Table 3-1

Bioaccumulation Factors (BF_i) to be Used in the Absence of Site-Specific Data

Element	BF_i for Freshwater Fish (pCi/kg per pCi/L)	Reference
H	9.0E-01	6
Be	2.8E+01	Footnote 2
C	4.6E+03	6
F	2.2E+02	Footnote 16
Na	1.0E+02	6
Mg	2.8E+01	Footnote 2
Al	2.2E+03	Footnote 13
P	1.0E+05	6
Cl	2.2E+02	Footnote 16
Ar	NA	NA
K	1.0E+03	Footnote 1
Ca	2.8E+01	Footnote 2
Sc	2.5E+01	Footnote 3
Ti	3.3E+00	Footnote 4
V	3.0E+04	Footnote 5
Cr	2.0E+02	6
Mn	4.0E+02	6
Fe	1.0E+02	6
Co	5.0E+01	6
Ni	1.0E+02	6
Cu	5.0E+01	6
Zn	2.0E+03	6
Ga	2.2E+03	Footnote 13
Ge	2.4E+03	Footnote 12
As	3.3E+04	Footnote 14
Se	4.0E+02	Footnote 15
Br	4.2E+02	6
Kr	NA	NA
Rb	2.0E+03	6
Sr	3.0E+01	6
Y	2.5E+01	6
Zr	3.3E+00	6
Nb	3.0E+04	6
Mo	1.0E+01	6
Tc	1.5E+01	6
Ru	1.0E+01	6
Rh	1.0E+01	6
Pd	1.0E+02	Footnote 9

Table 3-1(cont.) **Bioaccumulation Factors (BF_i) to be Used in the Absence of Site-Specific Data**		
Cd	2.0E+03	Footnote 11
In	2.2E+03	Footnote 13
Sn	2.4E+03	Footnote 12
Sb	1.0E+00	98
Ag	2.3E+00	56
Te	4.0E+02	6
I	1.5E+01	6
Xe	NA	NA
Cs	2.0E+03	6
Ba	4.0E+00	6
La	2.5E+01	6
Ce	1.0E+00	6
Pr	2.5E+01	6
Nd	2.5E+01	6
Pm	3.0E+01	98
Sm	3.0E+01	Footnote 3
Eu	1.0E+02	Footnote 3
Gd	2.6E+01	Footnote 3
Dy	2.2E+03	Footnote 3
Er	3.3E+04	Footnote 3
Tm	4.0E+02	Footnote 3
Yb	2.2E+02	Footnote 3
Lu	2.5E+01	Footnote 3
Hf	3.3E+00	Footnote 4
Ta	3.0E+04	Footnote 5
W	1.2E+03	6
Re	2.1E+02	Footnote 6
Os	5.5E+01	Footnote 7
Ir	3.0E+01	Footnote 8
Pt	1.0E+02	Footnote 9
Au	2.6E+01	Footnote 10
Hg	2.0E+03	Footnote 11
Tl	2.2E+03	Footnote 13
Pb	3.0E+02	98
Bi	2.0E+01	98
Ra	5.0E+01	98
Th	3.0E+01	98
U	1.0E+01	98
Np	1.0E+01	6
Am	3.0E+01	98

Footnotes:
NA = It is assumed that noble gases are not accumulated.

In Reference 6, see Table A-1.

A number of bioaccumulation factors could not be found in literature. In this case, the periodic table was used in conjunction with published element values. This method was used for periodic table columns except where there were no values for column 3A so the average of columns 2B and 4A was assigned.

1. Value is the average of Reference 6 values in literature for H, Na, Rb and Cs.
2. Value is the average of Ref. 6 values in literature for Sr, Ba and Ref. 98 values for Ra.
3. Value is the same as the Reference 6 value used for Y.
4. Value is the same as the Reference 6 value used for Zr.
5. Value is the same as the Reference 6 value used for Nb.
6. Value is the average of Reference 6 values in literature for Mn and Tc.
7. Value is the average of Reference 6 values in literature for Fe and Ru.
8. Value is the average of Reference 6 values in literature for Co and Rh.
9. Value is the same as the Reference 6 value used for Ni.
10. Value is the average of Reference 6 values in literature for Cu and Reference 56 value for Ag.
11. Value used is the same as the Reference 6 value used for Zn.
12. Value is the average of Reference 6 value in literature for C and Reference 98 value for Pb.
13. Value is the average of columns 2B and 4A, where column 2B is the "Reference 6 value for Zn" and column 4A is the average of "Reference 6 value for C and Reference 98 value for Pb".
14. Value is the average of Ref. 6 value found in literature for P and the Ref. 98 values for Bi and Sb.
15. Value is the same as the Reference 6 value used for Te.
16. Value is the average of Reference 6 values found in literature for Br and I.

4.0 Gaseous Effluents

4.1 Gaseous Effluents – General Information

This section reviews the offsite radiological limits applicable to the LaSalle Station and presents in detail the equations and procedures used to assess compliance with these limits. This calculational approach uses the methodology of NUREG-0133 (Reference 14), and incorporates certain simplifications such as the use of average meteorology.

4.1.1 Pre-calculated atmospheric transport parameters are based on historical average atmospheric conditions. These historical meteorological conditions have resulted in the dispersion parameters shown in Table 4-2 through Table 4-6, and Table 4-9 through Table 4-11. JAN 2015

4.1.2 The equations and parameters of this section are for use in calculating offsite radiation doses during routine operating conditions. They are not for use in calculating doses due to non-routine releases (e.g., accident releases).

4.1.3 An overview of the required compliance is given in Table 1-1. The dose components are itemized and referenced, and an indication of their regulatory application is noted. Additionally, the locations of dose receivers for each dose component are given in Table 1-2.

4.1.4 Airborne Release Point Classifications

The pattern of dispersion of airborne releases is dependent on the height of the release point relative to adjacent structures. Each release point is classified as one of the following three height-dependent types:

- Stack (or Elevated) Release Point (denoted by the letter S or subscript s)
- Ground Level Release Point (denoted by the letter G or subscript g)
- Vent (or Mixed Mode) Release Point (denoted by the letter V or subscript v)

4.1.5 Operability and Use of Gaseous Effluent Treatment Systems

10CFR50 Appendix I and ODCM Part I (RECS) require that the ventilation exhaust treatment system and the waste gas holdup system be used when projected offsite doses in 31 days, due to gaseous effluent releases, from each reactor unit, exceed any of the following limits:

- 0.2 mrad to air from gamma radiation.
- 0.4 mrad to air from beta radiation.

- 0.3 mrem to any organ of a member of the public. JAN 2015

The station must project doses due to gaseous releases from the site at least once per 31 days. The calculational methods shown in sections 4.2.2.1 and 4.2.2.2 are used for this dose projection.

4.1.6 For a release attributable to a processing or effluent system shared by more than one reactor unit, the dose due to an individual unit is obtained by proportioning the effluents among the units sharing the system.

4.2 Gaseous Effluents – Dose and Dose Rate Calculation Requirements

4.2.1 Instantaneous Dose Rates

4.2.1.1 Noble Gas: Total Body Dose Rate

RECS limits the total body dose rate due to noble gases in gaseous effluents released from a site to areas at and beyond the site boundary to less than or equal to 500 mrem/yr at all times.

In accordance with NUREG-0133 methodology, total body dose rate due to noble gases released in gaseous effluents is calculated:

$$\dot{D}_{TB} = \Sigma_i[V_i * \dot{Q}_{is} + K_i * ((\chi/Q)_v * \dot{Q}_{iv})]$$

where:

$\dot{D}_{TB}$ is the instantaneous dose rate to the total body due to radioactive materials (noble gasses) released in gaseous effluents from the site (mrem/yr)

V_i is the constant for each identified noble gas radionuclide accounting for the gamma radiation from the elevated finite plume (mrem*sec/yr*µCi)

$\dot{Q}_{is}$ is the release rate of radionuclides, i, in gaseous effluents from a free standing (elevated) stack (µCi/sec)

K_i is the total body dose factor due to gamma emissions for each identified noble gas radionuclide (mrem*m^3/yr*µCi). Reference table 4-13.

$(\chi/Q)_v$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for vent releases (sec/m^3).

$\dot{Q}_{iv}$ is the release rate of radionuclides, i, in gaseous effluents from all vent releases (µCi/sec)

To comply with this specification, the effluent radiation monitor has a setpoint corresponding to an offsite total body dose rate at or below the limit (see Part II Section 2.6). In addition, compliance is assessed by calculating offsite total body dose rate based on periodic samples obtained per station procedures. JAN 2015

4.2.1.2 Noble Gas: Skin Dose Rate

RECS limits the skin dose rate due to noble gases in gaseous effluents released from a site to areas at and beyond the site boundary to less than or equal to a dose rate of 3000 mrem/yr at all times. (See Part I Section 12.4.1)

In accordance with NUREG-0133 methodology, the skin dose rate due to noble gases released in gaseous effluents is calculated by the following expression:

$$\dot{D}_{Skin} = \Sigma_i[(L_i*(\chi/Q)_s + 1.1*B_i)*\dot{Q}_{is} + (L_i + 1.1*M_i)\cdot((\chi/Q)_v*\dot{Q}_{iv})]$$

where:

$\dot{D}_{Skin}$ is the instantaneous dose rate to the skin due to radioactive materials (noble gasses) released in gaseous effluents from the site (mrem/yr)

L_i is the skin dose factor due to beta emissions for each identified noble gas radionuclide (mrem*m^3/yr*µCi). Reference table 4-13.

$(\chi/Q)_s$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for elevated stack releases (sec/m^3).

1.1 is the unit conversion constant to convert air dose to skin dose (mrem/mrad).

B_i is the constant for long term releases (greater than 500 hr/yr) for each identified noble gas radionuclide accounting for the gamma radiation from the elevated finite plume (mrad*sec/yr*µCi).

$\dot{Q}_{is}$ is the release rate of radionuclides, i, in gaseous effluents from a free standing (elevated) stack (µCi/sec).

M_i is the air dose factor due to gamma emissions for each identified noble gas radionuclide (mrad*m^3/yr*µCi). Reference table 4-13.

$(\chi/Q)_v$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for vent releases (sec/m^3).

$\dot{Q}_{Iv}$ is the release rate of radionuclides, i, in gaseous effluents from all vent releases (µCi/sec). JAN 2015

To comply with this specification, gaseous effluent radiation monitors have setpoints corresponding to an offsite skin dose rate at or below the limit (see Part II Section 2.6). In addition, compliance is assessed by calculating offsite skin dose rate based on periodic samples obtained per station procedures.

4.2.1.3 Non-Noble Gas Radionuclides: Organ Dose Rate

RECS limits the dose rate to any organ, due to radioactive materials in gaseous effluents released from a site to areas at and beyond the site boundary, to less than or equal to a dose rate of 1500 mrem/yr (See Part I Section 12.4.1)

Typically the adult is considered to be the limiting receptor in calculating dose rate to organs due to inhalation of non-noble gas radionuclides in gaseous effluents.

In accordance with NUREG 0133 Methodology, the dose rate to any adult organ due to inhalation is calculated by the following expression:

$$\dot{D}^{inhal}_{ja} = \Sigma_i P^I_i * [(\chi/Q)_s * \dot{Q}_{Is} + (\chi/Q)_v * \dot{Q}_{Iv}]$$

$\dot{D}^{inhal}_{ja}$ is the instantaneous dose rate to organ (j) of an individual in ager group (a) due to inhalation of non noble gas radioactive materials released in gaseous effluents from the site (mrem/yr)

P^I_i is the inhalation dose rate factor for each identified non noble gas radionuclide, i, (mrem*m^3/yr*µCi). P_i inhalation dose rate factors are calculated in accordance with the following:

$$P^I_i = K'(BR)DFA_i$$

where:

P^I_i is the **inhalation** dose rate factor (mrem*m^3/yr*µCi).

K' is a **constant** of unit conversion = 1E+06 (pCi/µCi).

BR is the **breathing** rate of the age group of interest (m^3/yr).

DFA_i is the **inhalation** dose factor (mrem/pCi)

$(\chi/Q)_s$ is the highest **calculated** annual average relative concentration for areas at or beyond the unrestricted area boundary for elevated stack releases (sec/m^3).

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$\dot{Q}_{is}$ is the release rate of radionuclides, i, in gaseous effluents from a free standing (elevated) stack (µCi/sec).

$(\chi/Q)_v$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for vent releases (sec/m^3).

$\dot{Q}_{iv}$ is the release rate of radionuclides, i, in gaseous effluents from all vent releases (µCi/sec).

RECS requires the dose rate due to non-noble gas radioactive materials in airborne effluents be determined to be within the above limit in accordance with a sampling and analysis program specified in Part I Table R12.4.1-1.

The adult organ dose rate due to inhalation is calculated in each sector at the location of the highest offsite χ/Q (see Table 4-3). The result for the sector with the highest organ inhalation dose rate is compared to the limit.

4.2.2 Time Averaged Dose from Noble Gas

4.2.2.1 Gamma Air Dose

RECS limits the gamma air dose due to noble gas effluents released from each reactor unit to areas at and beyond the unrestricted area boundary to the following:

- Less than or equal to 5 mrad per calendar quarter.
- Less than or equal to 10 mrad per calendar year.

In accordance with NUREG 0133 Methodology, the gamma air dose due to noble gases released in gaseous effluents is calculated by the following expression:

$$D_\gamma = 3.17E\text{-}08 * \Sigma_i \{M_i [(\chi/Q)_v * \bar{Q}_{iv} + (\chi/q)_v * \bar{q}_{iv}] + [B_i * \bar{Q}_{is} + b_i * \bar{q}_{is}]\}$$

where:

D_γ is the dose to air due to gamma radiation from noble gas radiation released in gaseous effluents (mrad)

3.17E-08 is a conversion constant (yr/sec).

M_i is the air dose factor due to gamma emissions for each identified noble gas radionuclide (mrad*m^3/yr*µCi). Reference table 4-13.

$(\chi/Q)_v$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for long term (greater than 500 hr/yr) vent releases (sec/m^3).

$\bar{Q}_{iv}$ is the average release of noble gas radionuclides in gaseous effluents, i, for long term (greater than 500 hr/yr) vent releases (µCi).

$(\chi/q)_v$ is the relative concentration for areas at or beyond the unrestricted area boundary for short term (equal to or less than 500 hr/yr) vent releases (sec/m^3).

$\bar{q}_{iv}$ is the average release of noble gas radionuclides, i, in gaseous releases, i, for short term (equal to or less than 500 hr/yr) vent releases (µCi).

B_i is the constant for long term releases (greater than 500 hr/yr) for each identified noble gas radionuclide accounting for the gamma radiation from the elevated finite plume (mrad*sec/yr*µCi).

$\bar{Q}_{is}$ is the average release of noble gas radionuclides in gaseous effluents, i, for long term (greater than 500 hr/yr) releases from a free standing (elevated) stack (µCi).

b_i is the constant for short term releases (equal to or less than 500 hr/yr) for each identified noble gas radionuclide accounting for the gamma radiation from the elevated finite plume (mrad*sec/yr*µCi).

$\bar{q}_{is}$ is the average release of noble gas radionuclides in gaseous effluents, i, for short term (equal to or less than 500 hr/yr) releases from a free standing (elevated) stack (µCi).

RECS Section 12.4.2, RSR 12.4.2.1, and Section 12.4.5, RSR 12.4.5.1 require determination of cumulative and projected gamma air dose contributions due to noble gases for the current calendar quarter and the current calendar year at least once per 31 days.

Gamma air dose is calculated for the sector with the highest offsite (χ/Q) and is compared with the RECS limits on gamma air dose.

For a release attributable to a processing or effluent system shared by more than one reactor unit, the dose due to an individual unit is obtained by proportioning the effluents among the units sharing the system.

4.2.2.2 Beta Air Dose

RECS limits beta air dose due to noble gases in gaseous effluents released from each reactor unit to areas at and beyond the unrestricted area boundary to the following:

- Less than or equal to 10 mrad per calendar quarter.
- Less than or equal to 20 mrad per calendar year.

In accordance with NUREG 0133 Methodology, the beta air dose due to noble gases released in gaseous effluents is calculated by the following expression:

$$D_\beta = 3.17E\text{-}08 * \Sigma_i \{N_i[(\chi/Q)_v * \bar{Q}_{iv} + (\chi/q)_v * \bar{q}_{iv} + (\chi/Q)_s * \bar{Q}_{is} + (\chi/q)_s * \bar{q}_{is}]\}$$

where:

D_β is the dose to air due to beta radiation from noble gas radiation released in gaseous effluents (mrad)

3.17E-08 is a conversion constant (yr/sec).

N_i is the air dose factor due to beta emissions for each identified noble gas radionuclide (mrad*m^3/yr*µCi). Reference table 4-13.

$(\chi/Q)_v$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for long term (greater than 500 hr/yr) vent releases (sec/m^3).

$\bar{Q}_{iv}$ is the average release of noble gas radionuclides in gaseous effluents, i, for long term (greater than 500 hr/yr) vent releases (µCi).

$(\chi/q)_v$ is the relative concentration for areas at or beyond the unrestricted area boundary for short term (equal to or less than 500 hr/yr) vent releases (sec/m^3).

$\bar{q}_{iv}$ is the average release of noble gas radionuclides, i, in gaseous releases, i, for short term (equal to or less than 500 hr/yr) vent releases (µCi).

$(\chi/Q)_s$ is the highest calculated annual average relative concentration for areas at or beyond the unrestricted area boundary for long term (greater than 500 hr/yr) releases from a free standing (elevated) stack (sec/m^3).

$\bar{Q}_{is}$ is the average release of noble gas radionuclides in gaseous effluents, i, for long term (greater than 500 hr/yr) releases from a free standing (elevated) stack (µCi).

$(\chi/q)_s$ is the relative concentration for areas at or beyond the unrestricted area boundary for short term (equal to or less than 500 hr/yr) releases from a free standing (elevated) stack (sec/m^3).

$\bar{q}_{is}$ is the average release of noble gas radionuclides in gaseous effluents, i, for short term (equal to or less than 500 hr/yr) releases from a free standing (elevated) stack (µCi).

RECS Section 12.4.2, RSR 12.4.2.1, and Section 12.4.5, RSR 12.4.5.1 require determination of cumulative and projected beta air dose contributions due to noble gases for the current calendar quarter and the current calendar year at least once per 31 days. JAN 2015

Beta air dose is calculated for the sector with the highest offsite (χ/Q) and is compared with the RECS limit on beta air dose.

For a release attributable to a processing or effluent system shared by more than one reactor unit, the dose due to an individual unit is obtained by proportioning the effluents among the units sharing the system.

4.2.2.3 Whole Body Dose

The total (or whole) body dose, to any receiver is due, in part, to gamma radiation emitted from radioactivity in airborne effluents. This component is added to others to demonstrate compliance to the requirements of 40CFR190 and 10CFR20.

In accordance with NUREG 0133 Methodology, the total body dose component due to gamma radiation from noble gases released in gaseous effluents is calculated by the following expression:

$$D_{TB} = 3.17E\text{-}08 * t * \dot{D}_{TB}$$

where:

D_{TB} is the total (or whole) body dose due to gamma radiation from noble gas radionuclides released in gaseous effluents (mrem)

3.17E-08 is a conversion constant (yr/sec).

t is the number of seconds in the period of interest (sec)

$\dot{D}_{TB}$ is the instantaneous dose rate to the total body due to radioactive materials (noble gasses) released in gaseous effluents from the site (mrem/yr)

The total body dose is also calculated for the 40CFR190 and 10CFR20 compliance assessments. In some cases, the total body dose may be required in 10CFR50 Appendix I assessments (See Part II Table 1-1).

4.2.2.4 Skin Dose

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There is no regulatory requirement to evaluate skin dose. However, this component is evaluated for reference as there is skin dose design objective contained in 10CFR50 Appendix I. Note that in the unlikely event that if beta air dose guideline is exceeded, then the skin dose will require evaluation.

In accordance with NUREG 0133 Methodology, the part of skin dose due to noble gases released in gaseous effluents is calculated by the following expression:

$$D_{Skin} = 3.17E\text{-}08 * t * \dot{D}_{Skin}$$

where:

D_{Skin} is the skin dose due to beta and gamma radiation from noble gas radionuclides released in gaseous effluents (mrem)

3.17E-08 is a conversion constant (yr/sec).

t is the number of seconds in the period of interest (sec)

$\dot{D}_{Skin}$ is the instantaneous dose rate to the total body due to radioactive materials (noble gasses) released in gaseous effluents from the site (mrem/yr)

4.2.3 Time Averaged Dose from Non-Noble Gas Radionuclides

RECS provides the following limits, based on 10CFR50 Appendix I, on the dose to a member of the public from specified non-noble gas radionuclides in gaseous effluents released from each reactor unit to areas at and beyond the unrestricted area boundary:

- Less than or equal to 7.5 mrem to any organ during any calendar quarter
- Less than or equal to 15 mrem to any organ during any calendar year

The individual dose components are also required as part of the 40CFR190 assessments and combined as part of the 10CFR20 assessment (Part II Table 1-1). The dose due to radionuclides deposited on the ground is considered to be a component of the deep dose equivalent for 10CFR20 and 40CFR190 compliance and an organ (and total body) dose component for 10CFR50 Appendix I compliance.

The dose is calculated for releases in the time period under consideration.

In accordance with NUREG-0133 methodology, time averaged dose from non noble gas radionuclides can be calculated using the following equation and the pathway specific "R" dose factor defined in the subsections below: JAN 2015

$$D^{NNG} = 3.17E\text{-}08 * \Sigma_i \{R_i [W_s * \bar{Q}_{is} + w_s * \bar{q}_{is} + W_v * \bar{Q}_{iv} + w_v * \bar{q}_{iv}]\}$$

Where:

D^{NNG} is the committed dose equivalent (CDE) due to non noble gas radionuclides in gaseous effluents (mrem)

3.17E-08 is a conversion constant (yr/sec).

R_i is the dose factor for each identified radionuclide, i (m^2*mrem*sec/yr*µCi for (D/Q) calculations, or mrem*m^3/yr*µCi for (χ/Q) calculations)

W is the dispersion parameter for estimating the dose to an individual at the controlling location for long term (greater than 500 hr/yr) releases:

W = (χ/Q) for the inhalation pathway (sec/m^3)
W = (D/Q) for the food and ground pathways (m^{-2})

$\bar{Q}_i$ is the release of radionuclides, radioactive materials in particulate form, and radionuclides other than noble gasses in gaseous effluents, i, for long term (greater than 500 hr/yr) releases (µCi).

w is the dispersion parameter for estimating the dose to an individual at the controlling location for long term (equal to or less than 500 hr/yr) releases:

w = (χ/q) for the inhalation pathway (sec/m^3)
w = (D/q) for the food and ground pathways (m^{-2})

$\bar{q}_i$ is the release of radionuclides, radioactive materials in particulate form, and radionuclides other than noble gasses in gaseous effluents, i, for short term (equal to or less than 500 hr/yr) releases (µCi).

RECS Section 12.4.3, RSR 12.4.3.1, and Section 12.4.5, RSR 12.4.5.1 require cumulative and projected dose contributions for the current calendar quarter and the current calendar year for the specified non-noble gas radionuclides in airborne effluents to be determined at least once per 31 days.

To comply with this specification, each nuclear power station obtains and analyzes samples in accordance with the radioactive gaseous waste or gaseous effluent sampling and analysis program in its RETS. For each organ of each age group considered (adult/teenager/child/infant), the dose for each pathway is calculated in every sector (except for sectors over water bodies). The calculation is based on the

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location assumptions discussed below in conjunction with the pathway equations. For each organ of each age group, the doses are summed in each sector over all pathways. The result for the sector with the highest total dose is compared to the limit. The values used for (X/Q) and (D/Q) are shown in Table 4-3 through Table 4-5 and correspond to the applicable pathway location.

For a release attributable to a processing or effluent system shared by more than one reactor, the dose due to an individual unit is obtained by proportioning the effluents among the units sharing the system.

The dose evaluated is also included as part of the 10CFR20 and 40CFR190 assessment (See Part II Section 5).

4.2.3.1 Ground Plane

The dose due to ground deposition of radioactivity is considered to be a total body dose component.

Dose due to the ground plane pathway can be calculated using the methodology described in 4.2.3 and the ground plane dose factor (R^G_i) defined below:

$$R^G_i = K'*K"*SF*DFG_i*(1-\exp(-\lambda_i*t))/\lambda_i$$

where:

R^G_i is the ground plane dose factor for each identified radionuclide, i (m^2*mrem*sec/yr*μCi)

K' is a constant of unit conversion = 1E+06 (pCi/μCi)

K" is a constant of unit conversion = 8760 (hr/yr)

SF is the shielding factor (dimensionless)

DFG_i is the ground plane dose conversion factor for the ith radionuclide (mrem*m^3/hr*pCi)

λ_i is the decay constant for the ith radionuclide (sec^{-1})

t is the exposure time (sec)

Note that ground plane dose factors are only given for the total body and no age group. Doses to other organs are assumed to be equal to the total body dose. All age groups are assumed to receive the same dose.

The deep dose equivalent (DDE) due to ground deposition is determined for each sector using the highest calculated offsite value of **D/Q** for that sector.

The ground plane exposure pathway is considered to exist at all locations.

4.2.3.2 Inhalation

The committed dose equivalent (CDE) due to the inhalation pathway can be calculated using the methodology described in 4.2.3 and the inhalation dose factor (R^I_i) defined below:

$$R^I_i = K'*(BR)_a*(DFA_i)_a$$

where:

R^I_i is the inhalation dose factor for each identified radionuclide, i (mrem*m^3/yr*μCi)

K' is a constant of unit conversion = 1E+06 (pCi/μCi)

$(BR)_a$ is the breathing rate of the receptor age group (a) (m^3/yr)

$(DFA_i)_a$ is the organ inhalation dose factor for the receptor of age group (a) for the ith radionuclide (mrem/pCi)

The inhalation exposure pathway is considered to exist at all locations.

The CDE due to inhalation is determined for each sector using the highest calculated offsite value of X/Q for that sector.

4.2.3.3 Ingestion: Vegetation

Food ingestion pathway doses are calculated at locations indicated by the land use census survey. If no real pathway exists within 5 miles of the station, the cow-milk pathway is assumed to be located at 5 miles. Food pathway calculations are not made for sectors in which the offsite regions near the station are over bodies of water.

Dose due to the vegetation ingestion pathway can be calculated using the methodology described in 4.2.3 and the vegetation dose factor (R^V_i) defined below:

$$R^V_i = K'*[r/(Y_v*(\lambda_i+\lambda_w))]*DFL_{ia}*[(U^L_a*f_L*\exp(-\lambda_i*t_L)) + (U^S_a*f_g*\exp(-\lambda_i*t_h))]$$

or in the case of tritium:

$$R^V_i = K' * K''' * [(U^L_a * f_L) + (U^S_a * f_g)] *(DFL_i)_a * [0.75(0.5/H)]$$

or in the case of C-14:

$$R^{V}_{i} = K' * K''' * [(U^{L}_{a} * f_{L}) + (U^{S}_{a} * f_{g})] * (DFL_{i})_{a} * p * [0.11 / 0.16]$$

where:

R^{V}_{i} is the vegetation dose factor for each identified radionuclide, i (m^2*mrem*sec/yr*μCi)

K' is a constant of unit conversion = 1E+06 (pCi/μCi)

r is the fraction of deposited activity retained on vegetation/grass (dimensionless)

Y_v is the vegetation areal density (kg/m^2)

λ_i is the decay constant for the ith radionuclide (sec^{-1})

λ_w is the decay constant for removal of activity on leaf and plant surfaces by weathering = 5.73E-07 (sec^{-1})

$(DFL_i)_a$ is the organ ingestion dose factor for the ith radionuclide for the receptor in age group (a) (mrem/pCi)

U^{L}_{a} is the consumption rate of fresh leafy vegetation by the receptor in age group (a) (kg/yr)

f_L is the fraction of the annual intake of fresh leafy vegetation grown locally (dimensionless)

t_L is the average time between harvest of leafy vegetation and its consumption (sec)

U^{S}_{a} is the consumption rate of stored vegetation by the receptor in age group (a) (kg/yr)

f_g is the fraction of the annual intake of stored vegetation grown locally (dimensionless)

t_h is the average time between harvest of stored vegetation and its consumption (sec)

K''' is a constant of unit conversion = 1E+03 (g/kg)

H is the absolute humidity of the atmosphere (g/m^3)

0.75 is the fraction of total feed that is water (dimensionless)

0.5 is the ratio of the specific activity of the feed water to atmospheric water (dimensionless)

p is the fractional equilibrium ratio (4400 hrs/8760 hrs). The ratio of total annual release time (for C-14 atmospheric releases) to the total annual time during which photosynthesis occurs (taken to be 4400 hrs), under the condition that the value of p should never exceed unity. For continuous C-14 releases, p is taken to be unity.

0.11 is the fraction of total plant mass that is natural carbon (dimensionless)

0.16 is the concentration of natural carbon in the atmosphere (g/m^3)

4.2.3.4 Ingestion: Milk

Dose due to the milk ingestion pathway can be calculated using the methodology described in 4.2.3 and the milk dose factor (R^C_i) defined below:

$$R^C_i = K'*((Q_F*U_{ap})/(\lambda_i+\lambda_w))*F_m*r*(DFL_i)_a*[((f_p*f_s)/Y_p) + (((1-f_p*f_s)*\exp(-\lambda_i*t_h))/Y_s)]*\exp(-\lambda_i*t_f)$$

or in the case of tritium:

$$R^C_i = K'*K'''*F_m*Q_F*U_{ap}*(DFL_i)_a*[0.75(0.5/H)]$$

or in the case of C-14:

$$R^C_i = K' * K''' * F_m * Q_F * U_{ap} * (DFL_i)_a * p * [0.11 / 0.16]$$

where:

R^C_i is the milk dose factor for each identified radionuclide, i (m^2*mrem*sec/yr*μCi or mrem*m^3/yr*μCi)

K' is a constant of unit conversion = 1E+06 (pCi/μCi)

QF is the animal's consumption rate (kg/day, wet weight)

Uap is the receptor's milk consumption rate for age group (a) (L/yr)

λi is the decay constant for the ith radionuclide (sec-1)

λ_w is the decay constant for removal of activity on leaf and plant surfaces by weathering = 5.73E-07 (sec^{-1})

F_m is the stable element transfer coefficient (day/L)

r is the fraction of deposited activity retained on vegetation/grass (dimensionless)

$(DFL_i)_a$ is the organ ingestion dose factor for the ith radionuclide for the receptor in age group (a) (mrem/pCi)

f_p is the fraction of the year that the animal is on pasture (dimensionless)

f_s is the fraction of the feed that is pasture grass while the animal is on pasture (dimensionless)

Y_p is the agricultural productivity by unit area of pasture feed grass (kg/m2)

t_h is the transport time from pasture, to harvest, to animal, to milk, to receptor (sec)

Y_s is the agricultural productivity by unit area of stored feed (kg/m^2)

t_f is the transport time from pasture, to animal, to milk, to receptor (sec)

K''' is a constant of unit conversion = 1E+03 (g/kg)

H is the absolute humidity of the atmosphere (g/m^3)

0.75 is the fraction of total feed that is water (dimensionless)

0.5 is the ratio of the specific activity of the feed water to atmospheric water (dimensionless)

p is the fractional equilibrium ratio (4400 hrs/8760 hrs). The ratio of total annual release time (for C-14 atmospheric releases) to the total annual time during which photosynthesis occurs (taken to be 4400 hrs), under the condition that the value of p should never exceed unity. For continuous C-14 releases, p is taken to be unity.

0.11 is the fraction of total plant mass that is natural carbon (dimensionless)

0.16 is the concentration of natural carbon in the atmosphere (g/m^3)

4.2.3.5 Ingestion: Meat

Dose due to the meat ingestion pathway can be calculated using the methodology described in 4.2.3 and the meat dose factor (R^M_i) defined below:

$$R^M_i = K'*((Q_F*U_{ap})/(\lambda_i+\lambda_w))*F_f*r*DFL_{ia}*[((f_p*f_s)/Y_p) + (((1-f_p*f_s)*\exp(-\lambda_i*t_h))/Y_s)]*\exp(-\lambda_i*t_f)$$

or in the case of tritium:

$$R^M_i = K' * K''' * F_f * Q_F * U_{ap} * (DFL_i)_a * [0.75(0.5/H)]$$

or in the case of C-14:

$$R^M_i = K' * K''' * F_f * Q_F * U_{ap} * (DFL_i)_a * p *[0.11 / 0.16]$$

where:

R^M_i is the meat dose factor for each identified radionuclide, i (m^2*mrem*sec/yr*μCi)

K' is the animal's consumption rate (kg/day, wet weight)

QF is the animal's consumption rate (kg/day, wet weight)

U_{ap} is the receptor's meat consumption rate for age group (a) (kg/yr)

λi is the decay constant for the ith radionuclide (sec-1)

λ_w is the decay constant for removal of activity on leaf and plant surfaces by weathering = 5.73E-07 (sec^{-1})

F_f is the stable element transfer coefficient (day/kg)

r is the fraction of deposited activity retained on vegetation/grass (dimensionless)

$(DFL_i)_a$ is the organ ingestion dose factor for the ith radionuclide for the receptor in age group (a) (mrem/pCi)

f_p is the fraction of the year that the animal is on pasture (dimensionless)

f_s is the fraction of the feed that is pasture grass while the animal is on pasture (dimensionless)

Y_p is the agricultural productivity by unit area of pasture feed grass (kg/m^2)

t_h is the transport time from crop field to receptor (sec)

Y_s is the agricultural productivity by unit area of stored feed (kg/m^2)

t_f is the transport time from pasture to receptor (sec)

K''' is a constant of unit conversion = 1E+03 (g/kg)

H is the absolute humidity of the atmosphere (g/m^3)

0.75 is the fraction of total feed that is water (dimensionless)

0.5 is the ratio of the specific activity of the feed water to atmospheric water (dimensionless)

p is the fractional equilibrium ratio (4400 hrs/8760 hrs). The ratio of total annual release time (for C-14 atmospheric releases) to the total annual time during which photosynthesis occurs (taken to be 4400 hrs), under the condition that the value of p should never exceed unity. For continuous C-14 releases, p is taken to be unity.

0.11 is the fraction of total plant mass that is natural carbon (dimensionless)

0.16 is the concentration of natural carbon in the atmosphere (g/m^3)

Table 4-1

Critical Ranges

Direction	Unrestricted Area Boundary[a] (m)	Restricted Area Boundary (m)	Nearest Resident[b] (m)	Nearest Dairy Farm within 5 miles[c] (m)
N	1036	1036	6300	None
NNE	1378	1378	2575	None
NE	2408	1609	3400	None
ENE	4450	1079	5300	None
E	1996	833	5200	None
ESE	1465	845	2300	None
SE	969	969	2700	None
SSE	838	698	2900	None
S	829	620	2400	None
SSW	835	835	1100	None
SW	628	628	1600	None
WSW	533	533	2400	None
W	524	524	2400	None
WNW	643	643	1400	None
NW	762	762	2900	None
NNW	890	890	2700	None

a Used in calculating the meteorological dose factors in Tables 4-3, 4-4, 4-6, and 4-7.

b The distances are rounded to the nearest conservative 100 meters.

c Used in calculating the D/Q values in Table 4-5. The distances are rounded to the nearest conservative 100 meters. A default value of 8000 meters is used when there are no dairies within 5 miles.

Table 4-2

Average Wind Speeds

Downwind Direction	Average Wind Speed (m/sec)[a]		
	Elevated	Vent	Ground Level
N	9.7	7.7	4.9
NNE	10.1	8.0	5.1
NE	9.2	7.4	4.9
ENE	9.0	7.2	4.8
E	9.5	7.8	5.2
ESE	9.7	8.4	5.9
SE	8.1	7.4	5.9
SSE	7.4	8.7	5.0
S	6.7	5.9	4.3
SSW	5.6	3.7	2.9
SW	5.5	4.1	3.1
WSW	6.9	5.4	3.9
W	7.6	6.5	4.5
WNW	7.5	6.3	4.3
NW	7.5	6.2	3.9
NNW	8.3	6.7	4.3

[a] Based on LaSalle site meteorological data, January 1978 through December 1987. See Sargent & Lundy, Analysis and Technology Division, LaSalle calculation no. ATD-0164, revisions 0, 1, 2, and 3.

Table 4-3

X/Q and D/Q Maxima at or Beyond the Unrestricted Area Boundary

	Ground Level Release			Mixed Mode (Vent)			Elevated (Stack)			
Direction	Distance (meters)	X/Q (sec/m3)	D/Q (m-2)	Distance (meters)	X/Q (sec/m3)	D/Q (m-2)	Distance (meters)	X/Q (sec/m3)	Distance (meters)	D/Q (m-2)
N	1036	1.43E-06	9.09E-09	1036	4.73E-07	5.23E-09	6437	5.15E-09	1609	3.97E-10
NNE	1378	9.84E-07	6.85E-09	1378	4.01E-07	4.38E-09	5633	6.21E-09	1609	5.08E-10
NE	2408	4.43E-07	2.72E-09	2408	2.13E-07	1.81E-09	5633	6.42E-09	2408	1.74E-10
ENE	4450	1.70E-07	7.55E-10	4450	8.62E-08	4.89E-10	5633	5.38E-09	4450	1.53E-10
E	1996	5.52E-07	3.45E-09	1996	2.29E-07	2.24E-09	5633	6.60E-09	1996	1.84E-10
ESE	1465	9.07E-07	7.12E-09	1465	3.78E-07	4.92E-09	5633	8.46E-09	1609	6.75E-10
SE	969	1.05E-06	8.48E-09	969	3.80E-07	5.16E-09	5633	8.16E-09	1609	6.70E-10
SSE	838	1.16E-06	1.09E-08	838	4.68E-07	7.21E-09	6437	5.76E-09	1609	4.57E-10
S	829	1.40E-06	9.82E-09	829	3.76E-07	4.69E-09	6437	5.71E-09	1609	4.51E-10
SSW	835	1.21E-06	8.31E-09	835	3.00E-07	3.58E-09	6437	5.50E-09	1609	4.13E-10
SW	628	1.32E-06	1.32E-08	628	5.01E-07	8.29E-09	5633	6.52E-09	1609	5.47E-10
WSW	533	1.59E-06	1.70E-08	533	6.77E-07	1.13E-08	6437	6.13E-09	1609	4.80E-10
W	524	3.29E-06	2.33E-08	524	9.40E-07	1.13E-08	6437	4.32E-09	1609	2.99E-10
WNW	643	2.22E-06	1.26E-08	643	5.31E-07	5.80E-09	6437	3.41E-09	1609	2.53E-10
NW	762	1.88E-06	9.48E-09	762	4.33E-07	4.12E-09	7242	3.03E-09	1609	2.07E-10
NNW	890	1.63E-06	8.40E-09	890	4.18E-07	3.90E-09	7242	3.38E-09	1609	2.30E-10

LaSalle Site Meteorological Data 2000-2009

Table 4-4

X/Q and D/Q Maxima at or Beyond the Restricted Area Boundary

	Ground Level Release			Mixed Mode (Vent)			Elevated (Stack)			
Direction	Distance (meters)	X/Q (sec/m3)	D/Q (m-2)	Distance (meters)	X/Q (sec/m3)	D/Q (m-2)	Distance (meters)	X/Q (sec/m3)	Distance (meters)	D/Q (m-2)
N	1036	1.43E-06	9.09E-09	1036	4.73E-07	5.23E-09	6437	5.15E-09	1609	3.97E-10
NNE	1378	9.84E-07	6.85E-09	1378	4.01E-07	4.38E-09	5633	6.21E-09	1609	5.08E-10
NE	1609	7.99E-07	5.44E-09	1609	3.48E-07	3.53E-09	5633	6.42E-09	1609	5.43E-10
ENE	1079	1.28E-06	8.67E-09	1079	4.49E-07	5.11E-09	5633	5.38E-09	1609	4.62E-10
E	833	2.13E-06	1.50E-08	833	6.95E-07	9.04E-09	5633	6.60E-09	1609	5.23E-10
ESE	845	2.14E-06	1.78E-08	845	7.66E-07	1.18E-08	5633	8.46E-09	1609	6.75E-10
SE	969	1.05E-06	8.48E-09	969	3.80E-07	5.16E-09	5633	8.16E-09	1609	6.70E-10
SSE	698	1.52E-06	1.46E-08	698	5.88E-07	9.45E-09	6437	5.76E-09	1609	4.57E-10
S	620	2.16E-06	1.56E-08	620	5.25E-07	6.94E-09	6437	5.71E-09	1609	4.51E-10
SSW	835	1.21E-06	8.31E-09	835	3.00E-07	3.58E-09	6437	5.50E-09	1609	4.13E-10
SW	628	1.32E-06	1.32E-08	628	5.01E-07	8.29E-09	5633	6.52E-09	1609	5.47E-10
WSW	533	1.59E-06	1.70E-08	533	6.77E-07	1.13E-08	6437	6.13E-09	1609	4.80E-10
W	524	3.29E-06	2.33E-08	524	9.40E-07	1.13E-08	6437	4.32E-09	1609	2.99E-10
WNW	643	2.22E-06	1.26E-08	643	5.31E-07	5.80E-09	6437	3.41E-09	1609	2.53E-10
NW	762	1.88E-06	9.48E-09	762	4.33E-07	4.12E-09	7242	3.03E-09	1609	2.07E-10
NNW	890	1.63E-06	8.40E-09	890	4.18E-07	3.90E-09	7242	3.38E-09	1609	2.30E-10

LaSalle Site Meteorological Data 2000-2009

Table 4-5 (Page 1 of 2)

X/Q and D/Q at the Nearest Meat Animal Locations Within 5 Miles

JAN 2015

Direction	Distance		Ground Level Release		Mixed Mode (Vent)		Elevated (Stack)	
			X/Q	D/Q	X/Q	D/Q	X/Q	D/Q
	miles	meters	(sec/m3)	(m-2)	(sec/m3)	(m-2)	(sec/m3)	(m-2)
N	4.0	6400	1.11E-07	3.87E-10	5.69E-08	2.45E-10	5.15E-09	1.12E-10
NNE	1.7	2800	3.54E-07	2.03E-09	1.70E-07	1.35E-09	4.33E-09	3.44E-10
NE	3.5	5600	1.43E-07	6.19E-10	8.01E-08	4.21E-10	6.42E-09	1.75E-10
ENE	3.8	6116	1.11E-07	4.29E-10	6.01E-08	2.81E-10	5.39E-09	1.37E-10
E	5.0	8000	8.34E-08	2.99E-10	4.69E-08	2.05E-10	6.25E-09	1.07E-10
ESE	5.0	8000	8.37E-08	3.64E-10	5.10E-08	2.71E-10	7.82E-09	1.41E-10
SE	4.7	7600	5.41E-08	2.39E-10	3.66E-08	1.67E-10	7.71E-09	1.54E-10
SSE	4.7	7600	4.46E-08	2.41E-10	3.32E-08	1.93E-10	5.58E-09	1.06E-10
S	4.7	7600	5.45E-08	2.14E-10	3.86E-08	1.45E-10	5.60E-09	1.01E-10
SSW	5.0	8000	4.39E-08	1.67E-10	3.27E-08	1.10E-10	5.38E-09	8.37E-11
SW	5.0	8000	3.02E-08	1.69E-10	2.44E-08	1.37E-10	6.20E-09	1.11E-10
WSW	1.5	2400	1.69E-07	1.40E-09	1.10E-07	1.10E-09	2.75E-09	4.02E-10
W	3.0	4800	1.25E-07	5.58E-10	7.21E-08	3.33E-10	3.97E-09	1.34E-10
WNW	3.0	4800	1.15E-07	4.14E-10	5.35E-08	2.33E-10	3.17E-09	1.09E-10
NW	4.0	6400	8.73E-08	2.46E-10	4.06E-08	1.30E-10	3.02E-09	6.37E-11
NNW	4.6	7403	8.11E-08	2.15E-10	3.83E-08	1.16E-10	3.38E-09	5.50E-11

LaSalle Site Meteorological Data 2000-2009

Table 4-5 (Page 2 of 2)

JAN 2015

X/Q and D/Q at the Nearest Milk Cow Locations Within 5 Miles

Direction	Distance		Ground Level Release		Mixed Mode (Vent)		Elevated (Stack)	
			X/Q	D/Q	X/Q	D/Q	X/Q	D/Q
	miles	meters	(sec/m3)	(m-2)	(sec/m3)	(m-2)	(sec/m3)	(m-2)
N	5.0	8000	8.26E-08	2.59E-10	4.43E-08	1.65E-10	4.96E-09	7.82E-11
NNE	5.0	8000	8.80E-08	3.16E-10	5.06E-08	2.15E-10	5.82E-09	9.32E-11
NE	5.0	8000	8.95E-08	3.27E-10	5.28E-08	2.24E-10	6.05E-09	1.01E-10
ENE	5.0	8000	7.76E-08	2.65E-10	4.42E-08	1.75E-10	5.12E-09	8.92E-11
E	5.0	8000	8.34E-08	2.99E-10	4.69E-08	2.05E-10	6.25E-09	1.07E-10
ESE	5.0	8000	8.37E-08	3.64E-10	5.10E-08	2.71E-10	7.82E-09	1.41E-10
SE	5.0	8000	5.03E-08	2.17E-10	3.44E-08	1.53E-10	7.56E-09	1.41E-10
SSE	5.0	8000	4.14E-08	2.20E-10	3.11E-08	1.76E-10	5.49E-09	9.73E-11
S	5.0	8000	5.06E-08	1.95E-10	3.62E-08	1.33E-10	5.52E-09	9.30E-11
SSW	5.0	8000	4.39E-08	1.67E-10	3.27E-08	1.10E-10	5.38E-09	8.37E-11
SW	5.0	8000	3.02E-08	1.69E-10	2.44E-08	1.37E-10	6.20E-09	1.11E-10
WSW	5.0	8000	2.86E-08	1.67E-10	2.33E-08	1.38E-10	5.89E-09	1.01E-10
W	5.0	8000	6.20E-08	2.24E-10	4.01E-08	1.36E-10	4.25E-09	6.30E-11
WNW	5.0	8000	5.82E-08	1.66E-10	3.07E-08	9.52E-11	3.35E-09	5.15E-11
NW	5.0	8000	6.52E-08	1.64E-10	3.20E-08	8.77E-11	2.99E-09	4.45E-11
NNW	5.0	8000	7.34E-08	1.87E-10	3.53E-08	1.01E-10	3.34E-09	4.83E-11

LaSalle Site Meteorological Data 2000-2009

JAN 2015

Table 4-6 (Page 1 of 15)

Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-83m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	4.787E-07	3.609E-07	1036.	5.281E-07	3.982E-07	1036.	1.785E-04	1.346E-04
NNE	1378.	1378.	8.751E-07	6.599E-07	1378.	6.905E-07	5.206E-07	1378.	1.139E-04	8.586E-05
NE	2408.	2408.	6.471E-07	4.879E-07	2408.	6.697E-07	5.049E-07	2408.	4.355E-05	3.284E-05
ENE	4450.	4450.	5.700E-07	4.298E-07	4450.	5.653E-07	4.262E-07	4450.	1.466E-05	1.105E-05
E	1996.	1996.	4.687E-07	3.534E-07	1996.	7.559E-07	5.700E-07	1996.	5.491E-05	4.140E-05
ESE	1465.	1465.	5.252E-07	3.960E-07	1465.	1.002E-06	7.559E-07	1465.	8.270E-05	6.236E-05
SE	969.	969.	3.545E-07	2.673E-07	969.	1.267E-06	9.554E-07	969.	1.333E-04	1.005E-04
SSE	838.	838.	3.051E-07	2.301E-07	838.	1.512E-06	1.140E-06	838.	1.323E-04	9.978E-05
S	829.	829.	2.840E-07	2.141E-07	829.	1.040E-06	7.842E-07	829.	1.330E-04	1.003E-04
SSW	835.	835.	3.185E-07	2.401E-07	835.	1.071E-06	8.076E-07	835.	9.326E-05	7.032E-05
SW	628.	628.	3.177E-07	2.395E-07	628.	2.826E-06	2.131E-06	628.	2.305E-04	1.738E-04
WSW	533.	533.	2.617E-07	1.973E-07	533.	2.674E-06	2.017E-06	533.	2.568E-04	1.936E-04
W	524.	524.	2.327E-07	1.754E-07	524.	1.658E-06	1.250E-06	524.	3.352E-04	2.527E-04
WNW	643.	643.	1.714E-07	1.292E-07	643.	7.235E-07	5.455E-07	643.	2.728E-04	2.057E-04
NW	762.	762.	1.744E-07	1.315E-07	762.	4.391E-07	3.311E-07	762.	2.219E-04	1.673E-04
NNW	890.	890.	2.397E-07	1.807E-07	890.	3.334E-07	2.514E-07	890.	1.823E-04	1.374E-04

LASALLE SITE METEOROLOGICAL DATA 1/78 - 12/87

Based on Sargent & Lundy, Analysis and Technology Division, LaSalle calculation no. ATD-0164, revisions 0, 1, 2, and 3.

JAN 2015

Table 4-6 (Page 2 of 15)

Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-85m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	5.747E-05	5.560E-05	1036.	6.502E-05	6.388E-05	1036.	9.660E-04	9.252E-04
NNE	1378.	1378.	5.063E-05	4.886E-05	1378.	5.514E-05	5.334E-05	1378.	6.776E-04	6.496E-04
NE	2408.	2408.	2.592E-05	2.506E-05	2408.	2.727E-05	2.636E-05	2408.	2.969E-04	2.849E-04
ENE	4450.	4450.	1.351E-05	1.304E-05	4450.	1.332E-05	1.286E-05	4450.	1.156E-04	1.111E-04
E	1996.	1996.	2.705E-05	2.616E-05	1996.	2.863E-05	2.767E-05	1996.	3.557E-04	3.412E-04
ESE	1465.	1465.	4.351E-05	4.209E-05	1465.	4.624E-05	4.470E-05	1465.	5.201E-04	4.989E-04
SE	969.	969.	5.596E-05	5.415E-05	969.	6.610E-05	6.391E-05	969.	7.793E-04	7.470E-04
SSE	838.	838.	5.518E-05	5.339E-05	838.	6.630E-05	6.410E-05	838.	7.683E-04	7.364E-04
S	829.	829.	4.712E-05	4.560E-05	829.	5.330E-05	5.154E-05	829.	7.986E-04	7.657E-04
SSW	835.	835.	4.422E-05	4.279E-05	835.	5.351E-05	5.174E-05	835.	5.684E-04	5.450E-04
SW	628.	628.	7.281E-05	7.046E-05	628.	9.952E-05	9.618E-05	628.	1.285E-03	1.231E-03
WSW	533.	533.	7.757E-05	7.507E-05	533.	9.714E-05	9.388E-05	533.	1.389E-03	1.331E-03
W	524.	524.	7.601E-05	7.356E-05	524.	9.705E-05	9.385E-05	524.	1.687E-03	1.614E-03
WNW	643.	643.	5.286E-05	5.116E-05	643.	6.615E-05	6.399E-05	643.	1.327E-03	1.270E-03
NW	762.	762.	4.668E-05	4.518E-05	762.	5.688E-05	5.503E-05	762.	1.094E-03	1.047E-03
NNW	890.	890.	4.683E-05	4.532E-05	890.	5.142E-05	4.976E-05	890.	9.282E-04	8.885E-04

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-85

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	8.547E-07	8.265E-07	1036.	9.889E-07	9.563E-07	1036.	1.056E-05	1.021E-05
NNE	1378.	1378.	7.309E-07	7.068E-07	1378.	8.077E-07	7.811E-07	1378.	7.474E-06	7.227E-06
NE	2408.	2408.	3.651E-07	3.530E-07	2408.	3.909E-07	3.780E-07	2408.	3.363E-06	3.252E-06
ENE	4450.	4450.	1.885E-07	1.823E-07	4450.	1.856E-07	1.795E-07	4450.	1.377E-06	1.332E-06
E	1996.	1996.	3.912E-07	3.782E-07	1996.	4.096E-07	3.961E-07	1996.	4.008E-06	3.876E-06
ESE	1465.	1465.	6.359E-07	6.149E-07	1465.	6.632E-07	6.413E-07	1465.	5.783E-06	5.593E-06
SE	969.	969.	8.386E-07	8.110E-07	969.	9.583E-07	9.267E-07	969.	8.555E-06	8.273E-06
SSE	838.	838.	8.350E-07	8.075E-07	838.	9.612E-07	9.294E-07	838.	8.432E-06	8.154E-06
S	829.	829.	7.262E-07	7.023E-07	829.	8.087E-07	7.801E-07	829.	8.741E-06	8.453E-06
SSW	835.	835.	6.857E-07	6.630E-07	835.	8.402E-07	8.124E-07	835.	6.270E-06	6.063E-06
SW	628.	628.	1.142E-06	1.104E-06	628.	1.494E-06	1.444E-06	628.	1.401E-05	1.355E-05
WSW	533.	533.	1.211E-06	1.171E-06	533.	1.433E-06	1.386E-06	533.	1.510E-05	1.460E-05
W	524.	524.	1.172E-06	1.134E-06	524.	1.443E-06	1.395E-06	524.	1.824E-05	1.763E-05
WNW	643.	643.	8.185E-07	7.915E-07	643.	1.000E-05	9.670E-07	643.	1.436E-05	1.389E-05
NW	762.	762.	7.192E-07	6.954E-07	762.	8.694E-07	8.407E-07	762.	1.188E-05	1.148E-05
NNW	890.	890.	7.128E-07	6.893E-07	890.	7.849E-07	7.590E-07	890.	1.011E-05	9.778E-06

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-87

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	3.226E-04	3.135E-04	1036.	3.758E-04	3.652E-04	1036.	2.879E-03	2.795E-03
NNE	1378.	1378.	2.672E-04	2.597E-04	1378.	3.005E-04	2.920E-04	1378.	2.019E-03	1.960E-03
NE	2408.	2408.	1.283E-04	1.246E-04	2408.	1.359E-04	1.320E-04	2408.	8.605E-04	8.355E-04
ENE	4450.	4450.	5.904E-05	5.737E-05	4450.	5.859E-05	5.692E-05	4450.	3.133E-04	3.042E-04
E	1996.	1996.	1.412E-04	1.372E-04	1996.	1.458E-04	1.417E-04	1996.	1.030E-03	9.998E-04
ESE	1465.	1465.	2.351E-04	2.284E-04	1465.	2.426E-04	2.357E-04	1465.	1.545E-03	1.500E-03
SE	969.	969.	3.211E-04	3.120E-04	969.	3.612E-04	3.510E-04	969.	2.355E-03	2.287E-03
SSE	838.	838.	3.254E-04	3.162E-04	838.	3.655E-04	3.552E-04	838.	2.329E-03	2.262E-03
S	829.	829.	2.850E-04	2.770E-04	829.	3.081E-04	2.994E-04	829.	2.431E-03	2.361E-03
SSW	835.	835.	2.742E-04	2.665E-04	835.	3.400E-04	3.305E-04	835.	1.706E-03	1.657E-03
SW	628.	628.	4.614E-04	4.484E-04	628.	5.936E-04	5.769E-04	628.	3.903E-03	3.790E-03
WSW	533.	533.	4.880E-04	4.743E-04	533.	5.683E-04	5.523E-04	533.	4.251E-03	4.128E-03
W	524.	524.	4.675E-04	4.543E-04	524.	5.708E-04	5.547E-04	524.	5.136E-03	4.986E-03
WNW	643.	643.	3.224E-04	3.133E-04	643.	3.914E-04	3.804E-04	643.	4.001E-03	3.884E-03
NW	762.	762.	2.823E-04	2.743E-04	762.	3.397E-04	3.301E-04	762.	3.278E-03	3.180E-03
NNW	890.	890.	2.747E-04	2.669E-04	890.	3.031E-04	2.945E-04	890.	2.763E-03	2.683E-03

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-88

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S	SBAR	Mixed Mode(Vent) Release Radius (meters)	V	VBAR	Ground Level Release Radius (meters)	G	GBAR
			(mrad/yr)/(uCi/sec)			(mrad/yr)/(uCi/sec)			(mrad/yr)/(uCi/sec)	
N	1036.	1036.	8.602E-04	8.374E-04	1036.	1.003E-03	9.769E-04	1036.	6.988E-03	6.787E-03
NNE	1378.	1378.	7.111E-04	6.922E-04	1378.	7.989E-04	7.777E-04	1378.	4.940E-03	4.798E-03
NE	2408.	2408.	3.435E-04	3.344E-04	2408.	3.694E-04	3.596E-04	2408.	2.182E-03	2.120E-03
ENE	4450.	4450.	1.648E-04	1.604E-04	4450.	1.646E-04	1.602E-04	4450.	8.502E-04	8.263E-04
E	1996.	1996.	3.781E-04	3.680E-04	1996.	3.928E-04	3.824E-04	1996.	2.599E-03	2.525E-03
ESE	1465.	1465.	6.235E-04	6.070E-04	1465.	6.445E-04	6.273E-04	1465.	3.816E-03	3.707E-03
SE	969.	969.	8.537E-04	8.311E-04	969.	9.571E-04	9.317E-04	969.	5.712E-03	5.549E-03
SSE	838.	838.	8.671E-04	8.442E-04	838.	9.702E-04	9.445E-04	838.	5.645E-03	5.483E-03
S	829.	829.	7.696E-04	7.492E-04	829.	8.417E-04	8.194E-04	829.	5.862E-03	5.695E-03
SSW	835.	835.	7.427E-04	7.231E-04	835.	9.375E-04	9.127E-04	835.	4.167E-03	4.048E-03
SW	628.	628.	1.246E-03	1.213E-03	628.	1.601E-03	1.559E-03	628.	9.396E-03	9.126E-03
WSW	533.	533.	1.314E-03	1.279E-03	533.	1.525E-03	1.485E-03	533.	1.017E-02	9.882E-03
W	524.	524.	1.249E-03	1.216E-03	524.	1.520E-03	1.480E-03	524.	1.225E-02	1.190E-02
WNW	643.	643.	8.669E-04	8.440E-04	643.	1.045E-03	1.017E-03	643.	9.595E-03	9.317E-03
NW	762.	762.	7.580E-04	7.379E-04	762.	9.125E-04	8.884E-04	762.	7.895E-03	7.866E-03
NNW	890.	890.	7.369E-04	7.174E-04	890.	8.161E-04	7.945E-04	890.	6.693E-03	6.500E-03

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-89

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	3.904E-04	3.794E-04	1036.	4.258E-04	4.139E-04	1036.	2.051E-03	1.992E-03
NNE	1378.	1378.	2.820E-04	2.741E-04	1378.	2.988E-04	2.904E-04	1378.	1.151E-03	1.118E-03
NE	2408.	2408.	8.306E-05	8.072E-05	2408.	7.403E-05	7.195E-05	2408.	2.060E-04	2.001E-04
ENE	4450.	4450.	1.570E-05	1.526E-05	4450.	1.153E-05	1.121E-05	4450.	1.701E-05	1.653E-05
E	1996.	1996.	1.052E-04	1.023E-04	1996.	9.299E-05	9.037E-05	1996.	3.031E-04	2.944E-04
ESE	1465.	1465.	2.365E-04	2.299E-04	1465.	2.240E-04	2.177E-04	1465.	7.762E-04	7.540E-04
SE	969.	969.	3.891E-04	3.782E-04	969.	4.188E-04	4.070E-04	969.	1.846E-03	1.793E-03
SSE	838.	838.	4.108E-04	3.993E-04	838.	4.365E-04	4.243E-04	838.	1.831E-03	1.778E-03
S	829.	829.	3.408E-04	3.312E-04	829.	3.253E-04	3.162E-04	829.	2.034E-03	1.976E-03
SSW	835.	835.	2.921E-04	2.839E-04	835.	2.779E-04	2.702E-04	835.	1.021E-03	9.916E-04
SW	628.	628.	5.830E-04	5.667E-04	628.	6.600E-04	6.415E-04	628.	3.274E-03	3.180E-03
WSW	533.	533.	6.913E-04	6.720E-04	533.	7.525E-04	7.314E-04	533.	4.592E-03	4.460E-03
W	524.	524.	6.961E-04	6.766E-04	524.	8.259E-04	8.028E-04	524.	5.967E-03	5.796E-03
WNW	643.	643.	4.295E-04	4.174E-04	643.	5.147E-04	5.003E-04	643.	3.746E-03	3.638E-03
NW	762.	762.	3.500E-04	3.402E-04	762.	4.035E-04	3.922E-04	762.	2.561E-03	2.488E-03
NNW	890.	890.	3.301E-04	3.208E-04	890.	3.415E-04	3.319E-04	890.	1.966E-03	1.909E-03

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Kr-90

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	6.785E-05	6.586E-05	1036.	5.199E-05	5.047E-05	1036.	8.203E-05	7.954E-05
NNE	1378.	1378.	3.195E-05	3.102E-05	1378.	2.161E-05	2.098E-05	1378.	2.265E-05	2.196E-05
NE	2408.	2408.	2.160E-06	2.097E-06	2408.	9.136E-07	8.868E-07	2408.	5.870E-07	5.693E-07
ENE	4450.	4450.	1.109E-07	1.076E-07	4450.	3.907E-08	3.792E-08	4450.	1.814E-08	1.759E-08
E	1996.	1996.	4.713E-06	4.575E-06	1996.	2.562E-06	2.486E-06	1996.	2.865E-06	2.779E-06
ESE	1465.	1465.	2.134E-05	2.072E-05	1465.	1.551E-05	1.506E-05	1465.	2.503E-05	2.427E-05
SE	969.	969.	5.843E-05	5.673E-05	969.	5.324E-05	5.168E-05	969.	1.365E-04	1.324E-04
SSE	838.	838.	6.863E-05	6.663E-05	838.	6.174E-05	5.993E-05	838.	1.227E-04	1.190E-04
S	829.	829.	5.057E-05	4.909E-05	829.	3.745E-05	3.635E-05	829.	1.055E-04	1.023E-04
SSW	835.	835.	3.062E-05	2.972E-05	835.	1.274E-05	1.237E-05	835.	1.835E-05	1.779E-05
SW	628.	628.	9.754E-05	9.470E-05	628.	6.538E-05	6.347E-05	628.	1.410E-04	1.368E-04
WSW	533.	533.	1.892E-04	1.836E-04	533.	1.525E-04	1.480E-04	533.	4.861E-04	4.713E-04
W	524.	524.	2.165E-04	2.101E-04	524.	2.185E-04	2.121E-04	524.	8.427E-04	8.170E-04
WNW	643.	643.	1.018E-04	9.883E-05	643.	1.008E-04	9.787E-05	643.	3.141E-04	3.045E-04
NW	762.	762.	6.634E-05	6.440E-05	762.	5.815E-05	5.645E-05	762.	1.306E-04	1.267E-04
NNW	890.	890.	5.725E-05	5.558E-05	890.	4.336E-05	4.209E-05	890.	8.819E-05	8.551E-05

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-131m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	1.606E-06	1.473E-06	1036.	1.827E-06	1.679E-06	1036.	1.645E-04	1.283E-04
NNE	1378.	1378.	1.778E-06	1.572E-06	1378.	1.726E-06	1.553E-06	1378.	1.072E-04	8.384E-05
NE	2408.	2408.	1.086E-06	9.376E-07	2408.	1.136E-06	9.826E-07	2408.	4.347E-05	3.412E-05
ENE	4450.	4450.	7.931E-07	6.617E-07	4450.	7.858E-07	6.550E-07	4450.	1.623E-05	1.279E-05
E	1996.	1996.	9.572E-07	8.457E-07	1996.	1.230E-06	1.058E-06	1996.	5.428E-05	4.253E-05
ESE	1465.	1465.	1.347E-06	1.215E-06	1465.	1.789E-06	1.560E-06	1465.	7.935E-05	6.215E-05
SE	969.	969.	1.472E-06	1.365E-06	969.	2.408E-06	2.115E-06	969.	1.240E-04	9.696E-05
SSE	838.	838.	1.415E-06	1.318E-06	838.	2.598E-06	2.260E-08	838.	1.228E-04	9.597E-05
S	829.	829.	1.231E-06	1.144E-06	829.	1.966E-06	1.727E-06	829.	1.232E-04	9.639E-05
SSW	835.	835.	1.196E-06	1.103E-06	835.	2.003E-06	1.755E-06	835.	8.798E-05	6.885E-05
SW	628.	628.	1.802E-06	1.691E-06	628.	4.345E-06	3.728E-06	628.	2.109E-04	1.646E-04
WSW	533.	533.	1.859E-06	1.755E-06	533.	4.161E-06	3.577E-06	533.	2.324E-04	1.813E-04
W	524.	524.	1.800E-06	1.703E-06	524.	3.359E-06	2.972E-06	524.	3.000E-04	2.335E-04
WNW	643.	643.	1.263E-06	1.194E-06	643.	1.976E-06	1.791E-06	643.	2.446E-04	1.902E-04
NW	762.	762.	1.135E-06	1.069E-06	762.	1.561E-06	1.437E-06	762.	2.005E-04	1.560E-04
NNW	890.	890.	1.191E-06	1.112E-06	890.	1.363E-06	1.263E-06	890.	1.664E-04	1.295E-04

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-133m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	8.557E-06	8.199E-06	1036.	9.814E-06	9.407E-06	1036.	2.822E-04	2.410E-04
NNE	1378.	1378.	7.917E-06	7.509E-06	1378.	8.400E-06	8.009E-06	1378.	1.901E-04	1.633E-04
NE	2408.	2408.	4.246E-06	3.993E-06	2408.	4.482E-06	4.217E-06	2408.	8.032E-05	6.950E-05
ENE	4450.	4450.	2.488E-06	2.298E-06	4450.	2.450E-06	2.262E-06	4450.	3.108E-05	2.706E-05
E	1996.	1996.	4.247E-06	4.028E-06	1996.	4.721E-06	4.433E-06	1996.	9.835E-05	8.482E-05
ESE	1465.	1465.	6.614E-06	6.309E-06	1465.	7.393E-06	6.978E-06	1465.	1.432E-04	1.234E-04
SE	969.	969.	8.229E-06	7.903E-06	969.	1.039E-05	9.834E-06	969.	2.189E-04	1.879E-04
SSE	838.	838.	8.070E-06	7.758E-06	838.	1.060E-05	9.998E-06	838.	2.163E-04	1.856E-04
S	829.	829.	6.932E-06	6.660E-06	829.	8.449E-06	7.995E-06	829.	2.201E-04	1.893E-04
SSW	835.	835.	6.541E-06	6.276E-06	835.	8.500E-06	8.036E-06	835.	1.574E-04	1.354E-04
SW	628.	628.	1.059E-05	1.020E-05	628.	1.637E-05	1.535E-05	628.	3.668E-04	3.140E-04
WSW	533.	533.	1.121E-05	1.081E-05	533.	1.588E-05	1.490E-05	533.	4.005E-04	3.423E-04
W	524.	524.	1.096E-05	1.056E-05	524.	1.504E-05	1.427E-05	524.	5.039E-04	4.287E-04
WNW	643.	643.	7.648E-06	7.374E-06	643.	9.956E-06	9.510E-06	643.	4.055E-04	3.441E-04
NW	762.	762.	6.774E-06	6.526E-06	762.	8.435E-06	8.088E-06	762.	3.334E-04	2.831E-04
NNW	890.	890.	6.855E-06	6.594E-06	890.	7.588E-06	7.286E-06	890.	2.794E-04	2.377E-04

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-133

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	7.010E-06	6.757E-06	1036.	7.933E-06	7.649E-06	1036.	3.136E-04	2.785E-04
NNE	1378.	1378.	6.939E-06	6.629E-06	1378.	7.149E-06	6.860E-06	1378.	2.132E-04	1.903E-04
NE	2408.	2408.	3.969E-06	3.767E-06	2408.	4.106E-06	3.897E-06	2408.	9.094E-05	8.164E-05
ENE	4450.	4450.	2.442E-06	2.286E-06	4450.	2.384E-06	2.229E-06	4450.	3.540E-05	3.193E-05
E	1996.	1996.	3.841E-06	3.671E-06	1996.	4.310E-06	4.083E-06	1996.	1.109E-04	9.929E-05
ESE	1465.	1465.	5.762E-06	5.534E-06	1465.	6.599E-06	6.277E-06	1465.	1.612E-04	1.443E-04
SE	969.	969.	6.641E-06	6.416E-06	969.	8.978E-06	8.558E-06	969.	2.450E-04	2.185E-04
SSE	838.	838.	6.364E-06	6.153E-06	838.	9.231E-06	8.769E-06	838.	2.418E-04	2.156E-04
S	829.	829.	5.333E-06	5.152E-06	829.	6.962E-06	6.627E-06	829.	2.476E-04	2.212E-04
SSW	835.	835.	4.969E-06	4.793E-06	835.	6.598E-06	6.266E-06	835.	1.770E-04	1.582E-04
SW	628.	628.	7.798E-06	7.549E-06	628.	1.362E-05	1.285E-05	628.	4.090E-04	3.640E-04
WSW	533.	533.	8.245E-06	7.992E-06	533.	1.326E-05	1.252E-05	533.	4.447E-04	3.951E-04
W	524.	524.	8.166E-06	7.919E-06	524.	1.220E-05	1.164E-05	524.	5.551E-04	4.911E-04
WNW	643.	643.	5.715E-06	5.541E-06	643.	7.885E-06	7.574E-06	643.	4.444E-04	3.922E-04
NW	762.	762.	5.117E-06	4.958E-06	762.	6.538E-06	6.303E-06	762.	3.661E-04	3.233E-04
NNW	890.	890.	5.340E-06	5.165E-06	890.	5.911E-06	5.708E-06	890.	3.080E-04	2.725E-04

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-135m

Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth For Xe135m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	1.396E-04	1.349E-04	1036.	1.598E-04	1.545E-04	1036.	1.531E-03	1.475E-03
NNE	1378.	1378.	1.151E-04	1.113E-04	1378.	1.274E-04	1.232E-04	1378.	1.019E-03	9.821E-04
NE	2408.	2408.	5.077E-05	4.907E-05	2408.	5.129E-05	4.958E-05	2408.	3.516E-04	3.390E-04
ENE	4450.	4450.	1.919E-05	1.854E-05	4450.	1.778E-05	1.718E-05	4450.	8.758E-05	8.445E-05
E	1996.	1996.	5.672E-05	5.483E-05	1996.	5.675E-05	5.486E-05	1996.	4.329E-04	4.172E-04
ESE	1465.	1465.	1.005E-04	9.716E-05	1465.	1.024E-04	9.902E-05	1465.	7.369E-04	7.103E-04
SE	969.	969.	1.389E-04	1.343E-04	969.	1.575E-04	1.522E-04	969.	1.262E-03	1.216E-03
SSE	838.	838.	1.402E-04	1.356E-04	838.	1.591E-04	1.538E-04	838.	1.254E-03	1.209E-03
S	829.	829.	1.183E-04	1.144E-04	829.	1.235E-04	1.194E-04	829.	1.341E-03	1.292E-03
SSW	835.	835.	1.104E-04	1.068E-04	835.	1.260E-04	1.218E-04	835.	8.762E-04	8.444E-04
SW	628.	628.	1.904E-04	1.841E-04	628.	2.444E-04	2.363E-04	628.	2.173E-03	2.094E-03
WSW	533.	533.	2.063E-04	1.995E-04	533.	2.427E-04	2.345E-04	533.	2.479E-03	2.388E-03
W	524.	524.	2.033E-04	1.966E-04	524.	2.511E-04	2.427E-04	524.	3.050E-03	2.937E-03
WNW	643.	643.	1.363E-04	1.318E-04	643.	1.687E-04	1.631E-04	643.	2.286E-03	2.201E-03
NW	762.	762.	1.187E-04	1.148E-04	762.	1.423E-04	1.376E-04	762.	1.806E-03	1.739E-03
NNW	890.	890.	1.161E-04	1.122E-04	890.	1.259E-04	1.217E-04	890.	1.482E-03	1.427E-03

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-135

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR (mrad/yr)/(uCi/sec)	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR (mrad/yr)/(uCi/sec)	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR (mrad/yr)/(uCi/sec)
N	1036.	1036.	8.165E-05	7.902E-05	1036.	9.367E-05	9.085E-05	1036.	1.302E-03	1.257E-03
NNE	1378.	1378.	7.171E-05	6.940E-05	1378.	7.821E-05	7.569E-05	1378.	9.178E-04	8.866E-04
NE	2408.	2408.	3.669E-05	3.550E-05	2408.	3.876E-05	3.751E-05	2408.	4.075E-04	3.937E-04
ENE	4450.	4450.	1.928E-05	1.866E-05	4450.	1.899E-05	1.837E-05	4450.	1.625E-04	1.570E-04
E	1996.	1996.	3.838E-05	3.714E-05	1996.	4.056E-05	3.925E-05	1996.	4.869E-04	4.704E-04
ESE	1465.	1465.	6.171E-05	5.972E-05	1465.	6.539E-05	6.328E-05	1465.	7.073E-04	6.833E-04
SE	969.	969.	7.953E-05	7.697E-05	969.	9.346E-05	9.044E-05	969.	1.052E-03	1.017E-03
SSE	838.	838.	7.845E-05	7.593E-05	838.	9.367E-05	9.064E-05	838.	1.037E-03	1.002E-03
S	829.	829.	6.719E-05	6.503E-05	829.	7.587E-05	7.342E-05	829.	1.078E-03	1.041E-03
SSW	835.	835.	6.306E-05	6.103E-05	835.	7.636E-05	7.389E-05	835.	7.699E-04	7.438E-04
SW	628.	628.	1.039E-04	1.006E-04	628.	1.409E-04	1.363E-04	628.	1.729E-03	1.670E-03
WSW	533.	533.	1.106E-04	1.071E-04	533.	1.372E-04	1.328E-04	533.	1.864E-03	1.801E-03
W	524.	524.	1.082E-04	1.048E-04	524.	1.374E-04	1.329E-04	524.	2.256E-03	2.179E-03
WNW	643.	643.	7.538E-05	7.296E-05	643.	9.395E-05	9.092E-05	643.	1.775E-03	1.713E-03
NW	762.	762.	6.654E-05	6.440E-05	762.	8.098E-05	7.838E-05	762.	1.466E-03	1.415E-03
NNW	890.	890.	6.671E-05	6.456E-05	890.	7.927E-05	7.092E-05	890.	1.247E-03	1.204E-03

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-137

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	4.780E-05	4.627E-05	1036.	5.242E-05	5.074E-05	1036.	3.409E-04	3.298E-04
NNE	1378.	1378.	3.585E-05	3.471E-05	1378.	3.814E-05	3.692E-05	1378.	1.975E-04	1.911E-04
NE	2408.	2408.	1.153E-05	1.116E-05	2408.	1.052E-05	1.018E-05	2408.	3.979E-05	3.850E-05
ENE	4450.	4450.	2.512E-06	2.432E-06	4450.	1.933E-06	1.871E-06	4450.	3.949E-06	3.821E-06
E	1996.	1996.	1.420E-05	1.374E-05	1996.	1.285E-05	1.244E-05	1996.	5.599E-05	5.418E-05
ESE	1465.	1465.	3.033E-05	2.936E-05	1465.	2.918E-05	2.825E-05	1465.	1.327E-04	1.284E-04
SE	969.	969.	4.743E-05	4.591E-05	969.	5.188E-05	5.023E-05	969.	2.989E-04	2.892E-04
SSE	838.	838.	4.926E-05	4.769E-05	838.	5.357E-05	5.186E-05	838.	2.970E-04	2.874E-04
S	829.	829.	4.072E-05	3.942E-05	829.	3.975E-05	3.849E-05	829.	3.298E-04	3.191E-04
SSW	835.	835.	3.521E-05	3.408E-05	835.	3.424E-05	3.315E-05	835.	1.748E-04	1.691E-04
SW	628.	628.	6.779E-05	6.563E-05	628.	7.938E-05	7.685E-05	628.	5.333E-04	5.161E-04
WSW	533.	533.	7.919E-05	7.667E-05	533.	8.829E-05	8.548E-05	533.	7.164E-04	6.932E-04
W	524.	524.	7.990E-05	7.738E-05	524.	9.608E-05	9.302E-05	524.	9.223E-04	8.924E-04
WNW	643.	643.	5.023E-05	4.863E-05	643.	6.090E-05	5.896E-05	643.	6.002E-04	5.808E-04
NW	762.	762.	4.160E-05	4.028E-05	762.	4.841E-05	4.687E-05	762.	4.228E-04	4.090E-04
NNW	890.	890.	3.985E-05	3.858E-05	890.	4.152E-05	4.020E-05	890.	3.279E-04	3.172E-04

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Xe-138

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	3.926E-04	3.816E-04	1036.	4.523E-04	4.396E-04	1036.	3.178E-03	3.084E-03
NNE	1378.	1378.	3.160E-04	3.071E-04	1378.	3.536E-04	3.437E-04	1378.	2.117E-03	2.055E-03
NE	2408.	2408.	1.356E-04	1.318E-04	2408.	1.379E-04	1.340E-04	2408.	7.244E-04	7.032E-04
ENE	4450.	4450.	4.939E-05	4.799E-05	4450.	4.572E-05	4.443E-05	4450.	1.769E-04	1.718E-04
E	1996.	1996.	1.540E-04	1.497E-04	1996.	1.535E-04	1.492E-04	1996.	8.921E-04	8.659E-04
ESE	1465.	1465.	2.766E-04	2.689E-04	1465.	2.804E-04	2.725E-04	1465.	1.532E-03	1.487E-03
SE	969.	969.	3.938E-04	3.828E-04	969.	4.408E-04	4.285E-04	969.	2.641E-03	2.564E-03
SSE	838.	838.	4.037E-04	3.924E-04	838.	4.484E-04	4.358E-04	838.	2.628E-03	2.551E-03
S	829.	829.	3.457E-04	3.360E-04	829.	3.560E-04	3.460E-04	829.	2.809E-03	2.727E-03
SSW	835.	835.	3.277E-04	3.186E-04	835.	3.832E-04	3.724E-04	835.	1.828E-03	1.774E-03
SW	628.	628.	5.698E-04	5.538E-04	628.	7.209E-04	7.007E-04	628.	4.546E-03	4.412E-03
WSW	533.	533.	6.144E-04	5.973E-04	533.	7.121E-04	6.921E-04	533.	5.206E-03	5.053E-03
W	524.	524.	5.976E-04	5.809E-04	524.	7.318E-04	7.113E-04	524.	6.383E-03	6.195E-03
WNW	643.	643.	3.986E-04	3.875E-04	643.	4.887E-04	4.750E-04	643.	4.757E-03	4.616E-03
NW	762.	762.	3.457E-04	3.360E-04	762.	4.131E-04	4.016E-04	762.	3.746E-03	3.635E-03
NNW	890.	890.	3.330E-04	3.236E-04	890.	3.626E-04	3.525E-04	890.	3.069E-03	2.978E-03

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Maximum Offsite Finite Plume Gamma Dose Factors Based on 1 cm Depth at the Unrestricted Area Boundary for Ar-41

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR	Mixed Mode(Vent) Release Radius (meters)	V (mrad/yr)/(uCi/sec)	VBAR	Ground Level Release Radius (meters)	G (mrad/yr)/(uCi/sec)	GBAR
N	1036.	1036.	4.746E-04	4.594E-04	1036.	5.528E-04	5.351E-04	1036.	4.557E-03	4.411E-03
NNE	1378.	1378.	3.954E-04	3.828E-04	1378.	4.439E-04	4.297E-04	1378.	3.203E-03	3.101E-03
NE	2408.	2408.	1.925E-04	1.863E-04	2408.	2.045E-04	1.980E-04	2408.	1.387E-03	1.343E-03
ENE	4450.	4450.	9.141E-05	8.848E-05	4450.	9.061E-05	8.772E-05	4450.	5.219E-04	5.052E-04
E	1996.	1996.	2.110E-04	2.043E-04	1996.	2.180E-04	2.110E-04	1996.	1.658E-03	1.605E-03
ESE	1465.	1465.	3.480E-04	3.368E-04	1465.	3.593E-04	3.478E-04	1465.	2.459E-03	2.381E-03
SE	969.	969.	4.711E-04	4.560E-04	969.	5.320E-04	5.149E-04	969.	3.715E-03	3.597E-03
SSE	838.	838.	4.761E-04	4.608E-04	838.	5.378E-04	5.206E-04	838.	3.671E-03	3.554E-03
S	829.	829.	4.168E-04	4.035E-04	829.	4.533E-04	4.388E-04	829.	3.823E-03	3.701E-03
SSW	835.	835.	3.994E-04	3.866E-04	835.	4.930E-04	4.772E-04	835.	2.700E-03	2.614E-03
SW	628.	628.	6.711E-04	6.496E-04	628.	8.591E-04	8.316E-04	628.	6.139E-03	5.943E-03
WSW	533.	533.	7.089E-04	6.862E-04	533.	8.229E-04	7.966E-04	533.	6.667E-03	6.453E-03
W	524.	524.	6.802E-04	6.584E-04	524.	8.291E-04	8.026E-04	524.	8.057E-03	7.799E-03
WNW	643.	643.	4.708E-04	4.558E-04	643.	5.716E-04	5.533E-04	643.	6.300E-03	6.099E-03
NW	762.	762.	4.123E-04	3.991E-04	762.	4.970E-04	4.811E-04	762.	5.173E-03	5.008E-03
NNW	890.	890.	4.025E-04	3.896E-04	890.	4.447E-04	4.305E-04	890.	4.374E-03	4.234E-03

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Table 4-7 Deleted

Table 4-8

Parameters for Calculations of N-16 Skyshine Radiation From LaSalle

Location Number K	Activity	Occupancy Hours OH_k[a]	Occupancy Factor[c] OF_k	Shielding Factor SF_k	Distance R_k (m)
1	Living at home (nearest resident)	8360	0.95	0.7	1100[b]
2	Fishing	400	0.05	1.0	2100
3	Living at National Guard Facility	2500		0.7	2400

$M_h = 5$

K = 2.28 E-5 mrem / (MWe-hr)

These parameters are used to obtain an initial estimate of skyshine dose to the maximally exposed member of the public using ODCM Part II, Section 5, Equation 5-1. If desired, more realistic parameters could be used in place of these to refine the estimate. For example, one could determine whether the nearest resident really fishes the specified number of hours at the specified location.

Notes:

a The amount of time in a year that a maximally exposed fisherman would spend fishing near the site is estimates as 12 hours per week for 8 months per year. This yields an estimate of:

$$\left(12\frac{Hours}{Week}\right)\left[\frac{8\left(\frac{months}{year}\right)}{12\left(\frac{months}{year}\right)}\right]\left(52\frac{weeks}{year}\right) = 416\frac{hours}{year}$$

b Distance to nearest residence. (See Table 4-1)

c The OF_k is the quotient of the number of hours a location is occupied and the number of hours in a year. Thus, OH_k /8760 hours = OF_k rounded to the nearest 0.01 digit.

In determining the maximally exposed individual, the following possibilities were considered: the nearest resident, fisherman, and persons at the National Guard facility north of the site. The annual exposre time and .location of a maximally exposed fisherman were estimated on the basis of discussion with a member of the station staff. The nearest resident was found to have the greatest exposure to skyshine. For details, see Based on Sargent & Lundy, Nuclear Safeguards and Licensing Division, LaSalle calculation no. ATD-0139, "N-16 Skyshine Ground Level Doses from LaSalle Turbine Systems & Piping, Revision 0.

Table 4-9 (page 1 of 2)

Elevated Level Joint Frequency Distribution Table Summary

375 Foot Elevation Data

JAN 2015

Summary Table of Percent by Direction and Class

Class	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
A	.024	.032	.067	.057	.062	.040	.030	.060	.056	.169	.087	.051	.056	.064	.063	.024	.943
B	.149	.175	.227	.149	.080	.047	.056	.070	.233	.463	.330	.189	.145	.192	.153	.183	2.843
C	.300	.262	.351	.255	.138	.069	.104	.130	.375	.579	.454	.361	.344	.420	.329	.332	4.805
D	3.100	2.634	3.282	3.192	2.780	1.945	1.767	2.053	2.810	2.875	2.270	2.460	3.248	4.533	3.922	3.681	46.551
E	1.018	.813	1.162	1.431	1.823	1.495	1.460	1.752	2.867	2.978	2.124	1.531	1.575	2.065	1.670	1.186	27.061
F	.320	.182	.248	.260	.469	.707	.905	.995	1.459	1.735	1.561	1.041	1.012	1.099	.894	.553	13.438
G	.055	.039	.022	.012	.041	.081	.278	.507	.674	.658	.660	.460	.309	.242	.217	.103	4.358
Total	4.965	4.237	5.359	5.356	5.394	4.385	4.601	5.567	8.474	9.457	7.487	6.093	6.688	8.615	7.248	6.073	100.000

Summary Table of Percent by Direction and Speed

Speed	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
.45	.018	.017	.015	.010	.006	.010	.013	.008	.018	.010	.000	.013	.000	.000	.001	.000	.137
1.05	.016	.033	.030	.027	.021	.023	.032	.027	.027	.017	.017	.028	.021	.024	.034	.027	.402
2.05	.162	.260	.276	.215	.147	.149	.159	.171	.165	.168	.155	.135	.147	.115	.136	.160	2.721
3.05	.381	.479	.551	.477	.369	.287	.311	.278	.323	.317	.272	.302	.321	.317	.302	.311	5.599
4.05	.508	.647	.785	.547	.494	.428	.437	.404	.453	.455	.428	.400	.387	.482	.487	.455	7.798
5.05	.489	.598	.792	.515	.451	.403	.420	.505	.477	.489	.492	.472	.493	.540	.542	.533	8.213
6.05	.577	.599	.861	.596	.506	.419	.479	.483	.556	.584	.523	.487	.556	.598	.668	.656	9.150
8.05	1.297	.918	1.353	1.289	1.207	.972	.969	1.062	1.415	1.500	1.371	1.164	1.207	1.622	1.669	1.623	20.637
10.05	.912	.421	.487	.845	.998	.751	.736	.947	1.385	1.552	1.325	1.088	1.240	1.671	1.557	1.270	17.188
13.05	.482	.210	.183	.594	.858	.692	.749	1.187	2.107	2.440	1.822	1.338	1.432	1.962	1.428	.800	18.286
18.00	.120	.055	.026	.231	.326	.240	.283	.458	1.476	1.815	1.043	.581	.746	1.137	.404	.222	9.163
99.00	.002	.000	.000	.011	.011	.011	.013	.035	.072	.109	.038	.085	.137	.147	.019	.015	.706
Total	4.965	4.237	5.359	5.356	5.394	4.385	4.601	5.567	8.474	9.457	7.487	6.093	6.688	8.615	7.248	6.073	100.000

NOTE: Wind direction in tables are presented in "wind from" and not "wind to" direction.

Table 4-9 (page 2 of 2)

Elevated Level Joint Frequency Distribution Table Summary

375 Foot Elevation Data

JAN 2015

Summary Table of Percent by Speed and Class

Class Speed	A	B	C	D	E	F	G
.45	.000	.000	.000	.052	.058	.023	.004
1.05	.001	.004	.004	.176	.153	.060	.005
2.05	.017	.041	.109	1.540	.656	.307	.050
3.05	.046	.159	.290	3.269	1.193	.547	.096
4.05	.102	.249	.499	4.364	1.629	.788	.166
5.05	.102	.335	.547	4.159	1.945	.916	.210
6.05	.106	.341	.565	4.563	2.320	.986	.268
8.05	.225	.701	1.116	10.191	5.190	2.460	.755
10.05	.141	.429	.785	7.441	4.924	2.591	.878
13.05	.134	.404	.598	6.977	5.670	3.208	1.296
18.00	.068	.163	.256	3.424	3.126	1.511	.615
99.00	.001	.017	.036	.396	.198	.043	.015

Table 4-10 (Page 1 of 2)

Mid Elevation Joint Frequency Distribution Table Summaries

JAN 2015

200 Foot Elevation Data

Summary Table of Percent by Direction and Class

Class	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
A	.024	.032	.067	.057	.062	.040	.030	.060	.056	.169	.087	.051	.056	.064	.063	.024	.943
B	.149	.175	.227	.149	.080	.047	.056	.070	.233	.463	.330	.189	.145	.192	.153	.183	2.843
C	.300	.262	.351	.255	.138	.069	.104	.130	.375	.579	.454	.361	.344	.420	.329	.332	4.805
D	3.100	2.634	3.282	3.192	2.780	1.945	1.767	2.053	2.810	2.875	2.270	2.460	3.248	4.533	3.922	3.681	46.551
E	1.018	.913	1.162	1.431	1.823	1.495	1.460	1.752	2.867	2.978	2.124	1.531	1.575	2.065	1.670	1.196	27.061
F	.320	.182	.248	.260	.469	.707	.905	.995	1.459	1.735	1.561	1.041	1.012	1.099	.894	.553	13.438
G	.055	.039	.022	.012	.041	.081	.278	.507	.674	.658	.660	.460	.309	.242	.217	.103	4.358
Total	4.965	4.237	5.359	5.356	5.394	4.385	4.601	5.567	8.474	9.457	7.487	6.093	6.688	8.615	7.248	6.073	100.000

Summary Table of Percent by Direction and Speed

Speed	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
.45	.018	.017	.015	.010	.006	.010	.013	.008	.018	.010	.000	.013	.000	.000	.001	.000	.137
1.05	.016	.033	.030	.027	.021	.023	.032	.027	.027	.017	.017	.028	.021	.024	.034	.027	.402
2.05	.162	.260	.276	.215	.147	.149	.159	.171	.165	.168	.155	.135	.147	.115	.136	.160	2.721
3.05	.381	.479	.551	.477	.369	.287	.311	.278	.323	.317	.272	.302	.321	.317	.302	.311	5.599
4.05	.508	.647	.785	.547	.494	.428	.437	.404	.453	.455	.428	.400	.387	.482	.487	.455	7.798
5.05	.489	.598	.792	.515	.451	.403	.420	.505	.477	.489	.492	.472	.493	.540	.542	.533	8.213
6.05	.577	.599	.861	.596	.506	.419	.479	.483	.556	.584	.523	.487	.556	.598	.668	.656	9.150
8.05	1.297	.918	1.353	1.289	1.207	.972	.969	1.062	1.415	1.500	1.371	1.164	1.207	1.622	1.669	1.623	20.637
10.05	.912	.421	.487	.845	.898	.751	.736	.947	1.385	1.552	1.325	1.088	1.240	1.671	1.557	1.270	17.188
13.05	.482	.210	.183	.594	.858	.692	.749	1.187	2.107	2.440	1.822	1.338	1.432	1.962	1.428	.800	18.286
18.00	.120	.055	.026	.231	.326	.240	.283	.459	1.476	1.815	1.043	.581	.746	1.137	.404	.222	9.163
99.00	.002	.000	.000	.011	.011	.011	.013	.035	.072	.109	.038	.085	.137	.147	.019	.015	.706
Total	4.965	4.237	5.359	5.356	5.394	4.385	4.601	5.567	8.474	9.457	7.487	6.093	6.688	8.615	7.248	6.073	100.000

NOTE: Wind direction in tables are presented in "wind from" and not "wind to" direction.

Table 4-10 (Page 2 of 2)

Mid Elevation Joint Frequency Distribution Table Summaries

JAN 2015

200 Foot Elevation Data

Summary Table of Percent by Speed and Class

Class Speed	A	B	C	D	E	F	G
.45	.000	.000	.001	.046	.037	.021	.009
1.05	.013	.004	.022	.219	.175	.116	.063
2.05	.172	.130	.291	1.946	.732	.437	.207
3.05	.600	.453	.809	3.533	1.531	.642	.378
4.05	.776	.588	.970	4.134	2.329	.930	.591
5.05	.828	.588	.966	3.915	2.455	1.150	.690
6.05	.835	.533	.921	4.389	2.742	1.461	1.079
8.05	1.542	1.208	1.671	8.019	5.377	3.357	2.616
10.05	1.030	.780	.979	5.271	4.154	2.319	2.160
13.05	.874	.558	.754	4.155	2.854	.935	.597
18.00	.331	.207	.231	1.621	.630	.046	.020
99.00	.029	.012	.018	.162	.020	.005	.001

Table 4-11 (Page 1 of 2)

Ground Level Joint Frequency Distribution Table Summary

33 Foot Elevation Data

JAN 2015

Summary Table of Percent by Direction and Class

Class	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
A	.411	.318	.688	.887	.594	.308	.133	.135	.212	.407	.478	.447	.532	.665	.844	.904	7.962
B	.314	.150	.278	.310	.276	.177	.108	.071	.172	.239	.268	.222	.293	.405	.505	.501	4.288
C	.380	.233	.330	.328	.262	.270	.189	.172	.285	.385	.424	.343	.380	.507	.638	.501	5.626
D	3.149	1.449	2.178	2.504	2.687	1.735	1.577	1.540	2.195	2.873	2.178	1.925	2.243	3.240	3.269	2.509	37.051
E	1.131	.661	1.168	1.021	1.758	1.434	1.303	1.561	2.556	2.795	1.968	1.480	1.557	1.945	1.692	.917	24.947
F	.166	.087	.177	.160	.646	.840	.750	.817	1.259	1.280	1.376	1.039	1.048	.867	.609	.378	11.499
G	.019	.008	.017	.025	.127	.615	.873	1.023	1.183	1.050	.998	.966	.925	.490	.214	.093	8.627
Total	5.570	2.906	4.836	5.235	6.349	5.379	4.932	5.319	7.862	8.829	7.690	6.422	6.979	8.118	7.771	5.803	100.000

Summary Table of Percent by Direction and Speed

Speed	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
.45	.000	.004	.000	.002	.002	.000	.000	.002	.006	.002	.002	.004	.002	.000	.002	.002	.029
1.05	.052	.048	.073	.046	.056	.056	.052	.073	.081	.075	.079	.067	.102	.093	.066	.066	1.085
2.05	.378	.609	.813	.517	.424	.601	.686	.582	.532	.441	.457	.466	.613	.626	.497	.488	8.731
3.05	1.124	1.183	1.802	1.268	1.191	1.270	1.276	1.222	1.149	1.156	1.112	1.031	1.095	1.079	.931	1.043	18.932
4.05	1.326	.621	1.122	1.230	1.420	1.116	1.058	1.079	1.731	1.719	1.648	1.550	1.274	1.023	1.000	.896	19.813
5.05	1.129	.247	.617	1.106	1.189	.694	.642	.738	1.276	1.509	1.305	1.129	1.029	1.104	1.014	.777	15.505
6.05	.667	.091	.297	.597	.879	.551	.509	.586	1.047	1.434	1.112	.808	.894	.914	.966	.813	12.163
8.05	.628	.102	.106	.422	.817	.767	.480	.642	1.262	1.636	1.291	.827	1.072	1.478	1.644	1.014	14.189
10.05	.145	.002	.006	.042	.303	.227	.172	.289	.561	.588	.532	.358	.480	.942	.933	.457	6.036
13.05	.114	.000	.000	.002	.067	.093	.056	.094	.202	.256	.119	.121	.254	.634	.563	.220	2.797
18.00	.008	.000	.000	.002	.000	.004	.002	.012	.015	.012	.031	.046	.145	.212	.154	.029	.671
99.00	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.002	.013	.019	.012	.002	.000	.048
Total	5.570	2.906	4.836	5.235	6.349	5.379	4.932	5.319	7.862	8.829	7.690	6.422	6.979	8.118	7.771	5.803	100.000

NOTE: Wind direction in tables are presented in "wind from" and not "wind to" direction.

Table 4-11 (Page 2 of 2)

Ground Level Joint Frequency Distribution Table Summary

33 Foot Elevation Data

JAN 2015

Summary Table of Percent by Speed and Class

Class Speed	A	B	C	D	E	F	G
.45	.000	.000	.004	.002	.008	.010	.006
1.05	.021	.008	.012	.197	.355	.299	.195
2.05	.326	.202	.272	2.282	2.334	1.764	1.552
3.05	.998	.578	.798	5.133	5.350	3.267	2.808
4.05	1.247	.686	.862	6.435	4.793	3.064	2.725
5.05	1.203	.646	.852	6.115	3.880	1.773	1.037
6.05	1.201	.570	.804	5.472	3.049	.817	.251
8.05	1.629	.900	1.208	6.605	3.334	.463	.050
10.05	.775	.422	.518	2.955	1.334	.031	.002
13.05	.428	.212	.245	1.469	.438	.004	.002
18.00	.112	.052	.052	.382	.069	.004	.000
99.00	.023	.012	.000	.006	.004	.004	.000

Table 4-12

Station Characteristics

STATION: LaSalle

LOCATION: Six miles South of Marseilles, Illinois - LaSalle County

CHARATERISTICS OF ELEVATED RELEASE POINT

1) Release Height = 112.8 m[a]
2) Diameter = 5.64 m
3) Exit Speed = 14.7 m/s[a]
4) Heat Content = 0 Kcal/s[a]

CHARATERISTICS OF VENT STACK RELEASE POINT: NOT APPLICABLE

1) Release Height = _____m[a]
2) Diameter = _____m
3) Exit Speed = _____m/s[a]

CHARATERISTICS OF GROUND LEVEL RELEASE

1) Release Height = 0 m
2) Building Factor (D) = 56.4 m[a]

METEOROLOGICAL DATA

A 400 foot tower is located 725 meters Southeast of elevated release point.

Release Point	Wind Speed & Direction	Differential Temperature
Elevated	375 ft	375 – 33 ft
Vent	(N/A)	(N/A)
Ground	33 ft	200 – 33 ft

[a] Used in calculating the meteorological and dose factors in Tables 4-3, and 4-5 through 4-7.

Table 4 - 13
Dose Factors for Noble Gases

Nuclide	Beta Air Dose Factor N_i (mrad/yr per uCi/m^3)	Beta Skin Dose Factor L_i (mrem/yr per uCi/m^3)	Gamma Air Dose Factor M_i (mrad/yr per uCi/m^3)	Gamma Total Body Dose Factor K_i (mrem/yr per uCi/m^3)
Kr-83m	2.88E+02	---	1.93E+01	7.56E-02
Kr-85m	1.97E+03	1.46E+03	1.23E+03	1.17E+03
Kr-85	1.95E+03	1.34E+03	1.72E+01	1.61E+01
Kr-87	1.03E+04	9.73E+03	6.17E+03	5.92E+03
Kr-88	2.93E+03	2.37E+03	1.52E+04	1.47E+04
Kr-89	1.06E+04	1.01E+04	1.73E+04	1.66E+04
Kr-90	7.83E+03	7.29E+03	1.63E+04	1.56E+04
Xe-131m	1.11E+03	4.76E+02	1.56E+02	9.15E+01
Xe-133m	1.48E+03	9.94E+02	3.27E+02	2.51E+02
Xe-133	1.05E+03	3.06E+02	3.53E+02	2.94E+02
Xe-135m	7.39E+02	7.11E+02	3.36E+03	3.12E+03
Xe-135	2.46E+03	1.86E+03	1.92E+03	1.81E+03
Xe-137	1.27E+04	1.22E+04	1.51E+03	1.42E+03
Xe-138	4.75E+03	4.13E+03	9.21E+03	8.83E+03
Ar-41	3.28E+03	2.69E+03	9.30E+03	8.84E+03

Source: Table B-1 of Reference 6.