are averaged.

C_{Cs-134} = The average concentration of Cs-134 in Oconee's undiluted effluent, in uCi/ml, during the calendar year of interest.

C_{Cs-137} = The average concentration of Cs-137 in Oconee's undiluted effluent, in uCi/ml, during the calendar year of interest.

0.59 = The ratio of the adult total body ingestion dose factors for Cs-134 and Cs-137 or 7.14E-05 / 1.21E-04 = 0.59

Based on operational history, the Oconee fuel cycle maximum exposed individual maximum organ dose (Adult GI-Track) resulting from Oconee's liquid effluent releases ($D_{MO}(l_o)$) is estimated using the simplified dose calculation given below:

$$D_{MO}(l_o) = (\ 1.67E6\ )\quad (\ F_{\ell}\ )\ (\ T_{\ell}\ )\ (\ C_{Nb-95}\ )$$

where:

$$1.67E6 = 1.14E{+}05\ (\ U_{aw}\ /\ D_w + U_{af} \times BF_i\ )\ (\ DF_{ait}\ )\ (\ 1.11\ )$$

where:

1.14E+05 = (1.0E+06 pCi/uCi x 1.0E+03 ml/kg) / (8760 hr/yr)

U_{aw} = 730 ℓ/yr, Adult water consumption

D_w = 27.5, Dilution factor from the near field area to the nearest possible potable water intake

U_{af} = 21 kg/yr, Adult fish consumption

BF_i = 3.0E4, Bioaccumulation factor for Niobium (Table 3.1-1)

DF_{ait} = 2.10E-5, Adult GI-track ingestion dose factor for Nb-95 (Table 3.1-2)

1.11 = Factor derived from the assumption that 90% of the dose is derived from Nb-95 or 100% / 90% = 1.11

where:

$$F_{\ell} = (f)\ (\sigma)\ /\ (F + f)$$

where:

f = Oconee's liquid radwaste flow, in gpm

F = Oconee's dilution flow, in gpm

σ = 1.0, the recirculation factor at equilibrium

where:

T_{ℓ} = 8760 hours, the time period of time over which C_{Nb-95} and F_{ℓ} are are averaged.

C_{Nb-95} = The average concentration of Nb-95 in Oconee's undiluted effluent, in uCi/ml, during the calendar year of interest.

A4.4.2 GASEOUS EFFLUENTS FROM SEMI-ELEVATED RELEASE POINTS

Airborne effluent pathway dose estimates are based on the values and assumptions presented in Section A4.3.2. Station operational source term data shall be used to update these calculations as necessary.

Based on operational history, the Oconee fuel cycle maximum exposed individual whole body dose resulting from Oconee's semi-elevated gaseous effluent releases ($D_{WB}(g_e)$) is estimated using the simplified dose calculation given below:

$$D_{WB}(g_e) = (\ 9.32E-06\ )\ (\ w\ )\ (\ \tilde{Q}_{Xe-133}\ )\ (S_F)\ (\ 1.09\ )$$

where:

w = 2.6E-7 = $(\overline{X/Q})$ defined in Section A4.3.2.1.

$\tilde{Q}_{Xe-133}$ = The total Xe-133 activity released from Oconee during the calendar year of interest, in uCi.

9.32E-06 = (3.17E-08) (K_i), with appropriate substitutions for whole body exposure in a semi-infinite cloud of Xe-133. See Section 1.2.1.

S_F = 0.7 = External radiation shielding factor for individuals.

1.09 = The factor derived from the conservative assumption (based on historical data) that 92% of the whole body dose to the maximally exposed individual is contributed by Xe-133.

Based on operational history, the Oconee fuel cycle maximum exposed individual maximum organ dose (Adult GI-Track) resulting from Oconee's semi-elevated gaseous effluent releases ($D_{MO}(g_e)$) is conservatively estimated using the simplified dose calculation given below:

$$D_{MO}(g_e) = (3.27E+2) (W) (\tilde{Q}_{Cs-137}) (1.89)$$

where:

3.27E2 = (3.17E-8) ($R_i^G [\overline{D/Q}]$) with appropriate substitutions for the ground plane pathway factor, $R_i^G [\overline{D/Q}]$, for Cesium-137. See Section 3.1.2.2.

$(\tilde{Q})_{Cs-137}$ = the total Cs-137 activity released in µCi.

W = 4.5E-9, the semi-elevated release deposition parameter $(\overline{D/Q})$ for food and ground plane pathway, in m^{-2} corresponding to the controlling location S @ 1.0 miles.

1.89 = factor derived from the assumption that 53% of the total inhalation, food, and ground plane pathway dose to the maximally exposed individual is contributed by Cs-137 via the ground plane pathway.

A4.4.3 GASEOUS EFFLUENTS FROM GROUND-LEVEL RELEASE POINTS

Airborne effluent pathway dose estimates are based on the values and assumptions presented in Section A4.3.2. Station operational source term data shall be used to update these calculations as necessary.

Based on design basis source term data and operational history, the Oconee fuel cycle maximum exposed individual whole body dose resulting from Oconee's ground-level gaseous effluent releases ($D_{WB}(g_g)$) is estimated using the simplified dose calculation given below:

$$D_{WB}(g_g) = (9.32E-06) (w) (\tilde{Q}_{Xe-133}) (S_F) (1.05)$$

where:

w = 9.2E-6 = $(\overline{X/Q})$ as defined in Section A4.3.3.1.

$\tilde{Q}_{Xe-133}$ = The total Xe-133 activity released from Oconee during the calendar year of interest, in uCi.

9.32E-06 = (3.17E-08) (K_i), with appropriate substitutions for whole body exposure in a semi-infinite cloud of Xe-133. See Section 1.2.1.

S_F = 0.7 = External radiation shielding factor for individuals.

1.05 = The factor derived from the conservative assumption (based on historical data) that 95% of the whole body dose to the maximally exposed individual is contributed by Xe-133.

Based on design basis source term data and operational history, the Oconee fuel cycle maximum exposed individual maximum organ dose (Adult GI-Track) resulting from Oconee's ground-level gaseous effluent releases ($D_{MO}(g_g)$) is conservatively estimated using the simplified dose calculation given below:

$$D_{MO}(g) = (3.27E+2) (W) (\tilde{Q}_{Cs-137}) (1.89)$$

where:

3.27E2 = (3.17E-8) (R_i^G $[\overline{D/Q}]$) with appropriate substitutions for the ground plane pathway factor, R_i^G $[\overline{D/Q}]$, for Cesium-137. See Section 3.1.2.2.

$(\tilde{Q})_{Cs-137}$ = the total Cs-137 activity released in µCi.

W = 2.1E-8, the ground-level release deposition parameter ($\overline{D/Q}$) for food and ground plane pathway, in m^{-2} corresponding to the controlling location S @ 1.0 miles.

1.89 = factor derived from the assumption that 53% of the total inhalation, food, and ground plane pathway dose to the maximally exposed individual is contributed by Cs-137 via the ground plane pathway.

TABLE A4.0-1a

OCONEE NUCLEAR STATION
(1 of 1)

DISPERSION PARAMETER ($\overline{X/Q}$) FOR SEMI-ELEVATED LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

(sec/m³)

Distance to the control location, in miles

Sector	0-0.5*	0.5-1.0*	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N			6.5E-8	4.8E-8	4.7E-8	4.7E-8	4.7E-8	6.3E-8	5.9E-8	5.6E-8
NNE			1.1E-7	9.3E-8	8.7E-8	8.9E-8	9.2E-8	9.2E-8	7.2E-8	5.9E-8
NE			7.5E-8	7.2E-8	6.8E-8	5.8E-8	6.1E-8	6.4E-8	6.0E-8	5.7E-8
ENE			6.0E-8	6.4E-8	5.9E-8	6.1E-8	5.7E-8	5.7E-8	5.6E-8	5.6E-8
E			4.1E-8	3.7E-8	5.7E-8	4.8E-8	5.2E-8	4.9E-8	4.7E-8	4.5E-8
ESE			3.0E-8	4.0E-8	6.7E-8	5.8E-8	4.3E-8	5.3E-8	4.9E-8	4.7E-8
SE			2.8E-8	2.8E-8	6.0E-8	5.1E-8	4.1E-8	3.7E-8	3.8E-8	3.8E-8
SSE			2.3E-7	2.0E-7	3.2E-7	2.5E-7	3.7E-7	2.9E-7	2.7E-7	2.5E-7
S			2.6E-7	3.0E-7	2.1E-7	2.1E-7	3.6E-7	4.1E-7	3.7E-7	3.6E-7
SSW			3.2E-7	3.1E-7	2.9E-7	2.7E-7	2.0E-7	1.7E-7	1.7E-7	1.7E-7
SW			7.3E-8	7.1E-8	7.1E-8	5.9E-8	3.9E-8	4.4E-8	4.5E-8	4.5E-8
WSW			5.3E-8	5.2E-8	5.3E-8	4.2E-8	4.8E-8	4.3E-8	4.2E-8	4.2E-8
W			2.7E-8	3.2E-8	3.7E-8	3.7E-8	3.9E-8	3.9E-8	3.7E-8	3.6E-8
WNW			2.3E-8	2.5E-8	3.5E-8	3.5E-8	3.3E-8	3.2E-8	3.0E-8	2.9E-8
NW			3.2E-8	3.7E-8	3.1E-8	3.3E-8	3.0E-8	3.1E-8	2.9E-8	2.8E-8
NNW			6.8E-8	7.7E-8	8.3E-8	7.7E-8	7.8E-8	6.5E-8	6.3E-8	6.2E-8

* Inside Exclusion Area Boundary (EAB)

TABLE A4.0-1b

OCONEE NUCLEAR STATION
(1 of 1)

DEPOSITION PARAMETER ($\overline{D/Q}$) FOR SEMI-ELEVATED LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

(m^{-2})

Distance to the control location, in miles

Sector	0-0.5*	0.5-1.0*	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N			2.4E-9	1.4E-9	8.7E-10	6.0E-10	4.7E-10	3.6E-10	2.8E-10	2.3E-10
NNE			4.1E-9	2.2E-9	1.4E-9	9.6E-10	7.4E-10	5.7E-10	4.4E-10	3.6E-10
NE			2.7E-9	1.5E-9	9.7E-10	6.6E-10	5.0E-10	3.9E-10	3.1E-10	2.5E-10
ENE			1.5E-9	8.4E-10	5.4E-10	3.7E-10	2.8E-10	2.2E-10	1.7E-10	1.4E-10
E			1.6E-9	8.7E-10	5.6E-10	3.9E-10	3.0E-10	2.3E-10	1.8E-10	1.5E-10
ESE			1.3E-9	7.0E-10	4.5E-10	3.0E-10	2.3E-10	1.8E-10	1.4E-10	1.1E-10
SE			8.0E-10	4.4E-10	2.9E-10	2.0E-10	1.5E-10	1.2E-10	8.9E-11	7.3E-11
SSE			2.7E-9	1.6E-9	1.1E-9	7.5E-10	6.0E-10	4.6E-10	3.6E-10	3.0E-10
S			4.5E-9	2.6E-9	1.7E-9	1.2E-9	9.0E-10	7.0E-10	5.5E-10	4.5E-10
SSW			4.3E-9	2.5E-9	1.6E-9	1.1E-9	8.5E-10	6.5E-10	5.0E-10	4.2E-10
SW			1.4E-9	8.4E-10	5.5E-10	3.9E-10	3.0E-10	2.3E-10	1.8E-10	1.5E-10
WSW			1.6E-9	9.1E-10	6.0E-10	4.1E-10	3.2E-10	2.5E-10	1.9E-10	1.6E-10
W			1.4E-9	7.9E-10	5.1E-10	3.6E-10	2.7E-10	2.1E-10	1.6E-10	1.3E-10
WNW			7.7E-10	4.4E-10	2.9E-10	2.0E-10	1.5E-10	1.2E-10	9.2E-10	7.4E-11
NW			1.1E-9	5.9E-10	3.8E-10	2.6E-10	2.0E-10	1.6E-10	1.2E-10	9.9E-11
NNW			1.9E-9	1.0E-9	6.6E-10	4.5E-10	3.5E-10	2.7E-10	2.1E-10	1.7E-10

* Inside Exclusion Area Boundary (EAB)

TABLE A4.0-2a

OCONEE NUCLEAR STATION
(1 of 1)

DISPERSON PARAMETER ($\overline{X/Q}$) FOR GROUND LEVEL, LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

(sec/m^3)

Distance to the control location, in miles

Sector	0-0.5*	0.5-1.0*	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N			2.7E-6	1.1E-6	6.1E-7	3.9E-7	2.8E-7	2.1E-7	1.6E-7	1.3E-7
NNE			2.4E-6	9.8E-7	5.4E-7	3.4E-7	2.4E-7	1.8E-7	1.4E-7	1.2E-7
NE			2.9E-6	1.2E-6	6.5E-7	4.2E-7	2.9E-7	2.2E-7	1.7E-7	1.4E-7
ENE			2.6E-6	1.0E-6	5.7E-7	3.6E-7	2.6E-7	1.9E-7	1.5E-7	1.2E-7
E			3.0E-6	1.2E-6	6.6E-7	4.3E-7	3.0E-7	2.3E-7	1.8E-7	1.4E-7
ESE			3.1E-6	1.2E-6	6.9E-7	4.5E-7	3.2E-7	2.4E-7	1.9E-7	1.6E-7
SE			3.7E-6	1.5E-6	8.4E-7	5.4E-7	3.9E-7	2.9E-7	2.3E-7	1.9E-7
SSE			5.3E-6	2.2E-6	1.2E-6	7.9E-7	5.7E-7	4.3E-7	3.4E-7	2.8E-7
S			9.2E-6	3.7E-6	2.1E-6	1.4E-6	9.8E-7	7.4E-7	5.9E-7	4.8E-7
SSW			4.4E-6	1.8E-6	1.0E-6	6.5E-7	4.6E-7	3.5E-7	2.8E-7	2.3E-7
SW			4.5E-6	1.8E-6	1.0E-6	6.5E-7	4.6E-7	3.5E-7	2.7E-7	2.2E-7
WSW			2.6E-6	1.1E-6	5.9E-7	3.8E-7	2.7E-7	2.0E-7	1.6E-7	1.3E-7
W			2.2E-6	9.1E-7	5.0E-7	3.2E-7	2.3E-7	1.7E-7	1.3E-7	1.1E-7
WNW			1.6E-6	6.6E-7	3.6E-7	2.3E-7	1.7E-7	1.2E-7	9.8E-8	8.0E-8
NW			1.9E-6	7.7E-7	4.2E-7	2.7E-7	1.9E-7	1.4E-7	1.1E-7	9.1E-8
NNW			2.4E-6	9.9E-7	5.4E-7	3.5E-7	2.5E-7	1.9E-7	1.5E-7	1.2E-7

* Inside Exclusion Area Boundary (EAB)

TABLE A4.0-2b

OCONEE NUCLEAR STATION

DEPOSITION PARAMETER ($\overline{D/Q}$) FOR GROUND LEVEL, LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

(m^{-2})

Distance to the control location, in miles

Sector	0-0.5*	0.5-1.0*	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N			1.2E-8	4.3E-9	2.1E-9	1.3E-9	8.2E-10	5.8E-10	4.3E-10	3.3E-10
NNE			1.5E-8	5.2E-9	2.6E-9	1.5E-9	1.0E-9	7.0E-10	5.2E-10	4.0E-10
NE			1.7E-8	5.9E-9	2.9E-9	1.7E-9	1.1E-9	8.0E-10	5.9E-10	4.6E-10
ENE			1.1E-8	3.9E-9	1.9E-9	1.1E-9	7.5E-10	5.3E-10	3.9E-10	3.0E-10
E			1.2E-8	4.2E-9	2.1E-9	1.2E-9	8.0E-10	5.6E-10	4.2E-10	3.2E-10
ESE			1.1E-8	3.8E-9	1.9E-9	1.1E-9	7.3E-10	5.1E-10	3.8E-10	2.9E-10
SE			9.5E-9	3.4E-9	1.7E-9	1.0E-9	6.5E-10	4.6E-10	3.4E-10	2.6E-10
SSE			1.2E-8	4.2E-9	2.1E-9	1.2E-9	7.9E-10	5.6E-10	4.1E-10	3.2E-10
S			2.1E-8	7.5E-9	3.7E-9	2.2E-9	1.4E-9	1.0E-9	7.4E-10	5.7E-10
SSW			1.2E-8	4.1E-9	2.1E-9	1.2E-9	7.9E-10	5.6E-10	4.1E-10	3.2E-10
SW			1.6E-8	5.9E-9	2.9E-9	1.7E-9	1.1E-9	8.0E-10	5.9E-10	4.5E-10
WSW			1.3E-8	4.5E-9	2.2E-9	1.3E-9	8.6E-10	6.1E-10	4.5E-10	3.5E-10
W			9.8E-9	3.5E-9	1.8E-9	1.0E-9	6.7E-10	4.7E-10	3.5E-10	2.7E-10
WNW			5.9E-9	2.1E-9	1.1E-9	6.2E-10	4.1E-10	2.9E-10	2.1E-10	1.6E-10
NW			7.3E-9	2.6E-9	1.3E-9	7.7E-10	5.0E-10	3.5E-10	2.6E-10	2.0E-10
NNW			9.7E-9	3.5E-9	1.7E-9	1.0E-9	6.6E-10	4.7E-10	3.5E-10	2.7E-10

* Inside Exclusion Area Boundary (EAB)

OCONEE NUCLEAR STATION
ADULT A_{ait} DOSE PARAMETERS

(mrem/hr per μCi/ml)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LII
H 3	0.0	5.44E-01	5.44E-01	5.44E-01	5.44E-01	5.44E-01	5.44E-01
NA 24	4.12E+02	4.12E+02	4.12E+02	4.12E+02	4.12E+02	4.12E+02	4.12E+02
CR 51	0.0	0.0	1.28E+00	7.66E-01	2.82E-01	1.70E+00	3.22E+02
MN 54	0.0	4.39E+03	8.38E+02	0.0	1.31E+03	0.0	1.34E+04
MN 56	0.0	1.10E+02	1.96E+01	0.0	1.40E+02	0.0	3.53E+03
FE 55	6.67E+02	4.61E+02	1.07E+02	0.0	0.0	2.57E+02	2.64E+02
FE 59	1.05E+03	2.47E+03	9.48E+02	0.0	0.0	6.91E+02	8.24E+03
CO 58	0.0	9.14E+01	2.05E+02	0.0	0.0	0.0	1.85E+03
CO 60	0.0	2.63E+02	5.79E+02	0.0	0.0	0.0	4.93E+03
NI 63	3.15E+04	2.18E+03	1.06E+03	0.0	0.0	0.0	4.56E+02
NI 65	1.28E+02	1.66E+01	7.59E+00	0.0	0.0	0.0	4.22E+02
CU 64	0.0	1.02E+01	4.80E+00	0.0	2.58E+01	0.0	8.71E+02
ZN 65	2.32E+04	7.38E+04	3.33E+04	0.0	4.93E+04	0.0	4.65E+04
ZN 69	4.93E+01	9.44E+01	6.56E+00	0.0	6.13E+01	0.0	1.42E+01
BR 83	0.0	0.0	4.05E+01	0.0	0.0	0.0	5.84E+01
BR 84	0.0	0.0	5.25E+01	0.0	0.0	0.0	4.12E-04
BR 85	0.0	0.0	2.16E+00	0.0	0.0	0.0	0.0
RB 86	0.0	1.01E+05	4.71E+04	0.0	0.0	0.0	1.99E+04
RB 88	0.0	2.90E+02	1.54E+02	0.0	0.0	0.0	4.01E-09
RB 89	0.0	1.92E+02	1.35E+02	0.0	0.0	0.0	1.12E-11
SR 89	2.31E+04	0.0	6.62E+02	0.0	0.0	0.0	3.70E+03
SR 90	2.87E+05	0.0	7.71E+04	0.0	0.0	0.0	1.64E+04
SR 91	4.24E+02	0.0	1.71E+01	0.0	0.0	0.0	2.02E+03
SR 92	1.61E+02	0.0	6.96E+00	0.0	0.0	0.0	3.19E+03
Y 90	6.05E-01	0.0	1.62E-02	0.0	0.0	0.0	6.41E+03
Y 91M	5.72E-03	0.0	2.21E-04	0.0	0.0	0.0	1.68E-02
Y 91	8.87E+00	0.0	2.37E-01	0.0	0.0	0.0	4.88E+03
Y 92	5.31E-02	0.0	1.55E-03	0.0	0.0	0.0	9.31E+02

* Methodology for table provided by: M. E. Wrangler, RAB:NRR:NRC on 3/17/83

TABLE A4.0-3

(2 of 3)

OCONEE NUCLEAR STATION
ADULT A_{ait} DOSE PARAMETERS

(mrem/hr per µCi/ml)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LII
Y 93	1.69E-01	0.0	4.65E-03	0.0	0.0	0.0	5.34E+03
ZR 95	3.32E-01	1.07E-01	7.21E-02	0.0	1.67E-01	0.0	3.38E+02
ZR 97	1.84E-02	3.70E-03	1.69E-03	0.0	5.59E-03	0.0	1.15E+03
NB 95	4.47E+02	2.49E+02	1.34E+02	0.0	2.46E+02	0.0	1.51E+06
MO 99	0.0	1.16E+02	2.21E+01	0.0	2.63E+02	0.0	2.69E+02
TC 99M	9.62E-03	2.72E-02	3.46E-01	0.0	4.13E-01	1.33E-02	1.61E+01
TC 101	9.89E-03	1.43E-02	1.40E-01	0.0	2.57E-01	7.28E-03	4.28E-14
RU 103	4.99E+00	0.0	2.15E+00	0.0	1.90E+01	0.0	5.82E+02
RU 105	4.15E-01	0.0	1.64E-01	0.0	5.37E+00	0.0	2.54E+02
RU 106	7.42E+01	0.0	9.38E+00	0.0	1.43E+02	0.0	4.80E+03
AG 110M	1.37E+00	1.26E+00	7.50E-01	0.0	2.48E+00	0.0	5.15E+02
E 125M	2.57E+03	9.33E+02	3.45E+02	7.74E+02	1.05E+04	0.0	1.03E+04
TE 127M	6.50E+03	2.32E+03	7.93E+02	1.66E+03	2.64E+04	0.0	2.18E+04
TE 127	1.06E+02	3.79E+01	2.29E+01	7.83E+01	4.30E+02	0.0	8.34E+03
TE 129M	1.10E+04	4.12E+03	1.75E+03	3.79E+03	4.61E+04	0.0	5.56E+04
TE 129	3.02E+01	1.13E+01	7.35E+00	2.32E+01	1.27E+02	0.0	2.28E+01
TE 131M	1.66E+03	8.13E+02	6.77E+02	1.29E+03	8.23E+03	0.0	8.07E+04
TE 131	1.89E+01	7.91E+00	5.98E+00	1.56E+01	8.29E+01	0.0	2.68E+00
TE 132	2.42E+03	1.57E+03	1.47E+03	1.73E+03	1.51E+04	0.0	7.41E+04
I 130	2.94E+01	8.68E+01	3.43E+01	7.36E+03	1.35E+02	0.0	7.48E+01
I 131	1.62E+02	2.32E+02	1.33E+02	7.59E+04	3.97E+02	0.0	6.11E+01
I 132	7.90E+00	2.11E+01	7.40E+00	7.40E+02	3.37E+01	0.0	3.97E+00
I 133	5.53E+01	9.62E+01	2.93E+01	1.41E+04	1.68E+02	0.0	8.64E+01
I 134	4.13E+00	1.12E+01	4.01E+00	1.94E+02	1.78E+01	0.0	9.77E-03
I 135	1.72E+01	4.52E+01	1.67E+01	2.98E+03	7.24E+01	0.0	5.10E+01
CS 134	2.98E+05	7.09E+05	5.80E+05	0.0	2.29E+05	7.62E+04	1.24E+04
CS 136	3.12E+04	1.23E+05	8.86E+04	0.0	6.85E+04	9.39E+03	1.40E+04
CS 137	3.82E+05	5.22E+05	3.42E+05	0.0	1.77E+05	5.89E+04	1.01E+04
CS 138	2.64E+02	5.22E+02	2.59E+02	0.0	3.84E+02	3.79E+01	2.23E-03
BA 139	1.22E+00	8.71E-04	3.58E-02	0.0	8.14E-04	4.94E-04	2.17E+00

OCONEE NUCLEAR STATION
ADULT $A_{ai\tau}$ DOSE PARAMETERS

(mrem/hr per µCi/ml)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LII
BA 140	2.56E+02	3.21E-01	1.68E+01	0.0	1.09E-01	1.84E-01	5.27E+02
BA 141	5.94E-01	4.49E-04	2.00E-02	0.0	4.17E-04	2.55E-04	2.80E-10
BA 142	2.68E-01	2.76E-04	1.69E-02	0.0	2.33E-04	1.56E-04	3.78E-19
LA 140	1.57E-01	7.92E-02	2.09E-02	0.0	0.0	0.0	5.82E+03
LA 142	8.05E-03	3.66E-03	9.12E-04	0.0	0.0	0.0	2.67E+01
CE 141	5.07E-02	3.43E-02	3.89E-03	0.0	1.59E-02	0.0	1.31E+02
CE 143	8.94E-03	6.61E+00	7.32E-04	0.0	2.91E-03	0.0	2.47E+02
CE 144	2.65E+00	1.11E+00	1.42E-01	0.0	6.56E-01	0.0	8.94E+02
PR 143	5.78E-01	2.32E-01	2.87E-02	0.0	1.34E-01	0.0	2.53E+03
PR 144	1.89E-03	7.86E-04	9.62E-05	0.0	4.43E-04	0.0	2.72E-10
ND 147	3.95E-01	4.57E-01	2.74E-02	0.0	2.67E-01	0.0	2.19E+03
W 187	2.96E+02	2.48E+02	8.66E+01	0.0	0.0	0.0	8.11E+04
NP 239	3.21E-02	3.16E-03	1.74E-03	0.0	9.84E-03	0.0	6.47E+02

A5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

The radiological environmental monitoring program shall be conducted in accordance with Technical Specification 4.11.

The monitoring program locations and analyses are given in Tables A5.0-1 through A5.0-3 and Figure A5.0-1.

Site specific characteristics make ground water sampling and food product sampling unnecessary. Ground water recharge is from precipitation and the ground water gradient is toward the effluent discharge area; therefore, contamination of ground water from liquid effluents is highly improbable. However, some ground water sampling is performed to verify this. Food products will not be sampled since lake water irrigation of crops is not practiced in the vicinity.

The laboratory performing the radiological environmental analyses shall participate in an interlaboratory comparison program which has been approved by the NRC. This program is the Environmental Protection Agency's (EPA's) Environmental Radioactivity Laboratory Intercomparison Studies (Crosscheck) Program, our participation code is CP.

The dates of the land-use census that was used to identify the controlling receptor locations was 08/02/89 - 08/10/89.

TABLE A5.0-1
(1 of 1)

OCONEE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS

(TLD LOCATIONS)

SAMPLING LOCATION DESCRIPTION *			SAMPLING LOCATION DESCRIPTION *		
020	SITE BOUNDARY	(0.2 MILES N)	040	4-5 MILE RADIUS	(4.5 MILES E)
021	SITE BOUNDARY	(0.2 MILES NNE)	041	4-5 MILE RADIUS	(4.0 MILES ESE)
022	SITE BOUNDARY	(0.5 MILES NE)	042	4-5 MILE RADIUS	(5.0 MILES SE)
023	SITE BOUNDARY	(0.9 MILES ENE)	043	4-5 MILE RADIUS	(4.0 MILES SSE)
024	SITE BOUNDARY	(0.8 MILES E)	044	4-5 MILE RADIUS	(4.0 MILES S)
025	SITE BOUNDARY	(0.6 MILES ESE)	045	4-5 MILE RADIUS	(5.0 MILES SSW)
026	SITE BOUNDARY	(0.3 MILES SE)	046	4-5 MILE RADIUS	(4.5 MILES SW)
027	SITE BOUNDARY	(0.3 MILES SSE)	047	4-5 MILE RADIUS	(4.0 MILES WSW)
028	SITE BOUNDARY	(0.5 MILES S)	048	4-5 MILE RADIUS	(4.0 MILES W)
029	SITE BOUNDARY	(0.6 MILES SSW)	049	4-5 MILE RADIUS	(4.0 MILES WNW)
030	SITE BOUNDARY	(0.4 MILES SW)	050	4-5 MILE RADIUS	(4.0 MILES NW)
031	SITE BOUNDARY	(0.2 MILES WSW)	051	4-5 MILE RADIUS	(4.5 MILES NNW)
032	SITE BOUNDARY	(0.2 MILES W)	052	SPECIAL INTEREST	(12.0 MILES ENE)
033	SITE BOUNDARY	(0.2 MILES WNW)	053	SPECIAL INTEREST	(11.0 MILES E)
034	SITE BOUNDARY	(0.2 MILES NW)	054	SPECIAL INTEREST	(9.5 MILES ESE)
035	SITE BOUNDARY	(0.1 MILES NNW)	055	SPECIAL INTEREST	(9.5 MILES SSE)
036	4-5 MILE RADIUS	(4.0 MILES N)	056	SPECIAL INTEREST	(8.4 MILES SSW)
037	4-5 MILE RADIUS	(4.5 MILES NNE)	057	SPECIAL INTEREST	(9.0 MILES SW)
038	4-5 MILE RADIUS	(4.0 MILES NE)	058	SPECIAL INTEREST	(10.0 MILES WSW)
039	4-5 MILE RADIUS	(4.0 MILES ENE)	059	SPECIAL INTEREST	(9.0 MILES NW)

* All sampling locations are collected quarterly

TABLE A5.0-2

(1 OF 1)

OCONEE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS

(OTHER SAMPLING LOCATIONS)

CODE:

W - Weekly (≤ 7 days)
SM - Semimonthly (≤ 15 days)
M - Monthly (≤ 31 days)
SA - Semiannually (≤ 184 days)

	SAMPLING LOCATION DESCRIPTION	Air Radioiodines and Particulates	Surface Water	Drinking Water	Shoreline Sediment	Milk	Fish	Broadleaf Vegetation
028	Site Boundary (0.5 miles S)							M
060	New Greenville Water Intake Rd. (2.5 miles NNE) *	W		M			SA	M
061	Old Hwy. 183 (1.5 miles SSW)	W						
062	Lake Keowee/Hydro Intake (0.7 mile ENE) (CONTROL)		M					
063	Lake Hartwell - Hwy 183 Bridge (0.8 mile ESE) (000.7)		M		SA		SA	
064	Seneca (6.7 miles SW) (004.1) (CONTROL)			M				
065	Clemson (8.1 miles SSE) (006.1) DELETED			M				
066	Anderson (19.0 miles SSE) (012) (CONTROL FOR MILK ONLY)			M		SM		
067	Lawrence Ramsey Bridge, Hwy 27 (4.2 miles SSE) (005.2)				SA		SA	
068	High Falls County Park (2.0 miles W) (CONTROL)				SA			
069	Powell Residence (4.5 miles WNW) (002.1)					SM		
071	Clemson Dairy (10.3 miles SSE) (006.3)					SM		
072	Hwy 130 (1.7 miles S)	W						
073	Tamassee Dar School (9.0 miles NW) (CONTROL)	W						M
074	Keowee Key Resort (1.7 miles NNW)	W						
075	Willimon Residence (6.0 miles NE) DELETED					SM		

* Control for Fish only

TABLE A5.0-3
(1 of 1)

OCONEE RADIOLOGICAL MONITORING PROGRAM ANALYSES

SAMPLE MEDIUM	ANALYSIS SCHEDULE	ANALYSES				
		GAMMA ISOTOPIC	TRITIUM	LOW LEVEL I-131	GROSS BETA	TLD
1. Air Radioiodine and Particulates	Weekly	X				
2. Direct Radiation	Quarterly					X
3. Surface Water	Monthly	X				
	Quarterly Composite		X			
4. Drinking Water	Monthly	X			X	
	Quarterly Composite		X			
5. Shoreline Sediment	Semiannually	X				
6. Milk	Semimonthly	X		X		
7. Fish	Semiannually	X				
8. Broadleaf Vegetation	Monthly	X				