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MAIL STATION P1-137

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Attached are the recent revisions to the Offsite Dose Calculation Manual's (ODCM) Chapter 10 and Appendix F for LaSalle Station. Please complete the following manual update:

REMOVE	INSERT
LaSalle Station Annex Entire Chapter 10. p. 10-i to 10-iii, 10-1 to 10-20	LaSalle Station Annex Entire Chapter 10 Revision 0.K, Jan. 1993 p. 10-i to 10-v, 10-1 to 10-20
LaSalle Station Annex Entire Appendix F p. F-i to F-iv, F-1 to F-24	LaSalle Station Annex Entire Appendix F Includes Rev. 0.K p. F-i to F-iv, F-1 to F-24

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LASALLE ANNEX INDEX

CHAPTER 10

RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

TABLE OF CONTENTS

CHAPTER 10

RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

TABLE OF CONTENTS (Cont'd)

CHAPTER 10

LIST OF TABLES

CHAPTER 10

LIST OF FIGURES

CHAPTER 10

RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

10.1 AIRBORNE RELEASES

10.1.1 System Description

A simplified gaseous radwaste and gaseous effluent flow diagram are provided in Figure 10-1.

The airborne release point for radioactive effluents is the ventilation stack which is classified as a stack in accordance with the definitions in Section 4.1.4 and the results in Table A-1 of Appendix A.

In addition, the standby gas treatment system effluent is released through a separate stack inside the ventilation stack. This release point has the same location and classification as the ventilation stack.

10.1.1.1 Condenser Offgas Treatment System

The condenser offgas treatment system is designed and installed to reduce radioactive gaseous effluents by collecting non-condensable off-gases from the condenser and providing for holdup to reduce the total radioactivity by radiodecay prior to release to the environment. The daughter products are retained by charcoal and HEPA filters. The system is described in Section 11.3.2.1 of the LaSalle UFSAR.

10.1.1.2 Ventilation Exhaust Treatment System

Ventilation exhaust treatment systems are designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in selected effluent streams by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters prior to release to the environment. Such a system is not considered to have any effect on noble gas effluents. The ventilation exhaust treatment systems are shown in Figure 10-1.

Engineered safety features atmospheric cleanup systems are not considered to be ventilation exhaust treatment system components.

10.1.2 Radiation Monitors

10.1.2.1 Station Vent Stack Effluent Monitor

Monitor OPLD5J (Wide Range Noble Gas Monitor) continuously monitors the final effluent from the station vent stack.

The monitor system has isokinetic sampling, gaseous grab sampling, iodine and particulate sampling, tritium sampling, and postaccident sampling capability.

In normal operation the low-range noble gas channel is on line and active. The mid-range channel replaces the low-range channel at a concentration of 0.1 μCi/cc and the high-range channel replaces the mid-range channel at a concentration of 100 μCi/cc.

The low-range and mid/high-range iodine and particulate samplers operate in a similar manner. In normal operation the low-range samplers are on line. At a concentration of 0.05 μCi/cc the mid/high-range samplers are brought on line, and at a concentration of 10 μCi/cc the low-range sample pump is turned off.

No automatic isolation or control functions are performed by this monitor. Pertinent information on this monitor is provided in the LaSalle UFSAR Section 11.5.2.2.1.

10.1.2.2 Standby Gas Treatment System Effluent Monitor

Monitor OPLD2J (Wide Range Noble Gas Monitor) continuously monitors the final effluent from the standby gas treatment system (SGTS) stack.

The SGTS stack monitor has isokinetic sampling, gaseous grab sampling, particulate and iodine sampling, and post accident sampling capability.

In normal operation the low range noble gas channel is on line and active. The mid-range channel replaces the low-range channel at a concentration of 0.1 μCi/cc and the high-range channel replaces the mid-range channel at a concentration of 100 μCi/cc.

The low-range and mid/high-range iodine and particulate samples operate in a similar manner. In normal operation, the low-range samples are on-line. At a concentration of 0.05 μCi/cc the mid/high-range samplers are brought on-line, and at a concentration of 10 μCi/cc the low-range sample pump is turned off.

No automatic isolation or control functions are performed by this monitor.

Pertinent information on this monitor is provided in the LaSalle UFSAR Section 11.5.2.2.2.

10.1.2.3 Reactor Building Ventilation Monitors

Monitors 1(2)D18-N009 continuously monitor the effluent from the Unit 1(2) reactor building. On high alarm, the monitors automatically initiate the following actions:

A. Shutdown and isolation of the reactor building vent system

B. Startup of the standby gas treatment system

C. Isolation of primary containment purge and vent lines

Pertinent information on these monitors is provided in LaSalle UFSAR Section 11.5.2.1.1.

10.1.2.4 Condenser Air Ejector Monitors

Monitors 1(2)D18-N002/N012 (pre-treatment) and 1(2)D18-N903A/B (post-treatment) continuously monitor gross gamma activity downstream of the steam jet air ejector and prior to release to the main stack.

On "high-high-high" alarm monitor 1(2)D18-N903A/B automatically initiates closure of valve 1(2)N62-F057 thus terminating the release.

Pertinent information on these monitors is found in LaSalle UFSAR Sections 11.5.2.1.2 and 11.5.2.1.3.

10.1.3 Alarm and Trip Setpoints

10.1.3.1 Setpoint Calculations

10.1.3.1.1 Reactor Building Vent Effluent Monitor

The setpoint for the reactor building vent effluent monitor is established at 10 mR/hr.

10.1.3.1.2 Condenser Air Ejector Monitors

- Pre-Treatment Monitor

The high-high trip setpoint is conservatively set at or below one-half the release limit obtained from the post-treatment monitor "high-high-high" trip setpoint.

$$P \leq K \times 0.5 \times Q_{ts} \times \sum f_i \times e^{\lambda t} \qquad (10\text{-}1)$$

P Off-gas Pretreatment high-high alarm setpoint

K Conversion constant [(mr/hr) per (μCi/sec)]

The value is determined using noble gas radionuclides identified in a representative sample, and the off-gas release rate and monitor response at the time the sample is taken.

0.5 Factor for conservatism

Q_{ts} Release Rate [μCi/sec]

The release rate of all noble gas radionuclides released as stack releases based on post treatment monitor "high-high-high" trip setpoint. This is less than the solutions obtained from Equations 10-3 and 10-4.

f_i Predetermined fraction of total release attributed to nuclide i.

The fractions, f_i, are obtained from the mixture of radionuclides calculated to be present in the steam as it exits the vessel

$e^{\lambda t}$ Term to correct for 30 minute transit time.

The high trip setpoint is established at ≤ 100 μCi/sec per MW-th (≈ 3.4E5 μCi/sec) per Technical Specification 3.11.2.2.

- Post-Treatment Monitor

  The off gas isolation setpoint is conservatively set at or below one-half the release limit calculated using equations 10-3 and 10-4 below.

  The off-gas isolation setpoint is converted into the monitor units of counts per second (cps) as follows:

  $$P \leq 0.5 \times Q_{tn} \times E/(472 \times F) \qquad (10\text{-}2)$$

P	Off-gas Posttreatment Monitor Isolation Setpoint The off-gas posttreatment monitor setpoint which initiates isolation of flow of off-gas to the station vent stack.	[cps]
Q_{tn}	Total Allowed Release Rate, Stack Release The total allowed release rate of all noble gas radionuclides released as stack releases. This is the smaller of the solutions obtained from Equations 10-3 and 10-4.	[μCi/sec]
E	Efficiency of the Off-Gas Posttreatment Monitor The response of the off-gas post-treatment monitor to a reference source.	[cps per (μCi/cc)]
472	Conversion Constant Converts cubic feet per minute to cubic centimeters per second.	[(cc/sec)/cfm]
F	Maximum Off-Gas Flow Rate	[cfm]

10.1.3.1.3 Station Vent Stack Effluent Monitor

The setpoint for the station vent stack effluent monitor is conservatively set at or below one-half the calculated release limit calculated using equations 10-3 and 10-4 below.

10.1.3.1.4 Standby Gas Treatment Stack Monitor

The setpoint for the standby gas treatment system effluent monitor is conservatively set at or below one-half the release limit calculated using equations 10-3 and 10-4 below.

10.1.3.2 Release Limits

Alarm and trip setpoints of gaseous effluent monitors are established to ensure that the release rate limits of 10 CFR 20 are not exceeded. The release limit Q_{ts} is found by solving Equations 10-3 and 10-4.

$$(1.11)\ Q_{ts} \sum (f_i \overline{S}_i) < 500\text{mrem/yr} \qquad (10\text{-}3)$$

$$Q_{ts} \sum ((\overline{L}_i f_i (X/Q)_s \exp(-\lambda_i R/3600 u_s)^* + (1.11)(f_i)\ S_i) < 3000\ \text{mrem/yr} \qquad (10\text{-}4)$$

The summations are over noble gas radionuclides i.

f_i Fractional Radionuclide Composition

The release rate of noble gas radionuclide i divided by the total release rate of all noble gas radionuclides.

Q_{ts} Total Allowed Release Rate, Stack Release [μCi/sec]

The total allowed release rate of all noble gas radionuclides released as stack releases.

* $\exp(-\lambda_i R/3600\ U_s)$ is conservatively set equal to 1.0 for purposes of determining setpoints.

The remaining parameters in Equation 10-3 have the same definitions as in Equation A-8 of Appendix A. The remaining parameters in Equation 10-4 have the same definition as in Equation A-9 of Appendix A.

Equation 10-3 is based on Equation A-8 of Appendix A and the 10 CFR 20 restriction on whole body dose rate (500 mrem/yr) due to noble gases released in gaseous effluents (see Section A.1.3.1 of Appendix A). Equation 10-4 is based on Equation A-9 of Appendix A and the 10 CFR 20 restriction on skin dose rate (3000 mrem/yr) due to noble gases released in gaseous effluents (see Section A.1.3.2 of Appendix A).

Since the solution to Equation 10-3 is more conservative than the solution to Equation 10-4, the value of Equation 10-3, 1.22 x 10^6 μCi/sec, is used as the limiting noble gas release rate.

Calibration methods and surveillance frequency for the monitors will be conducted as specified in the RETS.

10.1.3.3 Release Mixture

In the determination of alarm and trip set points, the radioactivity mixture in the exhaust air is assumed to have the radionuclide composition in Table 10-1.

10.1.3.4 Conversion Factors

The conversion factors used to establish gaseous effluent monitor setpoints are obtained as follows.

- Station vent stack effluent monitor.

  Calibrations compare the response of station detectors to that of a reference detector using NIST traceable sources (Cs-137 and Co-60).

- Condenser air ejector monitor.

  Pretreatment Monitor

  The value is determined using noble gas radionuclides identified in a representative sample, and the offgas release rate and monitor response at the time the sample is taken.

Posttreatment Monitor

The value is determined using noble gas radionuclides identified in a representative sample, and the offgas concentration and monitor response at the time the sample is taken.

- Standby gas treatment system monitor.

  Calibrations compare the response of station detectors to that of a reference detector using NIST traceable sources (Cs-137 and Co-60).

10.1.3.5 HVAC Flow Rates

The main stack flow rate is obtained from either the process computer or Monitor RM-23.

The SGTS flow rate is obtained from either the process computer or chart recorders in the main control room.

10.1.4 Allocation of Effluents from Common Release Points

Radioactive gaseous effluents released from the main chimney are comprised of contributions from both units. Under normal operating conditions, it is difficult to allocate the radioactivity between units due to fuel performance, in-plant leakage, power history, and other variables. Consequently, no allocation is normally made between the units. Instead, the entire release is treated as a single source.

10.1.5 Dose Projections

Because the gaseous releases are continuous, the doses are routinely calculated in accordance with the RETS.

10.2 LIQUID RELEASES

10.2.1 System Description

A simplified liquid radwaste and liquid effluent flow diagram are provided in Figures 10-2 and 10-3.

The liquid radwaste treatment system is designed and installed to reduce radioactive liquid effluents by collecting the liquids, providing for retention or holdup, and providing for treatment by filter, demineralizer, or evaporator for the purpose of reducing the total radioactivity prior to release to

the environment. The system is described in Section 11.2.2 of the LaSalle UFSAR.

10.2.1.1 Radwaste Discharge Tanks

There are two discharge tanks (1(2)WF05T, 25,000 gallons each) which receive water for discharge to the Illinois River via the cooling lake blowdown.

10.2.2 Radiation Monitors

10.2.2.1 Liquid Radwaste Effluent Monitor

Monitor 0D018-N907 monitors all releases from the release tanks. On high alarm the monitor automatically initiates closure of valves 0WL067 and trips the radwaste discharge pump to terminate the release.

Pertinent information on the monitor and associated control devices is provided in LaSalle UFSAR Section 11.5.2.3.3.

10.2.2.2 Service Water Effluent Monitors

Monitors 1/(2)D18-N912 continuously monitor the service water effluent. On high alarm service water discharge may be terminated manually. No control device is initiated by these monitors.

Pertinent information on these monitors is provided in LaSalle UFSAR 11.5.2.3.2.

10.2.2.3 RHR Heat Exchanger Cooling Water Effluent Monitors

Instrument channels 1/(2)D18-N906/8 continuously monitor the RHR heat exchanger cooling water effluent. On high alarm the operating loop may be terminated manually and the redundant loop brought on line. No control device is initiated by these monitors.

Pertinent information on these monitors is provided in LaSalle UFSAR Section 11.5.2.3.4.

10.2.3 Alarm and Trip Setpoints

10.2.3.1 Setpoint Calculations

Alarm and trip setpoints of liquid effluent monitors at the principal release points are established to ensure that the limits of 10 CFR 20 are not exceeded in the unrestricted area.

10.2.3.1.1 Liquid Radwaste Effluent Monitor

The monitor setpoint is found by solving equation 10-5 for the total isotopic activity.

$$P \leq K \times \left(\sum C_i^T / \sum (C_i^T / MPC_i)\right) \times \left((F^d + F'_{max}) / F'_{max}\right) \qquad (10\text{-}5)$$

P	Release Setpoint	[cpm]
K	$\left(\sum (K_i \times C_i \times W_i) / \sum C_i^T\right)$	[cpm/μCi/mℓ]
K_i	Counting efficiency for radionuclide i	[cpm/μCi/mℓ]
W_i	Weighting Factor	
C_i^T	Concentration of radionuclide i in the release tank.	[μCi/mℓ]
F'_{max}	Maximum Release Tank Discharge Flow Rate The maximum flow rate is 45 gpm.	[gpm]
MPC_i	Maximum Permissible Concentration	[μCi/mℓ]
F^d	Dilution Flow	[gpm]

10.2.3.1.2 Service Water Effluent Monitors

The monitor setpoint is established at two times the background count rate (not to exceed 10000 cpm).

10.2.3.1.3 RHR Heat Exchanger Cooling Water Monitors

The monitor setpoint is established at two times the background count rate (not to exceed 10000 cpm).

10.2.3.2 Discharge Flow Rates

10.2.3.2.1 Release Tank Discharge Flow Rate

Prior to each batch release, a grab sample is obtained.

The results of the analysis of the sample determine the discharge rate of each batch as follows:

$$F'_{max} = 0.1 \times \left(F^d / \sum (C_i / MPC_i)\right) \times MF \qquad (10\text{-}6)$$

The summation is over radionuclides i.

0.1 Reduction factor for conservatism.

F'_{max} Maximum Permitted Discharge Flow Rate [gpm]

The maximum permitted flow rate from the radwaste discharge tank.

F^d Dilution Flow [gpm]

C_i Concentration of Radionuclide i in the Release Tank [μCi/mL]

The concentration of radioactivity in the radwaste discharge tank based on measurements of a sample drawn from the tank.

MPC_i Maximum Permissible Concentration of Radionuclide i [μCi/mℓ]

MF Multiplication Factor

$F'_{max} < 0.5$; MF = 3

$0.5 < F'_{max} \leq 5$; MF = 5

$5 < F'_{max}$; MF = 7.5

10.2.3.3 Release Limits

Release limits are determined from 10 CFR 20. Calculated maximum permissible discharge rates are divided by 10 for

conservatism and to ensure that release concentrations are well below applicable maximum permissible concentrations (MPC).

10.2.3.4 Release Mixture

For the liquid radwaste effluent monitor the release mixture used for the setpoint determination is the radionuclide mix identified in the grab sample isotopic analysis plus four additional radionuclides. The additional radionuclides are H-3, Fe-59, Sr-89, and Sr-90. The quantities to be added are obtained from the most current analysis for these four radionuclides.

For all other liquid effluent monitors no release mixture is used because the setpoint is established at "two times background."

10.2.3.5 Conversion Factors

The readout for the liquid radwaste effluent monitor is in CPM. The calibration constant is based on the detector sensitivity to Cs-137/Ba-137.

10.2.3.6 Liquid Dilution Flow Rates

A conservative maximum blowdown flowrate of 20,000 gpm is used for all radwaste discharge calculations unless actual blowdown flow is determined to be less.

10.2.4 Allocation of Effluents from Common Release Points

Radioactive liquid effluents released from the Unit 1 release tank are allocated to Unit 1, and effluents released from the Unit 2 tank are allocated to Unit 2. Other potential pathways (i.e., RHR) are allocated to their respective unit.

10.2.5 Projected Doses for Releases

Doses are not calculated prior to release. Dose contributions from liquid effluents are determined in accordance with the RETS and station procedures.

10.3 SOLIDIFICATION OF WASTE/PROCESS CONTROL PROGRAM

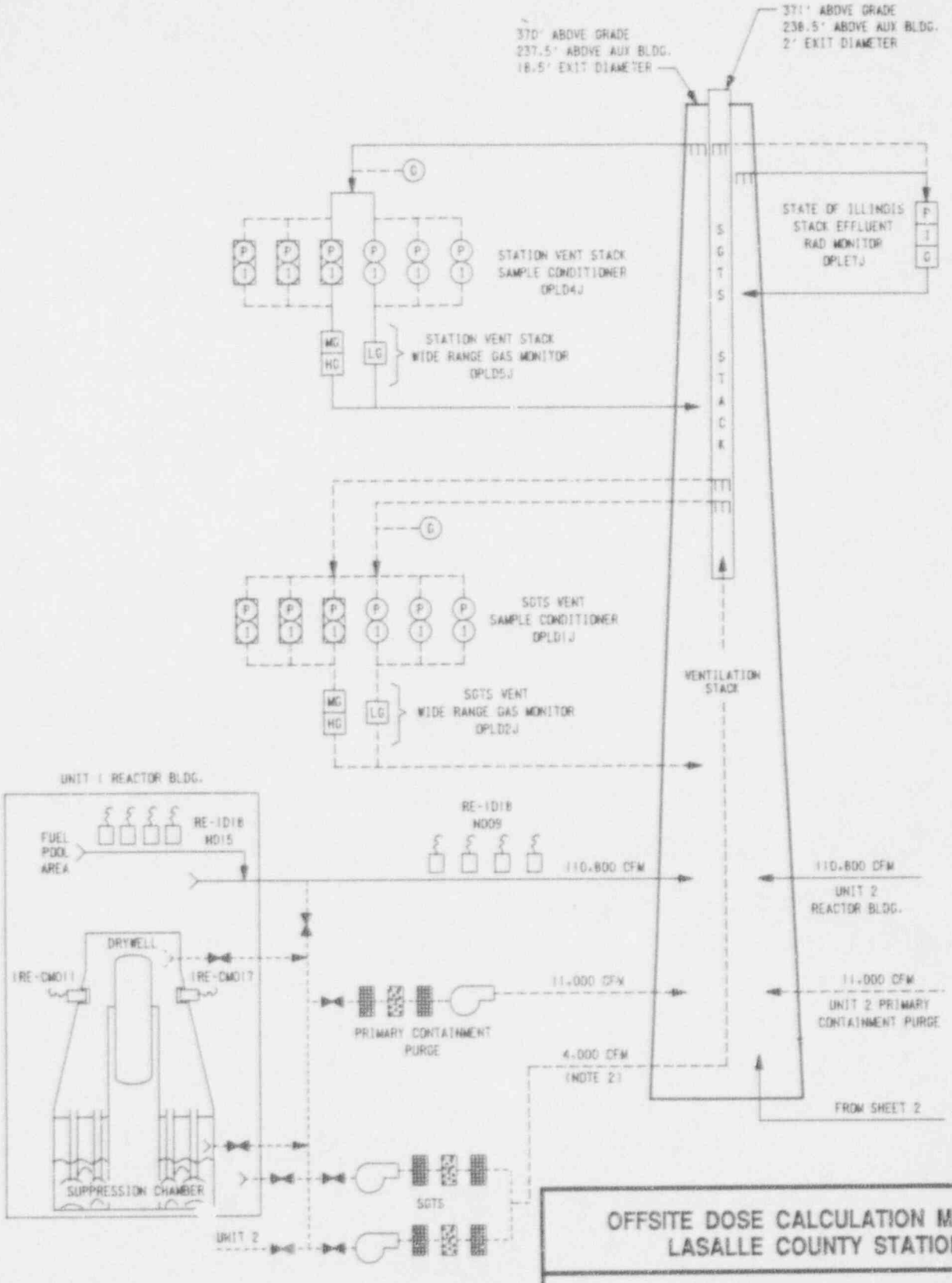
The process control program (PCP) contains the sampling, analysis, and formulation determination by which solidification of radioactive wastes from liquid systems is ensured.

Figure 10-4 is a simplified diagram of solid radwaste processing.

TABLE 10-1

Assumed Composition of the LaSalle Station Noble Gas Effluent

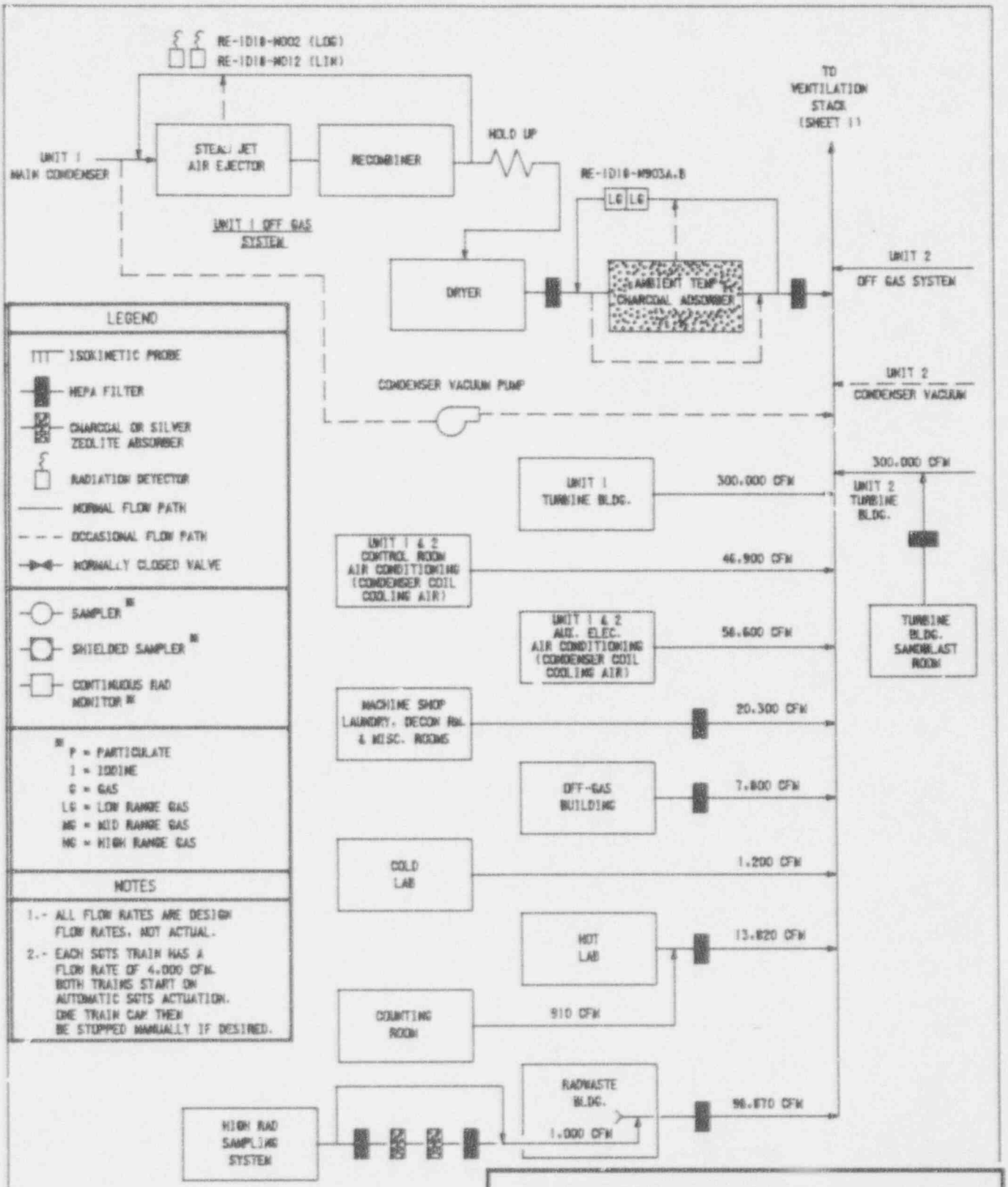
Isotope	Percent of Total Annual Release
Kr-83m	4.5E-3
Kr-85m	8.0E-3
Kr-85	2.6E-5
Kr-87	2.6E-2
Kr-88	2.6E-2
Kr-89	1.7E-1
Kr-90	3.7E-1
Xe-131m	2.0E-5
Xe-133m	3.8E-4
Xe-133	1.1E-2
Xe-135m	3.4E-2
Xe-135	2.9E-2
Xe-137	2.0E-1
Xe-138	1.2E-1



OFFSITE DOSE CALCULATION MANUAL
LASALLE COUNTY STATION

FIGURE 10-1

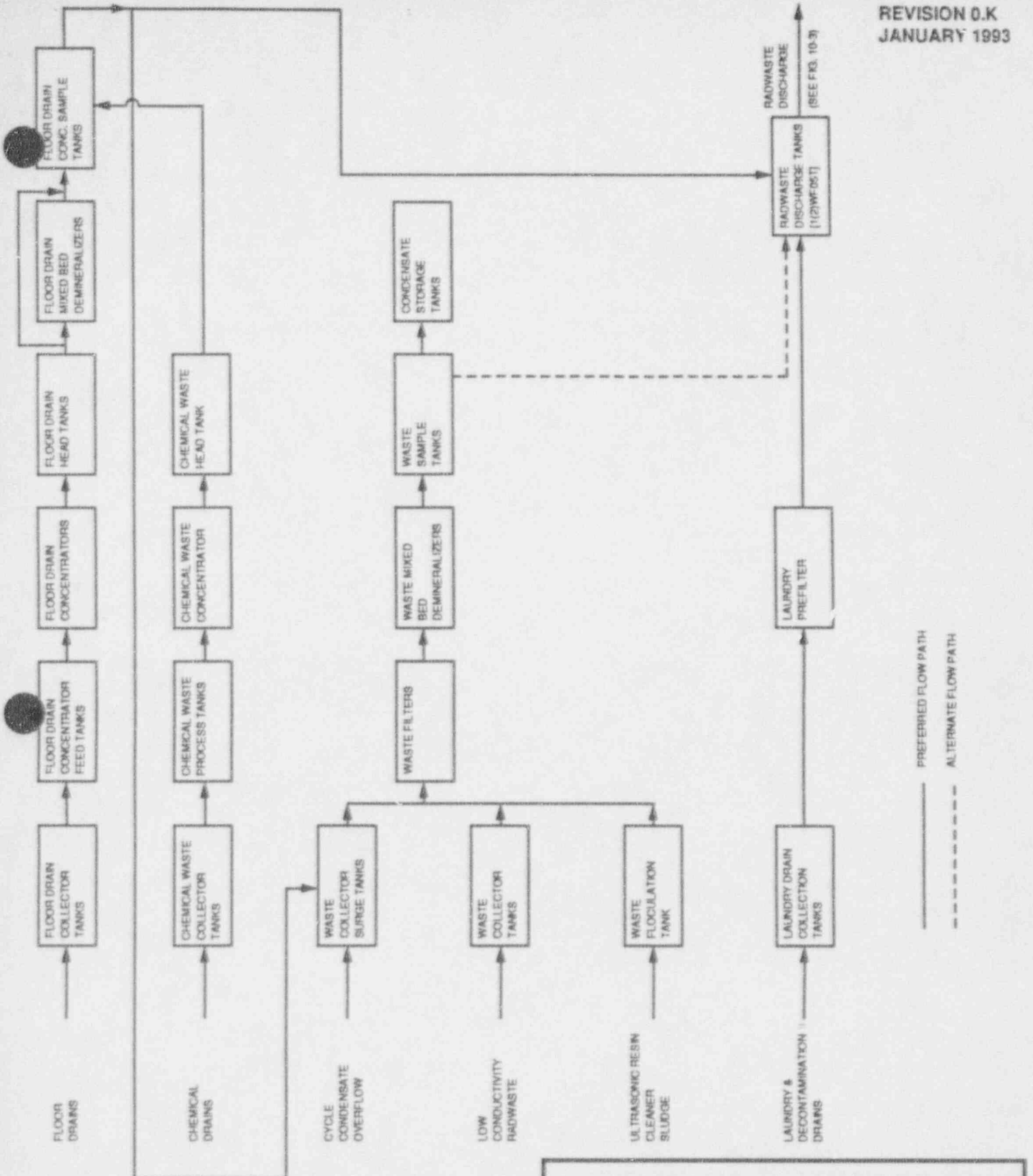
SIMPLIFIED GASEOUS RADWASTE AND
GASEOUS EFFLUENT FLOW DIAGRAM
(SHEET 1 OF 2)



OFFSITE DOSE CALCULATION MANUAL
LASALLE COUNTY STATION

FIGURE 10-1

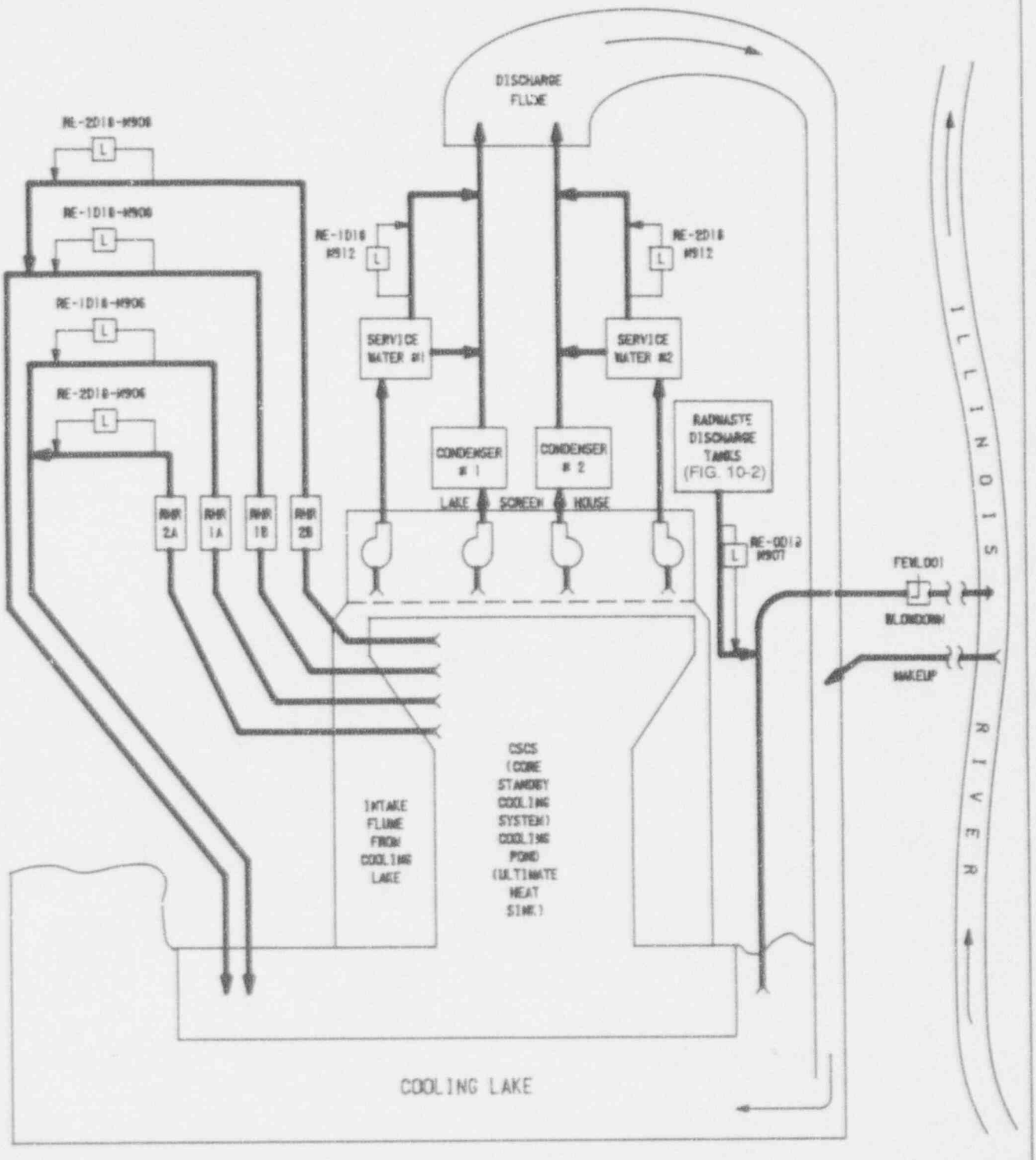
SIMPLIFIED GASEOUS RADWASTE AND GASEOUS EFFLUENT FLOW DIAGRAM
(SHEET 2 OF 2)



OFFSITE DOSE CALCULATION MANUAL
LASALLE COUNTY STATION

FIGURE 10-2

SIMPLIFIED LIQUID RADWASTE PROCESSING DIAGRAM

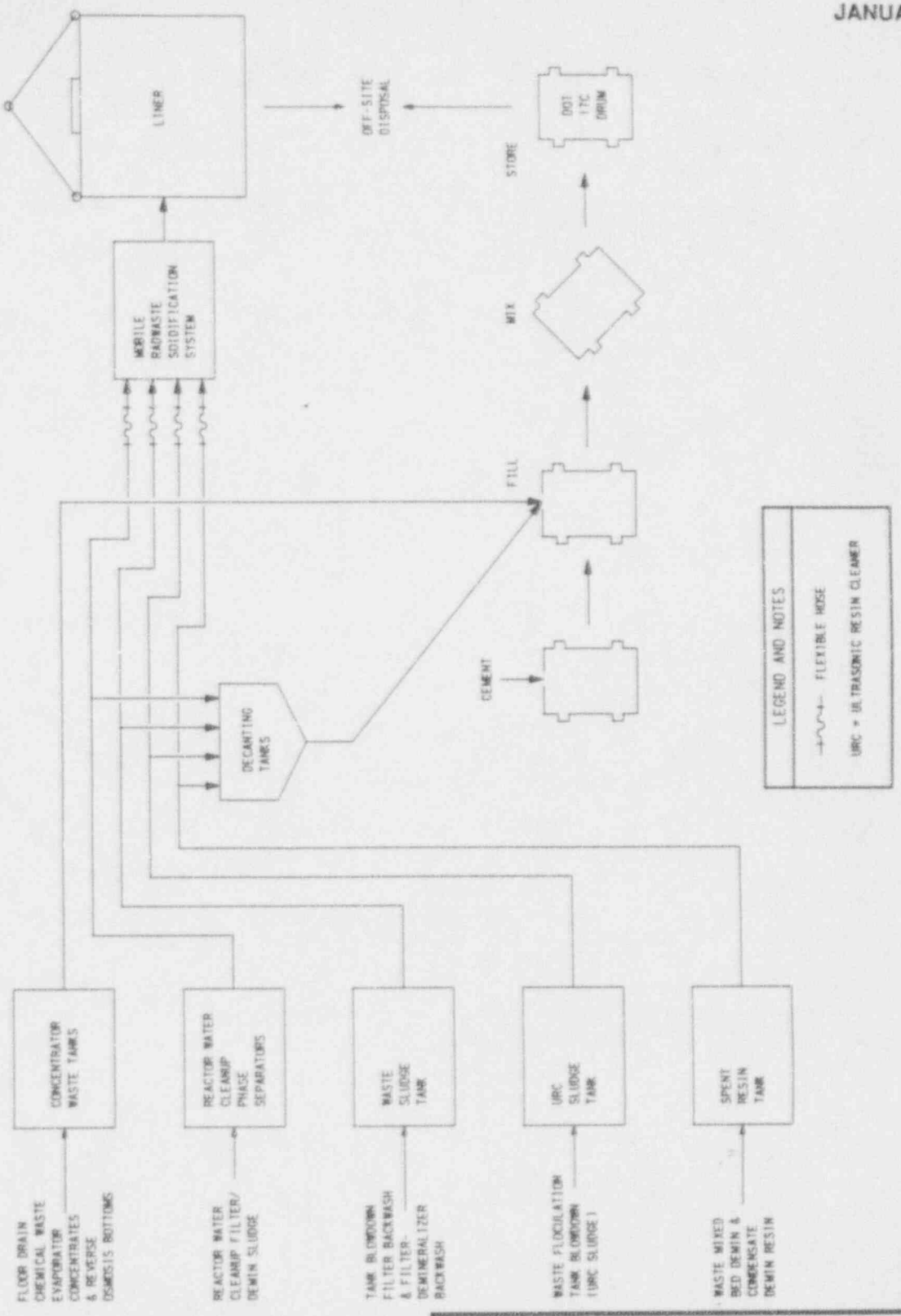


LEGEND AND NOTES	
L	LIQUID RADIATION MONITOR
F	FLOW ELEMENT

OFFSITE DOSE CALCULATION MANUAL
LASALLE COUNTY STATION

FIGURE 10-3

SIMPLIFIED LIQUID EFFLUENT FLOW DIAGRAM



OFFSITE DOSE CALCULATION MANUAL
LASALLE COUNTY STATION

FIGURE 10-4

SIMPLIFIED SOLID RADWASTE
PROCESSING DIAGRAM

LASALLE ANNEX INDEX

APPENDIX F

STATION-SPECIFIC DATA FOR LA SALLE UNITS 1 AND 2

TABLE OF CONTENTS

APPENDIX F

LIST OF TABLES

APPENDIX F
LIST OF FIGURES

APPENDIX F

STATION-SPECIFIC DATA FOR LA SALLE UNITS 1 AND 2

F.1 INTRODUCTION

This appendix contains data relevant to the La Salle site. Included is a figure showing the unrestricted area boundry and values of parameters used in offsite dose assessment.

F.2 REFERENCES

1. Sargent & Lundy, Nuclear Safeguards and Licensing Division, La Salle Calculation No. 3-PR-02, Rev. 0.

2. Sargent & Lundy, Nuclear Safeguards and Licensing Division, La Salle Calculation No. 0-SN-22, Rev. 0.

Table F-1
Aquatic Environment Dose Parameters

Parameter[a]	Value
$1/M^W$	1
$1/M^f$	1
F^W, cfs	1.37E4
F^f, cfs	1.37E4
t^f, hr[b]	24
t^W, hr[c]	97

Limits on Radioactivity in Unprotected Outdoor Tanks[d]

Outside Temporary Tank $\leq$ 10 Ci[d]

[a] The parameters are defined in Sections A.2.1 of Appendix A.

[b] t^f (hr) = 24 hr (all stations) for the fish ingestion pathway

[c] t^W (hr) = 97 hr (distance to Peoria is 97 miles; flow rate of 1 mph assumed)

[d] See Section A.2.4 of Appendix A.

[e] Tritium and dissolved or entrained noble gases are excluded from this limit.

Table F-2
Station Characteristics

STATION: LaSalle

LOCATION: 6 miles south of Marseilles, Illinois - LaSalle County

CHARACTERISTICS OF ELEVATED RELEASE POINT

1) Release Height = 112.8 m[a] 2) Diameter = 5.64 m

3) Exit Speed = 14.7 ms^{-1}[a] 4) Heat Content = 0 KCal s^{-1}[a]

CHARACTERISTICS OF VENT STACK RELEASE POINT: Not Applicable (NA)

1) Release Height = _____m 2) Diameter = _____m

3) Exit Speed = _____ms^{-1}

CHARACTERISTICS OF GROUND LEVEL RELEASE

1) Release Height = 0 m

2) Building Factor (D) = 56.4 m[a]

METEOROLOGICAL DATA

A 400 ft Tower is Located 300m SSW of elevated release point

Tower Data Used in Calculations

Release Point	Wind Speed and Direction	Differential Temperature
Elevated	375 ft	375-33 ft
Vent	(NA)	(NA)
Ground	33 ft	200-33 ft

[a]Used in calculating the meteorological and dose factors in Tables F-5, F-6, F-7. See Sections B.3 through B.6 of Appendix B.

Table F-3

Critical Ranges

Direction	Site Boundary[a] (m)	Nearest Resident[b] (m)	Nearest Dairy Farm Within 5 Miles[c] (m)
N	1022	3500	None
NNE	1330	2300	None
NE	2408	2900	None
ENE	4450	5500	None
E	1996	5000	None
ESE	838	2600	None
SE	884	2400	None
SSE	838	1800	None
S	829	3500	None
SSW	829	3200	None
SW	610	1100	None
WSW	509	2100	None
W	509	1400	None
WNW	625	1600	None
NW	732	4200	None
NNW	848	1900	None

[a]Used in calculating the meteorological and dose factors in Tables F-5 and F-7. See Sections B.3 through B.6 of Appendix B.

[b]1988 annual survey, Teledyne Isotopes Midwest Laboratories. Used in establishing the characteristics of the individual maximally exposed to N-16 skyshine (see Section A.3.2 of Appendix A and Table F-8).

[c]1988 annual survey, Teledyne Isotopes Midwest Laboratories. Used in calculating the D/Q values in Table F-6.

Table F-4

Average Wind Speeds

Downwind Direction	Wind Speed (m/sec)[a] Elevated Release
N	9.7
NNE	10.1
NE	9.2
ENE	9.0
E	9.5
ESE	9.7
SE	8.1
SSE	7.4
S	6.7
SSW	5.6
SW	5.5
WSW	6.9
W	7.6
WNW	7.5
NW	7.5
NNW	8.3

[a]Based on LaSalle site meteorological data, 1978 - 1987. Calculated in Reference 1 of Section F.2, using formulas in Section B.1.3 of Appendix B.

Table F-5

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

Downwind Direction	Elevated(Stack) Release			
	Radius (meters)	X/Q (sec/m**3)	Radius (meters)	D/Q (1/m**2)
N	5633.	6.123E-09	1022.	7.233E-10
NNE	1330.	7.059E-09	1330.	1.001E-09
NE	4400.	5.535E-09	2408.	4.245E-10
ENE	5200.	5.086E-09	4450.	2.021E-10
E	5200.	5.865E-09	1996.	5.415E-10
ESE	5200.	8.000E-09	1500.	8.896E-10
SE	5633.	7.116E-09	1500.	7.505E-10
SSE	5200.	6.717E-09	1500.	7.176E-10
S	5633.	5.910E-09	1500.	6.136E-10
SSW	6000.	5.269E-09	829.	5.804E-10
SW	6000.	6.767E-09	610.	8.619E-10
WSW	6000.	6.065E-09	509.	6.576E-10
W	6437.	5.354E-09	1500.	4.811E-10
WNW	7242.	3.916E-09	1500.	3.175E-10
NW	7242.	3.766E-09	1500.	3.118E-10
NNW	6437.	4.240E-09	1500.	3.806E-10

LaSalle Site Meteorological Data 1/78 - 12/87

Note: Based on Reference 1 of Section F.2 and the formulas in Sections B.3 and B.4 of Appendix B.

[a]Used for beta air, beta skin, and inhalation dose pathways. See Sections A.1.2, A.1.3, and A.1.4.2 of Appendix A.

[b]Used for produce and leafy vegetable pathways. See Section A.1.4 of Appendix A.

Table F-6

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

Downwind Direction	Nearest Milk Cow D/Q(1/m**2) Radius (meters)	Elevated Release	Nearest Meat Animal D/Q(1/m**2) Radius (meters)	Elevated Release
N	5047.	9.617E-11	2253.	4.691E-10
NNE	8047.	1.140E-10	2275.	5.988E-10
NE	8047.	8.754E-11	3219.	3.113E-10
ENE	8047.	8.476E-11	4506.	1.989E-10
E	8047.	1.046E-10	5150.	2.057E-10
ESE	8047.	1.436E-10	4345.	3.499E-10
SE	8047.	1.230E-10	4345.	2.996E-10
SSE	8047.	1.163E-10	5472.	2.105E-10
S	8047.	9.850E-11	2575.	4.054E-10
SSW	8047.	8.563E-11	2897.	3.202E-10
SW	8047.	1.085E-10	1287.	7.208E-10
WSW	8047.	1.007E-10	1448.	6.164E-10
W	8047.	8.411E-11	1770.	4.400E-10
WNW	8047.	5.767E-11	1609.	3.077E-10
NW	0.	1.474E-11	1609.	3.004E-10
NNW	0.	2.008E-11	1287.	3.650E-10

LaSalle Site Meteorological Data 1/78 - 12/87

Note: Based on Reference 1 of Section F.2 and the formulas in Section B.4 of Appendix B.

Table F-7

Site Boundary Finite Plume Gamma Dose Factors for Kr-83m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	4.764E-07	1.158E-07
NNE	1330.	1330.	8.721E-07	2.119E-07
NE	2408.	2408.	6.471E-07	1.573E-07
ENE	4450.	4450.	5.700E-07	1.385E-07
E	1996.	1996.	4.687E-07	1.139E-07
ESE	838.	838.	3.887E-07	9.444E-08
SE	884.	884.	3.364E-07	8.175E-08
SSE	838.	838.	3.051E-07	7.414E-08
S	829.	829.	2.840E-07	6.901E-08
SSW	829.	829.	3.163E-07	7.686E-08
SW	610.	610.	3.098E-07	7.528E-08
WSW	509.	509.	2.546E-07	6.187E-08
W	509.	509.	2.310E-07	5.613E-08
WNW	625.	625.	1.731E-07	4.206E-08
NW	732.	732.	1.710E-07	4.156E-08
NNW	848.	848.	2.398E-07	5.828E-08

LaSalle Site Meteorological Data 1/78 - 12/87

Note: Based on Reference 1 of Section F.2 and the formulas in Sections B.5 and B.6 of Appendix B.

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Kr-85m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	5.815E-05	4.947E-05
NNE	1330.	1330.	5.220E-05	4.434E-05
NE	2408.	2408.	2.592E-05	2.198E-05
ENE	4450.	4450.	1.351E-05	1.142E-05
E	1996.	1996.	2.705E-05	2.298E-05
ESE	838.	838.	7.001E-05	5.959E-05
SE	884.	884.	6.063E-05	5.160E-05
SSE	838.	838.	5.518E-05	4.696E-05
S	829.	829.	4.712E-05	4.011E-05
SSW	829.	829.	4.449E-05	3.786E-05
SW	610.	610.	7.473E-05	6.362E-05
WSW	509.	509.	8.091E-05	6.890E-05
W	509.	509.	7.809E-05	6.649E-05
WNW	625.	625.	5.429E-05	4.623E-05
NW	732.	732.	4.845E-05	4.125E-05
NNW	848.	848.	4.896E-05	4.167E-05

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Kr-85

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	8.653E-07	7.303E-07
NNE	1330.	1330.	7.544E-07	6.367E-07
NE	2408.	2408.	3.651E-07	3.081E-07
ENE	4450.	4450.	1.885E-07	1.591E-07
E	1996.	1996.	3.912E-07	3.301E-07
ESE	838.	838.	1.045E-06	8.817E-07
SE	884.	884.	9.113E-07	7.691E-07
SSE	838.	838.	8.350E-07	7.048E-07
S	829.	829.	7.262E-07	6.129E-07
SSW	829.	829.	6.901E-07	5.824E-07
SW	610.	610.	1.173E-06	9.899E-07
WSW	509.	509.	1.265E-06	1.068E-06
W	509.	509.	1.205E-06	1.017E-06
WNW	625.	625.	8.410E-07	7.098E-07
NW	732.	732.	7.471E-07	6.305E-07
NNW	848.	848.	7.459E-07	6.295E-07

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Kr-87

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR (mrad/yr)/(uCi/sec)
N	1022.	1022.	3.270E-04	2.83[illegible]-04
NNE	1330.	1330.	2.767E-04	2.39[illegible]-04
NE	2408.	2408.	1.283E-04	1.111E-04
ENE	4450.	4450.	5.904E-05	5.113E-05
E	1996.	1996.	1.412E-04	1.223E-04
ESE	838.	838.	4.018E-04	3.482E-04
SE	884.	884.	3.510E-04	3.042E-04
SSE	838.	838.	3.254E-04	2.821E-04
S	829.	829.	2.850E-04	2.471E-04
SSW	829.	829.	2.762E-04	2.395E-04
SW	610.	610.	4.748E-04	4.117E-04
WSW	509.	509.	5.109E-04	4.430E-04
W	509.	509.	4.812E-04	4.172E-04
WNW	625.	625.	3.318E-04	2.877E-04
NW	732.	732.	2.939E-04	2.548E-04
NNW	848.	848.	2.883E-04	2.499E-04

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Kr-88

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	8.716E-04	7.627E-04
NNE	1330.	1330.	7.359E-04	6.438E-04
NE	2408.	2408.	3.435E-04	3.004E-04
ENE	4450.	4450.	1.648E-04	1.441E-04
E	1996.	1996.	3.781E-04	3.307E-04
ESE	838.	838.	1.063E-03	9.299E-04
SE	884.	884.	9.329E-04	8.164E-04
SSE	838.	838.	8.671E-04	7.589E-04
S	829.	829.	7.696E-04	6.736E-04
SSW	829.	829.	7.479E-04	6.546E-04
SW	610.	610.	1.282E-03	1.123E-03
WSW	509.	509.	1.375E-03	1.203E-03
W	509.	509.	1.285E-03	1.125E-03
WNW	625.	625.	8.918E-04	7.806E-04
NW	732.	732.	7.888E-04	6.904E-04
NNW	848.	848.	7.730E-04	6.766E-04

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Kr-89

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	3.983E-04	3.456E-04
NNE	1330.	1330.	2.984E-04	2.589E-04
NE	2408.	2408.	8.306E-05	7.205E-05
ENE	4450.	4450.	1.570E-05	1.361E-05
E	1996.	1996.	1.052E-04	9.129E-05
ESE	838.	838.	5.474E-04	4.751E-04
SE	884.	884.	4.455E-04	3.866E-04
SSE	838.	838.	4.108E-04	3.566E-04
S	829.	829.	3.408E-04	2.958E-04
SSW	829.	829.	2.955E-04	2.566E-04
SW	610.	610.	6.085E-04	5.284E-04
WSW	509.	509.	7.361E-04	6.391E-04
W	509.	509.	7.236E-04	6.282E-04
WNW	625.	625.	4.471E-04	3.882E-04
NW	732.	732.	3.715E-04	3.225E-04
NNW	848.	848.	3.548E-04	3.080E-04

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Kr-90

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	7.066E-05	6.095E-05
NNE	1330.	1330.	3.604E-05	3.108E-05
NE	2408.	2408.	2.160E-06	1.863E-06
ENE	4450.	4450.	1.109E-07	9.554E-08
E	1996.	1996.	4.713E-06	4.063E-06
ESE	838.	838.	1.228E-04	1.060E-04
SE	884.	884.	7.761E-05	6.695E-05
SSE	838.	838.	6.863E-05	5.921E-05
S	829.	829.	5.057E-05	4.363E-05
SSW	829.	829.	3.138E-05	2.708E-05
SW	610.	610.	1.065E-04	9.194E-05
WSW	509.	509.	2.123E-04	1.832E-04
W	509.	509.	2.321E-04	2.003E-04
WNW	625.	625.	1.098E-04	9.474E-05
NW	732.	732.	7.440E-05	6.420E-05
NNW	848.	848.	6.602E-05	5.696E-05

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-131m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	1.619E-06	1.149E-06
NNE	1330.	1330.	1.809E-06	1.118E-06
NE	2408.	2408.	1.086E-06	6.023E-07
ENE	4450.	4450.	7.931E-07	3.740E-07
E	1996.	1996.	9.572E-07	5.855E-07
ESE	838.	838.	1.795E-06	1.343E-06
SE	884.	884.	1.556E-06	1.165E-06
SSE	838.	838.	1.415E-06	1.059E-06
S	829.	829.	1.231E-06	9.123E-07
SSW	829.	829.	1.200E-06	8.696E-07
SW	610.	610.	1.836E-06	1.416E-06
WSW	509.	509.	1.924E-06	1.517E-06
W	509.	509.	1.842E-06	1.459E-06
WNW	625.	625.	1.295E-06	1.020E-06
NW	732.	732.	1.169E-06	9.137E-07
NNW	848.	848.	1.236E-06	9.369E-07

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-133m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	8.652E-06	7.132E-06
NNE	1330.	1330.	8.136E-06	6.492E-06
NE	2408.	2408.	4.246E-06	3.282E-06
ENE	4450.	4450.	2.488E-06	1.807E-06
E	1996.	1996.	4.247E-06	3.380E-06
ESE	838.	838.	1.023E-05	8.523E-06
SE	884.	884.	8.871E-06	7.391E-06
SSE	838.	838.	8.070E-06	6.723E-06
S	829.	829.	6.932E-06	5.764E-06
SSW	829.	829.	6.578E-06	5.446E-06
SW	610.	610.	1.085E-05	9.094E-06
WSW	509.	509.	1.168E-05	9.823E-06
W	509.	509.	1.125E-05	9.467E-06
WNW	625.	625.	7.851E-06	6.603E-06
NW	732.	732.	7.021E-06	5.896E-06
NNW	848.	848.	7.155E-06	5.976E-06

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-133

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	7.076E-06	5.996E-06
NNE	1330.	1330.	7.099E-06	5.846E-06
NE	2408.	2408.	3.969E-06	3.192E-06
ENE	4450.	4450.	2.442E-06	1.873E-06
E	1996.	1996.	3.841E-06	3.162E-06
ESE	838.	838.	8.228E-06	7.043E-06
SE	884.	884.	7.079E-06	6.059E-06
SSE	838.	838.	6.364E-06	5.446E-06
S	829.	829.	5.333E-06	4.551E-06
SSW	829.	829.	4.991E-06	4.237E-06
SW	610.	610.	7.968E-06	6.849E-06
WSW	509.	509.	8.550E-06	7.382E-06
W	509.	509.	8.364E-06	7.230E-06
WNW	625.	625.	5.857E-06	5.057E-06
NW	732.	732.	5.288E-06	4.559E-06
NNW	848.	848.	5.548E-06	4.758E-06

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-135m

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	1.416E-04	1.194E-04
NNE	1330.	1330.	1.195E-04	1.008E-04
NE	2408.	2408.	5.077E-05	4.279E-05
ENE	4450.	4450.	1.919E-05	1.616E-05
E	1996.	1996.	5.672E-05	4.783E-05
ESE	838.	838.	1.786E-04	1.507E-04
SE	884.	884.	1.527E-04	1.288E-04
SSE	838.	838.	1.402E-04	1.183E-04
S	829.	829.	1.183E-04	9.980E-05
SSW	829.	829.	1.113E-04	9.389E-05
SW	610.	610.	1.963E-04	1.656E-04
WSW	509.	509.	2.165E-04	1.827E-04
W	509.	509.	2.095E-04	1.768E-04
WNW	625.	625.	1.405E-04	1.186E-04
NW	732.	732.	1.240E-04	1.046E-04
NNW	848.	848.	1.222E-04	1.031E-04

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-135

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	8.262E-05	7.032E-05
NNE	1330.	1330.	7.394E-05	6.291E-05
NE	2408.	2408.	3.669E-05	3.121E-05
ENE	4450.	4450.	1.928E-05	1.639E-05
E	1996.	1996.	3.838E-05	3.265E-05
ESE	838.	838.	9.937E-05	8.458E-05
SE	884.	884.	8.616E-05	7.334E-05
SSE	838.	838.	7.845E-05	6.677E-05
S	829.	829.	6.719E-05	5.719E-05
SSW	829.	829.	6.344E-05	5.399E-05
SW	610.	610.	1.066E-04	9.077E-05
WSW	509.	509.	1.154E-04	9.822E-05
W	509.	509.	1.112E-04	9.464E-05
WNW	625.	625.	7.742E-05	6.590E-05
NW	732.	732.	6.906E-05	5.879E-05
NNW	848.	848.	6.973E-05	5.935E-05

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-137

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	4.869E-05	4.135E-05
NNE	1330.	1330.	3.775E-05	3.206E-05
NE	2408.	2408.	1.153E-05	9.790E-06
ENE	4450.	4450.	2.512E-06	2.133E-06
E	1996.	1996.	1.420E-05	1.206E-05
ESE	838.	838.	6.553E-05	5.565E-05
SE	884.	884.	5.372E-05	4.563E-05
SSE	838.	838.	4.926E-05	4.184E-05
S	829.	829.	4.072E-05	3.459E-05
SSW	829.	829.	3.558E-05	3.023E-05
SW	610.	610.	7.052E-05	5.992E-05
WSW	509.	509.	8.398E-05	7.135E-05
W	509.	509.	8.287E-05	7.040E-05
WNW	625.	625.	5.216E-05	4.431E-05
NW	732.	732.	4.397E-05	3.735E-05
NNW	848.	848.	4.262E-05	3.620E-05

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)

Site Boundary Finite Plume Gamma Dose Factors for Xe-138

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	3.985E-04	3.453E-04
NNE	1330.	1330.	3.288E-04	2.848E-04
NE	2408.	2408.	1.356E-04	1.175E-04
ENE	4450.	4450.	4.939E-05	4.276E-05
E	1996.	1996.	1.540E-04	1.334E-04
ESE	838.	838.	5.071E-04	4.394E-04
SE	884.	884.	4.351E-04	3.770E-04
SSE	838.	838.	4.037E-04	3.499E-04
S	829.	829.	3.457E-04	2.996E-04
SSW	829.	829.	3.304E-04	2.864E-04
SW	610.	610.	5.882E-04	5.099E-04
WSW	509.	509.	6.457E-04	5.598E-04
W	509.	509.	6.165E-04	5.344E-04
WNW	625.	625.	4.113E-04	3.565E-04
NW	732.	732.	3.615E-04	3.134E-04
NNW	848.	848.	3.514E-04	3.046E-04

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-7 (Cont'd)
Site Boundary Finite Plume Gamma Dose Factors for Ar-41

Downwind Direction	Unrestricted Area Bound (meters)	Elevated(Stack) Release Radius (meters)	S (mrad/yr)/(uCi/sec)	SBAR
N	1022.	1022.	4.809E-04	4.097E-04
NNE	1330.	1330.	4.091E-04	3.485E-04
NE	2408.	2408.	1.925E-04	1.640E-04
ENE	4450.	4450.	9.141E-05	7.788E-05
E	1996.	1996.	2.110E-04	1.798E-04
ESE	838.	838.	5.887E-04	5.015E-04
SE	884.	884.	5.144E-04	4.383E-04
SSE	838.	838.	4.761E-04	4.056E-04
S	829.	829.	4.168E-04	3.551E-04
SSW	829.	829.	4.022E-04	3.426E-04
SW	610.	610.	6.903E-04	5.881E-04
WSW	509.	509.	7.417E-04	6.319E-04
W	509.	509.	6.999E-04	5.963E-04
WNW	625.	625.	4.843E-04	4.126E-04
NW	732.	732.	4.290E-04	3.655E-04
NNW	848.	848.	4.222E-04	3.597E-04

LaSalle Site Meteorological Data 1/78 - 12/87

Table F-8
Parameters for Calculation of N-16 Skyshine Radiation
From La Salle

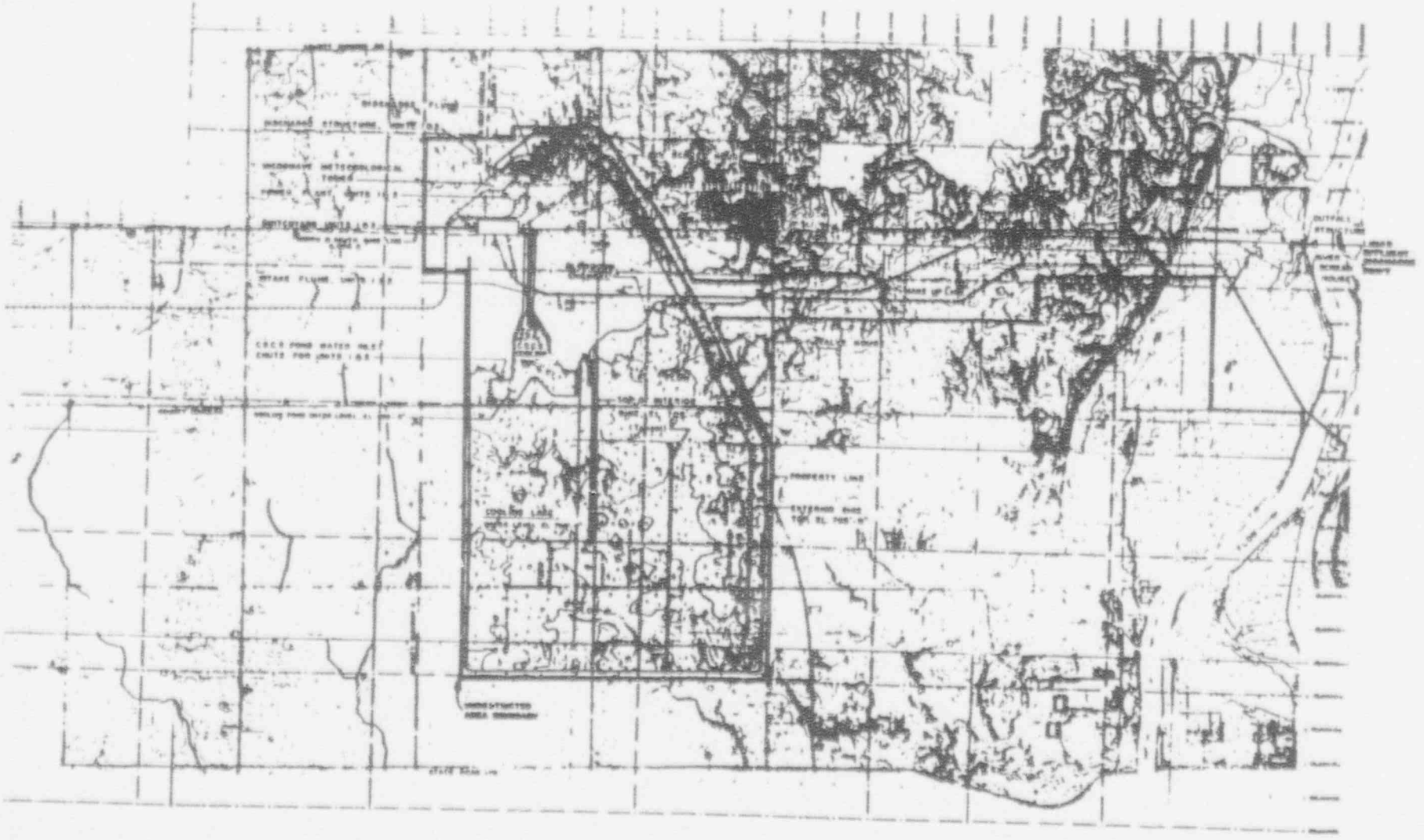
Location Number k	Activity	Occupancy Hours OH_k	Shielding Factor SF_k	Distance R_k (m)
1	Living at home	8360	0.7	1100[a]
2	Fishing	400	1.0	2100
3	Living at the National Guard Facility	2500	0.7	2400

Notes:

1. These parameters are used to obtain an initial estimate of skyshine dose to the maximally exposed member of the public using Equation A-35 of Appendix A. If desired, more realistic parameters could be used in place of these to refine the estimate.

2. In determining the maximally exposed individual, the following possibilities were considered: the nearest resident, fishermen, and persons at the National Guard facility north of the site. The exposure 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 Reference 2 of Section F.2.

a Distance to nearest residence (see Table F-3).



OFFSITE DOSE CALCULATION MANUAL LA SALLE COUNTY STATION
FIGURE F-1 UNRESTRICTED AREA BOUNDARY