



November 13, 2009
NND-09-0313

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

ATTN: Document Control Desk

Subject: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Combined License Application (COLA) - Docket Numbers 52-027 and 52-028 Response to NRC Request for Additional Information (RAI) Letter No.068 Related to Gaseous Waste Management System

- References:
1. Letter from Donald Habib (NRC) to Alfred M. Paglia (SCE&G), Request for Additional Information Letter No. 068 Related to SRP Section 11.03 for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application, dated October 14, 2009.
 2. Letter from Ronald B. Clary (SCE&G) to the Document Control Desk (NRC), Environmental Report Audit Information Needs: G-3, GW-4, HP-6, HP-10, HP-11, LU-4, and SE-1, dated June 1, 2009 (ML091550479)
 3. Letter from Ronald B. Clary (SCE&G) to Document Control Desk (NRC), Response to NRC Request for Additional Information (RAI) Letter No. 055, dated September 4, 2009 (ML092530688)

The enclosure to this letter provides the South Carolina Electric & Gas Company (SCE&G) response to the RAI items included in the above referenced letter (Reference 1). The enclosure also identifies any associated changes that will be incorporated in a future revision of the VCSNS Units 2 and 3 COLA.

Should you have any questions, please contact Mr. Al Paglia by telephone at (803) 345-4191, or by email at apaglia@scana.com.

DD83
HRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 13 day of November, 2009.

Sincerely,



Ronald B. Clary
Vice President
New Nuclear Deployment

AMM/RBC/jf

Enclosures

c: Luis A. Reyes
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NRC RAI Letter No. 068 Dated October 14, 2009

SRP Section: 11.03 – Gaseous Waste Management System

QUESTIONS from Health Physics Branch (CHPB)

NRC RAI Number: 11.03-3

In a July 30, 2009 letter, the applicant provided supplemental response information to RAI 02.03.03-1 that revised FSAR section 2.3.5 addressing the long-term dispersion and deposition factors based on 2 years of meteorological data. These long-term dispersion and deposition factors are inputs into the individual and population dose calculations for gaseous effluents in FSAR section 11.3. The present version of section 11.3 does not utilize these updated factors. Please revise the dose calculations and associated text and tables in FSAR section 11.3 to correspond with the updated dispersion and deposition factors in the July 30, 2009 supplemental response.

VCSNS RESPONSE:

The dose calculations and associated text and tables in VCSNS Units 2 and 3 FSAR Section 11.3 have been revised and are attached as Draft Revision 2 to the VCSNS Units 2 and 3 FSAR. It should be noted that the doses from liquid effluents, as reflected in VCSNS Units 2 and 3 FSAR Table 11.3-206, have also been revised. The liquid dose calculations have been revised as a result of an Information Need (HP-10) from the NRC's review of the VCSNS Units 2 and 3 COLA Environmental Report and the revised liquid dose analysis results are presented in SCE&G Letter NND-09-0148, dated June 1, 2009 (Reference 2). An additional conforming revision to VCSNS Units 2 and 3 FSAR Section 11.2 reflecting the revised liquid dose analysis results will be provided in a future revision to the VCSNS Units 2 and 3 FSAR.

The attached Draft Revision 2, VCSNS Units 2 and 3 FSAR Section 11.3, also includes changes from the response to NRC RAI 01-04 as documented in SCE&G Letter NND-09-0233, dated September 4, 2009 (Reference 3). In addition, minor editorial changes have been incorporated and a separator line has been added between Subsections 11.3.3.4.3 and 11.3.3.4.4. These changes are indicated by margin bars.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

Draft Revision 2 to the VCSNS Units 2 and 3 FSAR 11.3 "GASEOUS WASTE MANAGEMENT SYSTEM" is attached. Changes are shown in red strikeout and green underline except for Tables 11.3-203 and 205, which show only revisions in green underline since all values in these tables have changed.

Enclosure 1
Page 2 of 2
NND-09-0313

ASSOCIATED ATTACHMENTS:

VCSNS Units 2 and 3 FSAR Section 11.3, "GASEOUS WASTE MANAGEMENT SYSTEM", Draft Revision 2 (13 total pages)

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

11.3 GASEOUS WASTE MANAGEMENT SYSTEM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.3.3 Radioactive Releases

Add the following new paragraph at the end of DCD Subsection 11.3.3:

STD SUP 11.3-2 There are no gaseous effluent site interface parameters outside of the Westinghouse scope.

11.3.3.4 Estimated Doses

Add the following information at the end of DCD Subsection 11.3.3.4.

VCS COL 11.3-1 The VCSNS site-specific values are bounded by the DCD identified acceptable releases. With the annual airborne releases listed in DCD Table 11.3-3, the site specific air doses at ground level at the site boundary are ~~0.740~~0.71 mrad for gamma radiation and ~~3.43~~3.0 mrad for beta radiation. These doses are based on the annual average atmospheric dispersion factor from FSAR Section 2.3. These doses are below the 10 CFR Part 50, Appendix I design objectives of 10 mrad per year for gamma radiation or 20 mrad per year for beta radiation.

Dose and dose rate to man was calculated using the GASPAR II computer code. This code is based on the methodology presented in Regulatory Guide 1.109. Factors common to both estimated individual dose rates and estimated population dose are addressed in this subsection. Unique data are discussed in the respective subsections. Activity pathways considered are plume, ground deposition, inhalation, and ingestion of vegetables, meat, and milk (both cow and goat).

Agricultural products are estimated from U.S. Department of Agriculture (USDA) National Agricultural Statistics Service. GASPAR II evenly distributes the food production over the entire 50 miles when given a total production for calculating dose.

The population doses are based on the population, projected to the year 2060, within a 50-mile radius of the centroid between Units 2 and 3. The population

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

distribution is presented in FSAR Subsection 2.1.3 and Figures 2.1-211 and 2.1-219. Data from these figures are tabulated in Table 11.3-202.

11.3.3.4.1 Estimated Individual Doses

Dose rates to individuals are calculated for airborne decay and deposition, inhalation, and ingestion of milk (cow and goat), meat and vegetables. Dose from plume and ground deposition are calculated as affecting all age groups equally.

Table 11.3-201 contains GASPARD II input data for dose rate calculations. Information regarding the locations for the nearest resident, meat animal, milk animal, garden, and the dose evaluation periphery and power block area circle are described in Section 2.3. Table 11.3-203 contains total organ dose rates based on age group. Table 11.3-204 contains total air dose at each special location.

The total site doses due to liquid and gaseous effluents from Unit 1 and Units 2 and 3 would be well within the regulatory limits of 40 CFR Part 190, as shown in Table 11.3-206. The values in this table for Unit 1 are representative based on review of the Unit 1 annual radiological operating reports (References 202, through 206).

11.3.3.4.2 Estimated Population Dose

The population dose analysis performed to determine offsite dose from gaseous effluents is based upon the AP1000 generic site parameters included in DCD Chapter 11 and Tables 11.3-1, 11.3-2, and 11.3-4 and population data in Table 11.3-202. The population dose is shown in Table 11.3-205.

Table 11.3-205 shows that the total body and thyroid population doses per unit are approximately 2.92.7 and 6.76.4 person-rem per unit, respectively.

11.3.3.4.3 Gaseous Radwaste Cost-Benefit Analysis Methodology

STD COL 11.3-1 The guidance for performing cost-benefit analysis for the gaseous radwaste system is similar to that used and described for the liquid radwaste system in Section 11.2. The gaseous radwaste treatment system augments annual costs were determined and the lowest annual cost considered a threshold value. The lowest-cost option for gaseous radwaste treatment system augments is the Steam Generator Flash Tank Vent to Main Condenser at \$6,320 per year, which yields a threshold value of 6.32 person-rem total body or thyroid from gaseous effluents.

For AP1000 sites with population dose estimates less than 6.32 person-rem total body or thyroid dose from gaseous effluents, no further cost-benefit analysis is needed to demonstrate compliance with 10 CFR 50, Appendix I, Section II.D.

V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR

11.3.3.4.4 Gaseous Radwaste Cost-Benefit Analysis

VCS COL 11.3-1 As discussed in Subsection 11.3.3.4.3, the lowest cost gaseous radwaste system augment is \$6,320. Assuming 100 percent efficiency of this augment, the minimum possible cost per person-rem is determined by dividing the cost of the augment by the population dose. This is $\$2,1802,340$ per person-rem total body ($\$6,320/2.92.7$ person-rem) and $\$940988$ per person-rem thyroid ($\$6,320/6.76.4$ person-rem thyroid). While the costs per person-rem total body reduction exceed the \$1,000 per person-rem criterion, the costs per person-rem thyroid dose are below the \$1,000 per person-rem and further evaluation is required.

Since the estimated thyroid dose of $6.76.4$ person-rem exceeds the 6.32 person-rem threshold value, those system augments listed in Regulatory Guide 1.110 with a Total Annual Cost less than $\$6,7006,400$ are evaluated to determine if they would be cost beneficial. The only system augment with a Total Annual Cost less than $\$6,7006,400$ is the lowest-cost option for gaseous radwaste treatment system augments, the Steam Generator Flash Tank Vent to Main Condenser. It is noted that this augment would not mitigate the dose contribution from noble gases. Of the $6.76.4$ person-rem thyroid dose given in FSAR Section 11.3.3.4.2, $4.31.2$ person-rem is due to noble gases. Assuming this system augment completely eliminates the dose of the remaining $5.45.2$ person-rem thyroid due to isotopes other than noble gases, the cost of the thyroid dose reduction would be $\$6,320/5.45.2$ person-rem thyroid, or $\$1,1701,215$ per person-rem thyroid. This cost per person-rem reduction exceeds the \$1,000 per person-rem criterion prescribed in Appendix I to 10 CFR Part 50 and this system augment is therefore not cost beneficial.

Due to the low VCSNS population doses, there are no other system augments from those listed in Regulatory Guide 1.110 which would be considered cost beneficial.

11.3.3.6 Quality Assurance

STD SUP 11.3-1 Add the following to the end of DCD Subsection 11.3.3.6:

Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation, and testing provisions of the gaseous radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

11.3.5 COMBINED LICENSE INFORMATION

11.3.5.1 Cost Benefit Analysis of Population Doses

STD COL 11.3-1 This COL Item is addressed in Subsection 11.3.3.4.3.

VCS COL 11.3-1 This COL Item is addressed in Subsections 11.3.3.4, 11.3.3.4.1, 11.3.3.4.2, and 11.3.3.4.4.

VCS COL 11.5-3 This COL Item is addressed in Subsection 11.3.3.4.

11.3.6 REFERENCES

201. Deleted
202. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2005 – December 31, 2005; April 2006.
203. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2003 – December 31, 2003; April 2004.
204. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station for the Operating Period January 1, 2004 – December 31, 2004; April 2005.
205. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2006 – December 31, 2006; April 2007.
206. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2007 – December 31, 2007; April 2008.

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-201
GASPAR II Input^(a)**

Input Parameter	Value
Number of Source Terms	1
Read Met data from XOQDOQ-generated file	Selected
Distance from site to NE Corner of the US	1129 mi
Source Term	DCD Table 11.3-3
Population Data	Table 11.3-202
Fraction of the year leafy vegetables are grown	0.583
Fraction of the year milk cows are on pasture	0.75
Fraction of maximally exposed individual's vegetable intake from own garden	0.76
Fraction of milk-cow feed intake from pasture while on pasture	1
Fraction of the year goats are on pasture	0.83
Fraction of goat feed intake from pasture while on pasture	1
Fraction of the year beef cattle are on pasture	0.75
Fraction of beef-cattle feed intake from pasture while on pasture	1
Total Production Rate for the 50-mile area	
-Vegetables	8.66E+07 kg per year
-Milk	6.78E+07 liters per year
-Meat	9.15E+08 kg per year
Special Location Data	Section 2.3

a) Input parameters not specified use default GASPAR II values.

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-202
Population Input for Population Dose Rates**

Direction	Distance (mi)									
	1	2	3	4	5	10	20	30	40	50
N	0	0	0	0	10	346	873	5086	9609	56103
NNE	0	0	0	10	73	491	651	9504	14976	214038
NE	0	0	115	25	83	155	2060	3485	12585	77448
ENE	0	51	0	19	0	793	12225	1477	2634	19934
E	0	19	147	0	0	915	4637	8552	31951	43930
ESE	117	4	12	133	22	321	6820	106337	19823	10765
SE	0	29	57	0	156	394	48768	343866	58718	14087
SSE	0	0	0	0	0	3242	118703	210614	59842	16596
S	0	6	0	117	102	3020	35109	57548	29388	15465
SSW	0	0	12	44	92	3907	18332	32814	14385	15326
SW	0	0	47	9	57	1576	5334	4697	10615	26568
WSW	0	36	17	0	168	1000	6268	3601	5059	9065
W	0	0	9	24	62	701	23548	2522	7991	79542
WNW	0	18	0	6	54	865	2800	4997	33560	44593
NW	0	0	0	9	0	639	721	4774	5727	20941
NNW	35	0	9	225	23	415	434	2812	23936	15182
Total	152	163	425	621	902	18780	287283	802686	340799	679583
Grand Total									2131394	

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

Revised

**Table 11.3-203 (Sheet 1 of 2)
Annual Individual Doses from Gaseous Effluents (per Unit)**

VCS COL 11.3-1
VCS COL 11.5-3

Nearest Site Boundary (0.50 mi SE)									
Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	All	4.5E-01	4.5E-01	4.5E-01	4.5E-01	4.5E-01	4.5E-01	4.8E-01	2.3E+00
Ground	All	1.5E-01	1.5E-01	1.5E-01	1.5E-01	1.5E-01	1.5E-01	1.5E-01	1.8E-01
Inhalation	Adult	4.9E-02	5.0E-02	7.8E-03	5.1E-02	5.1E-02	4.7E-01	6.4E-02	4.8E-02
	Teen	5.0E-02	5.0E-02	9.5E-03	5.2E-02	5.3E-02	5.8E-01	7.3E-02	4.8E-02
	Child	4.4E-02	4.4E-02	1.2E-02	4.6E-02	4.7E-02	6.8E-01	6.3E-02	4.3E-02
	Infant	2.6E-02	2.5E-02	5.8E-03	2.8E-02	2.8E-02	6.1E-01	3.9E-02	2.5E-02
Nearest Residence (1.68 mi SE)									
Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	All	6.0E-02	6.0E-02	6.0E-02	6.0E-02	6.0E-02	6.0E-02	6.5E-02	3.3E-01
Ground	All	3.0E-02	3.0E-02	3.0E-02	3.0E-02	3.0E-02	3.0E-02	3.0E-02	3.5E-02
Inhalation	Adult	7.4E-03	7.5E-03	1.1E-03	7.5E-03	7.7E-03	6.6E-02	9.4E-03	7.2E-03
	Teen	7.5E-03	7.5E-03	1.3E-03	7.7E-03	7.9E-03	8.3E-02	1.1E-02	7.2E-03
	Child	6.6E-03	6.5E-03	1.6E-03	6.9E-03	7.0E-03	9.6E-02	9.2E-03	6.4E-03
	Infant	3.8E-03	3.7E-03	8.0E-04	4.1E-03	4.1E-03	8.6E-02	5.6E-03	3.7E-03
Nearest Garden (1.68 mi SE)									
Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Vegetable	Adult	5.6E-02	5.7E-02	2.9E-01	5.6E-02	5.3E-02	6.6E-01	4.8E-02	4.8E-02
	Teen	8.3E-02	8.4E-02	4.4E-01	8.6E-02	8.1E-02	8.9E-01	7.5E-02	7.3E-02
	Child	1.8E-01	1.7E-01	1.0E+00	1.9E-01	1.8E-01	1.7E+00	1.7E-01	1.7E-01
Nearest Meat Animal (1.68 mi SE)									
Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Meat	Adult	1.7E-02	2.0E-02	7.2E-02	1.7E-02	1.6E-02	4.0E-02	1.6E-02	1.6E-02

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

Revised

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-203 (Sheet 2 of 2)
Annual Individual Doses from Gaseous Effluents (per Unit)**

Teen	1.3E-02	1.5E-02	6.1E-02	1.4E-02	1.3E-02	3.0E-02	1.3E-02	1.3E-02
Child	2.4E-02	2.5E-02	1.1E-01	2.4E-02	2.4E-02	5.0E-02	2.4E-02	2.4E-02

Nearest Milk Cow (1.68 mi SE)

Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Milk	Adult	2.5E-02	2.1E-02	8.6E-02	2.7E-02	2.5E-02	7.0E-01	2.0E-02	2.0E-02
	Teen	4.0E-02	3.6E-02	1.6E-01	4.6E-02	4.3E-02	1.1E+00	3.5E-02	3.4E-02
	Child	6.5E-02	8.0E-02	3.8E-01	1.0E-01	9.4E-02	2.2E+00	8.0E-02	7.8E-02
	Infant	1.7E-01	1.6E-01	7.3E-01	2.0E-01	1.9E-01	5.3E+00	1.6E-01	1.6E-01

Nearest Milk Goat (1.68 mi SE)

Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Milk	Adult	3.8E-02	2.6E-02	1.0E-01	4.3E-02	3.4E-02	9.2E-01	2.6E-02	2.4E-02
	Teen	5.4E-02	4.2E-02	1.8E-01	7.2E-02	5.8E-02	1.5E+00	4.3E-02	4.0E-02
	Child	1.0E-01	8.9E-02	4.3E-01	1.4E-01	1.2E-01	2.9E+00	9.3E-02	8.8E-02
	Infant	1.9E-01	1.7E-01	8.1E-01	2.8E-01	2.2E-01	7.0E+00	1.8E-01	1.7E-01

Maximally Exposed Individual (1.68 mi SE)

Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
All	Adult	2.1E-01	2.0E-01	5.5E-01	2.1E-01	2.0E-01	1.8E+00	1.9E-01	4.5E-01
	Teen	2.5E-01	2.4E-01	7.7E-01	2.7E-01	2.5E-01	2.6E+00	2.4E-01	4.9E-01
	Child	4.0E-01	3.8E-01	1.7E+00	4.5E-01	4.2E-01	4.9E+00	3.9E-01	6.4E-01
	Infant	2.8E-01	2.7E-01	9.0E-01	3.8E-01	3.2E-01	7.2E+00	2.8E-01	5.4E-01

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-203 (Sheet 1 of 2)
Annual Individual Doses from Gaseous Effluents (per Unit (mrem))**

Pathway	Age		Nearest Site Boundary (0.50 mi SE, 0.50 mi ENE/NE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	All	4.4E-01	4.4E-01	4.4E-01	4.4E-01	4.4E-01	4.4E-01	4.7E-01	2.2E+00
Ground	All	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.6E-01
Inhalation	Adult	4.8E-02	4.8E-02	7.6E-03	4.9E-02	5.0E-02	4.5E-01	6.2E-02	4.6E-02
	Teen	4.8E-02	4.9E-02	9.1E-03	5.0E-02	5.1E-02	5.6E-01	7.1E-02	4.7E-02
	Child	4.3E-02	4.2E-02	1.1E-02	4.5E-02	4.6E-02	6.6E-01	6.1E-02	4.1E-02
	Infant	2.5E-02	2.4E-02	5.6E-03	2.7E-02	2.7E-02	5.9E-01	3.8E-02	2.4E-02

Pathway	Age		Nearest Residence (1.68 mi SE, 1.3 mi ENE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	All	5.8E-02	5.8E-02	5.8E-02	5.8E-02	5.8E-02	5.8E-02	6.2E-02	3.1E-01
Ground	All	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	3.4E-02
Inhalation	Adult	7.1E-03	7.2E-03	1.1E-03	7.3E-03	7.4E-03	6.4E-02	9.1E-03	6.9E-03
	Teen	7.2E-03	7.3E-03	1.3E-03	7.5E-03	7.7E-03	8.0E-02	1.0E-02	7.0E-03
	Child	6.4E-03	6.3E-03	1.5E-03	6.7E-03	6.8E-03	9.4E-02	8.9E-03	6.2E-03
	Infant	3.7E-03	3.6E-03	7.8E-04	4.0E-03	4.0E-03	8.4E-02	5.5E-03	3.6E-03

Pathway	Age		Nearest Garden (1.68 mi SE, 1.3 mi ENE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Vegetable	Adult	5.4E-02	5.5E-02	2.8E-01	5.4E-02	5.1E-02	6.4E-01	4.7E-02	4.6E-02
	Teen	8.0E-02	8.1E-02	4.3E-01	8.3E-02	7.9E-02	8.6E-01	7.2E-02	7.1E-02
	Child	1.7E-01	1.7E-01	1.0E+00	1.8E-01	1.7E-01	1.7E+00	1.6E-01	1.6E-01

Pathway	Age		Nearest Meat Animal (1.68 mi SE, 1.3 mi ENE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Meat	Adult	1.6E-02	2.0E-02	6.9E-02	1.6E-02	1.6E-02	3.9E-02	1.5E-02	1.5E-02
	Teen	1.3E-02	1.5E-02	5.9E-02	1.3E-02	1.3E-02	2.9E-02	1.3E-02	1.3E-02
	Child	2.3E-02	2.4E-02	1.1E-01	2.4E-02	2.3E-02	4.8E-02	2.3E-02	2.3E-02

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-203 (Sheet 2 of 2)
Annual Individual Doses from Gaseous Effluents (per Unit (mrem))**

Pathway	Age		Nearest Milk Cow (1.68 mi SE, 1.3 mi ENE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Milk	Adult	<u>2.4E-02</u>	<u>2.0E-02</u>	<u>8.3E-02</u>	<u>2.6E-02</u>	<u>2.4E-02</u>	<u>6.7E-01</u>	<u>2.0E-02</u>	<u>1.9E-02</u>
	Teen	<u>3.8E-02</u>	<u>3.4E-02</u>	<u>1.5E-01</u>	<u>4.5E-02</u>	<u>4.2E-02</u>	<u>1.1E+00</u>	<u>3.4E-02</u>	<u>3.3E-02</u>
	Child	<u>8.2E-02</u>	<u>7.7E-02</u>	<u>3.7E-01</u>	<u>9.6E-02</u>	<u>9.1E-02</u>	<u>2.1E+00</u>	<u>7.7E-02</u>	<u>7.6E-02</u>
	Infant	<u>1.6E-01</u>	<u>1.5E-01</u>	<u>7.1E-01</u>	<u>2.0E-01</u>	<u>1.8E-01</u>	<u>5.2E+00</u>	<u>1.6E-01</u>	<u>1.5E-01</u>

Pathway	Age		Nearest Milk Goat (1.68 mi SE, 1.3 mi ENE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Milk	Adult	<u>3.6E-02</u>	<u>2.5E-02</u>	<u>9.6E-02</u>	<u>4.2E-02</u>	<u>3.3E-02</u>	<u>9.0E-01</u>	<u>2.5E-02</u>	<u>2.3E-02</u>
	Teen	<u>5.2E-02</u>	<u>4.1E-02</u>	<u>1.7E-01</u>	<u>7.0E-02</u>	<u>5.6E-02</u>	<u>1.4E+00</u>	<u>4.2E-02</u>	<u>3.9E-02</u>
	Child	<u>9.8E-02</u>	<u>8.6E-02</u>	<u>4.2E-01</u>	<u>1.4E-01</u>	<u>1.1E-01</u>	<u>2.8E+00</u>	<u>9.0E-02</u>	<u>8.5E-02</u>
	Infant	<u>1.8E-01</u>	<u>1.7E-01</u>	<u>7.8E-01</u>	<u>2.7E-01</u>	<u>2.1E-01</u>	<u>6.8E+00</u>	<u>1.8E-01</u>	<u>1.7E-01</u>

Pathway	Age		Maximally Exposed Individual (1.68 mi SE, 1.3 mi ENE) ^(a)						
	Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
All	Adult	<u>2.0E-01</u>	<u>1.9E-01</u>	<u>5.3E-01</u>	<u>2.1E-01</u>	<u>1.9E-01</u>	<u>1.7E+00</u>	<u>1.9E-01</u>	<u>4.4E-01</u>
	Teen	<u>2.4E-01</u>	<u>2.3E-01</u>	<u>7.5E-01</u>	<u>2.6E-01</u>	<u>2.4E-01</u>	<u>2.5E+00</u>	<u>2.3E-01</u>	<u>4.8E-01</u>
	Child	<u>3.9E-01</u>	<u>3.7E-01</u>	<u>1.6E+00</u>	<u>4.4E-01</u>	<u>4.0E-01</u>	<u>4.7E+00</u>	<u>3.8E-01</u>	<u>6.2E-01</u>
	Infant	<u>2.7E-01</u>	<u>2.6E-01</u>	<u>8.7E-01</u>	<u>3.6E-01</u>	<u>3.0E-01</u>	<u>7.0E+00</u>	<u>2.7E-01</u>	<u>5.2E-01</u>

a) The distances and directions are for the maximum applicable X/Q and the maximum D/Q respectively.

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-204
Comparison of Gaseous Effluent Doses to 10 CFR 50 Appendix I Limits**

Type of Dose	Location	Annual Dose per Unit	
		Unit 2 or 3	Limit
Gaseous Effluent	EAB		
Gamma Air (mrad)		0.740 <u>0.71</u>	10
Beta Air (mrad)		3.13 <u>0</u>	20
Total Body (mrem)		0.600 <u>0.58</u>	5
Skin (mrem)		2.4	15
Iodines and Particulates in Gaseous Effluent—Thyroid (mrem)	MEI ^(a) (1.68 mi SE)	7.27 <u>0</u>	15

a) Maximum X/Q occurs at 1.68 mi SE while the maximum D/Q occurs at 1.3 mi ENE. The MEI dose is based on this combination of X/Q and D/Q.

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

Revised

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-205
Annual Population Doses from Gaseous Effluents (per Unit)**

Pathway	Dose (person-rem/yr)							
	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	1.3E+00	1.3E+00	1.3E+00	1.3E+00	1.3E+00	1.3E+00	1.5E+00	1.2E+01
Ground	2.1E-01	2.1E-01	2.1E-01	2.1E-01	2.1E-01	2.1E-01	2.1E-01	2.5E-01
Inhalation	3.3E-01	3.4E-01	3.8E-02	3.4E-01	3.5E-01	2.6E+00	4.1E-01	3.3E-01
Vegetable	3.0E-01	3.0E-01	1.4E+00	3.0E-01	2.9E-01	3.1E-01	2.9E-01	2.9E-01
Cow Milk	1.5E-01	1.5E-01	6.2E-01	1.6E-01	1.5E-01	1.4E+00	1.4E-01	1.4E-01
Meat	6.3E-01	6.7E-01	2.8E+00	6.3E-01	6.2E-01	9.2E-01	6.2E-01	6.2E-01
Total	2.9E+00	2.9E+00	6.3E+00	2.9E+00	2.9E+00	6.7E+00	3.1E+00	1.4E+01

VCS COL 11.3-1
VCS COL 11.5-3

**Table 11.3-205
Annual Population Doses from Gaseous Effluents (per Unit)**

Pathway	Dose (person-rem/yr)							
	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	<u>1.2E+00</u>	<u>1.2E+00</u>	<u>1.2E+00</u>	<u>1.2E+00</u>	<u>1.2E+00</u>	<u>1.2E+00</u>	<u>1.4E+00</u>	<u>1.1E+01</u>
Ground	<u>2.1E-01</u>	<u>2.5E-01</u>						
Inhalation	<u>3.1E-01</u>	<u>3.1E-01</u>	<u>3.5E-02</u>	<u>3.1E-01</u>	<u>3.2E-01</u>	<u>2.4E+00</u>	<u>3.7E-01</u>	<u>3.0E-01</u>
Vegetable	<u>2.9E-01</u>	<u>2.9E-01</u>	<u>1.3E+00</u>	<u>2.9E-01</u>	<u>2.8E-01</u>	<u>3.0E-01</u>	<u>2.8E-01</u>	<u>2.8E-01</u>
Cow Milk	<u>1.5E-01</u>	<u>1.4E-01</u>	<u>6.1E-01</u>	<u>1.6E-01</u>	<u>1.5E-01</u>	<u>1.4E+00</u>	<u>1.4E-01</u>	<u>1.4E-01</u>
Meat	<u>6.2E-01</u>	<u>6.5E-01</u>	<u>2.8E+00</u>	<u>6.2E-01</u>	<u>6.1E-01</u>	<u>9.1E-01</u>	<u>6.1E-01</u>	<u>6.1E-01</u>
Total	<u>2.7E+00</u>	<u>2.8E+00</u>	<u>6.1E+00</u>	<u>2.8E+00</u>	<u>2.7E+00</u>	<u>6.4E+00</u>	<u>3.0E+00</u>	<u>1.3E+01</u>

**V. C. Summer Nuclear Station, Units 2 and 3
COL Application
Part 2, FSAR**

**Table 11.3-206
Comparison of Maximally Exposed Individual Doses with
40 CFR Part 190 Criteria**

	Dose (mrem/yr)					
	Units 2 and 3			Unit 1 ^(c)	Site Total	Regulatory Limit
	Liq ^(a)	Gas ^(b)	Total			
Total Body	0.400 <u>0.28</u>	0.800 <u>0.78</u>	0.911 <u>1.1</u>	1.2	2.122 <u>2.2</u>	25
Thyroid	0.140 <u>0.38</u>	44.414 <u>44.414</u>	44.614 <u>44.614</u>	0.0400 <u>0.043</u>	44.614 <u>44.614</u>	75
Other Organ - Bone	0.0820 <u>0.23</u>	3.332 <u>3.2</u>	3.435 <u>3.5</u>	0.0400 <u>0.043</u>	3.5	25

- a) Doses from Table 11.2-203 are doubled for two units.
b) Maximum doses (by age group) from Table 11.3-203 are doubled for two units.
c) Unit 1 doses are based on annual effluent reports.