Progress Energy

Serial: NPD-NRC-2008-061
November 7, 2008

10CFR52.79

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

SHEARON HARRIS NUCLEAR POWER PLANT, UNITS 2 AND 3
DOCKET NOS. 52-022 AND 52-023
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 027 RELATED TO GASEOUS RADWASTE MANAGEMENT SYSTEM

Reference: Letter from Ravindra G. Joshi (NRC) to James Scarola (PEC), dated October 6, 2008, "Request for Additional Information Letter No. 027 Related to SRP Section 11.03 for the Harris Units 2 and 3 Combined License Application"

Ladies and Gentlemen:

Progress Energy Carolinas, Inc. (PEC) hereby submits our response to the Nuclear Regulatory Commission's (NRC) request for additional information provided in the referenced letter.

A response to each NRC request is addressed in the enclosure. The enclosure also identifies changes that will be made in a future revision of the Shearon Harris Nuclear Power Plant Units 2 and 3 application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (919) 546-6107.

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

Executed on November 7, 2008.

Sincerely,

Garry D. Miller
General Manager
Nuclear Plant Development

Enclosure

cc : U.S. NRC Director, Office of New Reactors/NRLPO
U.S. NRC Office of Nuclear Reactor Regulation/NRLPO
U.S. NRC Region II, Regional Administrator
U.S. NRC Resident Inspector, SHNPP Unit 1
Mr. Manny Comar, U.S. NRC Project Manager

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P.O. Box 1551
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NRO

Shearon Harris Nuclear Power Plant Units 2 and 3
Response to NRC Request for Additional Information Letter No. 027 Related to SRP Section 11.03 for the Combined License Application, dated October 6, 2008

NRC RAI #	Progress Energy RAI #	Progress Energy Response
11.03-1	H-0170	Response enclosed – see following pages
11.03-2	H-0137	Response enclosed – see following pages

NRC Letter No.: HAR-RAI-LTR-027

NRC Letter Date: October 6, 2008

NRC Review of Final Safety Analysis Report

NRC RAI #: 11.03-1

Text of NRC RAI:

FSAR Sections 11.3.3.4.2 and 11.3.5.1 (including WLS COL Item 11.3-1) reference draft NEI Template 07-11 as the basis of the cost-benefit analysis for justifying, in part, the design of the Gaseous Waste Management System (GWMS). The NEI template proposed a bounding envelope of population doses associated with gaseous effluent releases, which, if met, would demonstrate compliance with ALARA cost-benefit requirements of Section II.D of Appendix I to Part 50. However, NEI Template 07-11 was withdrawn from further consideration by NEI. Accordingly, please explain how the applicant intends to develop a plant and site-specific cost-benefit analysis demonstrating compliance with Section II.D of Appendix I to Part 50 with respect to the GWMS, and provide sufficient information for the staff to evaluate the bases and assumptions used in the analysis against the applicable NRC regulations and guidance.

PGN RAI ID #: H-0170

PGN Response to NRC RAI:

A plant-specific cost-benefit analysis has been prepared that demonstrates compliance with Section II.D of Appendix I to Part 50 with respect to the GWMS. This cost-benefit analysis replaces the use of NEI 07-11; thus, reference to NEI 07-11 will be removed from the FSAR. The total annual costs of the gaseous radwaste system augments listed in Regulatory Guide 1.110, Revision 0, were developed using the methodology and parameters provided in the regulatory guide. Conservative values were chosen for parameters not specified in the regulatory guide. The following parameters were used in the analysis:

- Capital Recovery Factor (CRF) — This factor is taken from Table A-6 of Regulatory Guide 1.110 and reflects the cost of money for capital expenditures. A cost-of-money value of 7% per year is assumed in this analysis, consistent with the "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission" (NUREG/BR-0058). Using this after-tax rate of return on capital is considered conservative for new plants at HAR. While the North and South Carolina utility regulators have not yet approved a rate of return on capital for this project, Progress expects the approved rate will be comparable, if not higher. A CRF of 0.0806 was obtained from Table A-6.

- Indirect Cost Factor (ICF) —This factor takes into account whether the radwaste system is unitized or shared (in the case of a multi-unit site) and is taken from Table A-5 of Regulatory Guide 1.110. It is assumed that the radwaste system for this analysis is a unitized system at a 2- unit site, which equals an ICF of 1.625.

- Labor Cost Correction Factor (LCCF) —This factor takes into account the differences in relative labor costs between geographical regions and is taken from Table A-4 of Regulatory Guide 1.110. A LCCF of 1.0 (the lowest value) for Region III will be assumed in the analysis.

Appendix I to 10 CFR Part 50 prescribes a criterion of $1,000 per person-rem as the threshold to determine if the total body exposure-related costs per person-rem are cost beneficial. This criterion is utilized within Regulatory Guide 1.110. . While NRC guidance considers $2,000 per person-rem the criterion applicable in other situations, the criterion of $1,000 per person-rem is specifically applicable to cost-benefit evaluations of effluent treatment augments. The $1,000 per person-rem criterion is the long-standing NRC guidance for these evaluations, preserved through revisions of the NRC regulations governing new reactor designs, including a revision as recent as 2007. Therefore, a criterion of $1,000 per person-rem is considered appropriate for this analysis.

The methodology in Regulatory Guide 1.110 has not been updated to reflect the revised process for licensing new reactor plants in 10 CFR Part 52. For the HAR COLA that references a certified design, the Regulatory Guide 1.110 methodology does not reflect the additional burdens associated with departing from a standard design approval. Such departures result in additional administrative cost for review, including for some augments either revising the certified design rule or processing an exemption request. In addition, such departures are not consistent with the NRC's objective of standardization. These additional burdens arising from the revised process for licensing new reactor plants reinforce that none of the radwaste augments are appropriate for HAR.

The lowest cost option for gaseous radwaste treatment system augments is the Steam Generator Flash Tank Vent to Main Condenser at a total annual cost (TAC) of $6,320 per year, which yields a threshold value of 6.32 person-rem total body or 6.32 person-rem thyroid dose from gaseous effluents. As shown in FSAR Section 11.3.3.4.2 and Table 11.3-209, the HAR gaseous population doses are 6.52 person-rem total body and 12.9 person-rem thyroid which exceed the 6.32 person-rem threshold value. Further analysis is provided in revised FSAR subsection 11.3.3.4.4 using the methodology of Regulatory Guide 1.110. Based on the evaluation, none of the radwaste augments are cost beneficial in reducing the annual thyroid or total body dose from gaseous effluents for HAR.

Associated HAR COL Application Revisions:

Add new FSAR Chapter 11 Subsection 11.3.3.4.3 to read:

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 provided in Regulatory Guide 1.110. 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.

Add new FSAR Chapter 11 Subsection 11.3.3.4.4 to read:

11.3.3.4.4 Gaseous Radwaste Cost Benefit Analysis

HAR COL 11.3-1 As shown in FSAR Section 11.3.3.4.2 and Table 11.3-209 and the table below, the HAR gaseous population doses are 6.52 person-rem total body and 12.9 person-rem thyroid which exceed the 6.32 person-rem threshold value.

Source	Total Body (person-rem)	% of Total Total Body	Thyroid (person-rem)	% of Total Thyroid
Noble Gases	2.77E+00	42%	2.77E+00	22%
Iodine	1.33E-02	0%	6.37E+00	50%
Particulates	4.09E-01	6%	3.87E-01	3%
C-14	2.21E+00	34%	2.21E+00	17%
H-3	1.12E+00	17%	1.12E+00	9%
Total	6.52E+00	100%	1.29E+01	100%

Based on the estimated 12.9 person-rem thyroid dose, those augments with a "Total Annual Cost" less than $12,900 are considered below.

PWR Air Ejector Charcoal/HEPA Filtration Unit
The Total Annual Cost (TAC) for this augment is $9,140. To be cost beneficial at $1000 per person-rem, this augment must remove sufficient activity to decrease the population dose by at least 9.14 person-rem (thyroid); that is, decrease the thyroid dose from 12.9 person-rem (initial level) to a final level of 3.76 person-rem. No iodine is released through the condenser air removal (offgas) system as shown in DCD Table 11.3-3, sheet 2 of 3. Therefore, this augment does not affect the iodine discharged by the plant which accounts for 6.37 person-rem in the thyroid population dose. Therefore, it would be impossible to achieve the necessary dose reduction, and this augment is not cost-beneficial.

3-Ton Charcoal Absorber
The TAC for this augment is $8,770. To be cost beneficial at $1,000 per person-rem, this augment must remove sufficient activity to decrease the population dose by at least 8.77 person-rem (thyroid); that is, decrease the thyroid dose from 12.9 person-rem (initial level) to a final level of 4.13 person-rem.

The 3-Ton Charcoal Adsorber unit in Regulatory Guide 1.110 is based on a 200 cubic foot charge of activated charcoal for an "add-on" vessel to an existing system per the information contained within that document's Total Direct Cost Estimate Sheet attachments. For the AP1000, it is assumed this augment would be appended to the Gaseous Radwaste System where it would increase the delay time of noble gases exiting the existing activated carbon delay beds. No iodine is released through the Gaseous Radwaste System as shown in DCD Table 11.3-3, sheet 2 of 3.

This augment does not affect the iodine discharged from the plant which accounts for 6.37 person-rem in the thyroid population dose. Therefore, it would be impossible to achieve the necessary dose reduction, and this augment is not cost-beneficial.

Main Condenser Vacuum Pump Charcoal/HEPA Filtration System
The TAC for this augment is $7,690. To be cost beneficial at $1,000 per person-rem, this augment must remove sufficient activity to decrease the population dose by at least 7.69 person-rem (thyroid); that is, decrease the thyroid dose from an initial level of 12.9 person rem to a final level of 5.21 person-rem. However, no iodine is released through the condenser air removal system as shown in DCD Table 11.3-3, sheet 2 of 3. This augment does not affect the iodine discharged by the plant which accounts for 6.37 person-rem in the thyroid population dose. Therefore, it would be impossible to achieve the necessary dose reduction, and this augment is not cost-beneficial.

1,000 cfm Charcoal/HEPA Filtration System
The TAC for this augment is $7,580. To be cost beneficial at $1,000 per person-rem, this augment must remove sufficient activity to decrease the population dose by at least 7.58 person-rem (thyroid); that is, decrease the thyroid dose from an initial level of 12.9 person rem to a final level of 5.32 person-rem.

Conservatively assuming that this rather small capacity augment could be placed in the ventilation system at some point that would eliminate all iodine and particulate releases, it would not be effective in reducing the noble gas releases, the carbon-14 release, or the airborne tritium release. The noble gases, carbon-14, and tritium discharged by the plant account for 6.1 person-rem in the thyroid population dose. Therefore, it would be impossible to achieve the necessary dose reduction, and this augment is not cost-beneficial.

600 ft^3 Gas Decay Tank
The TAC for this augment is $7,460. Thus, to be cost beneficial at $1,000 per person-rem, this augment must remove at least 7.46 person-rem (thyroid); that is, decrease the thyroid dose from an initial level of 12.9 person-rem to a final level of 5.44 person-rem. The 600 cubic foot Gas Decay Tank suggested as an augment in the draft Regulatory Guide would be part of a conventional high pressure waste gas holding system.

No iodine is released through the AP1000 waste gas system as shown in DCD Table 11.3-3. This augment would not affect the iodine discharged by the plant which accounts for 6.37 person-rem in the thyroid population dose. Therefore, it would be impossible to achieve the necessary dose reduction, and this augment is not cost-beneficial.

Steam Generator Flash Tank Vent to Main Condenser
The TAC for this augment is $6,320. Thus, to be cost beneficial at $1,000 per person-rem, this augment must remove at least 6.32 person-

rem (thyroid or whole body); that is decrease the person-rem thyroid dose from an initial level of 12.9 person-rem thyroid to a final level of 6.58 person-rem thyroid or decrease the whole body from an initial level of 6.52 person-rem whole body to a final level of 0.2 person-rem whole body. Addition of this augment presumes that the design already includes a steam generator flash tank; the augment being evaluated is the installation of vent piping and instrumentation from the tank to the main condenser. However, the AP1000 design does not include a steam generator flash tank. Therefore, the TAC of $6,320 for this augment is underestimated. As shown in DCD Figure 10.4.8-1, the AP1000 design includes steam generator blowdown heat exchangers that provide cooling of the blowdown fluid and prevent flashing prior to the blowdown flow entering the main condenser. Therefore, this augment would not provide any additional dose reduction, and this augment is not cost-beneficial.

Conclusion

Based on the above evaluation, none of the radwaste augments are cost-beneficial in reducing the annual thyroid dose from gaseous effluents for HAR.

Revise FSAR Subsection 11.3.5.1 from:

HAR COL 11.3-1 This section adopts NEI 07-11 (Reference 201). This document is currently under review by the NRC staff. The augments provided in NEI 07-11 were evaluated and were found not to be cost beneficial due to the low HAR population doses.

To read:

STD COL 11.3-1 This COL Item is addressed in Subsection 11.3.3.4.3.
HAR 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.
HAR COL 11.5-3 This COL Item is addressed in Subsection 11.3.3.4.

Delete FSAR Subsection 11.3.6 in its entirety:

~~11.3.6 REFERENCES~~

~~201. NEI 07-11, "Generic Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light Water Cooled Nuclear Power Reactors," Revision 0, September 2007.~~

Attachments/Enclosures to Response to NRC:

None.

NRC Letter No.: HAR-RAI-LTR-027

NRC Letter Date: October 6, 2008

NRC Review of Final Safety Analysis Report

NRC RAI #: 11.03-2

Text of NRC RAI:

Please provide detailed information to enable the staff to validate and verify the estimated doses in FSAR section 11.3.3.4 with respect to the dose objectives of Appendix I to 10 CFR Part 50 and the dose limits in 10 CFR 20.1301(e); please revise the FSAR to include this information, or justify its exclusion. The information should include the following:

- a complete description of how the applicant derived all the values listed in Table 11.3-201, including all assumptions made
- citations to any reference material used (for documents not publicly available please provide a copy for staff's use)
- detailed breakdown of individual doses by pathway and organ
- detailed breakdown of population doses by pathway and organ

PGN RAI ID #: H-0137

PGN Response to NRC RAI:

Regulatory Guide 1.206, Revision 0, and Standard Review Plan 11.3, Revision 3, require the parameters used to determine estimated doses from the gaseous effluent system to be provided in the FSAR, but neither requires the FSAR to provide a detailed basis for each parameter. In lieu of providing this detail in the FSAR, the requested material is provided in the attached annotated table. Annotated Table 11.3-201 and the attached X/Q tables included in this response provide additional information on how the values in FSAR Table 11.3-201 were derived (see pages 10 through 16). These tables are not part of the FSAR and not included in the revision to the COLA.

FSAR Table 11.3-201 will be revised in a future amendment (as shown on the following pages 17 & 18) to provide an expanded list of the GASPAR II input parameters and values used in the performing the dose analyses. Based upon this update, the attached annotated table (11.3-201) documents the input parameters, values, and the basis for each value. The annotated table includes a reference for the values used and or supporting discussion about how the value was determined if it is not found directly from the reference.

The individual doses presented in FSAR Table 11.3-206 are for the maximum exposed person and will be expanded as shown in the attached revision to include the doses by pathway (Plume, Ground, Inhalation, Cow Milk, Goat Milk, Vegetable, and Meat) in addition to the organ dose provided for each of the age groups listed, i.e. adult, teenager, child and infant.

The following FSAR tables are being added to summarize, in a tabular manner, the results of analyses presented in FSAR Section11.3.3.4 relative to the regulatory requirements of Appendix I to 10 CFR 50.

FSAR Table 11.3-208 is being added to provided a summary of the calculated maximum individual doses per unit in comparison to 10 CFR Part 50 Appendix I limits.

FSAR Table 11.3-209 is being added to provide a breakdown of the calculated total population doses by pathway and organ.

In the response to NRC RAI Number 11.02-2, FSAR Table 11.2-206 is being added to provide the calculated individual dose to a member of the public due to the release of both liquid and gaseous effluent relative to the limits contained in 40 CFR 190 as required by 10 CFR 20.1301(e).

Associated HAR COL Application Revisions:

1. Revise the last sentence of the first paragraph of FSAR Section11.3.3.4.from:

   These doses are below the 10 CFR 50 Appendix I design objectives of 10 mrad per year for gamma radiation or 20 mrad per year beta radiation.

   To read:

   As shown in Table 11.3-208 these doses are below the 10 CFR 50 Appendix I design objectives of 10 mrad per year for gamma radiation or 20 mrad per year beta radiation.

2. At the end of FSAR Section 11.3.3.4 insert the following sentences:

   Table 11.3-201 contains GASPAR II input data for dose rate calculations. Information regarding the locations for the nearest man, milk animal, garden, and the EAB is located in Section 2.3.

3. Insert the following sentence at the end of the 1st paragraph of Section 11.3.3.4.1:

   Table 11.3-206 summarizes the maximum exposed individual annual organ dose by pathway and age group.

4. Revise the last sentence in the 2nd to the last paragraph of FSAR Section 11.3.3.4.1 from:

   These are below the 10 CFR 50, Appendix I design objectives of 5 mrem/yr to total body, and 15 mrem/yr to any organ including skin.

   To read:

   These doses are below the 10 CFR 50, Appendix I design objectives of 5 mrem/yr to total body, and 15 mrem/yr to any organ including skin, (Table 11.3-208).

5. Revise the last paragraph of FSAR Section 11.3.3.4.1 from

   Table 11.3-201 contains GASPAR II input data for dose rate calculations. Information regarding the locations for the nearest man, milk animal, garden, school, and the EAB is located in Section 2.3. Table 11.3-206 contains total organ dose rates based on age group. Table 11.3-207 contains total air dose at each special location.

   To read:

   Table 11.3-207 contains total air dose at each special location.

6. Revise the 1st paragraph of FSAR Section 11.3.3.4.2 from:

   The estimated population dose within 81 km (50 miles) is calculated as 6.5 person-rem whole body and 12.9 person-rem thyroid.

   To read:

   Table 11.3-209 presents a listing of the estimated population doses by pathway and organ. The estimated population dose within 81 km (50 miles) is calculated as 6.5 person-rem whole body and 12.9 person-rem thyroid.

7. FSAR Tables 11.3-201 and 11.3-206 will be replaced with the revised tables shown on the following pages.

6. New FSAR Table 11.3-208 "Maximum Individual Doses Compared to 10 CFR 50 Appendix I" and Table 11.3-209 Population Doses will be added as shown on the following pages.

Attachments/Enclosures to Response to NRC:

None.

Annotated Table 11.3-201
GASPAR II Input

Input Parameter[1]	Value	Basis
Site Specific Data Values		
Distance from site to NE Corner of the United States (mi.)	1100	**Note 2**
Fraction of the year leafy vegetables are grown	0.42	NUREG-4635 page 2.8, **(Note 3)**
Fraction of the year milk cows are on pasture	0.67	SHNPP ODCM page B-9
Fraction of max individual's vegetable intake from own garden	1.0	SHNPP ODCM page B-14
Fraction of milk-cow feed intake from pasture while on pasture	1.0	SHNPP ODCM page B-9
Humidity over growing season (g/m^3) Absolute Humdity)	8	SHNPP ODCM page B-10
Average temperature over growing season	0	With humidity in g/m^3 temperature not needed.
Fraction of the year goats are on pasture	0.75	NUREG-4635 page 2.8, (add 1 month to values for cows.
Fraction of goat feed intake from pasture while on pasture	1.0	GASPAR II default value
Fraction of the year beef cattle are on pasture	0.67	Assumed to be same as cows.
Fraction of beef-cattle feed intake from pasture while on pasture	1.0	GASPAR II default value
Population Data*	Table 11.3-202	**Note 4**
Total Agriculture Production Rate (50-mile)*		
-Vegetables (kg/yr)	Table 11.3-203	62,401,256 **Note 5**

Annotated Table 11.3-201
GASPAR II Input

Input Parameter[1]	Value	Basis
-Milk (L/yr)	Table 11.3-204	52,027,546 **Note 5**
-Meat (kg/yr)	Table 11.3-205	629,959,233 **Note 5**
Source Term		
Source Term Multiplier	1	Control Parameter
Nuclide Release Data	DCD Table 11.3-3	**Note 6**
Meteorological Data*		
Met Data for XOQDOQ	Listing of Sector Average X/Q	**Note 7** and attached sector average X/Q tabulation.
Special Location Data:	Section 2.3.5 Table 2.3.5-201 Table 2.3.3-202 Table 2.3.5-203 Table 2.3.5-204	**Note 8**

Notes:

1. Input parameters not specified conservatively use default GASPAR II values as provided in NUREG/CR-4653, GAPAR II Technical Reference and User Guide. Input data marked with (*) are required for population dose computations but are not required for individual dose determinations.
2. Approximate distance in miles from site to NE Corner of the USA. This parameter is used by GASPAR to calculate the NEPA population doses and does not affect the doses calculated to demonstrate compliance with Appendix I of 10 CFR Part 50 or 10 CFR Part 20.
3. The length of the vegetable growing season and the amount of time cows and goats spend grazing on pasture are estimated using Figure 2.2 of NUREG/CR-4653 and the methodology therein. The results are a growing season for vegetables of five months, milk and beef cows are on pasture for eight months, and goats are on pasture for nine months.
4. Population data provided in Table 11.3-202 is Census data projected out to five years from the time of the licensing action is anticipated in accordance with guidance in NUREG-1555. Projections were estimated using North Carolina population growth rates. The population used for this calculation is for year 2020 to conservatively bound the 5-year criteria. The transient and permanent populations are included for conservatism, because this results in a higher projected

population and therefore a higher population dose. The population distribution for each of the 221/2-degree radial sectors centered on the 16 cardinal compass directions for radial distances of 1, 2, 3, 4, 5, 10, 20, 30, 40, and 50 miles were calculated assuming uniform distribution within the radial sectors.

5. Agricultural Statistics were calculated from County level statistics in the same format as population data. If a County was bisected by a sector, thus parts of the same County fell in 2 or more sectors, agricultural production statistics were proportioned by percent of the County area. Since agricultural data was only available at the County level, production was assumed to be fairly uniform across the County area. Sources of Information utilized include United States Department of Agriculture, North Carolina Department of Agriculture and Consumer Services and ArcGIS (Geographical Information System).
6. Expected Annual Average Releases of Airborne Radionuclides, as determined by the PWR-GALE Code, Revision1, are as given in AP1000 DCD Table 11.3-3.
7. GASPAR II requires inputs for the 16 compass sectors to be Sector Averages at the downwind distances. NUREG/CR-2919 "XOQDOQ Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations" describes the method for computing sector averages given the dispersion factors at various annual distances. Tabulation of sector averages is attached.
8. FSAR Section 2.3.5 provides values and describes the bases for determining long term X/Q and relative deposition (D/Q) factors using the XOQ/DOQ computer code for various site locations.

Sector Average X/Qs (Page 1 of 4)

Average Annual χ/Qs

Downwind Distance (miles)									Downwind Distance (Miles)										
0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
4.47E-06	1.57E-06	8.74E-07	5.79E-07	4.21E-07	3.25E-07	2.62E-07	2.17E-07	1.84E-07	1.59E-07	9.11E-08	6.16E-08	3.56E-08	2.43E-08	1.81E-08	1.42E-08	1.16E-08	9.77E-09	8.38E-09	7.31E-09
5.45E-06	1.91E-06	1.07E-06	7.11E-07	5.19E-07	4.02E-07	3.24E-07	2.69E-07	2.29E-07	1.98E-07	1.14E-07	7.71E-08	4.49E-08	3.07E-08	2.29E-08	1.80E-08	1.48E-08	1.24E-08	1.07E-08	9.31E-09
5.09E-06	1.76E-06	9.93E-07	6.62E-07	4.85E-07	3.76E-07	3.04E-07	2.53E-07	2.15E-07	1.86E-07	1.08E-07	7.31E-08	4.27E-08	2.93E-08	2.19E-08	1.73E-08	1.42E-08	1.20E-08	1.03E-08	8.99E-09
5.52E-06	1.88E-06	1.06E-06	7.11E-07	5.21E-07	4.06E-07	3.28E-07	2.74E-07	2.33E-07	2.02E-07	1.17E-07	8.01E-08	4.71E-08	3.24E-08	2.43E-08	1.93E-08	1.59E-08	1.34E-08	1.15E-08	1.01E-08
4.21E-06	1.42E-06	8.18E-07	5.53E-07	4.09E-07	3.20E-07	2.60E-07	2.18E-07	1.86E-07	1.62E-07	9.50E-08	6.53E-08	3.88E-08	2.69E-08	2.03E-08	1.61E-08	1.33E-08	1.13E-08	9.72E-09	8.53E-09
5.35E-06	1.77E-06	1.03E-06	6.99E-07	5.20E-07	4.08E-07	3.33E-07	2.80E-07	2.40E-07	2.09E-07	1.24E-07	8.55E-08	5.11E-08	3.56E-08	2.70E-08	2.15E-08	1.78E-08	1.51E-08	1.31E-08	1.15E-08
5.73E-06	1.88E-06	1.09E-06	7.40E-07	5.50E-07	4.31E-07	3.52E-07	2.95E-07	2.53E-07	2.20E-07	1.30E-07	9.01E-08	5.39E-08	3.76E-08	2.85E-08	2.27E-08	1.88E-08	1.59E-08	1.38E-08	1.21E-08
8.96E-06	2.92E-06	1.71E-06	1.17E-06	8.69E-07	6.84E-07	5.60E-07	4.70E-07	4.04E-07	3.52E-07	2.10E-07	1.45E-07	8.73E-08	6.10E-08	4.63E-08	3.70E-08	3.06E-08	2.60E-08	2.26E-08	1.99E-08
1.68E-05	5.43E-06	3.20E-06	2.20E-06	1.64E-06	1.30E-06	1.06E-06	8.95E-07	7.70E-07	6.73E-07	4.02E-07	2.80E-07	1.69E-07	1.18E-07	9.00E-08	7.20E-08	5.97E-08	5.08E-08	4.41E-08	3.88E-08
1.86E-05	5.95E-06	3.53E-06	2.43E-06	1.83E-06	1.45E-06	1.19E-06	1.00E-06	8.63E-07	7.55E-07	4.53E-07	3.17E-07	1.92E-07	1.35E-07	1.03E-07	8.23E-08	6.84E-08	5.82E-08	5.05E-08	4.45E-08
1.26E-05	4.06E-06	2.40E-06	1.65E-06	1.24E-06	9.76E-07	8.01E-07	6.75E-07	5.81E-07	5.08E-07	3.04E-07	2.12E-07	1.28E-07	8.99E-08	6.84E-08	5.48E-08	4.55E-08	3.87E-08	3.36E-08	2.96E-08
6.93E-06	2.28E-06	1.33E-06	9.05E-07	6.73E-07	5.29E-07	4.32E-07	3.63E-07	3.11E-07	2.71E-07	1.61E-07	1.11E-07	6.65E-08	4.64E-08	3.51E-08	2.80E-08	2.32E-08	1.97E-08	1.70E-08	1.50E-08
4.50E-06	1.50E-06	8.67E-07	5.90E-07	4.38E-07	3.44E-07	2.81E-07	2.35E-07	2.02E-07	1.76E-07	1.04E-07	7.18E-08	4.29E-08	2.99E-08	2.26E-08	1.80E-08	1.49E-08	1.26E-08	1.09E-08	9.60E-09
3.33E-06	1.13E-06	6.47E-07	4.37E-07	3.23E-07	2.53E-07	2.06E-07	1.72E-07	1.47E-07	1.28E-07	7.50E-08	5.15E-08	3.06E-08	2.12E-08	1.60E-08	1.27E-08	1.05E-08	8.86E-09	7.65E-09	6.71E-09
3.00E-06	1.03E-06	5.82E-07	3.90E-07	2.86E-07	2.23E-07	1.80E-07	1.50E-07	1.28E-07	1.11E-07	6.44E-08	4.40E-08	2.58E-08	1.78E-08	1.33E-08	1.06E-08	8.66E-09	7.31E-09	6.30E-09	5.51E-09
3.29E-06	1.15E-06	6.46E-07	4.30E-07	3.14E-07	2.43E-07	1.96E-07	1.63E-07	1.39E-07	1.20E-07	6.90E-08	4.68E-08	2.72E-08	1.86E-08	1.39E-08	1.10E-08	8.97E-09	7.55E-09	6.49E-09	5.66E-09
1.138E-04	3.764E-05	2.183E-05	1.485E-05	1.103E-05	8.663E-06	7.068E-06	5.931E-06	5.083E-06	4.429E-06	2.620E-06	1.812E-06	1.083E-06	7.546E-07	5.713E-07	4.557E-07	3.766E-07	3.195E-07	2.765E-07	2.431E-07
	Sector	Averages																	
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	2.54E-06		8.97E-07		4.25E-07		2.63E-07		1.85E-07		9.31E-08		3.64E-08		1.82E-08		1.17E-08		8.40E-09
NNE	3.09E-06		1.10E-06		5.24E-07		3.26E-07		2.29E-07		1.16E-07		4.57E-08		2.30E-08		1.48E-08		1.07E-08
NE	2.87E-06		1.02E-06		4.88E-07		3.05E-07		2.16E-07		1.10E-07		4.35E-08		2.20E-08		1.42E-08		1.03E-08
ENE	3.09E-06		1.09E-06		5.25E-07		3.29E-07		2.34E-07		1.20E-07		4.79E-08		2.45E-08		1.59E-08		1.15E-08
E	2.35E-06		8.34E-07		4.11E-07		2.61E-07		1.86E-07		9.66E-08		3.94E-08		2.04E-08		1.33E-08		9.73E-09
ESE	2.96E-06		1.05E-06		5.23E-07		3.34E-07		2.40E-07		1.26E-07		5.19E-08		2.71E-08		1.78E-08		1.31E-08
SE	3.16E-06		1.11E-06		5.53E-07		3.53E-07		2.53E-07		1.32E-07		5.47E-08		2.86E-08		1.88E-08		1.38E-08
SSE	4.94E-06		1.74E-06		8.74E-07		5.61E-07		4.04E-07		2.13E-07		8.85E-08		4.65E-08		3.07E-08		2.26E-08
S	9.20E-06		3.25E-06		1.65E-06		1.07E-06		7.71E-07		4.08E-07		1.71E-07		9.04E-08		5.98E-08		4.41E-08
SSW	1.02E-05		3.58E-06		1.84E-06		1.19E-06		8.64E-07		4.59E-07		1.94E-07		1.03E-07		6.85E-08		5.06E-08
SW	6.91E-06		2.43E-06		1.24E-06		8.03E-07		5.82E-07		3.08E-07		1.30E-07		6.87E-08		4.56E-08		3.36E-08
WSW	3.83E-06		1.35E-06		6.77E-07		4.33E-07		3.11E-07		1.63E-07		6.75E-08		3.53E-08		2.32E-08		1.71E-08
W	2.50E-06		8.84E-07		4.41E-07		2.81E-07		2.02E-07		1.06E-07		4.35E-08		2.27E-08		1.49E-08		1.09E-08
WNW	1.86E-06		6.61E-07		3.25E-07		2.06E-07		1.47E-07		7.63E-08		3.11E-08		1.60E-08		1.05E-08		7.66E-09
NW	1.68E-06		5.96E-07		2.88E-07		1.81E-07		1.28E-07		6.57E-08		2.63E-08		1.34E-08		8.69E-09		6.31E-09
NNW	1.87E-06		6.63E-07		3.17E-07		1.97E-07		1.39E-07		7.05E-08		2.78E-08		1.40E-08		9.00E-09		6.50E-09

Sector Average X/Qs (Page 2 of 4)

Average Annual D/Qs

Downwind Distance (miles)									Downwind Distance (Miles)										
0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
1.21E-08	3.82E-09	1.90E-09	1.16E-09	7.81E-10	5.66E-10	4.30E-10	3.39E-10	2.74E-10	2.27E-10	1.11E-10	6.98E-11	3.53E-11	2.14E-11	1.43E-11	1.03E-11	7.70E-12	5.99E-12	4.78E-12	3.90E-12
1.31E-08	4.14E-09	2.06E-09	1.25E-09	8.46E-10	6.13E-10	4.66E-10	3.67E-10	2.97E-10	2.46E-10	1.21E-10	7.56E-11	3.82E-11	2.31E-11	1.55E-11	1.11E-11	8.35E-12	6.49E-12	5.18E-12	4.23E-12
1.25E-08	3.94E-09	1.97E-09	1.19E-09	8.06E-10	5.84E-10	4.44E-10	3.50E-10	2.83E-10	2.34E-10	1.15E-10	7.21E-11	3.64E-11	2.20E-11	1.48E-11	1.06E-11	7.95E-12	6.18E-12	4.94E-12	4.03E-12
1.52E-08	4.79E-09	2.39E-09	1.45E-09	9.79E-10	7.09E-10	5.39E-10	4.25E-10	3.44E-10	2.85E-10	1.39E-10	8.75E-11	4.42E-11	2.68E-11	1.79E-11	1.29E-11	9.66E-12	7.51E-12	6.00E-12	4.89E-12
7.88E-09	2.49E-09	1.24E-09	7.51E-10	5.08E-10	3.68E-10	2.80E-10	2.21E-10	1.79E-10	1.48E-10	7.24E-11	4.54E-11	2.30E-11	1.39E-11	9.31E-12	6.67E-12	5.01E-12	3.90E-12	3.11E-12	2.54E-12
9.52E-09	3.00E-09	1.50E-09	9.07E-10	6.13E-10	4.44E-10	3.38E-10	2.66E-10	2.16E-10	1.78E-10	8.74E-11	5.48E-11	2.77E-11	1.68E-11	1.12E-11	8.06E-12	6.05E-12	4.70E-12	3.76E-12	3.07E-12
1.16E-08	3.66E-09	1.83E-09	1.11E-09	7.48E-10	5.42E-10	4.12E-10	3.25E-10	2.63E-10	2.18E-10	1.07E-10	6.69E-11	3.38E-11	2.05E-11	1.37E-11	9.83E-12	7.38E-12	5.74E-12	4.59E-12	3.74E-12
1.47E-08	4.64E-09	2.31E-09	1.40E-09	9.48E-10	6.87E-10	5.22E-10	4.12E-10	3.33E-10	2.76E-10	1.35E-10	8.47E-11	4.28E-11	2.59E-11	1.74E-11	1.25E-11	9.35E-12	7.27E-12	5.81E-12	4.74E-12
2.30E-08	7.26E-09	3.62E-09	2.20E-09	1.49E-09	1.08E-09	8.18E-10	6.44E-10	5.22E-10	4.32E-10	2.12E-10	1.33E-10	6.71E-11	4.06E-11	2.72E-11	1.95E-11	1.46E-11	1.14E-11	9.10E-12	7.42E-12
2.27E-08	7.15E-09	3.57E-09	2.16E-09	1.46E-09	1.06E-09	8.06E-10	6.35E-10	5.14E-10	4.25E-10	2.08E-10	1.31E-10	6.61E-11	4.00E-11	2.68E-11	1.92E-11	1.44E-11	1.12E-11	8.96E-12	7.31E-12
1.60E-08	5.05E-09	2.52E-09	1.53E-09	1.03E-09	7.48E-10	5.69E-10	4.48E-10	3.63E-10	3.00E-10	1.47E-10	9.23E-11	4.67E-11	2.82E-11	1.89E-11	1.36E-11	1.02E-11	7.92E-12	6.33E-12	5.16E-12
1.07E-08	3.37E-09	1.68E-09	1.02E-09	6.90E-10	5.00E-10	3.80E-10	2.99E-10	2.42E-10	2.01E-10	9.83E-11	6.17E-11	3.12E-11	1.89E-11	1.27E-11	9.06E-12	6.81E-12	5.29E-12	4.23E-12	3.45E-12
6.88E-09	2.17E-09	1.08E-09	6.56E-10	4.43E-10	3.21E-10	2.44E-10	1.93E-10	1.56E-10	1.29E-10	6.32E-11	3.96E-11	2.00E-11	1.21E-11	8.13E-12	5.83E-12	4.37E-12	3.40E-12	2.72E-12	2.22E-12
5.72E-09	1.80E-09	9.00E-10	5.46E-10	3.69E-10	2.67E-10	2.03E-10	1.60E-10	1.30E-10	1.07E-10	5.26E-11	3.30E-11	1.67E-11	1.01E-11	6.76E-12	4.85E-12	3.64E-12	2.83E-12	2.26E-12	1.85E-12
6.15E-09	1.94E-09	9.66E-10	5.86E-10	3.96E-10	2.87E-10	2.18E-10	1.72E-10	1.39E-10	1.15E-10	5.65E-11	3.54E-11	1.79E-11	1.08E-11	7.27E-12	5.21E-12	3.91E-12	3.04E-12	2.43E-12	1.98E-12
7.96E-09	2.51E-09	1.25E-09	7.58E-10	5.13E-10	3.72E-10	2.83E-10	2.23E-10	1.80E-10	1.49E-10	7.30E-11	4.58E-11	2.32E-11	1.40E-11	9.40E-12	6.74E-12	5.06E-12	3.93E-12	3.14E-12	2.56E-12
1.958E-07	6.173E-08	3.078E-08	1.867E-08	1.262E-08	9.145E-09	6.954E-09	5.478E-09	4.435E-09	3.668E-09	1.798E-09	1.128E-09	5.701E-10	3.451E-10	2.314E-10	1.658E-10	1.245E-10	9.680E-11	7.732E-11	6.311E-11

	Sector	Averages																	
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	6.58E-09		2.00E-09		7.94E-10		4.34E-10		2.76E-10		1.19E-10		3.68E-11		1.46E-11		7.78E-12		4.81E-12
NNE	7.14E-09		2.16E-09		8.61E-10		4.70E-10		2.99E-10		1.28E-10		3.98E-11		1.58E-11		8.43E-12		5.22E-12
NE	6.80E-09		2.06E-09		8.20E-10		4.48E-10		2.85E-10		1.22E-10		3.79E-11		1.50E-11		8.03E-12		4.97E-12
ENE	8.25E-09		2.50E-09		9.96E-10		5.44E-10		3.46E-10		1.49E-10		4.61E-11		1.83E-11		9.75E-12		6.04E-12
E	4.28E-09		1.30E-09		5.17E-10		2.82E-10		1.80E-10		7.71E-11		2.39E-11		9.48E-12		5.06E-12		3.13E-12
ESE	5.17E-09		1.57E-09		6.24E-10		3.41E-10		2.17E-10		9.31E-11		2.89E-11		1.14E-11		6.11E-12		3.78E-12
SE	6.31E-09		1.91E-09		7.62E-10		4.16E-10		2.64E-10		1.14E-10		3.52E-11		1.40E-11		7.46E-12		4.61E-12
SSE	7.99E-09		2.42E-09		9.65E-10		5.27E-10		3.35E-10		1.44E-10		4.46E-11		1.77E-11		9.44E-12		5.85E-12
S	1.25E-08		3.80E-09		1.51E-09		8.26E-10		5.25E-10		2.25E-10		6.99E-11		2.77E-11		1.48E-11		9.16E-12
SSW	1.23E-08		3.74E-09		1.49E-09		8.13E-10		5.17E-10		2.22E-10		6.88E-11		2.73E-11		1.46E-11		9.02E-12
SW	8.71E-09		2.64E-09		1.05E-09		5.74E-10		3.65E-10		1.57E-10		4.86E-11		1.93E-11		1.03E-11		6.37E-12
WSW	5.82E-09		1.76E-09		7.02E-10		3.84E-10		2.44E-10		1.05E-10		3.25E-11		1.29E-11		6.87E-12		4.25E-12
W	3.74E-09		1.13E-09		4.51E-10		2.47E-10		1.57E-10		6.73E-11		2.09E-11		8.28E-12		4.42E-12		2.73E-12
WNW	3.11E-09		9.43E-10		3.75E-10		2.05E-10		1.30E-10		5.60E-11		1.74E-11		6.88E-12		3.68E-12		2.27E-12
NW	3.34E-09		1.01E-09		4.03E-10		2.20E-10		1.40E-10		6.02E-11		1.87E-11		7.39E-12		3.95E-12		2.44E-12
NNW	4.32E-09		1.31E-09		5.22E-10		2.85E-10		1.81E-10		7.78E-11		2.41E-11		9.57E-12		5.11E-12		3.16E-12

Sector Average X/Qs (Page 3 of 4)

χ/Q 2.26 day decay

Downwind Distance (miles)									Downwind Distance (Miles)										
0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
4.45E-06	1.56E-06	8.63E-07	5.69E-07	4.12E-07	3.17E-07	2.54E-07	2.10E-07	1.77E-07	1.53E-07	8.54E-08	5.64E-08	3.13E-08	2.05E-08	1.47E-08	1.11E-08	8.74E-09	7.08E-09	5.87E-09	4.95E-09
5.42E-06	1.89E-06	1.06E-06	6.99E-07	5.08E-07	3.91E-07	3.14E-07	2.60E-07	2.20E-07	1.89E-07	1.06E-07	7.04E-08	3.91E-08	2.56E-08	1.83E-08	1.39E-08	1.09E-08	8.85E-09	7.32E-09	6.17E-09
5.07E-06	1.75E-06	9.79E-07	6.50E-07	4.73E-07	3.65E-07	2.94E-07	2.43E-07	2.06E-07	1.77E-07	1.00E-07	6.63E-08	3.70E-08	2.42E-08	1.74E-08	1.31E-08	1.03E-08	8.37E-09	6.93E-09	5.84E-09
5.50E-06	1.86E-06	1.05E-06	6.97E-07	5.09E-07	3.94E-07	3.17E-07	2.63E-07	2.23E-07	1.92E-07	1.09E-07	7.24E-08	4.05E-08	2.66E-08	1.91E-08	1.45E-08	1.14E-08	9.27E-09	7.68E-09	6.48E-09
4.18E-06	1.41E-06	8.04E-07	5.41E-07	3.97E-07	3.09E-07	2.50E-07	2.08E-07	1.77E-07	1.53E-07	8.72E-08	5.83E-08	3.28E-08	2.16E-08	1.55E-08	1.17E-08	9.22E-09	7.47E-09	6.18E-09	5.20E-09
5.32E-06	1.75E-06	1.01E-06	6.83E-07	5.04E-07	3.94E-07	3.19E-07	2.66E-07	2.27E-07	1.97E-07	1.13E-07	7.57E-08	4.27E-08	2.82E-08	2.02E-08	1.54E-08	1.21E-08	9.79E-09	8.11E-09	6.83E-09
5.70E-06	1.86E-06	1.07E-06	7.23E-07	5.33E-07	4.16E-07	3.37E-07	2.81E-07	2.40E-07	2.07E-07	1.19E-07	7.98E-08	4.51E-08	2.97E-08	2.13E-08	1.62E-08	1.28E-08	1.03E-08	8.56E-09	7.21E-09
8.90E-06	2.89E-06	1.68E-06	1.14E-06	8.43E-07	6.59E-07	5.36E-07	4.47E-07	3.82E-07	3.31E-07	1.91E-07	1.28E-07	7.26E-08	4.79E-08	3.45E-08	2.62E-08	2.06E-08	1.67E-08	1.38E-08	1.17E-08
1.66E-05	5.36E-06	3.13E-06	2.14E-06	1.59E-06	1.25E-06	1.02E-06	8.49E-07	7.26E-07	6.30E-07	3.64E-07	2.46E-07	1.40E-07	9.22E-08	6.64E-08	5.04E-08	3.97E-08	3.22E-08	2.66E-08	2.24E-08
1.85E-05	5.87E-06	3.46E-06	2.37E-06	1.77E-06	1.39E-06	1.13E-06	9.48E-07	8.11E-07	7.05E-07	4.09E-07	2.77E-07	1.57E-07	1.04E-07	7.48E-08	5.68E-08	4.47E-08	3.62E-08	3.00E-08	2.52E-08
1.25E-05	4.01E-06	2.35E-06	1.61E-06	1.19E-06	9.38E-07	7.64E-07	6.39E-07	5.46E-07	4.75E-07	2.75E-07	1.86E-07	1.05E-07	6.96E-08	5.01E-08	3.80E-08	2.99E-08	2.42E-08	2.01E-08	1.69E-08
6.89E-06	2.26E-06	1.30E-06	8.83E-07	6.53E-07	5.10E-07	4.14E-07	3.45E-07	2.94E-07	2.55E-07	1.46E-07	9.82E-08	5.54E-08	3.65E-08	2.62E-08	1.99E-08	1.56E-08	1.27E-08	1.05E-08	8.81E-09
4.48E-06	1.48E-06	8.52E-07	5.76E-07	4.25E-07	3.32E-07	2.69E-07	2.24E-07	1.91E-07	1.65E-07	9.47E-08	6.35E-08	3.58E-08	2.36E-08	1.69E-08	1.28E-08	1.01E-08	8.17E-09	6.76E-09	5.68E-09
3.31E-06	1.12E-06	6.37E-07	4.28E-07	3.14E-07	2.44E-07	1.98E-07	1.64E-07	1.40E-07	1.21E-07	6.88E-08	4.60E-08	2.58E-08	1.70E-08	1.22E-08	9.22E-09	7.25E-09	5.87E-09	4.86E-09	4.09E-09
2.98E-06	1.02E-06	5.74E-07	3.82E-07	2.79E-07	2.16E-07	1.74E-07	1.44E-07	1.22E-07	1.06E-07	5.96E-08	3.97E-08	2.21E-08	1.45E-08	1.04E-08	7.87E-09	6.19E-09	5.01E-09	4.15E-09	3.49E-09
3.28E-06	1.14E-06	6.38E-07	4.22E-07	3.07E-07	2.37E-07	1.90E-07	1.57E-07	1.33E-07	1.15E-07	6.44E-08	4.27E-08	2.37E-08	1.56E-08	1.11E-08	8.43E-09	6.63E-09	5.37E-09	4.45E-09	3.75E-09
1.131E-04	3.721E-05	2.145E-05	1.450E-05	1.071E-05	8.357E-06	6.776E-06	5.650E-06	4.813E-06	4.169E-06	2.392E-06	1.605E-06	9.058E-07	5.973E-07	4.290E-07	3.253E-07	2.563E-07	2.076E-07	1.718E-07	1.447E-07
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	2.52E-06		8.86E-07		4.16E-07		2.55E-07		1.78E-07		8.74E-08		3.21E-08		1.48E-08		8.78E-09		5.89E-09
NNE	3.07E-06		1.08E-06		5.12E-07		3.15E-07		2.20E-07		1.09E-07		4.01E-08		1.85E-08		1.10E-08		7.35E-09
NE	2.85E-06		1.00E-06		4.77E-07		2.95E-07		2.06E-07		1.02E-07		3.78E-08		1.75E-08		1.04E-08		6.96E-09
ENE	3.07E-06		1.07E-06		5.13E-07		3.18E-07		2.23E-07		1.11E-07		4.14E-08		1.93E-08		1.15E-08		7.71E-09
E	2.33E-06		8.21E-07		4.00E-07		2.51E-07		1.77E-07		8.89E-08		3.35E-08		1.56E-08		9.26E-09		6.20E-09
ESE	2.94E-06		1.03E-06		5.08E-07		3.20E-07		2.27E-07		1.15E-07		4.36E-08		2.04E-08		1.21E-08		8.13E-09
SE	3.14E-06		1.09E-06		5.37E-07		3.38E-07		2.40E-07		1.21E-07		4.60E-08		2.15E-08		1.28E-08		8.59E-09
SSE	4.89E-06		1.71E-06		8.48E-07		5.37E-07		3.82E-07		1.94E-07		7.40E-08		3.47E-08		2.07E-08		1.39E-08
S	9.12E-06		3.19E-06		1.60E-06		1.02E-06		7.27E-07		3.71E-07		1.42E-07		6.69E-08		3.99E-08		2.67E-08
SSW	1.01E-05		3.51E-06		1.78E-06		1.14E-06		8.12E-07		4.16E-07		1.60E-07		7.54E-08		4.49E-08		3.01E-08
SW	6.85E-06		2.39E-06		1.20E-06		7.66E-07		5.47E-07		2.80E-07		1.07E-07		5.05E-08		3.01E-08		2.01E-08
WSW	3.80E-06		1.33E-06		6.57E-07		4.15E-07		2.94E-07		1.49E-07		5.65E-08		2.64E-08		1.57E-08		1.05E-08
W	2.48E-06		8.68E-07		4.28E-07		2.70E-07		1.91E-07		9.66E-08		3.65E-08		1.71E-08		1.01E-08		6.78E-09
WNW	1.85E-06		6.50E-07		3.16E-07		1.98E-07		1.40E-07		7.02E-08		2.64E-08		1.23E-08		7.29E-09		4.87E-09
NW	1.67E-06		5.87E-07		2.81E-07		1.75E-07		1.23E-07		6.09E-08		2.26E-08		1.05E-08		6.22E-09		4.16E-09
NNW	1.85E-06		6.54E-07		3.10E-07		1.91E-07		1.33E-07		6.59E-08		2.43E-08		1.12E-08		6.67E-09		4.46E-09

Sector Average X/Qs (Page 4 of 4)

χ/Q depleted and 8 day decay

Downwind Distance (miles)									Downwind Distance (Miles)										
0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
4.08E-06	1.37E-06	7.39E-07	4.77E-07	3.39E-07	2.57E-07	2.03E-07	1.65E-07	1.38E-07	1.17E-07	6.30E-08	4.03E-08	2.13E-08	1.35E-08	9.38E-09	6.95E-09	5.36E-09	4.27E-09	3.49E-09	2.90E-09
4.97E-06	1.67E-06	9.05E-07	5.86E-07	4.18E-07	3.17E-07	2.51E-07	2.05E-07	1.71E-07	1.46E-07	7.86E-08	5.05E-08	2.68E-08	1.70E-08	1.18E-08	8.77E-09	6.77E-09	5.40E-09	4.41E-09	3.67E-09
4.64E-06	1.54E-06	8.40E-07	5.45E-07	3.90E-07	2.96E-07	2.35E-07	1.92E-07	1.61E-07	1.37E-07	7.42E-08	4.77E-08	2.54E-08	1.62E-08	1.13E-08	8.37E-09	6.48E-09	5.17E-09	4.22E-09	3.51E-09
5.04E-06	1.64E-06	8.98E-07	5.85E-07	4.19E-07	3.19E-07	2.54E-07	2.08E-07	1.74E-07	1.48E-07	8.09E-08	5.22E-08	2.80E-08	1.78E-08	1.25E-08	9.29E-09	7.20E-09	5.76E-09	4.71E-09	3.92E-09
3.83E-06	1.24E-06	6.91E-07	4.55E-07	3.28E-07	2.52E-07	2.01E-07	1.65E-07	1.39E-07	1.19E-07	6.53E-08	4.24E-08	2.29E-08	1.47E-08	1.03E-08	7.69E-09	5.97E-09	4.77E-09	3.91E-09	3.26E-09
4.88E-06	1.54E-06	8.68E-07	5.75E-07	4.17E-07	3.21E-07	2.57E-07	2.12E-07	1.78E-07	1.53E-07	8.48E-08	5.54E-08	3.01E-08	1.94E-08	1.37E-08	1.02E-08	7.93E-09	6.35E-09	5.21E-09	4.34E-09
5.22E-06	1.64E-06	9.20E-07	6.09E-07	4.41E-07	3.39E-07	2.71E-07	2.23E-07	1.88E-07	1.61E-07	8.95E-08	5.84E-08	3.18E-08	2.04E-08	1.44E-08	1.08E-08	8.36E-09	6.70E-09	5.49E-09	4.58E-09
8.17E-06	2.55E-06	1.44E-06	9.59E-07	6.98E-07	5.38E-07	4.31E-07	3.56E-07	3.00E-07	2.58E-07	1.44E-07	9.41E-08	5.14E-08	3.31E-08	2.34E-08	1.75E-08	1.36E-08	1.09E-08	8.95E-09	7.47E-09
1.53E-05	4.74E-06	2.70E-06	1.80E-06	1.32E-06	1.02E-06	8.18E-07	6.77E-07	5.72E-07	4.92E-07	2.75E-07	1.81E-07	9.91E-08	6.40E-08	4.53E-08	3.39E-08	2.64E-08	2.12E-08	1.74E-08	1.45E-08
1.70E-05	5.19E-06	2.98E-06	2.00E-06	1.47E-06	1.14E-06	9.14E-07	7.57E-07	6.41E-07	5.52E-07	3.10E-07	2.04E-07	1.12E-07	7.27E-08	5.15E-08	3.86E-08	3.01E-08	2.42E-08	1.98E-08	1.66E-08
1.15E-05	3.54E-06	2.02E-06	1.36E-06	9.91E-07	7.67E-07	6.16E-07	5.10E-07	4.31E-07	3.71E-07	2.08E-07	1.37E-07	7.51E-08	4.86E-08	3.44E-08	2.57E-08	2.01E-08	1.61E-08	1.32E-08	1.10E-08
6.32E-06	1.99E-06	1.12E-06	7.44E-07	5.40E-07	4.16E-07	3.33E-07	2.74E-07	2.31E-07	1.98E-07	1.10E-07	7.20E-08	3.92E-08	2.52E-08	1.78E-08	1.33E-08	1.03E-08	8.26E-09	6.77E-09	5.65E-09
4.11E-06	1.31E-06	7.33E-07	4.85E-07	3.52E-07	2.70E-07	2.16E-07	1.78E-07	1.50E-07	1.29E-07	7.13E-08	4.65E-08	2.53E-08	1.62E-08	1.14E-08	8.53E-09	6.63E-09	5.31E-09	4.35E-09	3.63E-09
3.04E-06	9.84E-07	5.47E-07	3.60E-07	2.60E-07	1.99E-07	1.59E-07	1.30E-07	1.10E-07	9.37E-08	5.15E-08	3.35E-08	1.81E-08	1.16E-08	8.12E-09	6.05E-09	4.70E-09	3.76E-09	3.08E-09	2.56E-09
2.73E-06	8.97E-07	4.92E-07	3.21E-07	2.30E-07	1.75E-07	1.39E-07	1.14E-07	9.55E-08	8.16E-08	4.44E-08	2.87E-08	1.53E-08	9.76E-09	6.83E-09	5.07E-09	3.93E-09	3.14E-09	2.56E-09	2.13E-09
3.00E-06	1.01E-06	5.47E-07	3.54E-07	2.53E-07	1.92E-07	1.52E-07	1.24E-07	1.04E-07	8.82E-08	4.77E-08	3.06E-08	1.63E-08	1.03E-08	7.18E-09	5.32E-09	4.12E-09	3.28E-09	2.68E-09	2.23E-09
1.038E-04	3.284E-05	1.845E-05	1.221E-05	8.860E-06	6.810E-06	5.449E-06	4.490E-06	3.783E-06	3.244E-06	1.799E-06	1.175E-06	6.383E-07	4.103E-07	2.891E-07	2.160E-07	1.680E-07	1.345E-07	1.103E-07	9.198E-08
	Sector	Averages																	
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	2.27E-06		7.63E-07		3.43E-07		2.04E-07		1.38E-07		6.50E-08		2.21E-08		9.50E-09		5.40E-09		3.50E-09
NNE	2.77E-06		9.33E-07		4.22E-07		2.52E-07		1.72E-07		8.10E-08		2.77E-08		1.20E-08		6.82E-09		4.43E-09
NE	2.57E-06		8.64E-07		3.94E-07		2.36E-07		1.61E-07		7.64E-08		2.63E-08		1.14E-08		6.52E-09		4.24E-09
ENE	2.77E-06		9.24E-07		4.24E-07		2.55E-07		1.74E-07		8.31E-08		2.89E-08		1.26E-08		7.25E-09		4.73E-09
E	2.11E-06		7.08E-07		3.31E-07		2.02E-07		1.39E-07		6.70E-08		2.36E-08		1.04E-08		6.00E-09		3.92E-09
ESE	2.65E-06		8.88E-07		4.21E-07		2.58E-07		1.79E-07		8.69E-08		3.10E-08		1.38E-08		7.98E-09		5.23E-09
SE	2.84E-06		9.42E-07		4.45E-07		2.72E-07		1.89E-07		9.17E-08		3.26E-08		1.45E-08		8.41E-09		5.51E-09
SSE	4.42E-06		1.47E-06		7.03E-07		4.33E-07		3.01E-07		1.47E-07		5.27E-08		2.36E-08		1.37E-08		8.98E-09
S	8.25E-06		2.75E-06		1.33E-06		8.21E-07		5.73E-07		2.82E-07		1.02E-07		4.57E-08		2.66E-08		1.75E-08
SSW	9.12E-06		3.04E-06		1.48E-06		9.17E-07		6.42E-07		3.17E-07		1.15E-07		5.20E-08		3.03E-08		1.99E-08
SW	6.19E-06		2.06E-06		9.98E-07		6.19E-07		4.32E-07		2.13E-07		7.70E-08		3.47E-08		2.02E-08		1.33E-08
WSW	3.43E-06		1.15E-06		5.45E-07		3.34E-07		2.32E-07		1.13E-07		4.02E-08		1.79E-08		1.04E-08		6.80E-09
W	2.24E-06		7.50E-07		3.55E-07		2.17E-07		1.50E-07		7.30E-08		2.60E-08		1.16E-08		6.67E-09		4.37E-09
WNW	1.67E-06		5.61E-07		2.62E-07		1.59E-07		1.10E-07		5.29E-08		1.86E-08		8.21E-09		4.73E-09		3.09E-09
NW	1.51E-06		5.06E-07		2.32E-07		1.40E-07		9.58E-08		4.57E-08		1.58E-08		6.91E-09		3.95E-09		2.57E-09
NNW	1.67E-06		5.63E-07		2.55E-07		1.53E-07		1.04E-07		4.91E-08		1.68E-08		7.27E-09		4.14E-09		2.69E-09

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Table 11.3-201
GASPAR II Input

Input Parameter[1]	Value
Site Specific Data Values	
Distance from site to NE Corner of the United States (mi.)	1100
Fraction of the year leafy vegetables are grown	0.42
Fraction of the year milk cows are on pasture	0.67
Fraction of max individual's vegetable intake from own garden	1.0
Fraction of milk-cow feed intake from pasture while on pasture	1.0
Humidity over growing season (g/m^3) Absolute Humdity)	8
Average temperature over growing season	0
Fraction of the year goats are on pasture	0.75
Fraction of goat feed intake from pasture while on pasture	1.0
Fraction of the year beef cattle are on pasture	0.67
Fraction of beef-cattle feed intake from pasture while on pasture	1.0
Population Data*	Table 11.3-202
Total Agriculture Production Rate (50-mile)*	
-Vegetables (kg/yr)	Table 11.3-203
-Milk (L/yr)	Table 11.3-204
-Meat (kg/yr)	Table 11.3-205
Source Term	
Source Term Multiplier	1
Nuclide Release Data	DCD Table 11.3-3

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Table 11.3-201
GASPAR II Input

Input Parameter[1]	Value
Meteorological Data*	
Met Data for XOQDOQ	Sector Average X/Q
Special Location Data:	Section 2.3.5
	Table 2.3.5-201
	Table 2.3.3-202
	Table 2.3.5-203
	Table 2.3.5-204

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Table 11.3-206
Individual Dose Rates
(mrem/yr)

Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume (EAB)[1]		5.88E-01	5.88E-01	5.88E-01	5.88E-01	5.88E-01	5.88E-01	6.31E-01	3.18E+00
Ground (EAB)[1]		9.62E-02	9.62E-02	9.62E-02	9.62E-02	9.62E-02	9.62E-02	9.62E-02	1.13E-01
Cow Milk	Adult	1.60E-02	1.56E-02	6.13E-02	1.63E-02	1.61E-02	8.33E-02	1.56E-02	1.55E-02
	Teen	2.73E-02	2.69E-02	1.13E-01	2.81E-02	2.77E-02	1.34E-01	2.68E-02	2.67E-02
	Child	6.25E-02	6.19E-02	2.77E-01	6.40E-02	6.34E-02	2.75E-01	6.20E-02	6.18E-02
	Infant	1.26E-01	1.25E-01	5.41E-01	1.30E-01	1.28E-01	6.42E-01	1.25E-01	1.25E-01
Goat Milk	Adult	2.05E-02	1.93E-02	6.28E-02	2.11E-02	2.02E-02	1.10E-01	1.93E-02	1.91E-02
	Teen	3.29E-02	3.16E-02	1.15E-01	3.49E-02	3.33E-02	1.76E-01	3.18E-02	3.14E-02
	Child	7.07E-02	6.94E-02	2.83E-01	7.51E-02	7.22E-02	3.55E-01	6.98E-02	6.92E-02
	Infant	1.38E-01	1.36E-01	5.49E-01	1.48E-01	1.41E-01	8.31E-01	1.37E-01	1.36E-01
Vegetable	Adult	6.76E-02	6.78E-02	2.69E-01	6.76E-02	6.69E-02	1.94E-01	6.59E-02	6.57E-02
	Teen	1.05E-01	1.05E-01	4.48E-01	1.06E-01	1.05E-01	2.81E-01	1.03E-01	1.03E-01
	Child	2.37E-01	2.36E-01	1.08E+00	2.39E-01	2.37E-01	5.78E-01	2.34E-01	2.34E-01
Inhalation	Adult	8.02E-03	8.09E-03	1.07E-03	8.17E-03	8.29E-03	6.65E-02	1.01E-02	7.81E-03
	Teen	8.11E-03	8.17E-03	1.30E-03	8.37E-03	8.54E-03	8.25E-02	1.13E-02	7.88E-03
	Child	7.17E-03	7.09E-03	1.58E-03	7.44E-03	7.58E-03	9.54E-02	9.78E-03	6.96E-03
	Infant	4.14E-03	4.05E-03	7.94E-04	4.42E-03	4.41E-03	8.52E-02	5.97E-03	4.00E-03

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Table 11.3-206
Individual Dose Rates
(mrem/yr)

Pathway	Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Meat	Adult	1.69E-02	1.76E-02	7.42E-02	1.69E-02	1.68E-02	2.12E-02	1.68E-02	1.67E-02
	Teen	1.37E-02	1.41E-02	6.27E-02	1.38E-02	1.37E-02	1.69E-02	1.37E-02	1.37E-02
	Child	2.50E-02	2.51E-02	1.18E-01	2.50E-02	2.50E-02	2.98E-02	2.49E-02	2.49E-02
Total w/o Plume	Adult	2.25E-01	2.25E-01	5.65E-01	2.26E-01	2.24E-01	5.71E-01	2.24E-01	2.38E-01
	Teen	2.83E-01	2.82E-01	8.36E-01	2.87E-01	2.84E-01	7.87E-01	2.83E-01	2.96E-01
	Child	4.99E-01	4.96E-01	1.86E+00	5.07E-01	5.01E-01	1.43E+00	4.97E-01	5.10E-01
	Infant	3.64E-01	3.61E-01	1.19E+00	3.79E-01	3.70E-01	1.65E+00	3.64E-01	3.78E-01
	Maximum	4.99E-01	4.96E-01	1.86E+00	5.07E-01	5.01E-01	1.65E+00	4.97E-01	5.10E-01
Total w/Plume	Adult	8.13E-01	8.13E-01	1.15E+00	8.14E-01	8.12E-01	1.16E+00	8.55E-01	3.42E+00
	Teen	8.71E-01	8.70E-01	1.42E+00	8.75E-01	8.72E-01	1.38E+00	9.14E-01	3.48E+00
	Child	1.09E+00	1.08E+00	2.45E+00	1.10E+00	1.09E+00	2.02E+00	1.13E+00	3.69E+00
	Infant	9.52E-01	9.49E-01	1.78E+00	9.67E-01	9.58E-01	2.24E+00	9.95E-01	3.56E+00
	Maximum	1.09E+00	1.08E+00	2.45E+00	1.10E+00	1.09E+00	2.24E+00	1.13E+00	3.69E+00

Note : EAB = Exclusion Area Boundary

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Table 11.3-208 Maximum Individual Doses Compared to 10 CFR50 Appendix I			
	Appendix I Criteria	**Harris Unit 2 and 3**	
Type of Dose	**Design Objective**	**Calculated Dose**	**Highest Offsite Dose Location**
Gaseous Effluents (Noble Gases)			
Gamma Air	10 mrad	0.97 mrad	EAB
Beta Air	20 mrad	4.47 mrad	EAB
Total Body D	5 mrem	0.59 mrem	EAB
Skin	15 mrem	3.18 mrem	EAB
Radioiodines and Particulates			
Dose to any Organ from all pathways	15 mrem	1.86 mrem (Child - bone)	

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Table 11.3-209

Population Doses
(person-rem)

Pathway	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	2.77E+00	2.77E+00	2.77E+00	2.77E+00	2.77E+00	2.77E+00	3.24E+00	2.97E+01
Ground	3.89E-01	3.89E-01	3.89E-01	3.89E-01	3.89E-01	3.89E-01	3.89E-01	4.56E-01
Inhalation	8.32E-01	8.35E-01	9.41E-02	8.46E-01	8.55E-01	6.09E+00	1.01E+00	8.15E-01
Vegetable	3.67E-01	3.67E-01	1.54E+00	3.67E-01	3.64E-01	3.70E-01	3.63E-01	3.62E-01
Cow Milk	2.61E-01	2.57E-01	1.09E+00	2.66E-01	2.63E-01	1.08E+00	2.57E-01	2.56E-01
Meat	1.90E+00	1.93E+00	8.53E+00	1.90E+00	1.89E+00	2.16E+00	1.89E+00	1.89E+00
Total	6.52E+00	6.55E+00	1.44E+01	6.54E+00	6.53E+00	1.29E+01	7.15E+00	3.34E+01